The repeated-suspect effect: What is the effect of repeated identification attempts on eyewitness accuracy and the original memory for the culprit?

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The repeated-suspect effect: What is the effect of repeated identification attempts on eyewitness accuracy and the original memory for the culprit?

by

Adele Quigley-McBride

A dissertation submitted to the graduate faculty

in partial fulfillment of the requirements for the degree of

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The student author, whose presentation of the scholarship herein was approved by the program of study committee, is solely responsible for the content of this dissertation. The Graduate College will ensure this dissertation is globally accessible and will not permit alterations after a degree is conferred.

Iowa State University
Ames, Iowa
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ABSTRACT

Police routinely give eyewitnesses multiple opportunities to identify the same suspect, and numerous exoneration cases demonstrate that this practice can contribute to wrongful convictions. Empirical research addressing this practice shows it can lead to the repeated-suspect effect, which is a significant increase in suspect identifications after the same suspect has been presented in a previous showup or lineup (Steblay & Dysart, 2016). Procedures that tend to increase the chance of innocent suspect identifications are considered suggestive and produce unreliable eyewitness decisions. Thus, the use of multiple identification opportunities is considered suggestive and are discouraged by researchers (Wells et al., 2020). Despite this, eyewitness testimony obtained using suggestive procedures is frequently used at trial anyway because it is still admissible in court if other criteria are met indicating the identification was “nevertheless reliable” (Manson v. Brathwaite, 1977; Wells & Quinlivan, 2009). This dissertation builds on past research in this area by examining the effect of more the one intervening lineup and biased intervening lineups containing the same innocent suspect in two experiments, and how these different intervening lineup manipulations impact identification outcomes, confidence, and mechanism-related questions.

Participants in both experiments watched a crime video, completed an intervening task phase, then evaluated a final, fair lineup. For Experiment 1, the intervening tasks were a fair lineup, a biased lineup, or a reading comprehension control task, and the final lineup contained either an innocent suspect, repeated from the intervening lineup, or the true culprit embedded among five fillers. For both studies, a repeated-suspect effect occurred such that a fair intervening lineup containing the innocent suspect resulted in more misidentifications of that same innocent suspect in the final lineup, consistent with past research. Furthermore, when
participants received an intervening lineup that was biased towards the repeated innocent suspect, the repeated-suspect effect was more pronounced with significantly more innocent suspect picks from the final lineup when compared with participants who received a fair intervening lineup. Similarly, in Experiment 2, presenting participants with two intervening lineups exacerbated repeated-suspect effects relative to only one intervening lineup, particularly when one of those intervening lineups was biased. In Experiment 1, participants who received a final lineup containing the culprit were equally able to identify the culprit regardless of the intervening task condition, indicating that the memory for the true culprit was maintained despite exposure to misleading intervening lineups.

Overall, these studies confirm that multiple identification attempts that each contain the same innocent suspect decreases the reliability of eyewitness decisions and increases the risk of misidentification for the innocent suspect. Moreover, these effects become stronger when the intervening lineups are biased or when more intervening lineups are introduced. Post-identification questions were also used to determine how the repetition manipulation and lineup bias manipulation might influence the relative contribution of two cognitive (dual-process recognition and source misattribution) and two social (commitment and demand characteristics) mechanisms for repeated-suspect effects. These self-report measures were used to speculate about how these processes are involved in creating repeated-suspect effects and to encourage future research addressing non-memory mechanisms in eyewitness identification research.
CHAPTER 1. INTRODUCTION

Most errors in eyewitness identification occur as a result of relatively common, everyday failures in decision-making and memory. In the context of everyday life, these types of errors are inconvenient, but ultimately relatively inconsequential (Neth & Gigerenzer, 2015). Consider a situation where a person comes across someone that they know and, after some thought, decides that they recognize them from a yoga class. If the recognizer is mistaken and this person is actually a barista who works regularly at the local café, the consequences are unlikely to be severe for any of the individuals involved. The “victim” of the memory failure might correct the person and may even be mildly offended, but any lasting penalties are unlikely. Yet, if an eyewitness to a crime makes an error like this and is mistaken about the reason that they remember someone during a criminal investigation, this type of ordinary mistake can lead to serious consequences. In fact, using the database of forensic DNA-based exonerations, eyewitness misidentification is the leading cause of proven wrongful convictions in the US legal system (Innocence Project, 2020).

Consider a case in which decision making and memory errors resulted in the wrongful conviction of John Jerome White. White was convicted of sexual assault and burglary in 1979 in Atlanta, Georgia, and the victim in this case identified White as her attacker in two different lineups. After 22 years in prison, however, White was exonerated using DNA evidence (Innocence Project, 2020). In this case, the DNA evidence also revealed the identity of the actual perpetrator, a man named James Parham. At first glance, the White case does not seem unique when considered among the more than 200 cases of DNA-based exonerations of innocent people who were mistakenly identified by eyewitnesses. Here, though, the victim identified White twice—initially from a photo-lineup and subsequently identified him again from a live lineup.
Importantly, the only person in common between the two lineups was White. That is, the fillers in the first (photo) lineup and the second (live) lineup were different people. Presenting an eyewitness with multiple lineups is not unusual in the DNA exoneration cases of mistaken identification as it is distressingly common in police practice (Steblay & Dysart, 2016). But the second (live) lineup in the White case had a bizarre fluke in it. Unbeknownst to anyone at the time, one of the people chosen to be a filler in the live lineup was the actual perpetrator, James Parham. Despite the fact that the actual perpetrator was now fully visible in person to the victim, she made no hesitation in re-identifying White. The live lineup in this case is shown in Figure 1. The actual perpetrator is on the far right, and White is in the middle.

Figure 1. Lineup containing John Jerome White (third from the left) and the real culprit, James Parham (fifth from the left), along with three known-innocent fillers.

There are few details available regarding the initial photo lineup, so no one can say for sure why the eyewitness picked White the first time. In hindsight, it is surprising that she picked White initially as he does not look very similar to the true culprit at all, with the exception of also
being a black male with a moustache. Perhaps the fillers in the first photo lineup were even less similar in appearance to Parham than was White. Or perhaps the lineup administrator, who was the case detective rather than a blind administrator, cued the witness to pick White from that initial photo-lineup in some way. We will never know what exactly transpired, but it is certainly possible that the eyewitness was either nudged by the administrator or biased by the lineups.

However, for the purposes of this dissertation, the most interesting part of this case is that the second lineup afforded the eyewitness a good, close, live view of the actual culprit, Parham. Why did the eyewitness not pick Parham, the actual culprit, now that he was in the lineup? When she identified White in the previous lineup, did she then feel committed to that decision and felt she had to pick White in order to stay consistent? Is it because White felt very familiar to her, but she misremembered the situation in which she had seen White before? Had exposure to White somehow displaced or altered her memory of Parham? These are some of the potential processes that were investigated in this dissertation.

Inspired by instances such as the White case, the current project addressed the effect on eyewitness identification decisions and associated confidence levels when the eyewitness is repeatedly exposed to a particular suspect across multiple identification procedures (referred to here as repeated-suspect effects). A body of literature already exists demonstrating that misidentifications of a suspect increase when people see that innocent suspect multiple times, whether the prior presentation was in a mugshot (e.g., Deffenbacher, Bornstein, & Penrod, 2006), an initial showup (e.g., Haw, Dickinson, & Meissner, 2007), or a previous lineup (e.g., Steblay & Dysart, 2013).

The current work draws inspiration from prior repeated-suspect studies but is also unique in several ways. First, the current studies extend the repeated-suspect literature by including both
biased and fair intervening lineups. To be clear, though the presentation of multiple identification procedures containing the same innocent suspect is not a “fair” eyewitness identification procedure when considered as a whole. But the individual procedures can be constructed in ways that are fair or biased. In other words, a final identification attempt may be constructed in a way that ensures the innocent suspect does not stand out (a fair lineup), but a previous lineup may make the lineup unfair if the innocent suspect was also in a previous lineup. Investigating the role of biased lineups in repeated-suspect effects is an important contribution for a couple of key reasons. A biased lineup changes how people perceive, process, and remember the faces in that lineup—namely, by drawing attention away from the fillers and towards the suspect in the lineup. Thus, there are theoretical reasons to believe that a repeated innocent suspect who appears in a previous biased lineup will receive significantly more misidentifications in another, fair lineup at a later time compared with if that same innocent suspect was previously seen in a fair lineup.

The use of biased lineups in a repeated-suspect effect paradigm also directly tested the suggestion made by the dissenting judges in the Supreme Court decision of *Manson v. Braithwaite* (1977)—that a subsequent fair lineup can “correct” any suggestive influence caused by a previous, suggestive identification procedure (such as a biased lineup). Under the current law in *Manson v. Braithwaite*, suggestive identification procedures and any associated eyewitness testimony can be admissible in court if the eyewitness meets a set of criteria. That is, eyewitness testimony is admissible if the eyewitness was, in general, confident in the identification, had a good view of the culprit during the crime, was attentive during the crime, the accused matches their initial description of the culprit, and the time that passed between the crime and identification procedure was reasonable. But the dissenting judges in this case
proposed a different solution. Specifically, they proposed that if a prosecutor learns that an identification procedure was unfairly suggestive, the prosecution can “easily arrange another lineup conducted under scrupulously fair conditions” (Manson v. Braithwaite, 1977, p.g. 11) to ensure their eyewitness can appear in court. The current studies test this idea for the first time. These experiments were expected to show that the dissenting judges were misguided and, once an eyewitness has been given an opportunity to identify a suspect (in a suggestive or fair procedure), any subsequent decisions made by that eyewitness about that same suspect are contaminated and should not be admissible in court.

Second, post-identification questions about participants’ subjective memory experience were administered to investigate the nature of any memory processes associated with repeated-suspect effects. Although assessing memory processes is not unique to this work (see Haw, Dickinson, & Meissner, 2007), these experiments are the first to measure a combination of memory and non-memory mechanisms in a repeated-suspect paradigm and how the relative contribution of these mechanisms might shift as a result of the various repetition manipulations. That is, the relative contribution of these memory processes was expected to change according to which intervening task a participant received (i.e., fair versus biased initial lineup, the number of intervening lineups, and whether the true culprit or the repeated innocent suspect is present in the final lineup). For example, determining the source of any feeling of recognition is predicted to be influenced by the fairness of the intervening lineup (source monitoring). Specifically, because an innocent suspect is more salient in a biased lineup than in a fair lineup, it was predicted that participants will be more likely to report that the previous lineup was a source of recognition when the lineup is biased rather than fair.
The experimental conditions should also change participants’ reports about their recognition experience (*dual-process recognition*). Sometimes eyewitnesses feel like a lineup member is familiar, but no particular reason for that familiarity comes to mind. This situation may arise when an eyewitness has seen an innocent suspect before in a context where the innocent suspect was not particularly salient or memorable, such as a previous, fair lineup in which the innocent suspect was embedded among other, similar looking individuals. Other times (e.g., after a biased intervening lineup), participants may recall both the face and the context in which they have seen that face before. Variations in participants’ reports of recognition experiences and source judgments across the current experimental conditions have yet to be examined in repeated-suspect effect research.

Another of the more unique features of the current studies is the use of post-identification questions to assess participants’ motivations for misidentifying the innocent suspect more than once. Do participants report that they identified the same person again because they wanted to appear consistent (*commitment processes*; Foote, 1951; Kielser, Pallack, & Kanouse, 1968)? Past research suggests that choosing a person from an earlier lineup is associated with choosing the same person again later if that they appear in a subsequent lineup (Steblay & Dysart, 2016). However, calling this a commitment effect involves implicit assumptions about the reasons for these choosing patterns without an actual investigation into the underlying mechanisms.

Specifically, the label “commitment” presumes a motive on the part of the eyewitness—that they wish to remain consistent with their earlier decisions (Brigham & Cairns, 1988; Swann & Bosson, 2010). Alternatively, though, it may be that these participants simply have a stable preference for that individual across identification procedures. That is, those eyewitnesses who thought that the innocent suspect looked most like the culprit in the first lineup are also likely to
think that person looks like the culprit again even when presented with different fillers. The
current studies are the first to look for evidence that participants who choose the innocent suspect
multiple times do so as a result of a particular motive to appear consistent.

The aspects of the experiments discussed so far appear in both experiments. There were
also three additional manipulations that only appear in one of the experiments. In Experiment 1,
half of the people saw the true culprit in their final lineup so that I could measure participants’
abilities to maintain the memory for the true culprit’s face despite having viewed an intervening
culprit-absent lineup and even having picked an innocent person in the intervening lineup. Does
a biased or fair intervening lineup containing an innocent suspect prevent participants from
identifying the true culprit in a later lineup, compared with when someone receives no
intervening lineups? The fate of the memory for the true culprit has not been a focus in past
research, but knowing the impact of a repeated-suspect on the true memory for the culprit is
crucial for assessing the risk associated with target-absent, intervening lineups.

Another possible process that might lead to a repeated-suspect effect is demand
characteristics. In a real case, for example, the fact that a detective has chosen to include a person
seen in a previous identification procedure in a new lineup could lead the eyewitness to make an
inference about what the detective is trying to achieve by repeating that individual. In this
context, the repetition heavily suggests that the detective believes this person is the culprit and
expects the eyewitness to pick that person. Experiment 2 explores the possibility of this type of
social influence by asking some questions of the participants at the conclusion of the study. To
better simulate a real-world situation, the experimenter remained in the room with the participant
for the duration of the procedure in Experiment 2 to help create the appearance that the
experimenter knew how the participant had responded to the previous lineup and had control
over what lineup came next. Non-memory factors, such as demand characteristics, have not received attention in past studies (the focus has been almost exclusively on memory processes). However, as will be discussed later, social influence can have powerful effects on eyewitness decision-making independent from, and in conjunction with, memory effects.

Finally, Experiment 2 introduced an additional intervening lineup phase and increased the potential for social influence factors to affect participants. So, Experiment 2 participants might have received zero, one, or two target-absent intervening lineups. Moreover, as in Experiment 1, the first intervening lineup could be biased or fair lineup containing the innocent suspect, but if participants received a second target-absent, intervening lineup, this was always a fair lineup. The additional lineup phase was expected to increase the strength of the repeated-suspect effect—people should be more likely to misidentify an innocent suspect after seeing them in two previous lineups, rather than one or none—but also alter the nature of the associated source monitoring, recognition, and social influence processes.

This paper begins with a review of the relevant literature, starting with a summary of eyewitness identification procedures. Specifically, I focus on what the recommendations are for administering fair lineups that reduce the risk to innocent suspects, while maintaining the rate of true culprit identifications as much as possible. The suggestive eyewitness procedures that are relevant to the current dissertation are also discussed with an emphasis on how these procedures alter choosing and increase the risk of innocent suspect misidentifications. The next section of this dissertation explores the research relevant to investigations of multiple lineup procedures and the repeated-suspect effect, before addressing any current research about the repeated-suspect effect specifically. The introductory section of this dissertation finishes with a
comprehensive discussion of the five potential memory and non-memory factors measured here. Each is described more broadly and in the specific context of repeated-suspect effects.

Next, the predictions relevant to Experiment 1 are outlined and the associated experimental methods are described, followed by an explanation of the results that were found. Results are organized based on the predictions that each set of analyses is designed to address. The results of Experiment 1 are summarized before Experiment 2 hypotheses are introduced along with the associated experimental design. After the methods for Experiment 2, the results are presented, again organized by the hypotheses that each section addresses. Experiment 2 results are discussed in brief before moving into a General Discussion of these studies.

**Eyewitness Identification Procedures**

An *identification procedure* is a protocol used by criminal investigators to present a person to someone who witnessed a crime with the goal determining whether that person is the perpetrator that the witness saw. The person being presented to the witness is called a *suspect* and has been singled out by the police as someone who might have committed the crime. A suspect, therefore, might or might not be guilty, but something has made the police think that there is a reason present this person the eyewitness. The suspicion could be based on something as simple as a hunch, or as strong as physical evidence placing the suspect at the scene of the crime (Wells & Quigley-McBride, 2016). Identification procedures are a type of *system variable*—a variable that the criminal justice system has control over and can influence eyewitnesses when they provide evidence about the crime or make identification decisions (Wells, 1978). Repeated-suspect effects occur when an eyewitness is presented with *multiple* identification procedures containing the *same* suspect, which is a specific type of eyewitness identification context.
It is well-established that aspects of an identification procedure can increase suspect identifications whether or not the suspect is guilty. Procedures that result in the types of errors that put innocent suspects at risk are part of a larger class of suggestive eyewitness identification procedures—decision-making protocols that can influence an eyewitness’s memory for the crime event or encourage an eyewitness to use information other than their memory for the culprit to make an identification decision. There are a variety of identifications procedures that can be considered “suggestive,” but this dissertation will focus on those that are most relevant to the current studies: showup procedures, biased lineup procedures, and multiple identification procedures with the same eyewitness. To begin, though, I will discuss what research recommends regarding best practices for identification procedures.

**Research-Based Recommendations for Conducting Eyewitness Identification Procedures**

Eyewitnesses are vulnerable to influence from many different sources, regardless of the quality of their memory for the true culprit. Even an eyewitness who originally had a high-quality memory for the culprit’s face can be influenced to identify an innocent person, or feel more or less confident in their decision, based on information encountered before, during and after a lineup procedure (Wells & Quigley-McBride, 2016). There are many ways that an eyewitness’s ability to identify the culprit may be hindered, and many cannot be controlled by law enforcement. Eyewitnesses cannot be prevented from engaging with news media or talking to others about the event. Plus, their memory for the culprit’s face may have been limited from the outset due to features of the crime, such as the presence of a weapon or a poor view of the culprit (estimator variables, Wells, 1978). Law enforcement can control the procedures that they use when interacting with eyewitnesses and gathering evidence from eyewitnesses, though, and there is a wealth of literature demonstrating best-practices for gathering eyewitness evidence.
Ideally, an identification procedure will maximize the number of times eyewitnesses make correct identifications of true culprits and minimize the number of misidentifications of innocent suspects. There is already a wealth of research concerning the types of procedures that are most likely to achieve these outcomes (see Wells et al., 2020 for a recent summary of the research-based recommendations). In general, the best-practice recommendation is to have an eyewitness take part in a single identification procedure (Steblay & Dysart, 2016) that makes use of a fair lineup (Luus & Wells, 1991), accompanied by unbiased instructions informing them that the culprit may not be one of the people in the lineup (Clark, 2005). The lineup should be administered by a person who does not know who the investigators expect the eyewitness to pick from the lineup (double-blind administration; Kovera & Evelo, 2017), and the lineup should contain only one person that the police think committed the crime as a result of other investigative work (Wells & Turtle, 1986). This suspect should be surrounded by up to five other individuals that are known to be innocent—called fillers—that match the general description of the suspect and culprit, but are not so similar that even someone who got a good look at the culprit would be confused (Fitzgerald, Price, Oriet, & Charman, 2013). There are other recommendations detailed by Wells and et al. (2020), but generally speaking if the identification procedure follows these guidelines, the procedure will encourage accurate decisions and discourage incorrect identifications.

Many of these research-based recommendations have been used to create law enforcement policies, but policies are not always indicative of true police behavior in practice. Results from self-report surveys suggest that there are many instances in which policies are not followed in the field (Behrman & Davey, 2001; Wells, et al., 2000). For example, police frequently conduct showups initially, followed by a lineup containing the same suspect at a later
time to ensure the eyewitness evidence will be admissible in court. Similarly, police might construct a second, “better” lineup to secure a conviction (Wells & Quinlivan, 2009). Both showups and multiple identification attempts with the same suspect have been defined as “suggestive” by empirical work, but are regularly used in practice.

**Suggestive Identification Procedure: A Showup Procedure**

A “showup” is an identification procedure in which the eyewitness is simply asked to decide if one individual, presented alone, is the perpetrator of the crime (Haw, Dickinson, & Meissner, 2007; Steblay, Dysart, Fulero, & Lindsay, 2003). Showups typically occur in a specific context—immediately after a crime event. The police called to the scene will often scour the surrounding area to see if anyone nearby matches the eyewitness description of the culprit. If someone is found during this search, the police might conduct a showup to determine if this is the culprit the eyewitness saw (Smith, Wells, Lindsay, & Myerson, 2018). However, an identification made using a showup procedure might not be admissible in court—showups are suggestive procedures and evidence obtained from suggestive procedures can only be presented in court if the judge finds that the identifications was “nevertheless reliable” (two-step test outlined in *Manson v. Braithwaite*, 1977 and *Neil v. Biggers*, 1972). To do this, the judge will assess the eyewitness’s experience during the crime and identification procedure using five criteria: the quality of their view, how attentive they were during the crime, how accurate their description of the culprit was, how much time passed between the crime and the identification procedures, and their certainty in their identification decision. So, a showup could pass these criteria and be admissible, but police can also circumvent addressing these criteria by conducting a subsequent, fair lineup procedure, which will be admissible as evidence in court under the first step of the test. As a result, showups are frequently followed by a lineup procedure at a later time with the same suspect and eyewitness to ensure that the eyewitness’s testimony can be used in
court (Haw et al., 2007). Therefore, an intervening showup is likely to be one of the most common examples of a repeated-suspect effect in the real world.

Though there are instructions that can be used to reduce the likelihood of a misidentification during a showup procedure, such as informing the eyewitness that there will be other opportunities to make an identification if they do recognize this person (Eisen, Smith, Olaguez, & Skerritt-Perta, 2017; Smith et al., 2018), this procedure is not recommended in practice (Wells et al., 2020). A showup procedure cannot be conducted double-blind as it is obvious to both the administrator and the eyewitness who the suspect is, so any suggestive information will increase identifications of that suspect regardless of their guilt. For instance, the knowledge that this person was found nearby is likely to bias eyewitness decisions in favor of “guilt” (Smith et al., 2018). Thus, showups put innocent suspects at a higher risk for misidentification because every mistaken identification will fall on the innocent suspect. Meta-analyses confirm that showups result in significantly more misidentifications of innocent suspects than fair lineups (Neuschatz, et al., 2016; Steblay et al., 2003). Showups often result in more correct identifications too, but this favorable outcome relies on the same mechanism that leads to increases in incorrect identifications—the suggestive nature of the procedure rather than an actual improvement in eyewitness performance (Smith, et al., 2018).

**Suggestive Identification Procedure: A Biased Lineup**

A lineup is a procedure where an array of photos, or a line of live individuals, is presented to an eyewitness. The person suspected of the crime is one of the people in the lineup (the guilty or innocent suspect), embedded among similar-looking people that are known to be innocent. The known-innocent lineup members are called fillers and can be selected for the lineup in various ways, such as matching them to the eyewitness’s description of the culprit, or to the suspect. Regardless of how the fillers are selected, a fair lineup must ensure that the suspect
does not stand out from the fillers in the lineup and can protect innocent suspects from being misidentified by eyewitnesses (Lindsay & Wells, 1980; Wells, Leippe, & Ostrom, 1979).

A fair lineup is effective in this way because, if an eyewitness views a fair lineup containing an innocent suspect (a target-absent lineup), the fillers and the innocent suspect should appear to be equally plausible choices to the eyewitness. The lineup is essentially an array of innocent people that the eyewitness has never seen before so, provided the lineup is actually fair and well-constructed, the eyewitnesses should reject the lineup (culprit is “not present”) or identify one of the lineup members at random (Smith, Wells, Lindsay, & Penrod, 2017).

Well-selected fillers are critical to an effective lineup procedure because they are definitely innocent (with the exception of the case described at the start of this dissertation, which was an anomaly). For this reason, fillers will never be prosecuted. So, if an eyewitness identifies a filler from a fair lineup rather than the suspect, this is relatively inconsequential for that filler. However, it does provide the police investigator with useful information about the reliability of the eyewitness and the probable guilt of the suspect (Smalarz, Kornell, Vaugh, & Palmer, 2019). In other words, the eyewitness felt that someone who is definitely not the culprit looked most like the culprit out of these individuals in the lineup, which may mean they did not get a good look at the culprit during the crime. If the eyewitness did get a good look at the culprit during the crime, their identification of a filler may also mean that the police suspect is not the culprit and the eyewitness was willing to select someone from the lineup even if they were a poor match to their memory of the perpetrator (Smith, Wells, Smalarz, & Lampinen, 2018).

For a truly fair lineup, when the suspect is not the culprit, there should be an equal chance that the eyewitness will identify one of the fillers or the innocent suspect—a one in six chance for a standard six-person lineup. Thus, five out of six decisions about a fair lineup in which an
eyewitness is guessing or makes a mistake will land on fillers (filler siphoning; Smith et al., 2017). However, if the real culprit is in the lineup (a target-present lineup), the eyewitness should find that they stand out from the fillers, because the culprit is familiar and the fillers are not. Fillers should, therefore, draw fewer choices away from the culprit than they do from an innocent suspect when a reliable eyewitness is presented with a fair lineup containing the true perpetrator. In this way, fair lineups do not change the decisions of relatively confident eyewitnesses with a good memory for the crime, but will redirect the decisions of uncertain eyewitnesses and those with weak memories away from the suspect to the fillers (Smith et al., 2017). A fair lineup procedure is the format recommended for presenting a suspect to an eyewitness (Wells et al., 2020).

Although a lineup is by far the best procedure for obtaining accurate eyewitness identification evidence, a lineup can still be administered ineffectively or in a suggestive manner. For instance, a biased lineup makes it obvious to the eyewitness, or sometimes anyone who views the lineup, which lineup member is the police suspect (Wells, et al., 1979). A lineup can be considered biased for many reasons. Lineup instructions that imply that the guilty person is definitely present in the lineup increase the rate at which eyewitnesses decide to make an identification (Clark, 2005; Malpass & Devine, 1981). When the suspect is the only person wearing clothes similar to those worn by the culprit during the crime, this will increase the rate at which participants select the suspect from the lineup (Lindsay, Wallbridge, & Drennan, 1987). However, the focus in this proposal is on filler-biased lineups.

Filler-biased lineups are constructed in a way that makes the suspect stand out from the other lineup members because the fillers do not match the suspect’s general appearance or description. For instance, take a situation where an eyewitness reports that the culprit has a scar.
If a lineup is created where the suspect is the only person in the lineup with that type of scar, then the lineup is biased. As a result, the same number of people will choose from the lineup as would from a fair lineup containing the same suspect, but these choices will accumulate mainly on the suspect (Smith et al., 2017). Therefore, although a biased lineup presents multiple people, only one of them is a truly plausible identification option. This means that, because the fillers are not sufficiently similar to the suspect or the description of the culprit, a biased lineup offers no protection to an innocent suspect because no filler siphoning occurs (Smith et al., 2017).

Bias can be subtle, such as in the White case (see Figure 1), where White is the only person in the lineup posing differently. Bias could also be extreme, such as a single, African American suspect surrounded by Caucasian fillers, but this is comparatively rare. Whatever the source of the bias, a biased lineup draws the decision-maker’s attention to the suspect and increases the chance that the suspect will be identified, regardless of their guilt. Sometimes a lineup is biased in such an obvious way that any person could look at the lineup and pick out the police suspect, such as a lineup in which only the suspect is wearing prison orange. The effect of a biased lineup is very similar to a showup, as there is only one plausible option and it is obvious who the suspect is. In fact, sometimes a biased lineup can be even more suggestive than a showup because lineups tend to increase choosing compared to showups, even when they are biased. Thus, the lineup procedure encourages more choosing but directs that choosing towards the suspect (Smith et al., 2017).

**Suggestive Procedure: Multiple Identification Attempts with the Same Eyewitness**

There are many reasons why police may present an eyewitness with a suggestive identification procedure—the police might be motivated to hold someone responsible for the crime, might seek retribution for a distressed witness, or might simply not understand that a procedure is suggestive. An eyewitness might also be uncertain the first time they identify
someone from a lineup, particularly in situations where there is no other evidence obtained during the investigation to suggest that this is the suspect (Wells et al., 2020). A suggestive procedure or a procedure in which the eyewitness was hesitant do not make a strong case, so the police investigator might feel a need to obtain some other eyewitness evidence to support a prosecution. The admissibility criteria for evidence at trial do not prevent police from conducting another, fair lineup procedure with the same suspect and eyewitness to ensure that the eyewitness evidence is compelling and can be presented in court (Manson v. Braithwaite, 1977). In fact, in the dissenting opinion of Manson, the judges specifically suggested that simply administering a new, fair lineup procedure with that same suspect was a way to correct for the previous, biased identification procedure. However, another identification procedure containing only a single, repeated person from a previous lineup is not a research-based solution to a previous, suggestive procedure. In fact, repetitive presentation of the same suspect to the same eyewitness is just another way to suggest to the eyewitness which lineup member is the suspect.

Actually, multiple identification procedures are problematic even when no one is repeated across identification procedures, though the repeated-suspect case is the focus of the current dissertation. When an eyewitness sees many different faces of individuals during the course of the criminal investigation, this can harm their ability to identify the true culprit later. Why? Each new face is a new piece of information relevant to the case and research shows that a plethora of new information can hinder a person’s ability to remember older, similar information (e.g., retroactive interference; Windschitl, 1996). That is, eyewitnesses are exposed to so many faces during the criminal investigation that this may interfere with their memory for the face associated with the actual crime event. In addition, if an eyewitness selects someone from a previous lineup (Smalarz et al., 2019) and receives feedback of any kind about a previous
identification (Smalarz & Wells, 2014), this will alter the identification decisions they make in later lineups even when no one is repeated across procedures. When the same person *does* appear in multiple lineups, the suggestive influence is more obvious and targeted towards a particularly lineup member, particularly when the initial presentation of the suspect is also inherently suggestive, such as a showup (Haw et al., 2007).

**Research Relevant to Repeated-Suspect Effects**

The research relevant to the repeated-suspect effect falls into four categories: bystander-culprit confusion effects, mugshot-exposure effects, “blank” lineup procedures, and repeated-suspect effects. Though not all of these paradigms involve two formal identification attempts, they all involve repeated exposure to an innocent person and examine the influence of that exposure on eyewitness accuracy in a final identification attempt. Hence, all of these areas are relevant to the potential underlying mechanisms that are responsible for repeated-suspect effects, and the relevant research in each area will be discussed in turn.

**Bystander-Culprit Confusion Effect**

One reason that a lineup may contain a person that an eyewitness recognizes is when multiple individuals are present at the crime scene or seen soon after the crime. Importantly, not all of the people present at a crime scene will be culprits—some are bystanders (e.g., Buckhout, 1974). The eyewitness might become familiar with the faces of any innocent bystanders and any culprits and, thus, might experience a similar level of familiarity for culprits and bystanders if these individuals are presented in a later identification procedure. Experiments investigating this type of scenario refer to this as *unconscious transference* (Loftus, 1976), but I will refer to this type of scenario as the *bystander-culprit confusion effect* because this label more clearly describes this type of identification error.
In one of the first empirical studies in this area, Loftus (1976) presented participants with photos of a guilty person and faces of other, innocent men. Three days later, the participants were asked to view a lineup containing either the person that they were told was the real culprit (target-present) or one of the innocent men (target-absent). When presented with the culprit-absent lineup, participants often misidentified the familiar, innocent face and found it very difficult to determine which familiar faces were innocent or guilty (Loftus, 1976). Similar results have been found with videotaped events containing a culprit and an accomplice (Geiselman, MacArthur, & Meerovitch, 1993). However, other studies have failed to find bystander-culprit confusion effects under similar conditions (Geiselman, Haghighi, & Stown, 1996).

Why do people find it difficult to determine whether a familiar face is the culprit or not? Some researchers suggest that people are better able to tell when a person’s face is familiar than they are at determining the source of that familiarity. Typically, when unsure, people will draw on contextual information or attempt to analyze the quality of their own memory (Johnson, Hashtroudi, & Lindsay, 1993; Tversky & Kahneman, 1974). In the case of a lineup, the context itself strongly suggests that anyone who is familiar must be familiar because the person is the culprit. If this is the process underlying bystander-culprit confusion, participants will find it easy to determine whether a particular face is familiar, but struggle to attribute this feeling of familiarity to something other than this person being the culprit. Thus, the eyewitness misidentifies a familiar, innocent bystander as the culprit.

Some research suggests that warning people about the possibility of this confusion reduces bystander-culprit confusion effects (Ross, Ceci, Dunning & Toglia, 1994). Bystander-culprit confusion effects are also sensitive to the timing or features of the encoding scenario, with attenuated effects in weaker encoding conditions (Read, Tollestrup, Hammersley, McFazden, &
Christensen, 1990). Age and in-group biases can also exacerbate confusion between bystanders and culprits. For instance, older adults show different patterns of results when viewing older and younger bystanders or culprits (Perfect & Harris, 2003). If the culprit and bystanders belong to a different social group than the eyewitness, this increases misidentifications of innocent bystanders. However, in general, the literature in this area is mixed. A meta-analysis was conducted and the overall effect size associated with bystander-culprit confusion was small, with a reported Cohen’s $d$ of approximately 0.19 (Deffenbacher, Bornstein, & Penrod, 2006). Thus, bystander-culprit confusion effects do not appear to be as robust as other eyewitness identification effects (Geiselman et al., 1996).

**Mugshot-Exposure Effect**

When an eyewitness is exposed to mugshots prior to any formal identification procedure, this situation can also create feelings of familiarity for an innocent person. The *mugshot-exposure effect* refers to the increase in misidentifications seen after eyewitnesses view many mugshots, one of which appears again in subsequent lineup—a mugshot is *repeated* in a later lineup. In contrast to bystander-culprit confusion, mugshot exposure appears to have a larger overall effect, with a Cohen’s $d$ of approximately 0.44 (Deffenbacher et al., 2006).

In some jurisdictions, such as New York City (Goldstein, 2019), it is common for police to ask eyewitnesses to look through a large number of mugshots when they do not have a suspect yet. Unfortunately, this procedure increases the likelihood of misidentification of an innocent person for two reasons. First, the sheer number of people presented in a mugshot set means that there is a high chance there will be at least one person that resembles the culprit enough for the eyewitness to pick them out. Second, unlike a situation with one culprit and a number of innocent bystanders, someone in a mugshot book can very easily become a suspect—even if the eyewitness is not sure, the person in the mugshot clearly has a history of criminal behavior, and
the police will be willing to believe they may be guilty (Wells, 1988). Even if the witness does not identify someone from the mugshots, the potential for misidentification remains—if one of the mugshots is repeated in a later identification procedure (e.g., lineup), an innocent person might stand out as familiar simply because the face was viewed earlier (Brown, Deffenbacher, & Sturgill, 1977; Perfect & Harris, 2003). As mentioned already, an eyewitness might easily be confused by a feeling that they have seen a face before, believing the face was present at the crime rather than seen in the mugshots (for a review, see Deffenbacher, et al., 2006).

Mugshot-exposure effects have been demonstrated to occur in various experimental conditions. Misidentifications occur when participants view just a few or many mugshots. For instance, participants viewed only 18 mugshots in an early study (Brigham & Cairns, 1988), but, in a later study, participants viewed 600 mugshots (Dysart, Lindsay, Hammond & Dupuis, 2001). These effects are found when the to-be-remembered face appears in live events (e.g., Brown et al., 1977 in Experiments 2 and 3, and Lindsay et al., 1994), a crime video (Memon, Hope, Bartlett, & Bull, 2002), or photographs (Brown et al., 1977 in Experiment 1; Loftus 1976). Mugshot-exposure effects also occur even when they are not the focus of an investigation, such as when it is just one of many variables manipulated systematically to influence encoding and retrieval in eyewitness identification tasks (Cutler, Penrod, O’Rourke, & Martens, 1986; Cutler, Penrod, & Martens, 1987).

There are conditions that can exacerbate these effects too, such as including biased instructions, drawing attention to mugshots with clothing biases, or changing the order of the mugshots according to the eyewitness description of the culprit (Lindsay, Nosworthy, Martin, & Martynuck, 1994). In contrast, there is little evidence that the effect of viewing mugshots can be reversed once an eyewitness has seen the photos. For instance, mugshot viewing still results in
many false alarms even when participants are encouraged to use techniques known to improve memory performance, such as context reinstatement (Memon, et al., 2002). Mugshot-exposure paradigms have been important for determining some of the processes responsible for increased false alarms after seeing a set of mugshots.

Consider one of the first examples of mugshot-exposure effects, where participants learned a large number of faces in two different rooms (Experiment 1; Brown, et al., 1977). Although people were proficient at distinguishing between faces seen before versus new faces, they were less capable at reporting the room in which they viewed a particular face. Furthermore, when people witnessed an event and then half of the participants viewed mugshots (Experiments 2 and 3), the people who viewed the mugshots made significantly more misidentifications in a later lineup that includes people who were in the mugshots. These experiments show that people easily determine when someone’s face is familiar, but cannot easily determine the reason for the familiarity.

The mechanisms that have been used to explain these effects are discussed in detail later in this paper. In brief, though, researchers typically conclude that a witness is using other available information to provide clues about where the feeling of familiarity came from (Tversky & Kahneman, 1974), concluding that someone must be the culprit if their face does not feel new (Yonelinas, 2002), or failing to accurately determine the sources of memory (Johnson et al., 1993). These are the same processes that are typically used to explain bystander-culprit confusion—people seek other information, analyze the memory, or look to the context to explain why a face is familiar (Johnson et al., 1993; Tversky & Kahneman, 1974). Finally, in situations where an eyewitness actually chooses one of the mugshots, research shows that people are more likely to choose that face again if it appears in a final lineup compared with a face seen the
mugshot phase but not selected (e.g., in Brigham & Cairns, 1988 and Dysart et al., 2001). This associated between choosing during an earlier mugshot phase or intervening identification procedure phase has been referred to as a commitment effect in the literature.

**Blank Lineup Paradigms**

The concept of “blank” lineups was originally introduced to separate reliable eyewitnesses from eyewitnesses who are highly likely to make an identification error (Wells, 1984; Smalarz et al., 2019). For this procedure, eyewitnesses are shown an initial lineup and, unbeknownst to the eyewitness, this lineup is always target-absent and contains only known innocent fillers. Thus, there is no culprit nor any designated innocent suspect, only people who are known to be innocent. The initial lineup serves as a test that eyewitnesses could pass by rejecting the lineup and saying that the culprit is “not present” (Wells, 1984; Wells & Turtle, 1986). However, because eyewitnesses will often adopt a relative decision-making strategy when viewing a lineup, some eyewitness will misidentify a person in the initial lineup that they believe looks most like the person they remember from the crime (Palmer, Brewer, & Weber, 2012; Wells, 1984). Including a blank lineup first helps to distinguish between eyewitnesses who will identify someone even when they have a weak memory, are uncertain, or are guessing (a low criterion for identification) and eyewitnesses who will wait until they see someone that is a sufficiently high match to their memory (higher criteria for an identification decision). There is an important distinction between blank-lineup and repeated-suspect paradigms, though—there is no risk of wrongful conviction for anyone in the initial lineup and no one appears in both lineups.

Although they cannot speak to the influence of a repeated individual on decisions, blank lineups can speak to the decision-making patterns that occur when someone is presented with multiple lineup procedures and can make an identification in each instance. For instance, Palmer et al. (2012) investigated the impact of a blank lineup on a subsequent lineup decision. In Studies
1a and 1b, people who chose from the initial, blank lineup were less likely to identify someone from the subsequent lineup compared with those who did not choose from the blank lineup or who never received an initial lineup. The blank lineup also reduced the number of culprit identifications, particularly when the participant chose from the blank lineup, but did not affect the number of filler identifications. Thus, the blank lineup actually impaired performance. Study 2, however, showed that choosing from the initial, blank lineup was also associated with reports of a weaker memory of the culprit. Thus, the blank lineup highlighted those individuals who were more likely to make memory errors.

One reason for conducting a blank lineup is that, theoretically, it should allow police to quickly determine the reliability of an eyewitness before showing them the lineup containing their suspect. This means that, if people became reluctant to choose or less accurate after an initial, blank lineup, then blank lineups are not useful for their intended applied purpose. In light of the studies already discussed here, blank lineups do not seem to help researchers sort between reliable and unreliable eyewitnesses, rather blank lineups have a negative impact on eyewitness accuracy in a later procedure. Even when feedback was provided to eyewitnesses after the blank lineup, there was no improvement in outcomes (Palmer, Brewer, & Weber, 2010a). When participants were told that they made an incorrect identification, their performance was worse on the subsequent lineup containing the culprit than people who did not receive an initial, blank lineup. A correct rejection of the blank lineup made no significant difference when participants received feedback and impaired performance when no feedback was given. Thus, these results suggest that multiple identification procedures can only impair eyewitness outcomes, with no evidence that blank lineups could improve performance (Palmer et al., 2010a).
In two recent experiments, researchers investigated the validity of the practice of “burning” witnesses (i.e., no longer considering that witness to be a reliable source of information) who demonstrate poor recall or a willingness to identify someone even when uncertain (Smalarz et al., 2019). For both experiments, a video was presented and then some participants saw an initial, target-absent lineup, and others did not (control condition). Experiment 1 included only target-present final lineups, whereas Experiment 2 manipulated whether the culprit was present in the final lineup or not. As in Palmer et al. (2012), “blank lineup” participants were split into two categories for analyses: 1) those that chose someone from the blank lineup, and; 2) those that rejected the blank lineup. The results support the practice where police discontinue using eyewitnesses that choose from blank lineups, believing this to be a sign of unreliability. In these studies, participants who rejected the initial lineup showed similar final lineup performance to the control condition, but participants who chose from the blank lineup made decisions with little diagnostic value in subsequent lineups (Smalarz et al., 2019).

Blank lineups as a formal procedure are not popular in practice and are not recommended by researchers (Wells et al., 1998; 2020). However, police will sometimes disregard the fact that an eyewitness picked a filler from a prior lineup, or bury evidence that the eyewitness took part in a previous lineup at all (Smalarz, et al., 2019). Thus, even though the research shows that eyewitnesses who make an identification of a filler in a first lineup are not reliable for a second lineup, police practices sometimes fail to properly reflect this fact. With respect to the current project, the blank lineup studies demonstrate that, even when none of the lineup members are repeated, making decisions about multiple lineups can hinder eyewitness decisions.

**Direct Studies of the Repeated-Suspect Effect**

The repeated-suspect effect concerns situations where the *same* suspect is presented to the *same* eyewitness in multiple, formal identification procedures presented serially. This is
different from the paradigms used to investigate bystander-culprit confusion, mugshot exposure, and blank lineups, though the mechanisms involved in all of these effects are similar. For instance, the cognitive and social processes that contribute to the mugshot-exposure effect and repeated-suspect effect are similar, but the relative contribution of the processes may differ because the mugshot-exposure effect involves a slightly different paradigm. The type of situation that results in a single person appearing in multiple, formal identification attempts is qualitatively different to a situation where a lineup is created after an eyewitness views many mugshots. When an eyewitness is asked to inspect mugshots (images of people who have come into contact with the criminal justice system before), the police usually do not have a suspect and this is one method used to find a suspect. When a formal, identification procedure is conducted, the police already have a hypothesis about who the culprit is as a result of other investigative work, and they test that hypothesis by showing their suspect to the eyewitness. The police investigator might do this by placing their specific suspect in a showup, where suspect is presented alone, or in a lineup, where the suspect is embedded among known-innocent fillers (Wells & Luus, 1990). Regardless of the exact nature of the identification procedure, the goal of the identification procedure is to see if the eyewitness recognizes a specific suspect from the crime event.

If this identification test is done “wrong” though, any information obtained is potentially unreliable. For instance, if anyone is presented to the same eyewitness in multiple lineups, such as a filler, identification data can be influenced by the repeated procedure itself. In particular, if the police suspect appears in more than one lineup, it is potentially impossible to determine whether the eyewitness identified them due to their memory of the crime, the previous lineup, or both (Steblay & Dysart, 2016). Consider again the White case described earlier. We know that White appeared in both the intervening, photo lineup and the final, live lineup. In addition, we
now know that the final lineup was, in fact, target-present because Parham was later discovered to be the true culprit rather than a mere filler. At the time, though, police did not know ground truth—that is why they completed the identification procedures. Although, the second identification of White could have been because the eyewitness was certain that White was the culprit or because White appeared in the previous lineup, the police interpreted her identification as incriminating evidence against White.

The literature addressing repeated-suspect effects is not large and there is variation in the experimental methods used. Overall, however, the studies tend to show some consistencies in methods and results. First, participants are exposed to the culprit, either using a photo (Haw et al., 2007), a video (Steblay, Tix, & Benson, 2013), or a live encounter (Gorenstein & Ellsworth, 1980). Then, usually after some time has passed, participants are presented with the first identification procedure (the intervening lineup or showup) which contains someone who is not the culprit but will appear again in the final lineup. A control condition is used during the intervening lineup phase so that some participants make judgments about a final lineup after an intervening lineup that does not include a repeated individual. The retention interval between phases varies a lot between experiments (from a few minutes in Haw et al., 2007 to two weeks in Steblay et al., 2013), but participants will see a final lineup some time later for which identification decisions will be analyzed to look for repeated-suspect effects. Sometimes, the final lineup contains the culprit that was repeated in a previous lineup. In other conditions, the designated innocent suspect appears in the final lineup and the intervening lineup (e.g., Steblay et al., 2013). Other times, the final lineup will contain the culprit, the repeated innocent person, or both the culprit and the person from the previous lineup (e.g., Haw et al., 2007). Despite variation within each phase described here, there is a typical paradigm used for examining
increased innocent suspect identifications when that innocent suspect appears in both the initial and final lineup.

The earliest example of repeated-suspect effect research involved a staged event during a large psychology class, where the “culprit” interrupted the class (Gorenstein & Ellsworth, 1980). Immediately after this class, half of the students were dismissed and the other half remained behind to complete a 12-person lineup. Between four and six days later, everyone from the class was presented with a six-person lineup, which always contained the culprit. In addition, though, for some of the participants, the final lineup also contained one of the individuals from the initial, 12-person lineup (the repeated innocent suspect). The results showed that the students who viewed the initial lineup often selected the repeated innocent face rather than the true culprit’s face, suggesting that the intervening lineup both impaired people’s ability to accurately identify the culprit and increased their chance of misidentifying an innocent person.

Although mugshot exposure and other lineup effects were studied extensively during this time, repeated-suspect effects received little attention for the next 20 years. Two publications then emerged from a research team that emphasized the effect of encoding quality and amount of time between identification procedures in the repeated-suspect effect. Participants in the first of these projects saw a photo of a face for 60 seconds in the initial session, which served as the “culprit” in this experiment (Hinz & Pezdek, 2001). The following week, participants viewed a six-person, target-absent lineup that sometimes contained an innocent person who would appear in the final lineup too. The six-person, final lineup took place two days later and could contain the true culprit, the innocent person from the intervening lineup, or both of these individuals embedded among new fillers. As anticipated, when the innocent suspect was repeated, that person was misidentified more frequently in the final lineup, with the highest misidentification
rates occurring when the true culprit was not also present in the lineup. That is, when the culprit and the repeated innocent person appeared in the final lineup, participants identified the true culprit less frequently compared with when the true culprit appeared with a set of five new fillers. Finally, when the true culprit appeared alone in the final lineup, the correct identification rate was fairly consistent across the experimental and control conditions, both before and after “non-choosers” were forced to identify someone. These results suggest that the memory for the culprit survives intervening lineups.

The set of experiments manipulated other variables known to impair an eyewitness’s ability to accurately identify the true culprit in an identification procedure (Pezdek & Blandon-Gitlin, 2005). In the first experiment, the paradigm was similar to the earlier study (Hinz & Pezdek, 2001), but the race of the culprit was manipulated such that some participants saw a culprit that was a different race to them and others saw a same-race culprit. Identification of individuals from a different race is known to be more difficult and impair eyewitness identification performance (cross-race effect, Meissner & Brigham, 2001). Because cross-race identification of a culprit is already more difficult, misidentifications of a repeated innocent suspect were significantly more common for those in the cross-race condition than those in the same race condition. In addition, accurate identifications were much lower for those in the cross-race condition. Thus, it appears that when the identification task more difficult, the effect of a repeated innocent person is stronger.

In the second experiment (Pezdek & Blandon-Gitlin, 2005), the strength of encoding was manipulated by presenting the culprit’s face to participants for 10 or 60 seconds in the initial session. The second manipulation involved shifting when the intervening lineup took place during the procedure—the intervening lineup was either presented closer in time to the initial
experimental session or closer in time to the final lineup. Again, when participant’s identification task was more difficult (shorter encoding time), there were significantly more misidentifications of the repeated innocent person and significantly fewer correction identifications. In addition, when the intervening lineup took place closer in time to the final lineup, this also resulted in a stronger repeated-suspect effect (more misidentifications of the repeated innocent person and fewer correct identifications).

So far, the studies described have followed a fairly uniform design using classic eyewitness identification paradigms and lineup identification procedures. A study by Haw et al. (2007) introduced a within-subjects design so as have more power to investigate the processes responsible for these effects (which they called eyewitness carryover effects in Haw et al., 2007). In addition, they used a showup procedure for the intervening identification procedure rather than a lineup. Showups are suggestive, so this design decision might have also increased the magnitude of the repeated-suspect effect. The final, unique aspect of this study was that the researchers collected self-report measures on the details of participants’ memory experiences. Thus, for each final lineup decision, there was an associated “remember”, “know”, or “guess” judgment. Dual-process recognition memory (Yonelinas, 2002) will be discussed in more detail in the next section of this paper, but this was the first study to address the role of dual-processing (familiarity and recollection processes) hypothesis in the repeated-suspect effect.

Participants in the Haw et al. (2007) study completed a single session. First, they studied eight faces that served as “culprits” in this study. After a three-minute filler task, participants made decisions about six different, intervening showups. This was followed by another three-minute task before participants were presented with sixteen different, final lineups that they made identification decisions about. Half of these lineups contained a culprit from the study
phase and half did not include any of the culprit faces. Some of these final lineups also included a repeated, designated innocent suspect who had appeared in one of the intervening showups. Haw et al. (2007) found that repeated innocent suspects were identified at a significantly higher rate than photos that were not repeated (a repeated-suspect effect). In addition, correct identifications were less common when both a target (culprit) faces and a repeated (innocent person) face were present in a final lineup, as participants often misidentified the innocent person that had appeared in the showups. When a culprit was not in the lineup, though, and the lineup only contained the repeated innocent person and five new fillers, the repeated-suspect effect was strongest. Identifying the innocent suspect during the showup phase was also related to identifying the innocent suspect in the final lineup phase. This means that participants who chose the innocent suspect during the intervening showup phase had a higher innocent suspect misidentification rate in the final lineup than those who did not identify the innocent suspect during the showup phase (referred to by the authors as a commitment effect).

Misidentifying the innocent suspect in two different identification procedures was also associated with significantly more “remember” reports. Haw et al. (2007) interpreted this as an increase in false recognition when participants identified the innocent suspect twice. That is, they posited that act of identifying the culprit during the intervening showups may make recognizing that person again later feel like a stronger memory experience than if that person had only been passively viewed. This difference in subjective memory experience led to an increase in the number “remember” judgments for individuals who misidentified the innocent suspect twice compared with individuals who made a single misidentification during the final lineup.

A more recent study followed a classic eyewitness identification approach with one set of lineup data per participant, a videoed crime event, and two well-constructed lineups (Steblay et
Participants completed two experimental sessions, which were 14 to 18 days apart. In the first session, participants watched a 30-second video of a perpetrator snatching someone’s purse, received pre-lineup instructions, and then made an identification decision about a six-person lineup (intervening lineup). For the second session, participants received lineup instructions again and made decisions about a new lineup (final lineup). For both lineups, the experimenter presented either a target-present or target-absent lineup, which was randomly assigned to be in a simultaneous (all photos at once) or sequential format (one at a time). Thus, the final lineup either contained the culprit from the video (target-present) or the designated innocent suspect that appeared in the intervening lineup (target-absent). Thus, in this study, none of the lineups pitted the guilty person and the innocent suspect against one another.

The results were consistent with previous studies. Participants were able to identify the culprit if the guilty suspect appeared in one of the lineups, though accuracy did not improve and confidence was inflated when the culprit was repeated. When the innocent suspect was repeated, in contrast, misidentification of this lineup member increased significantly between the intervening and final lineup. Thus, seeing the guilty person in multiple lineups did not change accurate decisions very much, but significantly increased incorrect identifications of the innocent suspect for the final lineup. Steblay et al. (2013) also found evidence that, participants who chose the innocent or guilty suspect in the intervening lineup were more likely to choose that person again if they appeared in the final lineup than participants who did not choose one of the repeated individuals in the first session (which they described as a commitment effect). Finally, lineup format altered identification decisions such that sequential lineups reduced the repeated-suspect effect—reduced misidentifications of a repeated innocent suspect—as compared to a simultaneous procedure. Thus, it was already well-known that sequential procedures are slightly
better than simultaneous procedures at reducing the risk of misidentification for innocent suspects, but these results demonstrate that sequential lineup presentation better protects innocent suspects even when they are repeated across identification procedures.

Overall, there is fairly strong support for the idea that participating in multiple identification procedures is detrimental to eyewitness identification outcomes, regardless of whether someone is repeated across the procedures. It is also clear from the literature reviewed here that including the same person in multiple identification procedures is particularly detrimental as it can increase misidentifications of a particular person who was not involved in the original crime event (repeated-suspect effects, see Steblay & Dysart, 2016 for a review). The evidence suggests that when an eyewitness views a showup or a lineup containing any suspect, this contaminates any subsequent identification procedures, especially those that contain the same suspect, shown to the same eyewitness (Smalarz et al., 2019; Steblay & Dysart, 2016; Wells et al., 2020). Thus, relying on eyewitness evidence in any situation involving a multiple identification procedure is ill-advised, and more than one identification procedure presented to an eyewitness in which only one person is repeated is highly questionable. Despite this, multiple identification procedures in which the police suspect appears multiple times are often still admitted in court using the two-step legal test from *Manson* (*Manson v. Braithwaite*, 1977), providing law enforcement with little motivation to change their methods.

**Processes and Mechanisms Contributing to the Repeated-Suspect Effect**

The processes and mechanisms relevant to eyewitness misidentification tend to fall into two main categories (Steblay et al., 2013): 1) memory factors (e.g., dual-process recognition, source monitoring, and memory for the culprit), and; 2) non-memory factors (e.g., commitment effects and social influence). Each of these are relevant to the current dissertation and will be considered below in the context of repeated-suspect effects.
Memory Factors

Memory is almost always an important component when considering eyewitness identification errors. Did the eyewitness identify this person because the face is clearly the same as the face they remember seeing during the crime event? Or is the eyewitness just inferring that this must be the criminal because this face stands out as more familiar than the other faces? By answering questions like this, researchers can make conclusions about some of the cognitive mechanisms underlying specific eyewitness errors.

Dual-process models of recognition memory

As the name suggests, the dual-process model of recognition memory posits that a person’s memory experience is created by two different processes that some researchers have called recollection and familiarity (Yonelinas, 2002). The contribution of each process when retrieving specific episodes from the past will alter the subjective experience for the person attempting to recognize something or someone. As a result, both processes will influence any judgments that people make about their memory for a person or other item. Some researchers refer to recollection and familiarity as “remembering” and “knowing,” respectively (Tulving, 1985). Remembering and knowing are the labels typically used when asking participants to report their subjective experience during recognition memory experiments (e.g., Meissner, Tredoux, Parker, & MacLin, 2005). Dual-process approaches theorize that recollection/remembering and familiarity/knowing are distinct, categorical descriptors of different processes through which recognition can occur.

In the past, there has been some disagreement about the nature of the distinction between remember, know, and guess processes (Gardiner, Ramponi, & Richardson-Klavehn, 2002). Some researchers theorized that the distinction is purely quantitative in nature and can be measured by determining the strength of the memory trace and how confident the recognizer is (e.g.,
Donaldson, 1996). Thus, a very strong memory trace will result in a “remember” judgment and high confidence. The weaker the memory trace, the more common judgments like “know” or “guess” become, with each of these levels of recognition associated with a distinct decision criterion (Gardiner et al., 2002). Other researchers (e.g., Jacoby, 1991 and Rajaram, 1996) posit that decision criteria and memory strength alone cannot explain the distinction between “remember” and “know” experiences. A “remember” judgment represents a qualitatively different memory trace than would be associated with a “know” judgment about the same information. Moreover, “knowing” describes an automatic process that is affected by processing fluency, whereas “remembering” is consciously controlled. Though diverging opinions still exist, most researchers now describe familiarity and recollection as qualitatively different, subjective memory experiences (for a meta-analysis, see Gardiner et al., 2002).

Familiarity refers to situations in which someone simply has a sense that an item or person has been seen before, or that a piece of information is not new. This “sense” arises without any accompanying information about the encoding experience or reasons for the feeling of familiarity (Jacoby, 1991). The phenomenological experience of familiarity feels similar to experiencing other heuristic-type processes (System 1 processes; Kahneman, 2011), and will arise quickly and automatically in response to a stimulus, without effort on the part of the perceiver. That is, when people encounter a stimulus that has been seen before, such as a face, it is easier to process than a novel face would be. The feeling associated with ease of processing signals to the perceiver that the face belongs to someone they have encountered previously, but lacks details about why the face is familiar such as how or when the original encounter occurred (Alter & Oppenheimer, 2009; Rajaram, 1996; Steblay et al., 2013). Therefore, other information
or strategies might be used to infer something about why this person is familiar (Mandler, 1980; Tversky & Kahneman, 1974).

Familiarity is thought of as a continuous variable, so a feeling of familiarity can be very strong, very weak, or anything in between (MacPherson, 2015). However, only a few researchers measure “know” judgments in a graded manner (e.g., Palmer, Brewer, McKinnon, & Weber, 2010b). To help explain how familiarity is a matter of degree, take a situation where a person has met someone else only once before, in passing. They recognize the other person, but know nothing about the person or the circumstances in which they have met. In addition, because they have only encountered this other person once before, the feeling of familiarity is weak. They may have even taken some time to realize that this person was familiar. In contrast, if the familiar person was someone who regularly attended the same events, they might find this person’s face extremely familiar. They might even feel quite frustrated at the absence of other information to accompany this feeling—what is their name? Where have we met before? These examples are one way to portray different extremes on the familiarity continuum. Despite this, familiarity is usually measured by asked people to make a forced-choice, categorical judgment between “remember”, “know”, or “guess” (Meissner et al., 2005; Palmer et al., 2010b).

Dual-process models posit that recollection processes occur independently of familiarity. Recollection is a controlled process that provides rich information about previous encounters with the subject of the recognition experience—a qualitatively different experience to familiarity (Gardiner et al., 2002; Rajaram, 1996). In other words, someone is having a recollection experience when they recognize an item or person and can recall details about the relevant encoding experience (Yonelinas, 2002). To illustrate, consider the example in the previous paragraph. A recollection experience in the same context would mean that, when that person was
recognized, the feeling associated with that recognition was not merely a sense that their face has been encountered before. Rather, the specific instance(s) in which they have been encountered before will also come to mind. Maybe they met this person last year at the same event. Because they are experiencing episodic recall, they will also remember contextual details about the encoding episode, such as their name, as well as specific details about their conversation and the event itself.

Unlike familiarity, recollection is not treated as continuous in dual-process models. Rather, recognition experiences must cross a threshold or meet particular criteria to be categorized as recollection (MacPherson, 2015; Wixted, 2007). According to this way of thinking, recollection is binary—something is recalled or not—but the way dual-process recognition is typically measured does not reflect this distinction. Participants are usually asked to choose the category (“remember”, “know”, or “guess”) that best describes their memory experience, and each category is defined in detail (Gardiner & Richardson-Klavehn, 2000). This means, though, that a memory experience with some features of recollection, but not enough to cross the “recollection threshold”, falls within familiarity. Thus, a familiarity judgment could be made in a situation where a person does actually know something about the encoding event (Palmer et al., 2010b). A recollection judgment could also encompass a variety of recognition experiences. It could be used to label a strong recognition experience associated with a very detailed and clear memory trace, or a single coding experience remembered with minimal level of detail. But recollection is not measured in this way, despite research suggesting that recollection functions as a continuous variable (Mickes, Wais, & Wixted, 2009).

Because recollection provides more detail regarding the encoding episode, researchers will often state that recollection experiences tend to be more accurate than familiarity (e.g., Wais
et al., 2006), and that eyewitness misidentification is often the result of relying on familiarity. In particular, if the same suspect is presented to an eyewitness in multiple lineups, that suspect’s face will seem familiar for reasons that are not relevant to whether that is the face of the culprit or not (Haw et al., 2007; Steblay & Dysart, 2016). In this way, mere familiarity can contribute to repeated-suspect effects. To clarify, I will revisit the case of White and Parham. White’s face would have looked familiar to the eyewitness because she had seen White in the first, photo lineup. She was not wrong that his face was familiar. Her mistake was that she inferred that his face was familiar because he was the culprit.

But unless an eyewitness experiences recollection and, therefore, recalls the context of encoding too, they must interpret their feelings of familiarity based on clues from the recognition context (Tversky & Kahneman, 1974). Why would a person in a police lineup look familiar? The context strongly suggests what a familiar face should mean—this must be the perpetrator. But why, then, did the eyewitness in the White case not recognize the true culprit (Parham)? Because familiarity is graded, if two faces in the lineup were familiar, White’s face could have seemed more familiar than Parham’s. The eyewitness had a good view and plenty of time to study White’s face during the lineup, which also occurred more recently than the crime. Crime events are typically not conducive to encoding. In fact, the victim reported being stressed and scared during the crime, and was not wearing her prescription glasses. Thus, the encoding event for White’s face was likely more favorable for forming a memory than was the crime event and reliance on familiarity could have contributed to White’s wrongful conviction.

However, even if familiarity can often contribute to eyewitness errors, it does not necessarily follow that recollection, a process independent of familiarity, would be comparatively more accurate. Certainly, by definition, recollection requires someone to
remember the specific event that produced the recollection experience. Would details about the encoding experience only be available if the recognizer was remembering the person or information correctly? In eyewitness identification situations, remembering the specific reason that a face is familiar might well be essential to making a correct decision (Meissner et al., 2005). Yet, people will make recollection judgments when they are incorrect, so self-reports about memory processes like recollection cannot guarantee accuracy (Lindsay, 2008). For example, in Haw et al. (2007), individuals who chose the same innocent suspect from an initial showup and subsequent lineup often reported experiencing recollection about these incorrect recognition decisions (called false recollection). Studies like this suggest that an incorrect recognition experience can feel like a detailed recollection of a specific encoding event in repeated-suspect effect paradigms.

**Source monitoring in recognition memory**

Source misattribution is another potential mechanism underlying repeated-suspect effects, and in many ways is extremely similar to dual-process recognition. There are some important distinctions, though, that I will clarify here. In the *Source-Monitoring Framework* (Johnson, Hashtroudi, & Lindsay, 1993), “source” refers to the circumstances under which a person, item, or piece of information was encoded as a memory, allowing it to be recognized and tied to this specific encoding event later. Information that contributes to accurate source monitoring includes the place where encoding occurred, the time encoding occurred, the context surrounding the encoding event, and the modality through which the relevant item was experienced (Lindsay & Johnson, 1991). People often have a very clear memory for a piece of information, an item, or a person, but have trouble determining the source of that memory. The Brown et al.’ (1977) mugshot-exposure study (Experiment 1) is a particularly compelling example of how source-monitoring can contribute to eyewitness misidentification. Participants
made very accurate judgments about whether a face was old or new, but had great difficulty remembering in which of two rooms each face was studied—their ability to recognize faces was superior to their ability to accurately determine the source of the recognition.

Source monitoring often involves inferring the correct source from aspects of the memory that can provide clues about when the learning occurred (e.g., does the memory feel vivid and clear, indicating the event was recent?). People will also assess how plausible the potential sources of the memory are along with other heuristic-type reasoning strategies, as well as the context in which the recognition occurs (Johnson et al., 1993). Take, for example, an eyewitness who recognizes an innocent person presented in a lineup procedure. If the eyewitness was also able to attribute that recognition to the proper source, they might avoid a misidentification—they might realize that this person was a bystander at the crime scene (bystander-culprit confusion; Deffenbacher, et al., 2006), in one of the mugshots that they saw earlier in the investigation (mugshot-exposure effect; Deffenbacher et al., 2006), or in a previous showup or lineup (repeated-suspect effect; Steblay & Dysart, 2016). Inaccurate source monitoring can also contribute to misidentification rates and wrongful conviction, though. For instance, if nothing specific about the encoding event springs to mind, but a lineup member feels very familiar to them, they may make a source misattribution error by relying on the most plausible explanation in that context. When any person is recognized in a lineup presented during a police investigation, the assumption is that this must be true culprit.

The primary cause of source-monitoring errors is a high degree of similarity between the true source of a memory and other potential sources of a memory (Johnson et al., 1993). That is, when an item, person, or piece of information was presented in a different modality, context, or in the company of different people, source judgments will be easier. Conversely, a high level of
correspondence between the features of various potential sources and the correct source will make it more difficult to make an accurate source judgment (Lindsay & Johnson, 1989). Brown et al.'s (1977) study is another good example here. Faces were learned in two different rooms that likely had a lot in common and were in the same general location on a campus. Thus, though it was easy to determine which faces were new or old, the setting in which the faces were learned was easily confused. In a similar way, a face appearing in an eyewitness lineup and a face seen at a crime event are hard to distinguish—both involve a stressful situation where the visual memory for a face is very important and both situations are related to a specific crime.

How people engage in the source-monitoring reasoning process will also influence accuracy. In some situations, the source judgment is easy and will not require a lot of time nor a lot of thought to come to an accurate conclusion. However, other times there will be more uncertainty about the source of a feeling of recognition—maybe there are many possible sources given the information available, or there are few clues to help determine the source. The success of the source-monitoring process in this type of situation will depend on how carefully the person evaluates the possible sources. People might make a quick, low-quality judgment, but the resulting source judgment is more likely to be incorrect than if they had taken their time (Johnson et al., 1993). Moreover, people will change their criteria for making source attributions based on the context they are in—the amount of evidence people require before they are willing to make a definitive source judgment is malleable. People will shift the threshold for a source judgment around based on the importance of the task, what others expect of them, what they want to achieve, and based on feedback (Dodson & Johnson, 1993; Lindsay & Johnson, 1989).
Comparing and contrasting source monitoring and dual-process recognition

In most cases, the outcomes of a source-monitoring focused approach and a dual-process recognition approach will be extremely similar, so it can be difficult to explain the features unique to each approach. In addition, proponents of both approaches generally agree that both familiarity and recollection are used when people evaluate their memory and make memory judgments, and explain qualitatively different recognition phenomena (Johnson et al., 1993; Mickes et al., 2009; Wixted, 2007). For example, recollection is defined by whether source information can be recalled alongside the memory itself—this is key to distinguishing recall and familiarity. Successful source monitoring results in the same outcome—the correct source of the recognition experience is determined from information the person already has, or information they deduce from the memory itself (Macpherson, 2015). So, what are the differences between these two functionally similar approaches in an experimental or applied context?

In the past, researchers have differentiated these approaches by classifying source monitoring as a separate reasoning process that occurs during recall. Accordingly, source information is not recalled automatically and it must be deduced by the recognizer after the fact, using source monitoring strategies (Johnson et al., 1993). Furthermore, some researchers argue that a source monitoring approach leads to more accurate memory judgments. Rather than obtaining a single categorical judgment, participants are asked whether an item, person, or piece of information has been encountered before on a graded scale and only afterwards that are they asked about source information. This avoids confusing the recognition experience with the ability to recall the source of the memory (Lindsay & Johnson, 1989). Source monitoring has also been differentiated from dual-process approaches on the basis that it can occur regardless of whether an original memory exists. People might use the features of the memory experience only
(e.g., vividness) or the surrounding context (e.g., where the recognition took place) to determine reason for recognition even if they cannot remember anything about the encoding event or the recognition itself is weak (Lindsay & Johnson, 1989).

More recently, research in this area has started to view source monitoring and dual-process recognition as supplemental to each other—dual-process recognition interacts with source monitoring to influence memory judgments (Wixted, 2007; Wais et al., 2006). One important distinction that remains, though, is that source-monitoring conceives of recollection and familiarity as subjective experiences that are continuous, rather than separate, independent processes (MacPherson, 2015). Thus, both familiarity and recollection can be associated with memory judgments that are strong—made with high confidence and high levels of accuracy—or weak—made with low confidence and low levels of accuracy (Mickes et al., 2009). Source monitoring researchers consider source information as separate to recollection and familiarity judgments, and source information can be linked to memories with low levels of subjective familiarity and recall. There is evidence that the frequency of accurate source judgments tends to be similar for both familiarity and recollection judgments, consistent with this conception of source monitoring and recognition processes (MacPherson, 2015).

The White case can be used to demonstrate how source monitoring and dual-process recognition might differ in their explanation of eyewitness errors. As already explained, dual-process recognition models would hypothesize that her error occurred because she relied on familiarity recognition and did not carefully consider the reason for the feeling of familiarity. A source-monitoring researcher might approach this problem slightly differently, beginning with the idea that her memory was actually accurate—the eyewitness indicated that she had seen
White before, and she was correct. The misidentification happened because she made an incorrect judgment about the source of the memory.

The eyewitness may have struggled to distinguish between the initial photo lineup and the crime event itself given the shared characteristics of the events. Moreover, her decision-making process would have contributed to the source misattribution. As mentioned when discussing familiarity processes, a lineup context strongly suggests that any familiar face is likely to be the culprit, so an eyewitness might require relatively little evidence to conclude that the source of familiarity was the original witnessed event.

**Maintaining the memory of the culprit**

Conditions relevant to assessing whether participants can accurately remember the culprit after multiple identification attempts have been included in repeated-suspect effect studies, but have not been explored in detail or with appropriate control groups (e.g., Hinz & Pezdek, 2001). This is surprising given that this is a situation where preserving the original memory is very important—someone has witnessed criminal activity and their memory is often crucial for discovering what really happened and who committed the crime. Decades of research shows, for instance, that eyewitnesses frequently incorporate misinformation into their memory for the crime (Loftus, 2005). Although people tend to perceive their own memory as fixed, memory is actually constantly updated as new knowledge is encoded (Newman & Garry, 2013). Repeated identification paradigms introduce an eyewitness to new information over time, and so there is potential for this type of memory task to impact a person’s ability to maintain an accurate, original memory in a similar way to misinformation paradigms.

Misinformation effects occur after exposure to misleading post-event information, which is any incorrect information encountered after an event that was not part of the original memory. Misinformation can be communicated to an eyewitness in many ways: news, social media, other
eyewitnesses, leading questions, or discussing the event with others (see Newman & Garry, 2013 for a review). It is very difficult to know if misinformation has been incorporated into an eyewitness’s memory once time has passed after the crime event. The leading solution to this is to obtain detailed information from eyewitnesses immediately after the crime, before they have talked with other eyewitnesses, been interviewed by police, had time to read the news, or recounted their experience to others (e.g., the Self-Administered Interview; Gabbert, Hope, Fisher, & Jamieson, 2012). However, recalling crime-relevant information can also increase an eyewitness’s vulnerability to subsequent suggestive information, so even obtaining a record of an eyewitness’s memory soon after the event may not guarantee maintenance of an accurate memory for the crime (Chan, Thomas, & Bulevich, 2009).

Importantly, intervening identification procedures can be characterized as post-event information (Windschitl, 1996), which makes the misinformation effect literature relevant to the current project. If an eyewitness picks someone from a lineup and then is shown a totally different lineup soon after, the eyewitness might conclude that their first identification was wrong. If an eyewitness rejects an initial lineup, and is given another lineup with only one person in common with the previous lineup, this is particularly informative and suggestive—the eyewitness might then assume that repeated person is the police suspect. The White case can, again, be used as a demonstration. Presenting White to the eyewitness in a photo lineup procedure before the second live lineup is a type of misinformation, as White’s face was new information and not part of the original memory for the crime event. When she saw White in the first lineup and chose to identify him, White’s face was encoded and associated with the crime event and would be recalled alongside other information about the crime.
Early studies addressing the misinformation effect posited that the original memory may be replaced by the newly encountered information (Loftus, Miller & Burns, 1978; Loftus, 2005). So, in the context of the White case, the memory of Parham’s face could have been replaced by White’s face after the eyewitness selected White from the initial lineup. If this was true, the eyewitness would never be able to identify Parham in a later lineup, even if White was not present, as the original memory no longer existed. In this situation, when the eyewitness thought of her attacker, she would have thought of Parham’s face before the intervening lineup, and White’s face after the intervening lineup. However, the consensus in the field is that memory replacement does not play a central role in the vast majority of misinformation paradigms, as people demonstrate an ability to remember the misinformation and the original information when given the opportunity (McCloskey & Zaragoza, 1985).

Other researchers conceptualize the effect of new information on memory as a graded outcome, so the new information may become incorporated into the original memory at various levels to form a blended memory (Loftus, 1977; Skagerberg & Wright, 2008). Under this view, the eyewitness’s misidentification of White might have occurred due to parts of White’s face and parts of Parham’s face becoming combined in her memory to form an entirely new, blended face. If the victim’s earlier identification of White resulted in a new, blended memory, Parham might still appear familiar to her, and the eyewitness might still have been able to identify Parham if he was presented in a lineup without White. She would be, however, less likely to identify Parham after blending the memories than if she had never identified White in the first lineup and her confidence in the identification of Parham would be lower. Although there is some evidence that memories can become blended, particularly for information exchanged in social settings.
(Skagerberg & Wright, 2008) this is not the leading view on what happens when an eyewitness encounters post-event information.

A final possibility, and the one with the most support in the literature, is that the first misidentification of White may have created a second memory trace that existed alongside the memory for Parham (McCloskey & Zaragoza, 1985). As a result, two memories of crime-related faces would co-exist after the first photo lineup—one of Parham and one of White—and associated with the crime event. Under these circumstances, the memory for Parham’s face remains intact, so the eyewitness would have been able to recognize and identify Parham in a lineup that did not contain White. In addition, the eyewitness’s recognition experience would have been similar to what she would have experienced had the initial identification of White not happened—the memory for Parham remains as it was after the crime event.

Competing memory traces would complicate future retrieval attempts in a situation where a subsequent identification procedure contains both individuals (the traditional misinformation paradigm created by Loftus, Miller, & Burns, 1978), as was the case for White. There are several theories to explain this phenomenon in the literature. One possibility is that the original memory is inhibited by the misinformation because, once accepted, the misleading information from the intervening lineup blocks access to the original crime information (Ayers & Reder, 1998). Alternatively, because two faces relevant to identification are now available in memory, which one informs the final lineup decision depends on which face is more accessible at retrieval and whether the witness was able to accurately determine the source of each memory trace (Lindsay & Johnson, 1989). White was seen more recently than Parham, so his face might have been more readily accessible. This fact alone might have led to the misidentification of White. However,
research on modified tests and the effect of a second memory trace suggests that, had the final
lineup not included White, only Parham, the victim might have managed to identify Parham.

The first study that was conducted in the current dissertation addressed the nature of the
original memory for the true culprit after intervening lineups. To do so, the experimental design
borrows a method from post-event information and misinformation effect experiments.
Typically, the post-event information effect is demonstrated by showing participants an event
(live, photo, or otherwise) and afterward providing participants with incorrect information,
correct information, or no extra information. To determine whether a participant shows evidence
of the misinformation effect, participants are tested by including both the original information
and the misinformation in a forced-choice test.

Essentially, this test pits the two pieces of information against each other to see which
one the participants choose (Loftus, 2003). This is analogous to many of the repeated-suspect
effect experiments described in this dissertation. Participants are shown the culprits face initially,
in some form (typically a video or photo), and then they view an identification procedure that
contains an innocent suspect—the misinformation. This misinformation might be particularly
strong if the intervening identification procedure is suggestive, as the relevant misinformation—
the repeated person—will stand out more (e.g., in Haw et al. (2007) a showup was used for the
intervening identification procedure, although their study did not include a less suggestive
procedure for comparison). Then, for the final test, many experiments include both the innocent
suspect and the culprit in a final lineup. Importantly, though, researchers have speculated that the
original memory for the culprit has been impaired or changed in repeated-suspect paradigms, but
the classic misinformation effect paradigm cannot actually speak to this point. In fact, it can only
reveal whether the misinformation is more accessible or salient than the original information, not
the state of the original memory. Demand characteristics might also be a underlying reason for participant’s choices in a classic misinformation paradigm—the information from the post-event information is what participant believe they are *supposed* to pick. Regardless, when this design is used, researchers can show whether an innocent suspect from an intervening lineup is more accessible than the culprit, but not how the culprit’s face is represented in their memory, if at all.

McCloskey and Zaragoza (1985) modified the traditional test of the misinformation effect to answer the question regarding the fate of the memory for the original information. Instead of pitting misinformation against the original information, the modification pitted the original information against novel information (not previously viewed in the experiment) in a forced-choice recognition task. The key aspect of this modified task is that the test does not include the misinformation as an option. To use a concrete example from the White case, this would be analogous to a situation where Parham had been presented surrounded by new fillers for the second, live lineup, without White. Using the traditional test where both the original information and misinformation are options, McCloskey and Zaragoza (1985) demonstrated the usual effect—more people chose the misinformation item even when the original information was present. When their modified version of the test was used, though, they found no evidence that exposure to misleading post-event information had altered or otherwise impaired the original memory. To be specific, the memory was *not* replaced, or even diminished, by the misinformation as evidenced by participants’ ability to identify the correct information when it was tested without the misinformation as an alternative.

The McCloskey and Zaragoza (1985) test is usually referred to as simply the “modified test”. The first proposed experiment, therefore, examined whether the memory for the true culprit’s face survived exposure to the intervening lineups using a design inspired by the
“modified test”. Specifically, the final lineup test includes either the true culprit from the crime video and five new fillers or the innocent suspect from the intervening lineups and five new fillers. In addition to the final test not including the misinformation alternative, there is another critical feature of the McCloskey and Zaragoza final test that is required to properly test whether the misinformation affected the original memory—the final test must be a forced-choice test. Hence, for a final lineup test, the culprit must be present and not the innocent suspect, and everyone must make an identification from that lineup eventually (the equivalent of a six-alternative forced-choice test). Forcing people to select a lineup member after they say “not present” for the final lineup has been done in some previous repeated-suspect effect work (e.g., Pezdek & Hinz, 2001; Pezdek & Blandon-Gitlin, 2005) and is necessary to ensure any differences in accurate identifications on the final test are due to change in memory not changes in decision criterion (an eyewitness’s willingness to choose from the lineup).

Previous research has examined final lineups containing the true culprit (e.g., Haw et al., 2007; Hinz & Pezdek, 2001, and Steblay et al., 2013), and some have also used forced-choice tests (e.g., Hinz & Pezdek, 2001; Pezdek & Blandon-Gitlin, 2005). Though the results suggested that memory is not impaired by lineup misinformation, the design of previous studies precluded a clean investigation of the participants’ ability to remember the culprit after intervening, target-absent lineups. These studies always preceded the final target-present lineups with a target-absent, fair lineup (e.g, Hinz & Pezdek, 2001), or repeated the culprit in the intervening lineups (e.g., Steblay et al., 2013). The current study improves the typical repeated-suspect paradigm for the purpose of examining an eyewitness’s ability to identify the culprit by using the “modified test” (McCloskey & Zaragoza, 1985), a forced-choice final task (Hinz & Pezdek, 2001; Pezdek & Blandon-Gitlin, 2005), fair and suggestive intervening lineups, an ecologically-valid design,
and, importantly, a no-misinformation control group to provide base levels of accurate culprit identifications for comparison.

Although I was not able to determine exactly how memories were altered or stored as a result of my experimental manipulations, I was able to see whether the memory for the original culprit remained intact. If a second memory was created by intervening identification procedures, and this second memory did not hinder access to the first memory, there should be no difference in participants’ abilities to correctly identify the true culprit when they see a final, target-present lineup and are forced to choose someone. If replacement or memory blends occurred, there would have been differences in correct identification across conditions, particularly when the intervening lineup was biased. This was a novel characteristic of the current dissertation, as no previous repeated-suspect effect studies have addressed the fate of the memory for the true culprit after exposure to a repeated, innocent suspect.

**Non-Memory Factors**

Memory mechanisms do not operate in isolation to produce repeated-suspect effects. Past research suggests that choosing from a previous identification procedure or rejecting a previous lineup is associated with different identification decisions in a later lineup (e.g., Haw et al., 2007, Palmer et al., 2010a, and Smalarz et al., 2019). Some researchers have suggested that the mere act of identifying a lineup member in an earlier lineup makes the eyewitness more likely to select that person again in a later identification procedure (called *commitment effects*; Steblay & Dysart, 2016). In addition, identification procedures in the real world have an administrator—usually a police officer—who may have an agenda or expect a particular decision (called *social influence*; Steblay, 1997). Both of these non-memory factors will be discussed here with reference to how they might influence eyewitness decisions in situations with multiple identification procedures containing a repeated individual.
Commitment effects

Commitment effects describe situations where people resist changing their prior decisions, even when presented with new circumstances or contrary evidence. The processes involved in psychological commitment have a rich history in social psychology and such effects are relevant to the theory of cognitive dissonance (Festinger, 1957) and belief perseverance (Anderson, Lepper, & Ross, 1980). Essentially, if people are given the opportunity to make a second, similar judgment, people tend to align with whatever decision they made previously.

Psychological commitment is a motivational construct. The idea is that people stick with earlier decisions out of a need or a drive to appear consistent to oneself or to others (Kiesler, Pallack & Kanouse, 1968). Commitment effects are frequently strongest when the decisions are made in public so that others could easily notice whether they are consistent or not, or when being inconsistent might threaten one’s self-concept or identity (e.g., Brigham & Cairns, 1988, public versus private mugshot decisions; also see Cialdini, 2009; Swann & Bosson, 2010).

If a psychological commitment effect occurs then we should observe that people make later decisions that are consistent with their prior decisions. But observing consistency in decisions does not mean that psychological commitment occurred. There are many possible reasons for consistency that have no relation to the motive of psychological commitment. If you have people choose which of two shirts they like best, one blue and the other green, it is very likely that someone who chooses blue will repeat choose that same blue shirt at a later time if you have them choose between that same blue shirt and a new green shirt. But their consistency is not because they felt committed to the blue shirt but instead because their preference has not changed – blue remains their preference. For most problems of this type, simple consistency of preference has to be ruled out in order to invoke a motive like psychological commitment.
Researchers have cited that commitment processes are responsible for some of the patterns seen in repeated-suspect effect experiments. Specifically, witnesses who picked an individual from an intervening showup or lineup tend to be more likely to pick that same person again from a later lineup than those who viewed the intervening showup or lineup but did not pick them. This consistency in choosing has been referred to as a commitment effect in mugshot-exposure effect and repeated-suspect effect studies. However, this term has been adopted without much reference to the meaning behind them. If the name is interpreted according to social psychological theory, this means that researchers believe that witnesses tend to pick the same person from the second lineup because they identified that person in an earlier identification procedure and are motivated to be consistent (Brigham & Cairns, 1988; Dysart et al., 2001; Haw et al., 2007). Invoking the construct of commitment assumes a causal claim (these people made the second decisions because they made the first) and a motivational mechanism.

Does an eyewitness who chooses consistently across identification procedures do so as a result of a commitment process, with prior choosing causing the eyewitness to choose the same person again later? Researchers describe the commitment effect as additive in the literature. This means that choosing in a previous identification procedure affects later misidentification rates over and above what can be explained by the eyewitness tending to merely prefer the same person in a second lineup as they did in an initial lineup (Deffenbacher et al., 2006; Haw et al., 2007; Steblay & Dysart, 2016). The White case, again, provides an ideal scenario to explain this concept. A commitment effect interpretation of the White case would hypothesize that the eyewitness misidentified White in the second, live lineup out of a desire to remain consistent with her earlier decision to select White in the first, photo lineup. Thus, whoever had been chosen in the previous lineup—whether it was White, the true culprit (Parham), or another
innocent suspect—if they appeared again in the second lineup, the eyewitness would have identified them again in order to be consistent. In other words, this account suggests that the eyewitness is motivated by a sense of commitment to the choice they made previously.

To date, though, the studies reporting commitment effects have not demonstrated a causal relationship between choosing in an initial identification procedure, and choosing the same person again later. Neither have they established that this association has anything to do with commitment processes. Rather, what they show is mere correspondence between choosing in an earlier procedure and choosing that person again in a later procedure. There is a much simpler alternative interpretation for this pattern: an eyewitness who finds a particular person to be the most similar to the culprit in an initial procedure is also more likely to think that lineup member looks most like the culprit in the later procedure. Whether this is due to familiarity or the person closely resembling the culprit by chance, it is not due to their earlier choice. These choosing patterns simply show that the eyewitness has a preference for a particular lineup member, and that preference led the eyewitness to select the same person in two different lineups.

Consistent preferences could occur for many different reasons, none of which require a commitment process. Let’s consider an extreme example—imagine that, in the first lineup, White was the only African American individual included in the lineup. Thus, he was the preferred choice because the lineup was biased. In the second lineup (Figure 1), White is in the middle of the lineup, standing differently and dressed differently to the other lineup members, and he was in the previous lineup. Thus, the eyewitness’s attention was likely drawn to White, leading to her choice. Or maybe he simply matched the description she gave to the police better than the other lineup members. All of these circumstances do not suggest a commitment effect. Rather, these are demonstrations of a consistent preference. It is not really surprising that
someone who made an identification from an intervening lineup because, in their opinion, that person looks a lot like the culprit, might be likely to pick that same person later because, even in the new lineup, they still look most like the culprit to them.

Given that there is no existing evidence of a commitment process, a simpler explanation might be preference. That is, the eyewitness’s choice in the initial identification procedure revealed the preference that would display again later, rather than causing the later preference. Another way to conceptualize consistency in preference is to view choosing as a predictor rather than a process or an effect. That is, rather than being the cause of increased choosing later, if an eyewitness identifies a mugshot, suspect, or lineup member, this predicts higher rates of that eyewitness choosing that the same person in a later lineup (e.g., Deffenbacher et al., 2006; Steblay & Dysart, 2016; Zajonc, 1968). The current research cannot definitively speak to causation, as people will still self-select into “initial choice” conditions based on their intervening lineup choice. However, post-identification questions will be used that might help to address whether participants who identify the same person in two identification procedures felt that any sense of commitment to their earlier decision played a role in their final lineup decision.

**Social influence**

The final process of interest in the current project is *social influence*. The impact of social influence can be substantial in eyewitness identification situations, especially in the actual cases with real eyewitnesses. For instance, there is a large literature addressing the effect of an administrator that knows who the suspect is in the lineup (e.g., see non-blind administration review Kovera & Evelo, 2017). Social influence refers to the ways in which a person’s thoughts, feelings, or behaviors are influenced by the actual or implied presence, words, or actions of other people (Allport, 1985). There are three main routes through which another person might change the way another thinks or behaves: obedience, compliance, and conformity. Interestingly, the
influencer can impact another person in this way even if the influencer is unaware of the effect they have on the other person, or if there is no pre-existing relationship between the influencer and the person influenced (Cialdini & Goldstein, 2004; Cialdini & Trost, 1998). These features of social influence mean that people are typically surprised to learn they have been subjected to social influence, or have influenced another. These aspects of social influence also mean that social influence is extremely difficult to manage in real-world situations.

In an eyewitness identification context, the lineup administrator or police creating the lineup can intentionally or unintentionally influence an eyewitness’s thoughts or behavior through the normal procedures they use to obtain identifications. This idea is not new—it has been referred to in numerous eyewitness identification publications (e.g., Brewer & Wells, 2011; Gabbert, Memon, & Allen, 2003; Steblay, 1997; Wells et al., 1998). But social influence is rarely given the spotlight in discussions of processes in eyewitness identification experiments. Let us return to the White case one final time to illustrate the importance of social influence. It has already been discussed extensively in this dissertation how the repeated presentation of White could have influenced the eyewitness’s memory. However, the repetition of White in these lineups was also potentially a form of informational social influence—social influence resulting from using others as a source of information about correct behavior or decisions, driven by the desire to behave appropriately or make accurate decisions (Cialdini, 2009). Under the right set of conditions, eyewitnesses could be making inferences about what decision the police expect (or want) the eyewitness to make. As alluded to in other sections of this dissertation, the eyewitness in the White case may have interpreted the repetition of White in the lineups as an indication of their what the police knew or wanted. Hence, demand characteristics might be another causal
path that the repeated-suspect effect might follow, manipulated in the current work with repetition of the innocent suspect.

There are related social influence processes that could be contributing to the repeated-suspect effect that I will not address in detail and are not the focus of the current project. *Obedience to authority*, a classic social influence process (Milgram, 1967), is relevant because police are authority figures. People have a pervasive tendency to obey authority figures, even when people are extremely uncomfortable with what the authority figure has asked them to do. *Expectation effects* (Rosenthal, 2002) could also impact eyewitness choices. As mentioned earlier, a lineup is like an experiment (Wells & Luus, 1990) and therefore lineup procedures are susceptible to the same kinds of biases and influences that impact experimental science procedures. If the administrator of a procedure has expectations about how the participant will behave, this might become apparent to participants and alter their behavior.

In fact, people can feel the pressure of social influence even if the administrator performs no explicit suggestive behaviors—even subtle changes in a lineup administrator’s behavior can have large effects on eyewitnesses. For example, *post-identification feedback* from the administrator of the lineup about the accuracy of an identification attempt can have alarming effects on eyewitness confidence, with even small suggestions resulting in large distortions in eyewitnesses’ retrospective confidence and recollections of their witnessing conditions (Wells & Bradfield, 1998). After confirmatory feedback, misidentifications can start to look like correct identifications because people will assume a confident eyewitness is an accurate eyewitness (Bradfield, Wells, & Olson, 2002). Eyewitnesses can be very uncertain about their decision about a fair lineup and will be looking for any evidence that they selected the person the police
wanted them to identify. Hence, a nod, a smile, or a gesture might be enough to influence an eyewitness’s confidence (Steblay, Wells, & Douglass, 2014).

In the case of the repeated-suspect effect, the most obvious possible social influence is embedded within the paradigm itself—the repeating of the suspect. Repeating the same suspect in a second lineup with all new fillers creates a situation in which the eyewitness might infer that the lineup administrator is telling the eyewitness which person to pick or has other evidence to suggest this person is guilty. Social influence does not require any form of direct request or suggestion. To the extent that the eyewitness is aware that the second lineup repeats only one person, a reasonable inference is that the lineup administrator is sending a message about which person they believe is the culprit or whom the lineup administrator wants the eyewitness to pick.

In order to explore the idea that the repeated-suspect effect might include a social influence component, post-identification questions were included that ask participants about whether they felt the experimenter was trying to influence them. Evidence for social influence would be indicated by participants reported more attempted influence in the repeated-suspect conditions than in the conditions where the suspect was not repeated. In particularly, conditions with biased intervening lineups may show particularly high levels of perceived attempts to influence as the suspect is made to stand out initially and then also repeated.

**Final Remarks on Processes Contributing to the Repeated-Suspect Effect**

In sum, as is typical in psychology, the answer to the question “How do repeated-suspect effects come about?” is not straightforward. To describe these effects as resulting from a single process would be to ignore the plethora of other, interesting explanations and how people behave during real lineup procedures. I identified five processes that I thought would contribute to repeated-suspect effects and used them to form predictions about the two studies proposed for this dissertation. Of course, the contribution of these mechanisms will vary based on the features...
of the situation, the behavioral tendencies of the eyewitness, and quality of the original memory, and not all of these conditions could be captured here. It was not my goal to conclude what processes are operating and when, but these studies can speak to some of the strategies and processes that people are using, and start to clarify which processes play a more significant role in each experimental condition.
CHAPTER 2. EXPERIMENT ONE

Overview

There were three main goals of this dissertation study. First, Experiment 1 was designed to demonstrate the repeated-suspect effect in a controlled laboratory setting. Second, the post-identification questionnaires created to examine the psychological mechanisms that contribute to the repeated-suspect effect, particularly when the answers were compared across experimental conditions. Experiment 1 had three experimental phases, separated by ten-minute filler tasks to promote some forgetting and maintain ecological validity. First, participants watched a crime event containing a single perpetrator. After a filler task, participants completed the intervening lineup phase. Third, after another filler task, participants completed the final lineup phase followed by process-related post-identification questions.

Finally, there were two key manipulations that were incorporated to influence the relative involvement of each psychological process being investigated in this dissertation. Specifically, the intervening lineup phase either included a biased lineup, a fair lineup, or no lineup. If participants received a lineup for their intervening task, it was always target-absent (containing an innocent suspect not in the video). Biased lineups were used here because they draw attention to the suspect, whether or not they are guilty, allowing an investigation into the mechanisms involved when errors and process-related responses in this condition are compared to those in the fair lineup and control conditions. The final lineup was either a target-present lineup (containing the suspect from the video) or a target-absent lineup (containing the innocent suspect). This manipulation was intended to provide insight into the fate of the memory for the true culprit. Does the memory for the true culprit survive the intervening lineup phase? Or does a fair or
biased, intervening lineup (target-absent) change the memory for the culprit in some way that hinders participants’ abilities to make a correct identification in the final lineup?

**Predictions**

**Hypotheses Set 1A: The Repeated-Suspect Effect**

Participants who received an intervening lineup containing an innocent suspect were hypothesized to be more likely to select that innocent suspect again later when compared with the control condition (an intervening reading task). For decisions made by participants who receive a fair, target-absent, intervening lineup, significantly more innocent suspect identifications were anticipated when assessing their final, target-absent identification decisions compared with the control condition. This effect was expected to be strongest when using overall choosing data. Initially, participants were allowed to make a final, “not present” judgment, but were then forced to choose the lineup member they would have picked if they had to. Overall choosing data includes identifications made after participants were forced to choose.

However, for the participants who saw an intervening, target-absent, biased lineup, the innocent suspect was expected to stand out in the intervening lineup, drawing participants’ attention to the innocent suspect and increasing misidentifications of the innocent suspect at this stage of the experiment. As a result, participants who saw a biased intervening lineup were hypothesized to demonstrate an even larger repeated-suspect effect than the participants who received a fair intervening lineup. That is, I predicted significantly more false alarms in the final, fair, target-absent lineup when participants received a biased intervening lineup compared with when participants received a fair intervening lineup or an intervening reading task. This effect was expected to be strongest when comparing the biased lineup condition to the control condition, and when overall decisions from the final lineup were examined.
Hypotheses Set 2A: Remember-Know-Guess and Source-Monitoring Processes

The intervening lineup manipulations were predicted to affect the number of participants in each condition reporting recollection, familiarity, or guess (Remember-Know-Guess judgment; RKG) to describe their recognition experience during their final identification decision. To recap, familiarity (*know*) is associated with a feeling that a face was seen before, but lacks information about the source of the memory. When someone *remembers* a face, they believe they have seen that person before and recall the specific circumstances in which that face was encountered. *Guessing* is a decision made without using memory—identifying someone with no evidence to support the choice. Results from the source measures should parallel the R-K-G results, as source judgments are expected to correlate with “remembering.”

The predictions for innocent suspect identifications are more complex. Participants in the fair intervening lineup condition were expected to notice the innocent suspect less often than participants in the biased intervening lineup condition because a fair lineup does not draw attention to the innocent suspect. Thus, for the participants in the fair intervening lineup condition, the source of recognition when choosing the innocent suspect should not be as easily accessible compared to participants in the biased intervening lineup condition. Innocent suspect identifications for fair intervening lineup participants were expected to report “knowing” the innocent suspect more often than “remembering” compared with other conditions. Fair intervening lineups were not expected to bring a particular source of recognition coming to mind so the scores for the sources of recognition should indicate a minimal role in their identification. However, it was possible that the participants in the fair lineup condition would report the video as a source of recognition, but not because they actually remember seeing the person they identified in the video. Rather, the feeling of familiarity was misattributed to the most probable source—the memory that they were asked to use (the video).
People who received a biased intervening lineup were hypothesized to be more likely to notice the innocent suspect in the intervening lineup, as biased lineups narrow attention towards the innocent suspect. Because the innocent suspect is so salient in a biased intervening lineup, these participants were expected to report the lineups as a prominent source of recognition. With a particular source in mind and a strong recognition experience, the participants who received a biased intervening lineup are also hypothesized to report more “remember” experiences than “know” experiences when identifying the innocent suspect from the final lineup (compared with a fair intervening lineup or no intervening lineup). The video is likely to be scored as a stronger source of recognition compared with other conditions too, because that is the probable source for a stronger recognition experience.

True culprit identifications were expected to be associated with higher rates of “remember” judgments regardless of intervening task condition. When participants identified the innocent suspect, they should attribute that recognition to the video more than innocent suspect and filler identifications, primarily in the no intervening lineups condition. Very little association was expected between reports that the lineup was a source when the culprit was identified in the final lineup, regardless of the type of intervening lineup. Finally, Haw et al. (2007) suggested that more incorrect “remember” judgments were a marker of commitment effects. If this is true, participants who chose the innocent suspect twice were expected to report “remember” more often than those who only identified the innocent suspect from the final lineup.

**Hypotheses Set 3A: Commitment Effects**

The literature review also gave rise to hypotheses regarding the potential for psychological commitment processes to influence participants. I expected to replicate prior research showing that people are more likely to select the innocent suspect from the final lineup when they also identified the innocent suspect from an intervening lineup, when compared to
participants who rejected or selected a filler from the intervening lineup. Though this pattern appears fairly robust in past literature, the question of why this effect occurs has not been addressed. Do people select the innocent suspect twice in a row in order to appear consistent and commit to the choice that they made earlier, as previous research has suggested? Or do people simply select the same face from two lineups because they think that person looks most like the culprit in both lineups?

To address the role of commitment, participants’ answers to post-identification questions were used. Participants self-reported how important they felt it was to make consistent choices across lineups (Commitment 1), pick the same person again (Commitment 2), and appear consistent (Commitment 4). Another question asked if participants identified the same person twice simply because they were correct (Commitment 3). If commitment processes play a role in participants’ identification decisions, participants who chose the innocent suspect twice were anticipated to show a higher mean score on each of these commitment questions than participants who only identified the innocent suspect from the final lineup.

**Hypotheses Set 4: Memory for the Culprit**

The final set of predictions related to participant’s decisions when they received a final, target-present, fair lineup from which all participants were eventually forced to choose. People in this condition were the only people with the opportunity to make a correct identification—in all other conditions, the only correct answer was “not present”. So, the key question that this manipulation was designed to address was whether or not our participants could remember the true culprit who appeared in the video they saw, and under what conditions participants were better or worse at identifying the true culprit. The comparison group here, again, was the group that received no intervening lineup. Thus, there was no chance for other faces or identification
procedures to influence their memory. This group, therefore, provided a base rate for correct identifications of the true culprit in this paradigm.

When participants received a biased intervening lineup, the innocent suspect would have stood out from the fillers in the lineup because these lineups were designed so that the innocent suspect was the only plausible choice. A biased lineup is a suggestive procedure—its structure points the decision-maker towards the suspect in the case, increasing the likelihood that they will be identified whether or not they are guilty. Thus, it is possible that the innocent suspect stood out enough that the innocent suspect’s face became the face that the participant remembered rather than the culprit’s face from the video. If this was the case, participants who saw a biased lineup would be less likely to correctly identify the culprit in the final lineup. However, an alternative possibility is that the intervening lineups create a new memory trace that is separate from the memory for the culprit, particularly when the innocent suspect stands out (i.e., the participant identified them and/or the lineup was biased). In this scenario, participants would be equally likely to identify the true culprit regardless of which intervening task condition they received. That is, whether they received an intervening biased or fair lineup, or a non-lineup task, their memory for the true culprit remains unchanged and intact. Participants’ abilities to identify the culprit after seeing additional faces should remain unhindered in this case so long as there are no other faces in the lineup providing a competing memory trace.

Method

Participants

The participants in this study were undergraduate students from Iowa State University recruited via an online website in which researchers could post advertisements for studies. Studies are completed in return for partial course credit. When I pilot tested this study with my research assistants, this study took approximately 40 minutes, so student-participants received
two SONA credits for up to one hour of participation. A total of 362 students were run in person, but some exclusions were made as a result of computer problems and randomization errors for one type of counterbalancing. In addition, any participants with incomplete data were excluded because data were required from all phases of the experiment. After exclusions, the sample size was 316 (refer to Table 1. for a summary of the sample sizes in each condition). No demographic information was collected but all participants were undergraduates from Iowa State University. This study was approved by the IRB Board at Iowa State University (ID: 19-322, see Appendix I). The final sample size is larger than the original goal of 250 participants because data collection was more efficient than anticipated. Thus, the research assistant ran Experiment 1 until the programming for Experiment 2 was complete. In addition, once I reviewed the data, a programming error was found in one type of counterbalancing. Some participants had seen three intervening lineups rather than one intervening lineup and their data were unusable. Thus, more data were collected to even out the sample sizes and correct for the programming error.

**Design**

This is an experimental study with a 3 (intervening task phase: biased lineup, fair lineup, vs. reading task) x 2 (final lineup phase: target-present vs. target-absent fair lineup) between-subjects design. Participants were randomly assigned to receive one of the intervening tasks and either a target present versus absent fair lineup for the final lineup phase (refer to Table 1. for a summary of the number of participants in each condition for the final sample). Figure 1 contains a diagram of the design and procedures.

**Materials**

New eyewitness research materials were created and pilot tested online for this study. The materials were created in a way that allowed for the dual-video counterbalancing design outlined in Oriet and Fitzgerald (2018). This design was fully counterbalanced so that there were
two crimes filmed, each with two possible targets (two young Caucasian men with small builds) and two complete sets of lineups with similar choosing patterns regardless of which of the two targets was present as the suspect (discussed in Quigley-McBride & Wells, 2020). Thus, there are two possible targets for the same crime, which was randomly assigned to participants, and each of the targets could serve as the designated innocent suspect for the other target in any target-absent lineups. Refer to Figure 2 for a visual representation of how this method can be used to create materials for eyewitness identification experiments. Full details of the pilot testing data and how the crime videos and suspect images were created and filler images selected can be found in Appendix A, but are also discussed here in brief.

Figure 2. A visual representation of how the materials will be counterbalanced, inspired by Oriet and Fitzgerald’s (2018) novel eyewitness lineup methodology.
Figure 3. Procedure, experimental manipulations, and timing for Experiment 1.
Table 1. *A summary of the sample sizes in each condition for Experiment 1.*

<table>
<thead>
<tr>
<th>Intervening Lineup Condition</th>
<th>Final Lineup Condition</th>
<th>TOTAL</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Target Present</td>
<td>Target Absent</td>
</tr>
<tr>
<td>Biased Lineup*</td>
<td>50</td>
<td>50</td>
</tr>
<tr>
<td>Fair Lineup*</td>
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<td>62</td>
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<tr>
<td>Reading Task</td>
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<tr>
<td>TOTAL</td>
<td>155</td>
<td>161</td>
</tr>
</tbody>
</table>

*Notes. * The intervening lineups were always target absent, containing the innocent suspect’s photo and five photos of individuals who are fillers.

**Suspect photos**

Two individuals that matched a similar description were used. They were both young, Caucasian men with a slender build, short hair, and no facial hair. For the photographs, the suspects were posed and dressed in a similar way to fillers (obtained from the Florida Inmate Database (www.dc.state.fl.us). Multiple photos were taken to achieve a variation across photos of the same individual. Thus, even though multiple lineups contained the same individual, the same photo did not appear twice.

**Filming the crime event**

Two different crime events were filmed for use in these experiments, each lasting 20 seconds—a theft in an office and a staged drug deal. The event was filmed multiple times, and from three different angles. The videos were edited so that most of the crime was seen from far away, with approximately three seconds of a close up of the suspect’s face. The quality of the video was degraded slightly for the current experiment.

**Filler photos**

The Florida Inmate Database (www.dc.state.fl.us) was searched for young, Caucasian men who matched the description of our suspects. Some fillers were also found for the biased lineups (also Caucasian but either heavier set, with glasses, or a lot of facial hair). The same
fillers never appeared in more than one lineup presented to a participant. A Mechanical Turk sample was obtained to get similarity ratings between the filler and suspect photos. So, each filler photo has a mean similarity rating for each of our two suspects.

**Creating the lineups**

The similarity data were used to create five fair lineups with fillers that had the same average similarity regardless of which suspect was used. Two biased lineups were also created in which the suspects stood out. All lineups can be found in Appendix A. To ensure that the fair lineups were achieving adequate filler siphoning and to confirm that the biased lineups were biased, the lineups were pilot tested on Mechanical Turk. These data are included in Appendix A. Three of the fair lineups demonstrated appropriate levels of filler siphoning and hits for both suspects.

**Questionnaires**

The questionnaires used in this experiment were created for the purpose of addressing the research questions in this dissertation. Many of these are Likert-type scales and some are open response to allow from content analyses later to determine whether participants were suspicious or noticed the manipulations. The exact wording of these questions can be found in Appendix B. One exception, however, were the instructions and judgement associated with participants’ initial “Remember-Know-Guess” judgments. A comprehensive set of instructions defining the different recognition concepts and the associated response options from Meissner et al. (2005) and Haw et al. (2007) were used here so that this judgment could be directly compared to the relevant, previous literature.

**Creating the experiment**

The experiment itself was created on Qualtrics. To make data set up and cleaning easier
at a later time, the manipulations and counterbalancing of materials was split up so that there were six different Qualtrics surveys in total. There were three different surveys created for each suspect: 1) biased intervening lineup, 2) fair intervening lineup, or 3) intervening reading task. Qualtrics was used to randomly assign participants to receive either the office theft video or the drug deal video with one of the suspects, and then randomly assign them to one of the possible lineups (or reading task, if relevant) for each lineup phase. In addition, participants were randomly assigned within each survey to receive a target-present or target-absent final lineup.

Procedure

Participants signed up for a one hour, in-lab session of their choosing using an online system. They were met at the door to the laboratory by an experimenter and brought through to one of the rooms in the laboratory. They were asked to leave their belongings in the main area, in particular their cell phones, so that they would not have any distractions during the experiment. The experimenter asked them to sit at the computer and then presented them with the consent document. Participants were told that the document explained what the experiment would involve, how their privacy would be protected, and what these data are used for. Importantly, although participants were told about the nature of the tasks they would be completing, information relevant to our hypotheses were not provided until the end of the study (e.g., how many lineups they would receive or that a lineup member may be repeated). Participants read the consent form at their own pace and asked questions before signing and dating the document, and checking the boxes indicating that they were over 18 years of age and had normal or corrected-to-normal vision (as stipulated in the online study advertisement).

Next, participants were told that they would be left in the room to complete the experiment on the computer. They were told that “a number of different kinds of tasks” would be completed in the session, and the computer would provide them with all of the instructions for
each task and guide them through the experiment. The experimenter informed them that, at the end, there would be a screen stating that the experiment is over and that was their cue to come out and let the experimenter know that they were finished. In addition, if they had any questions throughout, they were encouraged to come and find the experimenter. If there were no remaining questions, the participant was told to start the experiment.

The Qualtrics survey began by instructing participants that their first take was to watch a video. They were told that the video was “not very long, but it is relevant to your next task, so please do your best to pay close attention” to encourage them to watch the video carefully without revealing what they would be asked about later. On the next page, one of the four crime videos would play (each 20 seconds in length), after which the screen automatically advanced to the next page. On this page they were told that the next task involved completing a simple task for the next ten minutes. The first filler task was to “count the number of syllables in a series of words.” When participants clicked to move to the next page, the timer began and participants worked through a list of random words with a textbox next to each word to enter the number of syllables. Their accuracy did not matter—participants just needed to work on the task for the full 10 minutes. After 10 minutes, the page automatically advanced to the next set of instructions.

The next phase of the experiment was the intervening task. Participants in the control condition read an article about different types of cyclones or Tyrannosaurus Rex genetics and answered two multiple-choice questions designed to test their comprehension. Individuals assigned to receive a biased lineup were presented with a target-absent, biased lineup at this point and asked to make an identification decision and rate their confidence in that decision. Participants assigned to receive a fair intervening lineup made an identification decision and confidence judgment about a target-absent, fair lineup. All lineups in this phase are target absent,
which means the lineups contain the suspect that was not in the video at the start of the session (e.g., if suspect 1 was in the video the participant saw, these lineups would contain suspect 2).

Participants in the biased and fair intervening lineup conditions received instructions before viewing the lineups. They were told that they would see six photographs of different people, which is “called a lineup, which is a procedure used by police to gather evidence when they find a person that they think committed a crime.” Participants were told that this individual is called a “suspect” and is placed in a lineup with similar-looking people before being presented to an eyewitness of the relevant crime. If an eyewitness can pick the police suspect out of the lineup, this is considered incriminating evidence against the suspect. However, they are also informed that “the police are sometimes incorrect in their suspicions and the suspect is not the culprit.” So, a lineup will not always contain the person that the eyewitness saw committing the crime.” Participants were asked to decide if one of the people in the lineup is the person they saw in the video at the start of the session, and keeping in mind that the person in the video may not be in the lineup.

The biased or fair lineup was displayed on a new page and three questions were presented below. First, they were asked to select which photograph they thought was the person from the video (“Photo 1” to “Photo 6”) or select “Not Present.” There was a textbox where they were asked to write about why they made that decision. Finally, they were asked to indicate how confident they were in their decision from 0% (“not at all confident”) to 100% (“completely confident”) in 10% increments. For the reading task, participants read the article and responded two multiple-choice questions at the bottom that they needed to get correct before they could move to the next part of the experiment (details can be found in Appendix D.).
The next task was another 10-minute filler task where participants were asked to count the number of vowels in a fairytale story. There was a textbox under each paragraph for them to enter the number of vowels. As for the previous filler task, their accuracy for this task was irrelevant—they just needed to be occupied for the full 10 minutes. The page automatically advanced after 10 minutes elapsed. The next task for participants in all conditions involved making an identification decision about a fair lineup. Participants were randomly assigned to view a target-present lineup (contains the suspect that the participant saw in the video) or a target-absent lineup (contains the suspect that was not in the video). Initially, participants were given the same response options as the intervening lineup (called “final lineup decision” in the results). However, if a participant selected “Not Present” for this final lineup, the next screen instructed them to indicate the lineup member they would have identified if they had to choose (called “forced-choice task/decision” in the results). Participants also provided an explanation of why they made that decision and how confident they were in that forced identification decision.

The experimental session finished with a series of post-identification questionnaires designed to examine the mechanisms underlying participants’ decisions about the final lineup. These questions concerned participants’ memory experience when making decisions about the lineups, their ability to determine the source of any familiarity or recollection of a person, as well as questions about commitment effects and social influence. The full details of the instructions, questions, and questionnaires that participants worked through in this study can be found in Appendix B. Once these post-identification questionnaires were completed, participants reached the “end” screen of the survey where they were instructed to go get their experimenter. They were then debriefed about the purpose of the study and dismissed.
Results

Materials Check

Were there any differences in repeated-suspect effect outcomes based on which suspect served as the culprit and which served as the innocent suspect?

To determine whether the two suspects that were used in the current materials produced different hit or false alarm rates in the current study, I ran two logistic regression models. False alarms on the innocent suspect were the outcome variable for the first model (1 = innocent suspect identification, 0 = did not identify the innocent suspect), which tested for an interaction between which suspect served as the culprit and Intervening Task Condition on innocent suspect misidentification rates for target-absent final lineups. There were no significant interactions (biased lineup vs. no lineup X suspect 1 vs. suspect 2: $B < 0.01, p = 0.999, \theta = 1.00, 95\% CI [0.80, 10.38]$; fair lineup vs. no lineup X suspect 1 vs. suspect 2: $B = 0.86, p = 0.443, \theta = 2.36, 95\% CI [0.26, 25.53]$), nor a main effect of which suspect served as the culprit ($B = -0.49, p = 0.608, \theta = 0.61, 95\% CI [0.075, 4.01]$). Thus, which person served as the culprit and innocent suspect did not affect repeated-suspect effect outcomes, and it was not necessary to include “suspect” as a control variable in these analyses.

An identical analysis was run on the target-present final lineups to see whether correct identifications were influenced by which suspect acted as the culprits. Again, there were no significant interactions between Intervening Task Condition and suspect for predicting correct identification rates (biased lineup vs. no lineup X suspect 1 vs. suspect 2: $B = -0.61, p = 0.459, \theta = 0.54, 95\% CI [0.11, 2.70]$; fair lineup vs. no lineup X suspect 1 vs. suspect 2: $B = -0.75, p = 0.344, \theta = 0.47, 95\% CI [0.10, 2.23]$), nor a main effect of suspect on hits ($B = -0.09, p = 0.879, \theta = 0.91, 95\% CI [0.30, 2.83]$). Again, these results suggested that which person served as the
culprit made no significant difference for predicting hits for Experiment 1, so “suspect” was not included as a control variable in any analyses of hits.

**Manipulation Checks**

**Did the biased intervening lineup bias participants identification decisions?**

During the intervening lineup phase, participants who received a biased intervening lineup identified the innocent suspect significantly more frequently (38%) than participants who received a fair intervening lineup (9%, $B = -1.78$, $p < .001$, $\theta = 0.17$, 95% CI [0.42, 0.06]). Thus, participants presented with a fair intervening lineup misidentified the innocent suspect 29% fewer times than participants who saw a biased intervening lineup, indicating that the biased lineup made participants significantly more likely to identify the innocent suspect.

**Hypotheses Set 1A: Repeated-Suspect Effect**

**Identification decisions**

Identification decisions are binary variables, with each decision type coded as present or not for each lineup decision that each participant made. For instance, if a participant selected the innocent suspect from a lineup, that decision would receive a score of “1” in the column indicating the number of false alarms, and a score of “0” in each of the columns for hits, misses, correct rejections, and filler picks. Refer to Table 2 for definitions of what these signal-detection theory labels mean in the context of this experiment and Table 3 for a summary of identification decisions in each condition for this experiment.
Table 2. Summary of the identification decisions made in each between-subjects condition, for each phase of Experiment 1.

<table>
<thead>
<tr>
<th>Condition</th>
<th>Intervening Task Phase</th>
<th>Final Lineup Decisions</th>
<th>Final Lineup Phase</th>
<th>After Forced-Choice Task</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>Target Present</td>
<td>Target Absent</td>
<td>Target Present</td>
</tr>
<tr>
<td>Control — No</td>
<td>Culprit</td>
<td>0.24</td>
<td>IS</td>
<td>0.02</td>
</tr>
<tr>
<td>Intervening Lineup</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Filler</td>
<td>0.33</td>
<td>Filler</td>
<td>0.41</td>
</tr>
<tr>
<td></td>
<td>Miss</td>
<td>0.43</td>
<td>Reject</td>
<td>0.57</td>
</tr>
<tr>
<td>Biased Intervening</td>
<td>IS</td>
<td>0.38</td>
<td>Culprit</td>
<td>0.30</td>
</tr>
<tr>
<td>Lineup</td>
<td></td>
<td></td>
<td>Target</td>
<td>Target Absent</td>
</tr>
<tr>
<td></td>
<td>Filler</td>
<td>0.12</td>
<td>Filler</td>
<td>0.30</td>
</tr>
<tr>
<td></td>
<td>Reject</td>
<td>0.50</td>
<td>Miss</td>
<td>0.54</td>
</tr>
<tr>
<td>Fair Intervening</td>
<td>IS</td>
<td>0.09</td>
<td>Culprit</td>
<td>0.32</td>
</tr>
<tr>
<td>Lineup</td>
<td></td>
<td></td>
<td>Target</td>
<td>Target Absent</td>
</tr>
<tr>
<td></td>
<td>Filler</td>
<td>0.37</td>
<td>Filler</td>
<td>0.23</td>
</tr>
<tr>
<td></td>
<td>Reject</td>
<td>0.54</td>
<td>Miss</td>
<td>0.45</td>
</tr>
</tbody>
</table>

Notes. Culprit = Correct identification of the culprit; IS = incorrect, innocent suspect identification; Filler = incorrect filler identification; Reject = correct decision to reject the lineup ("not present"); Miss = failure to identify the culprit.
Table 3. *A summary of how signal-detection theory language relates to Experiments 1 and 2, and how this maps on to the various lineup conditions, identification decisions, and accuracy.*

<table>
<thead>
<tr>
<th>Lineup type</th>
<th>Decision</th>
<th>Label</th>
<th>Accuracy</th>
</tr>
</thead>
<tbody>
<tr>
<td>Target-Present</td>
<td>Identify Suspect</td>
<td>Hit</td>
<td>Correct Decision</td>
</tr>
<tr>
<td></td>
<td>Identify Filler</td>
<td>False Alarm (Filler)</td>
<td>Incorrect Decision</td>
</tr>
<tr>
<td></td>
<td>Reject lineup</td>
<td>Miss</td>
<td>Incorrect Decision</td>
</tr>
<tr>
<td>Target-Absent</td>
<td>Identify Suspect</td>
<td>False Alarm*</td>
<td>Incorrect Decision</td>
</tr>
<tr>
<td></td>
<td>Identify Filler</td>
<td>False Alarm (Filler)</td>
<td>Incorrect Decision</td>
</tr>
<tr>
<td></td>
<td>Reject lineup</td>
<td>Correct Rejection</td>
<td>Correct Decision</td>
</tr>
</tbody>
</table>

*Notes.* *When a false alarm is referred to in the current document, assume that this is a false alarm on the innocent suspect unless the author specifies that it is a false alarm on a filler.

**Analytic plan**

Participants who received an intervening lineup containing an innocent suspect should be more likely to select that innocent suspect later compared with the control condition where the intervening task was not a lineup and did not expose them to the innocent suspect’s face. This effect was expected to be strongest when an intervening lineup was biased versus fair, and when the decisions that participants made after they were forced to choose were included in the analysis. The key outcome in this case is the number of incorrect identifications (false alarms). The outcome variable was, therefore, the number of false alarms on the innocent suspect in each condition of interest, with “1” coded to indicate a false alarm and “0” to represent any other lineup decision. Logistic regression analyses were run with the number of false alarms as the outcome variable and the intervening task condition (biased lineup, fair lineup, and reading task) as a categorical predictor, with the reading task as the reference group (a control condition). Analyses only include participants who received a target absent lineup during their final lineup phase, as these were the only participants for whom these hypotheses were relevant.
**Biased intervening lineups**

A biased intervening lineup significantly increased participants’ likelihood of picking the innocent suspect out of the final, fair lineup when compared to the control participants who saw no lineup (34% versus 2%; \( B = 3.25, p = 0.002, \theta = 25.76, 95\% \text{ CI} [4.90, 473.43] \)). A similar effect was found when the forced-choice decisions were included in these data (52% versus 10%; \( B = 2.30, p < .001, \theta = 9.97, 95\% \text{ CI} [3.63, 32.46] \)). These are large effects, as was expected when participants saw the innocent suspect in a biased intervening lineup. Even before participants were forced to choose from the lineup, participants who had previously seen the innocent suspect in a biased lineup were much more likely to select the innocent suspect from the final lineup compared with participants who had never seen the innocent suspect before. When identification decisions from the forced-choice task were included, participants were more likely to select the innocent suspect if they had seen them before in a biased lineup (compared to control participants), but the effect was smaller than when the forced-choice decisions were not included. Figure 4 contains a graph of these results.

**Fair intervening lineups**

When compared to the control condition, participants who received a fair intervening lineup containing the innocent suspect were more likely to misidentify the innocent suspect in the final lineup. Although this was marginally significant for final lineup decisions (12% versus 2%; \( B = 1.89, p = 0.082, \theta = 6.61, 95\% \text{ CI} [1.12, 125.21] \)), the effect was significant when the identification decisions for the forced-choice task were included (28% versus 10%; \( B = 1.29, p = 0.019, \theta = 3.63, 95\% \text{ CI} [1.31, 11.82] \)). The final lineup decision results suggest that an incorrect identification of the innocent suspect in the final lineup were more likely when a fair intervening lineup was seen compared to no intervening lineup. Similarly, when the forced-choice data were
included too, participants were also more likely to selected the innocent suspect when they had a fair intervening lineup rather than no lineup. Note, though, these effects were smaller than those seen in the biased intervening lineup conditions, as was hypothesized (biased versus fair intervening lineup, final lineup decisions: $B = 1.36, p = 0.007, \theta = 3.90, 95\% \text{ CI } [1.51, 11.02]$; and forced-choice decisions: $B = 1.01, p = 0.012, \theta = 2.75, 95\% \text{ CI } [1.26, 6.11]$). Refer to Figure 4 for a visual representation of these data.

**Conclusion**

Analyses of the identification decisions across the different intervening tasks support the hypothesis that seeing an innocent suspect in an intervening lineup will increase the likelihood that the same innocent suspect will be identified in a subsequent lineup. Thus, this experiment shows a clear repeated-suspect effect. In addition, these data show that a biased intervening lineup produces the largest repeated-suspect effect, particularly when participants are forced to choose from the final, target-absent lineup. Although the effect was strongest for people in the biased intervening lineup condition and for the data including forced-choice decisions, both the fair and biased intervening lineups increased misidentifications of the innocent suspect in the final lineup, when the forced-choice data were included and when they were not. It seems that, whenever an intervening lineup containing the innocent suspect was presented, the innocent suspect was more familiar to the participants than any of the new fillers in the final lineup. Figure 5 contains a summary of final lineup identification decisions.

**Confidence in identifications**

There were two different confidence measures that were analyzed here. One was the participants’ reported confidence in their final lineup decisions, which will be referred to as confidence. A second confidence measure was collected for those who said “not present” for the
final lineup and went one to complete the forced-choice identification decision. The confidence data that includes the data from the forced-choice task will be called forced-choice confidence. Standardized beta values are reported.

**Analytic plan**

Linear multiple regressions were run to assess the effect of lineup decision and intervening task condition on confidence levels. Again, these results only include those participants who received a final lineup that was target absent. Initially, models were run looking for an interaction between the intervening task condition and whether a participant selected the innocent suspect. There were no significant interactions, though, so these were removed.

**Confidence**

When the responses from the participants’ final lineup decisions were analyzed (prior to being forced to choose from the lineup), there was no significant effect of intervening task condition (biased intervening lineup vs. control condition: $B = 0.07, p = 0.458$; fair intervening lineup vs. control condition: $B = 0.04, p = 0.668$) or identification decision on confidence levels (false alarm vs. other identification decision: $B = 0.05, p = 0.548$). Although all patterns were non-significant, participants were generally more confident in their final lineup decision for conditions where an intervening lineup was presented (biased: $M = 59\%, SD = 22\%$; fair: $M = 57\%, SD = 22\%$) compared with the control condition where the intervening task was not a lineup (control: $M = 54\%, SD = 23\%$).

**Forced-choice confidence**

When identification decisions from the forced-choice question were analyzed with confidence as the outcome variable, there was a marginally significant main effect of forced-choice identifications on confidence ($B = 0.15, p = 0.085$). That is, participants who did not
select the innocent suspect (i.e., identified a filler), even after being forced to choose, reported lower confidence levels on average ($M = 47\%, \ SD = 24\%$) than participants who selected the innocent suspect from the final lineup ($M = 56\%, \ SD = 19\%$). However, there was no significant effect of intervening task on forced-choice confidence levels (biased vs. control: $B = 0.07, \ p = 0.455$; fair vs. control: $B = 0.06, \ p = 0.520$). Forced-choice task confidence levels were lower than final lineup decision confidence levels (all forced-choice confidence responses: $M = 50\%, \ SD = 24\%$).

Figure 4. A graph showing the proportion of people in each condition, at each phase of the experiment, who selected the innocent suspect. Error bars represent 95% CIs.
Figure 5. A stacked bar graph showing the proportion of people selecting the innocent suspect in the final, target-absent lineups. Light grey sections represent additional participants who chose the innocent suspect after being forced to choose. Error bars represent 95% CIs.

**Hypotheses Set 2A: Remember-Know-Guess and Source-Monitoring Processes**

**Categorical Remember-Know-Guess judgment**

Did participants in different conditions report using recollection or familiarity to a greater extent when making lineup decisions? This was examined using participants’ responses to the post-identification Remember-Know-Guess (R-K-G) question (Appendix B contains the instructions and question prompt).

**Analytic plan**

The proportion of R-K-G judgments in each intervening task condition were compiled in Table 4, separated also by whether participants received a target-present or target-absent final lineup. This permitted a comparison of how “remember”, “know”, and “guess” were distributed
across conditions when participants made culprit identifications or innocent suspect identifications.

Chi-Square analyses were used to determine whether the distribution of R-K-G judgments was different for culprit identifications and innocent suspect identifications within the biased and fair intervening lineup conditions. There was a very low rate of innocent suspect identifications in the control condition, so an inferential analysis of those data was not appropriate. Supporting multinomial analyses can be found in Appendix H, but note that these are underpowered. Finally, the number of “remember” and “know” judgments associated with false alarms for the intervening and final lineup versus a false alarm only in the final lineup was analyzed to see if the “false recall” findings from Haw et al. (2007) replicated here.

When participants identified a suspect, did the distribution of “remember” and “know” judgments vary based on intervening task condition and target presence in the final lineup?

First, the distribution of remember, know, and guess judgments was examined for participants who received biased intervening lineups and then selected the culprit or innocent suspect from the final lineup. Table 4 contains a complete summary of these data. The first comparison of interest was between reports of subjective recognition experience for culprit and innocent suspect identifications. For participants who selected the true culprit from the final lineup after a biased, intervening lineup, there were 20.7% judgments of “know” and 37.9% “remember” judgments. For innocent suspect identifications after a biased intervening lineup, 38.5% reported “know” and 30.8% reported “remember.” A Chi-Square analysis indicated that there was no association between these categorical variables ($\chi^2 [1, N = 35] = 1.45, p = 0.229$). The percentages suggest that “remember” judgments tend to be more common than “know” judgments for culprit identifications, and “know” judgments more common for innocent suspect
identifications than “remember” judgments, which was hypothesized. However, the statistical
test was not significant due to low samples sizes, so interpret these patterns with caution.

Table 4. R-K-G judgments for suspect identifications separated by intervening task condition and
final lineup condition.

<table>
<thead>
<tr>
<th>Intervening Task Condition</th>
<th>Final Lineup &amp; Decision</th>
<th>N who identified the suspect*</th>
<th>Distribution of Judgments</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td></td>
<td>Remember</td>
</tr>
<tr>
<td>No Lineup</td>
<td>Target Present (Hits)</td>
<td>26</td>
<td>35.0%</td>
</tr>
<tr>
<td></td>
<td>Target Absent (FAs)</td>
<td>5</td>
<td>20.0%</td>
</tr>
<tr>
<td>Biased Lineup</td>
<td>Target Present (Hits)</td>
<td>29</td>
<td>37.9%</td>
</tr>
<tr>
<td></td>
<td>Target Absent (FAs)</td>
<td>26</td>
<td>30.8%</td>
</tr>
<tr>
<td>Fair Lineup</td>
<td>Target Present (Hits)</td>
<td>25</td>
<td>40.0%</td>
</tr>
<tr>
<td></td>
<td>Target Absent (FAs)</td>
<td>17</td>
<td>41.2%</td>
</tr>
</tbody>
</table>

Notes. FAs = False Alarms. *Target present suspect identification means that the participant
chose the true culprit from the lineup. Target absent suspect identification means that the
participant chose the innocent suspect from the lineup. Rows total to 100%. All percentages
rounded to 1dp.

Next, the R-K-G judgments were evaluated for culprit and innocent suspect
identifications after fair, intervening lineups. Again, Table 4 contains a complete summary of the
data relevant to these analyses. For the target-present final lineups, 24% of participants who
identified the culprit reported “know” and 40% reported “remember” after receiving a fair
intervening lineup. Similarly, 23.5% of participants who selected the innocent suspect in the
target-absent final lineup condition reported “know” and 41.2% reported “remember” after
seeing a fair intervening lineup. Again, there was no significant association between these
categories ($\chi^2 [N = 27] = 0.004, p = 0.95$). The percentages show that, regardless of whether the
final lineup was target-present or -absent, participants tended to judge their memory experience
as “remembering” more frequently than “knowing” after a fair intervening lineup.

Finally, Chi-Square analyses were performed on “remember” and “know” judgments hits
and false alarms from the final lineup. There was no evidence that the type of lineup (biased or
fair) was associated with frequency of “remember” and “know” judgments among those who identified the true culprit from the final lineup ($\chi^2 [1, N = 21] = 0.02, p = 0.818$). That is, “remember” judgments were associated with culprit identifications after fair and biased intervening lineups to a similar degree (fair: 40.0%; biased: 37.9%), and “know” judgments made about culprit identifications were equally common in the fair and biased intervening lineup conditions (fair: 24%; biased: 20.7%). There was also no significant difference when looking at the “remember” and “know” frequencies for false alarms on the innocent suspect ($\chi^2 [1, N = 29] = 1.01, p = 0.316$). Innocent suspects that were identified after fair and biased intervening lineups were equally likely to be judged a “remember” experience (fair: 41.2%; biased: 30.8%) as a “know” experience (fair: 23.5%; biased: 38.4%).

It is important to clearly note that I cannot make any strong inferences about these recognition experience judgments given the low sample sizes and the correlational nature of these data. However, among those who saw a biased intervening lineup, there was a higher percentage of “remember” judgments when participants selected the true culprit than when participants identified the innocent suspect. In contrast, the fair intervening lineup condition was associated with a higher proportion of “remember” judgments than “know” judgments whether or not the person identified was the culprit or the innocent suspect. Perhaps the fair intervening lineup kept the repetition of the innocent suspect outside of participants’ awareness and, thus, led to more confusion about where they had seen that face before.

**How are confidence and correct/incorrect identifications of the suspect associated for “remember” and “know” judgements?**

Refer to Figure 6 to see a graph of the proportion of hits and false alarms on the innocent suspect associated with each level of confidence, as a function of whether the participants
reported “remembering” or “knowing”. Note that the sample sizes within each confidence level are relatively small. “Low confidence” in Figure 6 is defined as 0% through to 30%, “medium confidence” is 40% to 60%, and “high confidence” is 70% or higher.

First, let us consider the data from the target-present, final lineup condition (Figure 6, solid lines). For participants who reported low confidence, Figure 6 indicates equal proportions, and low frequency, of both “remember” and “know” judgments among those who chose the true culprit from the final lineup. There is a small increase in proportions of “remember” and “know” judgments for medium confidence among those who identification the culprit, but the proportions are still relatively equal, as was the case for low confidence. At the highest levels of confidence, though, the distribution of “remember” and “know” judgments appears different—there is a high proportion of “remember” judgments, and a low proportion of “know” judgments.

Figure 6. A chart of the suspect identifications in Experiment 1 at each level of confidence, separated also by whether participants reported “remember” or a “know” post-identification. Dotted lines indicate target-absent final lineups (innocent suspect identifications) and solid lines indicate target-present final lineups (true culprit identifications). IS = innocent suspect.
A very similar pattern was found for participants in the target-absent, final lineup condition among participants who selected the innocent suspect from the final lineup. At both low and medium levels of confidence, there are equally low proportions of “remember” and “know” judgments associated with innocent suspect identifications. High levels of confidence are associated with a similar R-K-G distribution to culprit identifications—a high percentage of “remember” judgments and low rate of “know” judgments for innocent suspect picks.

Thus, the distribution of “remember”, “know”, and “guess” judgments for participants who misidentified the innocent suspect resembles the distribution seen for correct identifications when separated by confidence level. Very little can be concluded from these data because they are correlational and underpowered. Nevertheless, if this pattern held with a larger sample or repeated measures design, this might suggest that “remember” and “know” judgments and confidence levels are not diagnostic of whether the participant selected the true culprit or not when an innocent suspect has been repeated across multiple identification procedures—repeating someone across lineups might hinder the diagnostic value of these measures.

**Did participants who chose the innocent suspect from the intervening and final lineup report “remember” more frequently than participants who only identified the innocent suspect from the final lineup?**

This analysis included only participants who received a target-absent final lineup and identified the innocent suspect from the final lineup (forced-choice task included; \( N = 43 \)). Thus, the statistical power of the tests was low due to the small sample size. However, because the relevant comparison is between those who identified that innocent suspect in the final lineup and had the opportunity to identify the innocent suspect in a previous identification procedure, this
reduction in statistical power was necessary. Additional R-K-G analyses relevant to this research question can be found in Appendix H.

This analysis seeks to replicate a finding from Haw et al. (2007). That is, Haw et al. found that participants who identified the innocent suspect twice tended to report “remember” more frequently than those who did not, suggesting higher rates of “false recollection” when people misidentified the same person twice. A total of 22 people identified the innocent suspect from both the intervening lineup and the final lineup, and 21 identified the innocent suspect from the final lineup, but not an intervening lineup. Among participants who chose the innocent suspect from the intervening and final lineup, 50.0% reported “remembering” and 40.9% reported a “know” recognition experience. For those who only identified the innocent suspect from the final lineup, 19% reported “remembering” and 23.8% reported “knowing” the individual they identified. A Chi-Square analysis of these cell counts revealed that there was no association between the choosing condition and the R-K-G judgment ($\chi^2 [1, N = 29] = 0.28, p = 0.599$). However, the trends are consistent with Haw et al. (2007) and my predictions—there were more incorrect “remember” judgments when people selected the innocent suspect from the intervening lineup and the final lineup when compared with those who only selected the innocent suspect from the final lineup.

**Source monitoring measures**

There were two questions that specifically addressed whether people made an identification because they remember seeing that face in the video (“I can recall seeing this person’s face in the video” and “I was really sure this was the culprit from the video”), one specifically asking about whether the source could be a previous lineup (“I recall seeing them in a previous lineup”), and two referring to the encoding context without being specific about what
it was (“When I saw their face in the lineup, other information came to mind from the first time I saw their face” and “I could recall other details about the first time I saw their face”). These were included as post-identification questions to determine if people were able to successfully monitor the source of their memory experience.

**Analytic plan**

Multiple regressions were run with the responses to the specific questions highlighted in the previous paragraph as outcome variables. The two “video as source” questions were averaged to make a composite score, but there was only one “lineup as source” question so the original scores were used for those analyses. These outcome variables were continuous because the responses were from 1 (*completely false*) to 6 (*completely true*), so multiple regressions were used. For each question, a model was run with an interaction between final lineup identification decision (suspect pick or not) and intervening task condition, and this model was reduced if the interaction was nonsignificant. Standardized beta values are reported.

**Table 5. Descriptive statistics for the video and lineup as source post-identification questions for each intervening task condition in Experiment 1.**

<table>
<thead>
<tr>
<th>Intervening Task Condition</th>
<th>Final Lineup Condition</th>
<th>Lineup Outcome</th>
<th>Video as Source</th>
<th>Lineup as Source</th>
</tr>
</thead>
<tbody>
<tr>
<td>No Lineup</td>
<td>Target Present</td>
<td>Hit</td>
<td>3.64 (1.28)</td>
<td>1.50 (0.81)</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Filler</td>
<td>3.26 (0.95)</td>
<td>1.82 (0.85)</td>
</tr>
<tr>
<td></td>
<td>Target Absent</td>
<td>False Alarm</td>
<td>3.00 (0.00)*</td>
<td>-</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Filler</td>
<td>3.57 (0.97)</td>
<td>-</td>
</tr>
<tr>
<td>Biased Lineup</td>
<td>Target Present</td>
<td>Hit</td>
<td>3.26 (1.17)</td>
<td>1.83 (1.03)</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Filler</td>
<td>4.31 (1.28)</td>
<td>2.31 (1.49)</td>
</tr>
<tr>
<td></td>
<td>Target Absent</td>
<td>False Alarm</td>
<td>3.90 (1.03)</td>
<td>4.45 (1.23)</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Filler</td>
<td>3.13 (0.83)</td>
<td>2.67 (1.59)</td>
</tr>
<tr>
<td>Fair Lineup</td>
<td>Target Present</td>
<td>Hit</td>
<td>3.78 (1.64)</td>
<td>2.10 (1.25)</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Filler</td>
<td>3.33 (0.95)</td>
<td>2.46 (1.18)</td>
</tr>
<tr>
<td></td>
<td>Target Absent</td>
<td>False Alarm</td>
<td>3.08 (0.73)</td>
<td>3.23 (2.04)</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Filler</td>
<td>3.29 (0.99)</td>
<td>2.39 (1.03)</td>
</tr>
</tbody>
</table>

**Notes.** Mean scores are displayed (rated out of 6). Higher scores indicate that participants think the source is a likely source of recognition. Standard deviations are presented in parentheses. All values rounded to 2dp. * Cell contains only one person thus the standard deviation is zero.
**Video as source**

First, the participants in the target-present, final lineup condition were analyzed (forced-choice task data included). There was a significant interaction final lineup decision (hit versus filler selection) and intervening task condition ($B = -0.28$, $p = 0.017$). This means that participants who received a biased intervening lineup and identified the correct culprit from the final lineup were less likely to report that the video was a source of their recognition than those who selected a filler from the final lineup. In contrast, participants in the control condition (who received no intervening lineup) showed the opposite pattern, with participants who identified the true culprit from the final lineup reporting that the video was a source of recognition more often than those who picked fillers from the final lineup. There were no significant effects when comparing hit and filler picks between the fair intervening lineup condition and the control condition (interactions: $B = 0.01$, $p = 0.909$). Refer to Table 5 for relevant means. The means show that, as hypothesized, for those who received no intervening lineup and those who received a fair intervening lineup, the video was scored as a stronger source of recognition when they also selected the culprit. But, contrary to my predictions, the opposite was true for those in the biased intervening lineup condition—the video was rated as a source of memory more for participants who identified fillers from the target-present final lineup after seeing a biased intervening lineup with the innocent suspect.

When analyzing the participants who received a target-absent, final lineup (forced-choice decisions again included), the biased lineup was used as a reference group instead for this analysis because the innocent suspect identifications were so low in the control condition. There was a significant interaction observed between final lineup decision (false alarm versus filler) and the fair intervening lineup condition (compared with the biased intervening lineup condition;
B = -0.18, \( p = 0.034 \)). This indicates that, as anticipated, “video as source” reports were higher for people who selected the innocent suspect rather than a filler and saw that innocent suspect in a prior, biased intervening lineup (compared to people who received a fair intervening lineup). Again, refer to Table 5. for the relevant descriptive statistics.

**Previous lineup as source**

For both of the analyses in this section, the biased lineup was used as a reference group because the control condition did not receive an intervening lineup so it could not be a source of memory. When the target-present final lineup condition was analyzed, there were no significant interactions between final lineup decision (forced-choice included; hit versus filler) and intervening task condition, so the interaction effects were removed. There were no significant main effects either. Thus, there was no significant difference between the fair intervening lineup condition and the biased intervening lineup condition (\( B = 0.12, \ p = 0.143 \)) and no significant effect when comparing participants who selected the true culprit in the final lineup and participants who identified fillers (\( B = -0.11, \ p = 0.149 \)) with regard to reporting the lineup as a source of memory. Thus, the target-present final lineup results were consistent with my predictions—there was little evidence that participants thought the previous fair lineup containing the innocent suspect was a source of recognition when they successfully identified the culprit. The means can be found in Table 5.

For participants who received a target-absent, final lineup, there were no significant interactions found between final lineup decision (forced-choice included; false alarm versus filler) and Intervening Task Condition, so the interaction effects were removed from the model. The biased lineup was used as a reference group for this analysis because the no lineup group did not receive an intervening lineup and, thus, it could not be a source of memory. A significant
main effect of identification decision on the degree to which they thought a previous lineup was the source of their recognition (B = 0.32, p < 0.001). Specifically, people who identified the innocent suspect from the final lineup were more like to say that a previous lineup was one source of their recognition compared with individuals who selected a filler. In addition, there was a significant effect when people who saw a fair intervening lineup were compared to participants who were in the control condition (B = -0.21, p = 0.010). This means that, as hypothesized, people who saw a biased intervening lineup were more likely to say that the previous lineup was the source of their recognition than if they saw a fair intervening lineup (see Table 5 again).

**Recognition associated with non-specific encoding context**

People who saw a fair intervening lineup reported being more unsure about the situation in which they first saw the face they identified (M = 3.22, SD = 1.41) when compared with those who had no intervening lineup (M = 3.92, SD = 1.32; B = -0.88, p = 0.027). Yet, there was no significant main effect when comparing the biased intervening lineup condition (M = 3.54, SD = 1.42) to the control condition (B = -0.21, p = 0.125) or people who selected the innocent suspect (M = 3.70, SD = 1.29) or a filler (M = 3.40, SD = 1.46; B = 0.16, p = 0.146). There were also no significant results for the equivalent analyses in the target-present, final lineup condition, and no significant differences between conditions when examining ratings of participants’ recall of other details about the encoding event, for either target-absent and target-present final lineups.

**Conclusion on R-K-G and source monitoring measures**

Given the low sample sizes obtained for the R-K-G analyses, the lack of significance was unsurprising. Though no firm inferences can be made from these data, the patterns suggest that people were more likely to report “remember” when they identified the innocent suspect twice. This is consistent with previous literature (Haw et al., 2007), but the trends are not significant
and should be interpreted with caution. Culprit identifications tended to be linked with more “remember judgments” than “know” judgments regardless of intervening Task Condition. In contrast, innocent suspect identifications after a fair and biased intervening lineup seemed to be associated with “know” judgments more than “remember” judgments.

The source monitoring results were overall very consistent with my predictions and the R-K-G results. Participants receiving the target-present final lineup were less likely to report the lineup as a source of recognition and more likely to rate the video as a source of memory when they identified the true culprit. There was one exception though—participants who received a biased intervening lineup reported the video as a source of recognition more often when they chose a filler. This was not expected, but may indicate that these participants chose the filler that most resembled the salient, innocent suspect face that appeared in the biased lineup. So, they reasoned this person must have also been in video as the memory experience from the intervening lineup was so strong. Finally, people who received the target-absent final lineup and identified the innocent suspect were more likely to report the lineup as a source of memory than participants who picked fillers, particularly when they received a fair or biased intervening lineup. Interestingly, participants who selected the innocent suspect in both the biased and fair intervening lineup condition also attributed their memory to the video quite often, suggesting that the intervening lineups are associated with more source misattributions.

**Hypothesis Set 3A: Commitment Effects**

**Analytic plan**

Analyses relating to the investigation of potential commitment effects only included participants who received an intervening lineup (not the control condition) and a final, target-absent lineup ($N = 110$). Innocent suspect identification rates for the final lineup, including the forced-choice identifications, were used here, and intervening lineup choice was also coded for
use in these analyses (0 = “filler identification”; 1 = “innocent suspect identification”). A Chi-Square analysis was used to determine if choosing the innocent suspect from the intervening lineup was related to choosing that same innocent suspect from the final lineup. Next, I examined some potential explanations for why this pattern might have occurred. If a commitment process is responsible, and people are able to self-report this motivation, I expected to see higher scores on the post-identification, commitment process questions when individuals chose the innocent suspect from both lineups (rather than only made this mistake for the final lineup). To analyze these post-identification process questions, a multivariate t-test was used (Hotelling’s $T^2$). Note, though, that participants were only required to answer the first of the commitment related questions. The other three questions appeared only when participants reported that they believed they selected the same person in the intervening and final lineup. Thus, the sample sizes were smaller for responses that assessing participants who did not actually identify the same innocent suspect from the intervening and final lineup.

**Is choosing the innocent suspect from an intervening lineup related to choosing the same innocent suspect from the final lineup?**

Participants choosing the innocent suspect from the final lineup was not independent from their choosing of the innocent suspect in the intervening lineup ($X^2[1, N = 216] = 23.97, p < .001$). There was a higher rate of false alarms on the innocent suspect for participants that identified the innocent suspect from an intervening lineup ($P[\text{Final False Alarm} | \text{Intervening False Alarm}] = 0.46, N = 48$) than participants who identified a filler in the intervening lineup or rejected the intervening lineup ($P[\text{Final False Alarm} | \text{Intervening Filler Pick or Correct Rejection}] = 0.13, N = 168$).
Commitment effect versus. mere preference

Is there evidence of a commitment process for those who identified the innocent suspect twice? Analyses were run for the four commitment-relevant questions as outcome variables (refer to Appendix B for the exact wording of these questions). Higher scores for these questions indicate a higher levels of commitment processes. These were self-report questions, so some participants believed they chose the same person twice when they had not. However, because this question concerns participants’ motivations, their subjective belief about their lineup decisions was used.

Table 6. Summary of means, standard deviations, and sample sizes for responses to the optional, post-identification questions designed to measure commitment processes for Experiment 1.

<table>
<thead>
<tr>
<th>Group</th>
<th>Commitment Question 1</th>
<th>Commitment Question 2</th>
<th>Commitment Question 3</th>
<th>Commitment Question 4</th>
</tr>
</thead>
<tbody>
<tr>
<td>Identified IS* from intervening and final lineups</td>
<td>4.41 (1.22)</td>
<td>4.36 (1.18)</td>
<td>3.4 (0.82)</td>
<td>2.45 (1.00)</td>
</tr>
<tr>
<td>N = 21</td>
<td>N = 22</td>
<td>N = 20</td>
<td>N = 20</td>
<td></td>
</tr>
<tr>
<td>Identified IS* from final lineup only</td>
<td>4.24 (1.55)</td>
<td>4.00 (1.58)</td>
<td>3.00 (1.00)</td>
<td>2.80 (0.84)</td>
</tr>
<tr>
<td>N = 22</td>
<td>N = 5</td>
<td>N = 5</td>
<td>N = 5</td>
<td></td>
</tr>
</tbody>
</table>

Notes. * IS refers to “innocent suspect.” Means are displayed with standard deviations in parentheses and sample sizes denoted by N. All values are rounded to 2 decimal places.

The descriptive statistics in Table 6 indicate little difference in responses between people who identified the innocent suspect twice, and those who identified the innocent suspect only from the final lineup. A multivariate t-test confirmed that none of the differences seen between groups of participants for these commitment process questions were significant ($T^2[4, 16] = 0.40, p = 0.806$). Although there is an association between choosing the innocent suspect from the intervening lineup and the final lineup, these data provide no evidence that participants are driven to choose the innocent suspect again because they desire to appear consistent. It is possible, of course, that commitment may be responsible for some of the decisions made by
eyewitnesses. But the current study finds no evidence for a commitment process and mere consistency of preference might be the simpler explanation at this point.

**Hypotheses Set 4: Memory for the Culprit.**

**Analytic plan**

The final set of analyses are possible because half of the eyewitnesses in each experimental condition viewed a final, target-present lineup that did not include any of the lineup members who were shown previously. That is, the true culprit and innocent suspect never appeared in the same lineup, and fillers were never repeated. Participants were also given a forced-choice task if they chose to say “not present” for the final, target-present lineup so everyone had to decide between the lineup members eventually. Forcing participants to make an identification in the final, target-present lineup creates a test of whether the intervening lineups impaired the participant’s memory for the true culprit. For these analyses, the number of correct identifications (hits) is the outcome variable (0 = “not a hit”, 1 = “hit”) and intervening lineup condition used as a categorical predictor. Only participants who received a final, target-present lineup are included in these analyses (N = 155). Some additional exploratory analyses can be found in Appendix F.

**Is memory impaired when participants see an intervening lineup?**

Several analyses were conducted to determine whether participants were less able to identify the true culprit after receiving an intervening lineup. The key comparisons were between participants in the fair and biased intervening lineup conditions and the control, no intervening lineup condition for those in the target-present final lineup condition. The focus was on the hit rates in each condition—was their variation in the rate of successful identifications of the culprit across experimental conditions? The final lineup measures willingness to choose, whereas the forced-choice data is purely a memory test.
Were participants able to identify the culprit at above chance levels?

For these lineups, the chance that a person would select the culprit by guessing is 1/6. If participants identified the culprit at a rate significantly above 1/6, this would be evidence that the participants were able to recognize the culprit and were not guessing. When participants’ final lineup decision was examined, 43 selected the culprit from the target present final lineup. Thus, the hit rate for initial decisions was 28% (95% CI [0.21, 0.35]) which was significantly higher than chance; \( \chi^2(1, N = 155) = 12.90, p < .001 \). Similarly, when the decisions after participants were forced to pick from the lineup were analyzed, a total of 78 people selected the culprit (43 culprit identifications plus 35 forced culprit identifications). This hit rate was, obviously, higher at 50% (95% CI [0.42, 0.58]) and was significantly above chance; \( \chi^2(1, N = 155) = 124.00, p < .001 \). So, participants were able to recognize the culprit in the lineup and were not guessing.

Was there evidence of memory impairment and is it exacerbated by a biased intervening lineup?

The conditions with intervening lineups were compared to the control condition to determine whether hit rates were reduced when participants saw an intervening lineup. Figure 7 is a graph of the final lineup hit rates for each intervening task condition, including information about individuals who chose without encouragement and those who only selected the culprit after being forced to choose from the lineup. Contrary to hypotheses, the logistic regression analyses did not reveal any significant differences between final lineup hit rates for the biased intervening lineup and control condition \( (B = 0.28, p = 0.539, \theta = 1.32, 95\% \text{ CI} [0.54, 3.25]) \) or for participants who received a fair intervening lineup compared with the control condition \( (B = 0.38, p = 0.388, \theta = 1.46, 95\% \text{ CI} [0.62, 3.51]) \). Results were the same when the data included participants who only selected the culprit once they were forced to choose—both when
comparing identification decisions from the control condition to the biased intervening lineup condition \((B = 0.20, \ p = 0.621, \ \theta = 1.22, \ 95\% \ CI \ [0.55, \ 2.72])\) and the fair intervening lineup condition \((B = -0.34, \ p = 0.390, \ \theta = 0.71, \ 95\% \ CI \ [0.33, \ 1.54])\). The intervening lineups did not reduce accurate identifications of the culprit, as participants who saw intervening lineups did not have significantly lower hit rates than participants who saw no intervening lineup.

Though there was no evidence of memory impairment in participants decision patterns, I nevertheless went on to analyze participants confidence within each intervening lineup condition while controlling for their final lineup choice. Did the intervening lineups make participants less confident in their final lineup decisions? No significant interactions were found between intervening task condition and final lineup decision, and the addition of interactions did not significantly improve the models (forced-choice confidence: \(F(2, 151) = 1.26, \ p = 0.288\)). Thus, a main effects model was chosen. When assessing the confidence data that included decisions made after participants were forced to choose, there was no significant difference in confidence levels across intervening lineup conditions. Biased intervening lineups (52%; \(B = -0.001, \ p = 0.882\)) and fair intervening lineups (58%; \(B = 0.12, \ p = 0.200\)) resulted in approximately the same level of confidence as was seen in the control group (53%). However, people who identified the true culprit had significantly higher confidence (62%) than participants who made any other type of identification decision (52%; \(B = 0.19, \ p = 0.021\)). Thus, there is no evidence that intervening lineups prevent accurate identification of the culprit, or affect the certainty with which participants identified the culprit.
Did participants who identified a filler or the innocent suspect from an intervening lineup show memory impairment?

Previous research has shown that a participant might show memory impairment in a situation where the participant identifies someone from a lineup and is initially led to believe that choice is correct. After this, the experimenter pretends to have made an error and the participant is presented with a new lineup and told that the feedback they received was wrong (Smalarz & Wells, 2014). Although participants received no explicit feedback on their intervening lineup decisions here, I was able to examine whether choosing a person who was not the culprit from the final lineup influenced hit rates for the final, forced-choice lineup decisions. There was no significant difference in culprit identification rates found between people who identified an incorrect person from the intervening task (47% hit rate) compared with people who did not choose from the intervening lineup (54% hit rate; $X^2[1, N = 155] = 0.38$, $p = 0.539$). Thus, even choosing the incorrect person in an earlier lineup did not impair memory for the culprit.

Signal Detection Theory: Using $d'$ to examine discriminability across conditions

The $d'$ value is calculated in situations where there is a correct target and an incorrect distractor item, as is the case here, and is a standardized composite value that describes how well people can distinguish between the correct and incorrect targets. A higher $d'$ value indicates a large difference in the hit rate and false alarm rate—people make more correct decisions than they do incorrect decisions. In contrast, a low or negative $d'$ value indicates that the false alarm rate and hit rate and more similar and, therefore, the procedure does not help decision-makers discriminate well between the true target and a distractor stimulus. The values for this experiment can be found in Table 7.
When examining the final lineup decisions for participants in the control condition, the hit rate was high (24%) and the false alarm rate was low (2%). The same pattern occurred when examining the forced-choice decisions too (53% hits vs. 1% false alarms) and the $d'$ value indicated good discriminability among participants in this condition (refer to Table 7). The fair intervening lineup condition demonstrated worse discriminability compared with the control condition, with high culprit identifications (32%) and moderate false alarm rates for the innocent suspect (12%). Again, a similar pattern was found when the forced-choice decisions in the fair intervening lineup condition were included in these data (45% hits vs. 28% false alarms).

Finally, the biased intervening lineup condition had a very low $d'$ value associated with participants’ responses, and a very high false alarm rate (34%). Although the culprit identification rate also remained high (30%) the small difference in these values means that participants struggled to differentiate between the culprit and innocent suspect after viewing a biased intervening lineup containing the innocent suspect. Again, the same pattern was found when forced choice decisions were examined (58% hits vs. 52% false alarms).

Table 7. *A summary of the d prime ($d'$) values calculated for each intervening task condition in Experiment 1, for final lineup decisions and when the forced-choice task was included.*

<table>
<thead>
<tr>
<th>Intervening Task Condition</th>
<th>$d'$ for final lineup decisions</th>
<th>$d'$ when forced-choice decisions included</th>
</tr>
</thead>
<tbody>
<tr>
<td>No lineup (control)</td>
<td>1.36</td>
<td>1.35</td>
</tr>
<tr>
<td>Biased intervening lineup</td>
<td>0.15</td>
<td>-0.11</td>
</tr>
<tr>
<td>Fair intervening lineup</td>
<td>0.46</td>
<td>0.71</td>
</tr>
</tbody>
</table>

*Notes. All values rounded to 2dp.*
Figure 7. A graph showing the hit rate (proportion of correct identifications of the culprit) in each intervening task condition. The light grey sections indicate the number of additional participants who identified the culprit after they were forced to choose from the final lineup. Error bars represent 95% CIs.

Conclusion

These results show that there was no significant difference in willingness to identify the true culprit (final lineup decision) or ability to identify the culprit (forced-choice task included) regardless of whether participants received a fair, biased, or no intervening lineup. Figure 7 is a graph that clearly demonstrates these findings. In addition, participants confidence in these decisions did not appear to suffer as a result of misleading intervening lineup information. Thus, in this experiment, there is no evidence that the intervening lineups prevent people from making accurate decisions when the culprit is presented to them using the “modified test” design—surrounded by new fillers only, without the repeated innocent suspect. In addition, it appears that as the suggestiveness of a procedure increases (control condition < fair intervening lineup
condition < biased intervening lineup condition), participants’ ability to discriminate between the culprit and innocent suspect decreased, as evidenced by the $d'$ values.

**Experiment 1 Discussion**

Experiment 1 produced a robust repeated-suspect effect. The repeated-suspect effect was not limited to a particular suspect, a particular photo of a suspect, a particular crime video, a particular set of fillers, or suggestive intervening identification procedures. For all conditions involving more than one identification procedure with a repeated innocent person, there was a significant increase in misidentifications of the innocent suspect. In addition, I also found that biased intervening lineups produced much higher rates of innocent suspect misidentifications in the final lineup than did fair intervening lineups.

The finding that the influence of a biased lineup could not be remedied by a subsequent fair lineup means that the statement in the dissenting opinion of the Supreme Court decision in *Manson vs. Braithwaite* is unsubstantiated—administering a fair lineup cannot correct for the problems created by an earlier administration of a biased lineup (as shown, also, with an initial showup procedure by Haw et al., 2007). Similarly, these results also show that the practice of showing an eyewitness multiple lineups containing the same police suspect does not improve outcomes, as is typically the reasoning the police provide. In fact, here, the hit rate remained unchanged, and the false alarm rate increased. Even a previous, *fair* lineup significantly increased innocent suspect identifications in a later lineup with new fillers. The results are consistent with the proposition that any time a suspect is presented in more than one identification procedure to the same eyewitness, the initial procedure contaminates the results from any subsequent procedures.

Analyses of the post-identification questions in Experiment 1 were included to looking at the relative contribution of three potential psychological mechanisms underlying these repeated-
suspect effects. Responses to the categorical R-K-G question were analyzed to assess how the proportion of familiarity (“know” judgments) and recollection (“remember” judgments) processes changed across intervening task conditions. When participants who received a fair intervening lineup were compared to participants who saw a biased intervening lineup, different proportions of “remember” and “know” judgments were found. There was a lower percentage of “remember” judgments and a higher percentage of “know” judgments for participants who selected the innocent suspect after seeing a biased intervening lineup when compared with participations who selected the true culprit after a biased intervening lineup. In contrast, when a fair intervening lineup was presented to participants, there were approximately equal distributions of “remember” and “know” judgments regardless of whether a participant selected the true culprit or the innocent suspect. Furthermore, when participants were very confident, there was a higher proportion of “remember” judgments and a lower proportion of “know” judgments when compared to the R-K-G judgments associated with lower confidence culprit and innocent suspect identifications. Thus, distribution of R-K-G judgments and high, medium, and low confidence in identifications was approximately the same whether or not the person identified was a repeated innocent suspect or the true culprit.

Consistent with the R-K-G findings, the source-monitoring questions revealed that a biased intervening lineup was associated with more reports that a previous lineup was the source of recognition when compared to those in the fair intervening lineup condition. However, a substantial portion of these individuals had identified the innocent suspect despite being asked to think only about the person who appeared in the video. Interestingly, participants who selected the innocent suspect from the final lineup, after viewing a biased intervening lineup or a fair intervening lineup, often rated the video as a source of memory. This suggests that the
intervening lineups were resulting in source misattribution—people who identified the innocent suspect but had no particular source come to mind for that person attributed the recognition to the most plausible source, the video. People in the biased lineup condition often reported knowing the innocent suspect was in the previous lineup, but also thought the video was another reason that they recognized the innocent suspect.

There were no significant differences found between people who chose the innocent suspect and those who did not in terms their reports of how motivated they were to appear consistent. Thus, there was no evidence that a commitment process was a contributing factor for participants who choose the innocent suspect in the intervening lineup and the final lineup. Instead, these data suggest there is no reason to reject the simpler interpretation of this pattern—people who preferred the suspect as their choice when evaluating an intervening lineup continue to prefer that same person in the final lineup. The act of identifying someone from a lineup might narrow attention towards a particular lineup member, similar to a biased lineup. Therefore, participants’ recognition experience might have been stronger under conditions where they received a biased lineup or identified the innocent suspect from an intervening lineup. Ultimately, although identifying the innocent suspect might increase preference for the innocent suspect, there is no evidence that commitment processes or a need to appear consistent is responsible for choosing the innocent suspect again after having chosen that person once.

The final purpose of Experiment 1 was to determine whether the original memory for the culprit was in any way impacted by viewing an intervening lineup. The identification decisions and confidence associated with the target-present final lineups did not suggest that the presentation of intervening lineups reduced participants’ abilities to identify the culprit—the memory trace for the culprit was maintained to a similar extent across conditions. In fact, when
examining the data after they were forced to choose, hit rates were at about 50% for all conditions. This seems to suggest that even intervening lineup conditions that make the innocent suspect stand out (e.g., biased intervening lineup or choosing a lineup member in a previous lineup) does not prevent a successful identification of the culprit later, so long as the culprit is the only person in the line that has been seen before. Thus, these data are consistent with the idea that exposure to an innocent suspect creates a second memory trace that is associated with the original memory for the culprit, but does not alter the memory for the culprit.
CHAPTER 3. EXPERIMENT TWO

Overview

Experiment 2 had four experimental phases, again separated by ten-minute filler tasks in which participants completed puzzles on paper and relinquished control of the computer to the experimenter. Participants began by watching one of the crime events containing one of the suspects. There were three intervening lineup phases following this, separated by the 10 minutes of puzzles. The first task could be a biased, target-absent lineup, a fair, target-absent lineup, or no lineup (a reading comprehension task). The second intervening task was either a fair, target-absent lineup or another reading task. After a final 10-minute period, participants were given the final, fair lineup phase followed by process-related post-identification questions.

Experiment 2 builds on the findings in Experiment 1 in two main ways. First, an additional intervening lineup was added to the design, so the effects associated with more encoding opportunities could be assessed for the participants randomly assigned to the conditions with two intervening lineups. Second, this experiment sought to explore the potential impact of social influence. Unlike in Experiment 1, the experimenter was present in the room for identification procedures in Experiment 2, and the way the instructions were delivered suggested to the participant that the experimenter had control over which task they received next. Thus, in addition to the suggestive nature of a repeated individual across lineups, the participant was allowed to infer that the experimenter chose to give them the new lineup with the repeated person. In contrast to Experiment 1, this experiment did not investigate whether participants maintained their memory for the true culprit—the final lineup was always target absent. All lineups in Experiment 2 were, therefore, target absent and contained a single innocent suspect that was repeated in any lineup procedures a participant received.
Predictions

Hypotheses Set 1B: The Repeated-Suspect Effect

As in Experiment 1, I expected to find a repeated-suspect effect. This means that participants who saw an intervening lineup containing the innocent suspect should be significantly more likely to misidentify that innocent suspect again in the final lineup compared with participants who received no intervening lineups (control condition). I also anticipated two circumstances under which the repeated-suspect effect would be larger in this experiment (i.e., produce more misidentifications of the innocent suspect). When the first intervening lineup was biased, this was hypothesized to increase the amount of attention that participants directed at the innocent suspect relative to a fair lineup and, as a result, exacerbate the number of identifications errors of that same person in a later lineup, which is a replication of Experiment 1. Similarly, when the participant received two intervening lineups before being presented with the final lineup, the repeated-suspect effect was expected to be stronger because, in this case, participants will have seen the innocent suspect *twice* before the final lineup, strengthening the memory trace for that face. The strongest repeated-suspect effect should occur when both of these manipulations are introduced to a procedure—when a participant first saw an innocent suspect in a biased lineup, and then again in a new, fair lineup, before they made their last identification decision about another fair lineup which also contained the innocent suspect.

The effect of repeating an innocent suspect across lineups was also expected to influence participants’ confidence reports. When people identified an innocent suspect that they saw in a previous lineup, they were expected to be more confident in that incorrect identification decision compared with participants who received no intervening lineups. This increase in confidence levels should be especially prominent when the participant saw the innocent suspect in *two* previous lineups. In addition, a biased lineup should boost confidence more than a fair lineup, as
they will feel like they have a stronger memory for the innocent suspect’s face. Finally, as with the predictions for the identification decisions, participants who received a biased lineup and saw the innocent suspect in two intervening lineups should demonstrate the largest boost in confidence when identifying the innocent suspect in the final lineup. This should be evidenced by an interaction between the variable indicating whether a participant selected the innocent suspect in the final lineup or not and the intervening lineup condition with confidence levels as the outcome variable. These patterns are expected to occur when the identification and confidence data are analyzed with and without the forced-choice task decisions and confidence.

**Hypotheses Set 2B: Remember-Know-Guess and Source Monitoring Processes**

Associations between the experimental conditions and R-K-G judgments were already investigated in Experiment 1, as well as participants’ reports of their sources of recognition. Experiment 2 allowed us to replicate and extend these hypotheses, and yielded slightly larger cell sizes for some of the comparisons. As in Experiment 1, the post-identification questions were used to test these hypotheses. The predictions follow a similar pattern to those in Experiment 1, but have some additional predictions relevant to receiving more than one intervening lineup, which was anticipated to draw attention to the repeated innocent suspect in a similar way to a biased lineup, even if the intervening lineups were both fair.

For participants who selected the innocent suspect, the number of intervening lineups was expected to change the distribution of “remember,” “know,” and “guess” judgments. Each addition intervening lineup provided more exposure to the same innocent suspect, and therefore was expected to be associated with higher numbers of “remember” judgments, especially when one of the intervening lineups was a biased lineup. In addition, participants who received two lineups were expected to report the lineup as a source of memory more than participants who saw one or no intervening lineups. The type of intervening lineup was expected to influence...
source judgments too, with biased lineups increase the “lineup as source” scores. Participants were expected to report the video as a source of recognition more frequently when they received a biased intervening lineup, and also when they received more than one intervening lineup. Finally, participants who chose the innocent suspect from at least one intervening lineup should report a “remember” experience more than a “know” experience, and are expected to attribute the source of their recognition to the lineups, and possibility the video if they misattribute the source of their strong recognition experience.

**Hypotheses Set 3B: Commitment Effects**

As in Experiment 1, this experimental design offered an opportunity to examine the motivations of people who selected the innocent suspect from the intervening lineups prior to selecting them again in the final lineup. First, people who selected the innocent suspect from an intervening lineup were expected to show a greater tendency to select that person again in the final lineup, as was found in Experiment 1. Second, responses to the post-identification questions were used to shed light on why these participants selected the innocent suspect multiple times. If the underlying reason for their multiple identifications of this innocent suspect was a commitment process, higher ratings were expected on the relevant commitment questions for participants who identified the innocent suspect multiple times compared with participants who only selected the innocent suspect from the final lineup and not from any intervening lineups. In contrast, if mere preference was the reason that the innocent suspect is chosen twice, little or no difference in responses to these post-identification commitment questions as a function of which experiment condition the participant was randomly assigned to.

**Hypotheses Set 5: Social Influence**

One of the more unique hypotheses in this work concerned the potential role of demand characteristics as a form of social influence being triggered by the repetition manipulation. In
actual cases, such as in the White case, repeating the suspect in a new lineup might lead
witnesses to infer that the lineup administrator is trying to get the witness to pick that person. In
order to give a better test of this possibility, a procedural change was introduced by having the
experimenter in the room for the whole session, and it was implied that the experimenter was in
charge of choosing and bringing up each task that participants saw. The repetition was expected
to have an impact on participants decisions by serving as a form of informational social
influence. That is, in an eyewitness identification context, repetition might imply to the witness
that there was something special about the repeated individual and strongly suggests the repeated
person was the culprit.

As in Experiment 1, data bearing on these social influence possibilities was sought by
using post-identification questions. These included a “yes” or “no” question to assess whether
participants felt like the experimenter was trying to influence them and, if they did feel
influenced, the participant was asked to explain why in an open response textbox. It was
predicted that participants who received a biased lineup or two intervening lineups would report
feeling like the experimenter was attempting to influence them more frequently that participants
in other conditions. The open responses from participants who reported feeling influenced were
assessed for qualitative differences between conditions.

Method

Participants

Undergraduate students from Iowa State University were recruited using an online
system where psychology laboratories could post advertisements for studies. This study was
completed in return for partial course credit. Pilot testing indicated that this study took
approximately 45-50 minutes. A total of 349 students were run in person, but quite a few
exclusions need to be made as a result of computer problems. When this happened, the
participant had seen some of the materials, but not completed the task, so their data could not be used and they were no longer naïve and could not start over. Several participants were also excluded due to a randomization programming error in one counterbalance. After exclusions, the sample size was 303 (refer to Table 7 for a summary of the sample sizes in each condition). Demographic information was not collected, but all participants were undergraduate students from Iowa State University. This study was approved by the IRB Board at Iowa State University (ID: 19-322, see Appendix I). Some of these participants were collected in Fall Semester 2019, and the remainder were collected in Spring semester 2020. However, data collection was cut off on March 13th 2020 due to the COVID-19 world-wide pandemic that prohibited in-person testing. Because this experiment could not be run online, data collection stopped earlier than intended. Thus, some of the counterbalances have smaller sample sizes than others. The plan is to finish data collection at a later time and even out the sample sizes across conditions once in-person experiments are permitted again in the future.

**Design**

Similar to Experiment 1, this was an experimental study with a 3 (intervening task phase 1: biased intervening lineup, fair Intervening lineup, or intervening reading task) x 2 (intervening task phase 2: fair intervening lineup or intervening reading task) between-subjects design. Participants were randomly assigned to receive one of the tasks during the first phase of intervening tasks, and one of the second phase of intervening tasks. Unlike Experiment 1, this experiment had a third phase too, but there was no manipulation in this phase—it was always a target-absent, fair lineup. Thus, there were six possible between-subjects’ conditions (refer to Table 8 for a summary of the number of participants in each condition). Figure 8 contains a diagram to help describe the design and procedure.
Experiment: “You will be doing a number of tasks, separated by “rest periods” where you will complete puzzles. During these “rest periods,” I will take over the computer so that I can bring up your next task.”

Crime video
Either w/: Suspect 1 Suspect 2

Filler task 10 min puzzle task

Biased LUP with suspect NOT in video Decision Confidence

Filler task 10 min puzzle task

Experiment angles screen away from participant and pretends to bring up next task.

Fair LUP with the suspect NOT in the video Decision

Filler task 10 min puzzle task

Control Task Read an article and answer a brief quiz

Fair LUP with the suspect from lineup(s) Decision Confidence

Experiment angles screen away from participant and pretends to bring up next task.

Post ID Qs
- Remember/Know/Guess Source Monitoring Framework - Commitment Effect - Social Influence

~1 min ~10 mins ~5 mins ~10 mins ~5 mins ~10 mins ~5 mins ~10 mins

TOTAL TIME = less than 60 minutes

Figure 8. Procedure, experimental manipulations, and timing for Experiment 2.
Table 8. A summary of the sample sizes in each condition for Experiment 2

<table>
<thead>
<tr>
<th>Intervening Lineup Phase 1</th>
<th>Intervening Lineup Phase 2</th>
<th>TOTAL</th>
</tr>
</thead>
<tbody>
<tr>
<td>Biased Intervening Lineup</td>
<td>62</td>
<td>63</td>
</tr>
<tr>
<td>Fair Intervening Lineup</td>
<td>54</td>
<td>44</td>
</tr>
<tr>
<td>Reading Task</td>
<td>35</td>
<td>45</td>
</tr>
<tr>
<td>TOTAL</td>
<td>151</td>
<td>152</td>
</tr>
</tbody>
</table>

Notes. All lineups were always target absent, containing the innocent suspect’s photo and five photos of individuals who are fillers.

Materials

The materials used for Experiment 2 are the same as those used in Experiment 1. The lineups and pilot testing data can be found in Appendix A. Appendix C contains the instructions and post-identification questions presented to participants in a Qualtrics survey throughout Experiment 2. Appendix D contains the reading comprehension tasks used in the place of intervening lineups for control conditions.

Procedure

Participants signed up for a one hour, in-lab session and met an experimenter outside the laboratory. Participants were asked to leave their belongings in the main area to avoid distractions during the experiment, and then asked to sit at the computer and read the consent form. The experimenter explained that the consent document described what the experiment would involve, how their privacy was protected, and any plans for the data collected. If participants had no questions about the document or study, they were asked to sign the document, and check the boxes indicating that they were 18 years old with normal or corrected-to-normal vision.

Next, the experimenter for that session introduced the task and explained to participants that they would be remaining in the room for the duration of the experiment. Participants were
told that they would be “completing a number of different tasks that will be broken up by ‘rest period’ in which you will complete some puzzles of your choosing.” In addition, the experimenter’s presence in the room was explained: “I will be in the room with you for the whole session because, during these rest periods, I will need to take over the computer and check your answers so that I can bring up the correct materials for the next task.” Then, the participant was asked if they had any questions. If not, they were told to go to the next page and begin.

The procedure was very similar to Experiment 1, beginning with one of the four possible crime videos (drug deal or office theft; suspect 1 or suspect 2). After watching the video, participants had a screen that said they would now spend 10 minutes on a task of their choosing. The experimenter would say “This is one of the ‘rest periods’ I told you about. Which puzzle would you like?” On the screen, participants were instructed to tell the experimenter whether they wanted a crossword, sudoku, or word find. When participants clicked to the next page, a countdown would start so they would know when 10 minutes was up. At this point, once the participant had started on their puzzle, the experimenter would turn the screen away from the participant and pretend to do something with the experimental task. The experimenter’s presence in the room was intended to permit the participant to infer that the experimenter was choosing the tasks that they received. Thus, it was important they appear like the experimenters seemed like they were, actually, spending some time doing this during the filler tasks. In reality, the experimenters were looking up the weather, movie times, playing tic-tac-toe with google, or some other quick task in a new Google Chrome tab to make their activity on the computer realistic. The page would automatically advance to the next task after 10 minutes. When this happened, the experimenter asked the participant to return to the computer task and said “Now
you are set up to receive a [police lineup / reading task]. The instructions are all on the screen, so move through them at your own pace and let me know if you have any questions.”

The next task was the first Intervening Task Phase. Participants received either a biased intervening lineup (target absent), a fair intervening lineup (target absent), or a reading comprehension task (control condition; see Appendix D). The instructions and materials used here were identical to the intervening lineup phase used in Experiment 1 (refer to Appendix A for the lineup materials and Appendix C for the full instructions for Experiment 2), with participants randomly assigned to each condition. For those who received a lineup, participants needed to make an identification decision (select one of the photos or indicate “not present”), explain the reason behind their decision in an open-response format, and then rate their confidence in their decision. Participants in the control group needed to get two multiple choice reading comprehension questions correct. Then, participants moved on to the next 10-minute filler task. They could continue with the puzzle from the last ‘rest period’ or ask for a new one. Again, the experimenter pretended to set up the next task for them by turning the screen away from the participant and taking over the computer.

Once 10 minutes elapsed, the program automatically advanced to the next task, which was the second Intervening Task Phase. Participants were randomly assigned to receive either a fair intervening lineup (target absent) or a reading comprehension task (control condition) during this phase. This is one of the main differences between Experiment 1 and 2 in this dissertation—Experiment 2 had an additional intervening task phase and an additional filler task after this, so some participants saw the innocent suspect in two different lineups before seeing them again in the final lineup. Once participants recorded their responses about this lineup or answered the reading comprehension questions, they began the final filler task period. Again, the experimenter
turned the screen away so they could pretend to bring up the next task, and the participant spent 10 minutes working on a puzzle of their choice.

The final lineup phase was also different from Experiment 1. All participants received a target-absent, fair lineup for the final phase of the experiment. Participants were initially allowed to say “not present” if they did not think that the culprit was among the photos. After stating their reasoning in an open-response box and rating their confidence, though, these participants were asked to indicate who they would have chosen if they had to pick, explain why, and rate their confidence in that forced choice decision. This was followed by the same post-identification questionnaire used in Experiment 1 (found in Appendix C). Once these questions were completed, participants were debriefed and dismissed by the experimenter.

Results

Materials Check

Were there any differences in repeated-suspect effect outcomes based on which suspect served as the culprit and which served as the innocent suspect?

For these analyses, I used incorrect identifications of the innocent suspect as the outcome variable in a logistic regression (1 = innocent suspect identification, 0 = did not identify the innocent suspect). To determine whether the number of lineups interacted with which suspect served as the culprit to predict false alarm rates, the interaction between suspect and number of intervening lineups was examined. There was no significant interaction ($B = -0.29, p = 0.466, \theta = 0.75, 95\% \text{ CI} [0.35, 1.64]$) and no main effect of suspect ($B = -0.20, p = 0.734, \theta = 0.82, 95\% \text{ CI} [0.25, 2.59]$), suggesting that suspect need not be included in analyses as a control variable— which suspect served as the culprit did not influence the strength of the repeated-suspect effect.

Next, the six combinations of Intervening Task Condition were entered as predictors to determine how type and order of intervening tasks mattered for how the suspect identity
influenced false alarm rates. Again, there were no significant interactions (-1.23 ≤ B ≤ -0.49, 0.232 ≤ p ≤ 0.635, 0.29 ≤ θ ≤ 0.61) and no main effect of suspect (B = 0.05, p = 0.945, θ = 1.05, 95% CI [0.22, 5.10]). Thus, suspect was not a required control variable for any of the analyses in Experiment 2 because the outcomes remained unchanged by which person served as the culprit.

**Manipulation Checks**

*Were the biased lineups influencing participants’ identification decisions?*

As in Experiment 1, participants who received a biased intervening lineup for the first intervening task identified the innocent suspect significantly more frequently (26%) than participants who received a fair intervening lineup (7%; B = -1.50, p = 0.001, θ = 0.22, 95% CI [0.09, 0.50]). Thus, the biased intervening lineups were associated with a 19% increase in innocent suspect misidentifications during the intervening lineup phase, which means that the biased lineups had their intended effect. See Table 9 for a summary of participants’ intervening lineup decisions.

**Hypotheses Set 1B: Repeated-Suspect Effect**

**Identification decisions**

To assess the effect of a repeated, innocent suspect on participant’s identifications in the final lineup, their final lineup decisions we first coded as either one (“false alarm on the innocent suspect”) or zero (“not a false alarm on the innocent suspect”). Each participant was also coded as either seeing one intervening lineup (“1”) or not (“0”), and two intervening lineups (“1”) or not (“0”) in separate variables. Each of the six between-subjects’ groups was labelled to be used as a factor in these analyses.
Analytic plan

A logistic regression analysis was used to assess whether the number of previous lineups containing the innocent suspect, or the type of lineup, influenced the rate of false alarms on the innocent suspect for the final lineup. The number of false alarms was the binary outcome variable, and the number of lineups or the condition label served as predictor variables. The initial final lineup decisions were analyzed first, which were the decisions made when participants were allowed to select “not present”. Then, the overall decisions that included identifications made after people were forced to choose (thus, there were only innocent suspect or filler identification decisions in these data) were analyzed separately.

Table 9. A summary of identification decisions for the first and second intervening tasks in Experiment 2 as a function of condition.

<table>
<thead>
<tr>
<th>First Intervening Task</th>
<th>ID decision</th>
<th>Proportion</th>
<th>Second Intervening Task</th>
<th>ID decision</th>
<th>Proportion</th>
</tr>
</thead>
<tbody>
<tr>
<td>No Intervening Lineup (Control)</td>
<td>IS - Control (No Lineup)</td>
<td>IS -</td>
<td>Filler - Lineup</td>
<td>Filler -</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Reject -</td>
<td></td>
<td></td>
<td>Reject -</td>
<td></td>
</tr>
<tr>
<td></td>
<td>IS - Fair Intervening</td>
<td>IS 0.06</td>
<td>Filler - Lineup</td>
<td>Filler 0.29</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Reject -</td>
<td></td>
<td></td>
<td>Reject 0.66</td>
<td></td>
</tr>
<tr>
<td>Biased Intervening Lineup</td>
<td>IS 0.25</td>
<td>Control (No Lineup)</td>
<td>IS -</td>
<td>Filler 0.05</td>
<td>Lineup</td>
</tr>
<tr>
<td></td>
<td>Reject 0.70</td>
<td></td>
<td></td>
<td>Filler -</td>
<td></td>
</tr>
<tr>
<td></td>
<td>IS 0.26</td>
<td>Fair Intervening</td>
<td>IS 0.24</td>
<td>Filler 0.06</td>
<td>Lineup</td>
</tr>
<tr>
<td></td>
<td>Reject 0.68</td>
<td></td>
<td></td>
<td>Filler 0.32</td>
<td></td>
</tr>
<tr>
<td></td>
<td>IS 0.68</td>
<td>Reject</td>
<td>Reject 0.45</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Fair Intervening Lineup</td>
<td>IS 0.07</td>
<td>Control (No Lineup)</td>
<td>IS -</td>
<td>Filler 0.23</td>
<td>Lineup</td>
</tr>
<tr>
<td></td>
<td>Reject 0.70</td>
<td></td>
<td></td>
<td>Filler -</td>
<td></td>
</tr>
<tr>
<td></td>
<td>IS 0.07</td>
<td>Fair Intervening</td>
<td>IS 0.15</td>
<td>Filler 0.24</td>
<td>Lineup</td>
</tr>
<tr>
<td></td>
<td>Reject 0.69</td>
<td></td>
<td></td>
<td>Filler 0.39</td>
<td></td>
</tr>
</tbody>
</table>

Notes. IS = Innocent Suspect Identification, Filler = Filler Identification, and Reject = Selected “Not Present”/ Lineup Rejection.
Number of intervening lineups

The variables created to indicate whether a participant received one or two intervening lineups were significant predictors of participants’ final lineup decisions. A single intervening lineup led to a marginally significant increase in false alarms on the innocent suspect (one intervening lineup: $B = 1.24, p = 0.051, \theta = 3.44, 95\% \text{ CI} [1.14, 14.88]$). Two intervening lineups were associated with significantly higher rates of innocent suspect identifications than no intervening lineup (two intervening lineups: $B = 1.59, p = 0.012, \theta = 4.88, 95\% \text{ CI} [1.62, 21.12]$). When the forced choice decisions were also included in these analyses, similar effects were found. One intervening lineup had a nonsignificant impact on false alarms, but was associated with a higher innocent suspect identification rate than the no lineups condition ($B = 0.49, p = 0.261, \theta = 1.63, 95\% \text{ CI} [0.73, 4.05]$). Two intervening lineups was associated with a significant increase in incorrect identifications of the innocent suspect ($B = 1.08, p = 0.013, \theta = 2.93, 95\% \text{ CI} [1.30, 7.29]$). Thus, two intervening lineups consistently increased the rate of false alarms on the innocent suspect in the final lineup compared to a condition with no intervening lineup, but the effect of one intervening lineup was weaker.

The difference between the effect of one intervening lineup and two intervening lineups on false alarm rates was only significant when forced choice decisions were included though. That is, for final lineup decisions, there was a 20\% false alarm rate after one intervening lineup and a 26\% false alarm rate after two intervening lineups, which was a nonsignificant difference ($\chi^2 [1, N = 258] = 1.05, p = 0.152$). When the forced-choice task was included, though, 26\% of participants identified the innocent suspect after one intervening lineup and 39\% after two intervening lineups, which was a significant difference ($\chi^2 [1, N = 258] = 4.21, p = 0.02$). See Figure 9 for a graph of these data.
Figure 9. False alarm rate on the innocent suspect according to the number of lineups a participant saw in Experiment 2, with bars split by initial and after forced choice identifications.

Nature and order of intervening lineups

Refer to Table 10 for a complete summary of the final identification decisions (initial and forced-choice) associated with each combination of intervening tasks. To analyze these data, the false alarms rates (on the innocent suspect) was compared across six different conditions, based on which intervening task a participant received during the first phase (biased, fair, or no intervening lineup) and the second phase (fair or no intervening lineup). The participants who received no intervening lineups served as the reference group in these analyses and, as expected, this condition had the lowest rate of false alarms for both initial final lineup decisions (7% chose the innocent suspect) and after they were forced to pick from the lineup (18%). Refer to Table 11 for a summary of the results.

Participants who received an initial biased lineup made significantly more misidentifications of the innocent suspect compared to the condition in which no intervening

<table>
<thead>
<tr>
<th>Number of intervening Lineups</th>
<th>No Intervening Lineups</th>
<th>One Intervening Lineup</th>
<th>Two Intervening Lineups</th>
</tr>
</thead>
<tbody>
<tr>
<td>Final Lineup</td>
<td>0.1</td>
<td>0.2</td>
<td>0.3</td>
</tr>
<tr>
<td>After Forced Choice</td>
<td>0.1</td>
<td>0.2</td>
<td>0.3</td>
</tr>
</tbody>
</table>

Proportion of false alarms on the innocent suspect
lineups were seen. This was true when the biased lineup was followed by a fair intervening
lineup or no intervening lineup, and when assessing initial final lineup decisions (biased then fair
lineup: \( B = 2.04, p = 0.002, \theta = 7.69, 95\% \text{ CI} [2.43, 34.47] \); biased then no lineup: \( B = 1.64, p =
0.013, \theta = 5.16, 95\% \text{ CI} [1.60, 23.29] \)) and forced-choice decisions (biased then fair lineup: \( B =
1.66, p < .001, \theta = 5.26, 95\% \text{ CI} [2.19, 13.85] \); biased then no lineup: \( B = 0.91, p = 0.054, \theta =
2.48, 95\% \text{ CI} [1.02, 6.56] \)). Note, though, the difference between forced choice decisions for the
condition where a biased lineup is followed by no lineup compared with the control condition is
only marginally significant.

Table 10. Proportions showing the final lineup choosing patterns as a function of intervening
lineup condition in Experiment 2.

<table>
<thead>
<tr>
<th>First Intervening Task Condition</th>
<th>Second Intervening Task Condition</th>
<th>Final Lineup Decision</th>
<th>Final Lineup Decision Including Forced-Choice</th>
</tr>
</thead>
<tbody>
<tr>
<td>No Lineup</td>
<td>No Lineup</td>
<td>IS 0.07</td>
<td>IS 0.18</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Filler 0.31</td>
<td>Filler 0.82</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Reject 0.62</td>
<td></td>
</tr>
<tr>
<td>Fair Lineup</td>
<td>IS 0.17</td>
<td>IS 0.23</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Filler 0.40</td>
<td>Filler 0.77</td>
<td></td>
</tr>
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<td></td>
<td>Reject 0.43</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Biased Lineup</td>
<td>IS 0.27</td>
<td>IS 0.35</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Filler 0.43</td>
<td>Filler 0.63</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Reject 0.32</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Fair Lineup</td>
<td>IS 0.35</td>
<td>IS 0.53</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Filler 0.18</td>
<td>Filler 0.47</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Reject 0.47</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Fair Lineup</td>
<td>IS 0.11</td>
<td>IS 0.16</td>
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<tr>
<td></td>
<td>Filler 0.41</td>
<td>Filler 0.84</td>
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</tr>
<tr>
<td></td>
<td>Reject 0.48</td>
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<td></td>
</tr>
<tr>
<td>Fair Lineup</td>
<td>IS 0.15</td>
<td>IS 0.22</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Filler 0.37</td>
<td>Filler 0.78</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Reject 0.48</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Notes. IS = Innocent Suspect Identification, Filler = Filler Identification, and Reject = Selected “Not Present”/Lineup Rejection.
Other than when there was a biased lineup for the first intervening task, there were no conditions with significantly different false alarm rates to the control condition. However, though not statistically significant, the patterns show that any previous lineup containing the innocent suspect increased misidentifications of innocent suspect in a later lineup. For instance, two fair intervening lineups had the next largest influence on later false alarms. When only one fair intervening lineup was received, the largest effect was seen when that lineup was closer in time to the final lineup, rather than the video (similar to the findings in Pezdek & Blandon-Gitlin, 2005). However, because these patterns are nonsignificant, I must assume that these differences may not be robust.

Table 11. *Logistic regression results and the relevant proportion of false alarms for each possible combination of intervening task for Experiment 2.*

<table>
<thead>
<tr>
<th>Lineup Data</th>
<th>First Task</th>
<th>Second Task</th>
<th>Proportion of FAs on the IS</th>
<th>B</th>
<th>p</th>
<th>( \theta )</th>
</tr>
</thead>
<tbody>
<tr>
<td>Final</td>
<td>No Lineup</td>
<td>No Lineup</td>
<td>0.07</td>
<td>Reference Group</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Lineup</td>
<td>Fair Lineup</td>
<td></td>
<td>0.17</td>
<td>1.06</td>
<td>0.155</td>
<td>2.89</td>
</tr>
<tr>
<td>Decisions</td>
<td>Fair Lineup</td>
<td>No Lineup</td>
<td>0.35</td>
<td>2.04</td>
<td>0.002</td>
<td>7.69</td>
</tr>
<tr>
<td>Biased</td>
<td>No Lineup</td>
<td>Fair Lineup</td>
<td>0.27</td>
<td>1.64</td>
<td>0.013</td>
<td>5.16</td>
</tr>
<tr>
<td>Lineup</td>
<td>No Lineup</td>
<td>No Lineup</td>
<td>0.15</td>
<td>0.89</td>
<td>0.210</td>
<td>2.44</td>
</tr>
<tr>
<td>Fair Lineup</td>
<td>Fair Lineup</td>
<td></td>
<td>0.11</td>
<td>0.58</td>
<td>0.444</td>
<td>1.79</td>
</tr>
<tr>
<td>Fair Lineup</td>
<td>No Lineup</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Notes. FA = false alarm, IS = innocent suspect, \( B \) = parameter estimate, \( p \) = significance value, and \( \theta \) = odds ratio. All values rounded to 2dp except \( p \) values (3dp).

**Confidence associated with identification decisions**

As in Experiment 1, confidence levels could be measured in two ways: confidence in final lineup decision (referred to as confidence) and confidence that includes confidence in
identifications that were made only once participants were forced to choose someone from the lineup (referred to as forced-choice confidence). Thus, for forced-choice confidence, when participants chose “not present” from the final lineup, their response to the forced-choice task was used instead.

**Analytic plan**

Multiple regression analyses were run with either final lineup or forced-choice confidence as the outcome variable. The variable indicating the number of intervening lineups, or which combination of intervening tasks a participant received was included as a predictor, as well as whether they selected the innocent suspect from the final lineup or not. An interaction between these two predictors was included to see if the effect of the intervening tasks on participants’ confidence level was moderated by their final lineup decision (false alarm or not) but was removed if it was nonsignificant. Standardized beta values are reported.

**Number of intervening lineups**

There was a significant interaction between the number of intervening lineups that a participant received and their final lineup choice for predicting confidence and forced-choice confidence levels. This interaction is depicted in Figure 10. Participants who received one intervening lineup had significantly higher confidence levels than participants who received no intervening lineup, but only when they selected the innocent suspect from the final lineup (no lineups: 39%; one lineup: 63%). There was no significant difference in confidence level for the equivalent groups of participants who made a different final lineup decision, such as a filler identification or a lineup rejection (no lineups: 58%, one lineup: 58%, B = 0.25, p = 0.048). A similar effect was found when comparing participants who received two intervening lineups and those who received no lineups (B = 0.28, p = 0.024). Participants who received two intervening
lineups rather than no intervening lineups were significantly more confident, but only when they also selected the innocent suspect from the final lineup (two lineups: 68%). Participants who did not select the innocent suspect, and instead identified a filler or rejected the lineup, were equally confident regardless of the number of lineups they received (two lineups: 58%).

When forced-choice confidence was included, the patterns were the same as the patterns seen for the final lineup confidence. There was a significant interaction between the number of lineups a participant received (one or two intervening lineups versus no intervening lineups) and the variable indicating final lineup choice with forced-choice decisions included on forced-choice confidence. Participants who saw one intervening lineup were significantly more confident than those who did not have any intervening lineups, but this pattern was only present when participants also selected the innocent suspect from the final lineup (no lineups: 45%; one lineup: 62%; B = 0.20, p = 0.040). Confidence levels were equal when compared the same conditions for participants who selected a filler for the final lineup or when forced to choose (no lineups: 54%; one lineup: 52%). Receiving two intervening lineups was also associated with higher confidence than the no intervening lineups condition but, again, only for participants who selected the innocent suspect (two lineups: 64%) not participants who selected a filler (two lineups: 51%; B = 0.23, p = 0.017).

**Nature and order of intervening lineups**

There were six different combinations of conditions that participants were randomly assigned to during the first and second intervening task phases. When assessing confidence, there was a significant interaction between whether a participant selected the innocent suspect from the final lineup and the combination of intervening tasks they received. Participants who received a biased intervening lineup followed by a fair intervening lineup were 69% confident on
average in their identifications of the innocent suspect, but those who completed only non-lineup tasks during the intervening phases were 39% confident in their innocent suspect identifications (B = 0.26, p = 0.013). Similarly, participants who were presented with a biased intervening lineup followed by a non-lineup task were 68% confident in their identification of the innocent suspect from the final lineup (B = 0.24, p = 0.026). In contrast, when participants selected a filler or rejected the lineup, there was no significant difference in confidence levels for any of the intervening lineup conditions (control: 58%; biased, fair: 56%; biased, no lineup: 58%). There were no other significant effects.

Figure 10. A graphical representation of the interaction between the number of lineups and whether a participant selected the innocent suspect from the final lineup for Experiment 2 on confidence. Error bars represent 95% CIs. Sample sizes are smaller for the “Identified Innocent Suspect” bars than the other bars.
When analyzing forced-choice confidence, there were also significant interactions between the intervening task conditions and participants final lineup decisions. Participants who identified the innocent suspect after receiving a biased intervening lineup followed by a fair lineup were significantly more confident in their innocent suspect identifications (64%) than people who received no intervening lineup (45%; B = 0.22, p = 0.009). The same interaction was found when assessing the participants who saw a biased intervening lineup followed by a non-lineup task (68%, B = 0.20, p = 0.017). There was also a marginally significant interaction of the same type for participants who received two fair intervening lineups containing the innocent suspect prior to their final lineup (62%; B = 0.15, p = 0.090). However, this was not the case for participants who identified a filler, either initially or after being forced to choose from the lineup (control: 54%; biased, fair: 56%; biased, no lineup: 53%; fair, fair: 53%).

**Hypotheses Set 2B: Remember-Know-Guess Processes and Source Monitoring**

**Categorical Remember-Know-Guess judgment**

**Analytic plan**

The proportion of R-K-G judgments in each intervening task condition were compiled in Table 11, as a function of whether participants received a target-present or target-absent final lineup. This permitted a comparison of how “remember”, “know”, and “guess” were distributed across conditions when participants made culprit identifications or innocent suspect identifications. Chi-Square analyses were used to determine whether the distribution of R-K-G judgments was different for innocent suspect identifications within the various intervening task conditions. Supporting analyses using multinomial regression can be found in Appendix H. The number of “remember” and “know” judgments associated with participants who identified at least one innocent suspect during the intervening tasks and also the final lineup. These
participants were compared to the R-K-G judgments made by participants who only selected the innocent suspect from the final lineup to determine whether there was more “false recall” among participants who chose the innocent suspect multiple times.

**Number of lineups**

First, the percentage of “remember” and “know” was examined for participants who identified the innocent suspect in the final lineup for each number of intervening lineups—no intervening lineups, one intervening lineup, and two intervening lineups. A full summary of these data can be found in Table 12. A Chi-Square analysis was run to evaluate the distribution of “remember” and “know” judgments for participants based on whether they received one or two intervening lineups. The test was non-significant ($\chi^2 [1, N = 82] = 0.43, p = 0.513$) indicating that R-K-G judgments did not differ based on the number of lineups seen by participants who selected the innocent suspect from the final lineup. Specifically, among participants who identified the innocent suspect from the final lineup after seeing one intervening lineup, 45.9% reported “know” compared with 21.7% who reported “remember.” When participants identified the innocent suspect after receiving two intervening lineups, 35.6% of participants reported a “know” judgment and 24.4% reported a “remember” experience. Though no significant effects were found, there appeared to be more “know” judgments associated with intervening lineups. Contrary to hypotheses, presenting participants with more than one target-absent intervening lineup did not appear to increase the percentage of “remember” judgments.

**Combination of intervening tasks.** Next, the distribution of R-K-G judgments was assessed for each of the combinations of intervening tasks, focusing on participants who selected the innocent suspect from the final lineup again. A full summary of these data can also be found in Table 12. The sample sizes in some of these cells were far too low for any kind of
comprehensive, adequately-powered, categorical analysis. Chi-Square analyses were used to compare the impact a biased intervening lineup followed by a fair intervening lineup on R-K-G judgments compared with only a biased lineup followed by a reading task, or two fair lineups. When comparing the influence of a biased intervening lineup followed by a fair intervening lineup to a biased lineup was followed by a non-lineup task, there was no significant association between intervening lineup condition and the number of “remember” and “know” judgments ($\chi^2 [1, N = 34] = 1.40, p = 0.236$). Participants who received a biased intervening lineup followed by a fair intervening lineup did not differ in the number of “remember” and “know judgments compared with people who received two fair lineups ($\chi^2 [1, N = 45] = 0.31, p = 0.580$).

As in Experiment 1, the sample sizes make it difficult to make any firm conclusions regarding dual-process recognition. However, consistent with the findings for the number of lineups, reports of “knowing” were overall far more common for all combinations of intervening tasks with the exception of when participants received no lineup. There was some evidence of higher rates of “remembering” when participants received a fair lineup for the second intervening lineup, regardless of what type of task was first.

Were there more “remember” judgments for those who identified the innocent suspect from the final lineup and at least once from an intervening lineup compared with participants who only identified the innocent suspect from the final lineup?

Again, only participants who selected the innocent suspect from the final lineup were included in this analysis. Participants were coded as “did not identify the innocent suspect from an intervening lineup” (coded as “0”, $N = 44$) and “identified the innocent suspect from one or two intervening lineups” (coded as “1”, $N = 38$). Among those who identified the innocent suspect from at least one intervening lineup, 31.6% reported “remembering” the innocent
suspect, and 55.3% reported “knowing” the innocent suspect. For participants who only identified the innocent suspect from the final lineup, although they did receive at least one intervening lineup containing the innocent suspect, 15.9% judged their recognition experience as “remember” and 27.3% reported a “know” judgments. There was no significant association between whether participants identified the innocent suspect from an intervening lineup and their R-K-G judgment ($\chi^2 [1, N = 82] = 0.002, p = 0.972$), but both “remember” and “know” judgments were much more common among participants who selected the innocent suspect from at least one intervening lineup before identifying them in the final lineup. Choosing someone from a lineup may narrow attention on that individual, making any recognition of that person later on feel much stronger, as compared to people who received the same intervening tasks, but did not to identify the innocent suspect. However, it is important not to read into these patterns too much as the statistical test was nonsignificant.

**How are confidence and innocent suspect identifications associated for “remember” and “know” judgments?**

Refer to Figure 11 for a graph of participants who reported “remembering” and “knowing” the person they identified from the final lineup. The lines indicate the proportion of participants who selected the innocent suspect at each level of confidence, as a function of their R-K-G judgment. Note that the sample sizes, particularly at low levels of confidence, are small and so no inferential statistics were computed for these data. The distribution of “remember” and “know” judgments appears to change based on the confidence level associated with the identification decision. When participants were more confident, there was a higher proportion of “know” judgments than for medium levels of confidence, and a much higher proportion of “know” judgments than the participants who reported low confidence in the innocent suspect.
identification. The proportion of “remember” judgments remained fairly stable and lower than the percentage of “know” judgments across the levels of confidence associated with participants’ innocent suspect identifications.

Table 12. R-K-G judgments for suspect identifications separated by the number of lineups or the combination of intervening task conditions for Experiment 2.

<table>
<thead>
<tr>
<th>Intervening Task Conditions</th>
<th>N who identified the IS</th>
<th>Distribution of Judgments</th>
</tr>
</thead>
<tbody>
<tr>
<td>No Lineups</td>
<td>8</td>
<td>25.0% 0.0% 75.0%</td>
</tr>
<tr>
<td>One Lineup</td>
<td>37</td>
<td>21.7% 45.9% 32.4%</td>
</tr>
<tr>
<td>Two Lineups</td>
<td>45</td>
<td>24.4% 35.6% 40.0%</td>
</tr>
<tr>
<td>No LUP</td>
<td>8</td>
<td>25.0% 0.0% 75.0%</td>
</tr>
<tr>
<td>Biased LUP</td>
<td>33</td>
<td>24.2% 30.3% 45.5%</td>
</tr>
<tr>
<td>Biased LUP</td>
<td>22</td>
<td>18.2% 54.5% 27.2%</td>
</tr>
<tr>
<td>Fair LUP</td>
<td>12</td>
<td>25.0% 50.0% 25.0%</td>
</tr>
<tr>
<td>Fair LUP</td>
<td>7</td>
<td>14.3% 42.9% 42.9%</td>
</tr>
<tr>
<td>No LUP</td>
<td>8</td>
<td>37.5% 25.0% 37.5%</td>
</tr>
</tbody>
</table>

Notes. IS = Innocent Suspect and LUP = Lineup. Rows total to 100%. All proportions are rounded to 1dp.

Figure 11. A chart displaying the Experiment 2 false alarm rate at low, medium, and high confidence as a function of whether the participant reported a “remember” or “know” recognition experience post-identification.
Thus, as suggested by the equivalent chart in Experiment 1, R-K-G judgments and confidence judgments in a repeated-suspect paradigm may not be diagnostic of accuracy. However, in Experiment 2, the relative proportion of “remember” judgments does not increase as much as was seen in Experiment 1 when confidence levels were high. Here, the “know” judgments seemed more closely related to the confidence associated with innocent suspect identifications than “remember” judgments.

Source Monitoring Measures

A multiple regression was used to examine the impact of intervening lineup type and number on source monitoring abilities. These analyses also included whether condition interacted with selecting the innocent suspect in the final lineup to predict source monitoring ability. Descriptive statistics for participant who identified the innocent suspect from the final lineup can be found in Table 13. Standardized beta values are reported.

Video as source

The two post-identification questions relevant to determining whether participants believed the video to be the source of any recognition were averaged to create a composite score. There was a significant interaction found between the number of intervening lineups and whether the participant selected the innocent suspect from the final lineup for responses to this “video as source” question (B = 0.22, p = 0.014). Participants tended report that the video was a greater source of recognition when they identified the innocent suspect from the final lineup, and received one or two intervening lineups. Participants who selected a filler from the final lineup tended to show the opposite pattern, with the video reported a source more when no intervening lineup was received compared with one or two intervening lineups. Essentially, people who were
given intervening lineups containing the innocent suspect and chose the innocent suspect from the final lineup were more likely to incorrectly attribute their feeling of recognition to the video.

Similar results were found when the combination of intervening tasks was considered as well as participants’ final lineup choice—participants who selected the innocent suspect reported thinking that the video was a source of recognition. Relative to the condition in which no intervening lineups were presented, all lineup conditions increased reports that the video was the source when participants misidentified the innocent suspect from the final lineup at a significant or marginally significant level: 1) biased lineup, fair lineup, $B = 0.27, p = 0.043$; 2) biased lineup, no lineup, $B = 0.25, p = 0.067$; 3) fair lineup, fair lineup, $B = 0.38, p = 0.007$; 4) fair lineup, no lineup, $B = 0.28, p = 0.037$; and, 5) no lineup, fair lineup, $B = 0.32, p = 0.007$. Thus, any type and number of intervening lineups seemed to increase source confusion compared with the control condition. When an innocent suspect appeared in multiple lineups, this was associated with more identifications of the innocent suspect from the final lineup and the associated feeling of recognition being attributed, at least in part, to the video. Participants who identified fillers also tended to attribute their recognition to the video, but the average score was lower (indicating that they felt like the video played a smaller role in recognition) and there were no large differences between intervening task conditions.

**Lineup as source**

The influence of the number of intervening lineups on reports that a previous lineup was a source of recognition, as well as whether participants identified the innocent suspect or a filler from the final lineup. There was only a marginally significant interaction between these variables ($B = 0.15, p = 0.062$), so that effect was removed. The number of intervening lineups and the final lineup choice both yielded significant main effects on responses to the “lineup as source”
Each additional intervening lineup increased ratings on this question regardless of a participant’s final lineup decision ($B = 0.19$, $p = 0.005$). In addition, ratings in response to this question were lower when participants selected a filler from the final lineup rather than the innocent suspect ($B = 0.37$, $p < .001$). This suggests that increasing the number of intervening lineups drew attention to the fact that an individual is repeated, causing all participants to report previous lineups as a source of recognition more frequently. Participants who identified the innocent suspect were also more likely to attribute recognition of the innocent suspect to a previous lineup, which was maybe in part due to the weak interaction effect. This is particularly interesting in light of the results in the previous section—participants who identified the innocent suspect attribute their recognition of this person to the previous lineups as well as the video.

Table 13. *Descriptive statistics for the video and lineup as source post-identification questions for participants who identified the innocent suspect from the final lineup in Experiment 2.*

<table>
<thead>
<tr>
<th>Intervening Task Conditions</th>
<th>Video as Source</th>
<th>Lineup as Source</th>
</tr>
</thead>
<tbody>
<tr>
<td>No Lineups</td>
<td>2.81 (0.28)</td>
<td>-</td>
</tr>
<tr>
<td>One Lineup</td>
<td>3.54 (0.56)</td>
<td>4.14 (1.75)</td>
</tr>
<tr>
<td>Two Lineups</td>
<td>3.59 (0.45)</td>
<td>4.24 (1.54)</td>
</tr>
<tr>
<td>No Lineup</td>
<td>No Lineup</td>
<td>2.81 (0.28)</td>
</tr>
<tr>
<td>No Lineup</td>
<td>Fair Lineup</td>
<td>3.37 (0.41)</td>
</tr>
<tr>
<td>Biased Lineup</td>
<td>Fair Lineup</td>
<td>3.53 (0.48)</td>
</tr>
<tr>
<td>Biased Lineup</td>
<td>No Lineup</td>
<td>3.59 (0.64)</td>
</tr>
<tr>
<td>Fair Lineup</td>
<td>Fair Lineup</td>
<td>3.73 (0.35)</td>
</tr>
<tr>
<td>Fair Lineup</td>
<td>No Lineup</td>
<td>3.37 (0.45)</td>
</tr>
</tbody>
</table>

*Notes.* LUP = Lineup. Mean scores are displayed (rated out of 6). Higher scores indicate that participants think the source is a likely source of recognition. Standard deviations are presented in parentheses. All values rounded to 2dp.

An analysis of the six combinations of intervening tasks and final lineup identification decision was conducted next. Any condition where participants saw a biased lineup (biased then fair intervening lineup, biased intervening lineup then non-lineup task), and any condition where participants received two intervening lineups (biased then fair intervening lineups, and two fair
intervening lineups) was associated with significantly higher ratings on the “lineup as source” question when compared to the no lineups condition. This was only true, though, for participants who identified the innocent suspect from the final lineup (evidenced by significant and marginally significant interactions with final lineup decision: biased & no lineup, $B = 0.29, p = 0.016$; fair & fair, $B = 0.23, p = 0.068$).

These results add to the results suggesting that biased lineups and more than one intervening lineup containing a repeated innocent suspect may draw attention to that innocent suspect, or make the repetition more salient. Under these conditions, participants are more likely to report a previous lineup as a source of memory. As Table 13 clearly shows, the conditions associated with increase reporting of the lineup as a source of memory for those who misidentified the innocent suspect were also the conditions in which people reporting the video as a fairly strong source of recognition. Thus, participants seemed to believe that the person they identified was in the original video and a previous lineup.

**Non-specific context as source**

Two questions were designed to address whether participants could recall a specific source when they identified someone from the final lineup. Thus, these questions did not ask about a specific source and simply examined whether participants were able to recall any details from the context in which they first saw the face they identified. However, there were no significant effects when examining intervening task conditions and final lineup decision, so these results are not reported here.

**Summary of R-K-G judgments and source monitoring measures**

The majority of these results were consistent with the target-absent final lineup findings from Experiment 1. Biased intervening lineups and more than one intervening lineup tended to
be associated with much higher percentages of “know” judgments, and some increase in “remember” judgments when participants received two intervening lineups. Thus, feelings of familiarity were stronger when participants were in conditions that drew their attention to the innocent suspect, but biased lineups alone did not increase incorrect “remember” judgments, as was hypothesized—two lineups appeared to be key to increasing “remember” judgments. There was a higher percentage of “remember” judgments and “know” judgments among participants who chose the innocent suspect from at least one intervening lineup when compared to participants who only identified the innocent suspect from the final lineup, which is mostly consistent with the “false recollection” finding in Haw et al. (2007). Finally, participants who received more than one intervening lineup, especially if one of those lineups was biased, tended to report that the lineup and the video was a source of recognition. Thus, they seemed to notice the repetition and can remember seeing the innocent suspect in the intervening lineups, but become confused and make an incorrect attribution that the innocent suspect was in the original video too.

**Hypotheses Set 3B: Commitment Effects**

**Analytic plan**

These analyses included only participants who received at least one intervening lineup ($N = 258$). The forced-choice lineup decisions were used for this analysis. A new variable was created in which participants who chose the innocent suspect from at least one intervening lineup were coded as “1” (and “0” for anyone who never selected the innocent suspect from an intervening lineup). First, a Chi-Square analysis was used to determine whether choosing the innocent suspect from any of the intervening lineups was independent from choosing the innocent suspect from the final lineup (using the data that includes the forced-choice, final lineup decisions). The next step was to examine if there was any evidence of a commitment process
using participants responses to the four, commitment relevant post-identification questions. If a commitment process is responsible for this association, the responses for individuals who selected the innocent suspect from the intervening and final lineups should be higher compared with people who did not choose the innocent suspect from an intervening lineup, analyzed using a multivariate t-test (Hotelling’s $T^2$). Note that the first question should be the focus of these results because that is the only question that all participants were required to respond to. The other questions only appeared if they reported that they thought they had selected the same person multiple times.

**Was there an association between selecting the innocent suspect in a previous, intervening lineup and selecting the innocent suspect from the final lineup?**

The Chi-Square analysis revealed a significant association between choosing the innocent suspect from at least one intervening lineup and choosing the innocent suspect from the final lineup ($\chi^2[1, N = 258] = 55.86, p < .001$). In other words, participants who identified the innocent suspect from at least one of the intervening lineups were more likely to identify the innocent suspect from the final lineup compared with people who did not identify the innocent suspect from any intervening lineups, ($P[\text{Final False Alarm} | \text{Intervening False Alarm}] = 0.78, N = 49$). Participants who did not select the innocent suspect from one of the intervening lineups and, instead, selected a filler, rejected the lineups, or received a non-lineup task, had a lower rate of false alarms on the innocent suspect ($P[\text{Final False Alarm} | \text{Another Intervening Lineup Decision}] = 0.21, N = 209$).
Table 14. Summary of means, standard deviations, and sample sizes for responses to the post-identification questions designed to measure commitment processes in Experiment 2.

<table>
<thead>
<tr>
<th>Group</th>
<th>Commitment Question 1</th>
<th>Commitment Question 2</th>
<th>Commitment Question 3</th>
<th>Commitment Question 4</th>
</tr>
</thead>
<tbody>
<tr>
<td>Identified IS* from intervening and final lineups</td>
<td>4.76 (0.59)</td>
<td>4.58 (0.90)</td>
<td>3.29 (0.71)</td>
<td>2.40 (1.03)</td>
</tr>
<tr>
<td></td>
<td>$N = 38$</td>
<td>$N = 33$</td>
<td>$N = 35$</td>
<td>$N = 35$</td>
</tr>
<tr>
<td>Identified IS* from final lineup only</td>
<td>4.70 (0.85)</td>
<td>5.33 (0.58)</td>
<td>3.33 (0.87)</td>
<td>2.11 (0.60)</td>
</tr>
<tr>
<td></td>
<td>$N = 44$</td>
<td>$N = 3$</td>
<td>$N = 9$</td>
<td>$N = 9$</td>
</tr>
</tbody>
</table>

*IS refers to “innocent suspect.” Means are displayed with standard deviations in parentheses and sample sizes denoted by $N$. All values are rounded to 2 dp.

Commitment process versus mere preference

One of the research questions in both Experiment 1 and 2 concerned with whether there was evidence to suggest that the association between choosing in the intervening lineup and the final lineup due to a commitment process. A summary of the descriptive statistics for the post-identification commitment questions can be found in Table 14. Only participants who chose the innocent suspect from the final lineup were included, and I compared participants who chose the innocent suspect from at least one intervening lineup to those who did not identify the innocent suspect until the final lineup. A multivariate t-test analysis indicated that there were no significant differences on any of these measures among participants who misidentified the innocent suspect from the final lineup based on whether they identified the innocent suspect in one of the intervening lineups ($T^2 (4, 27) = 1.40, p = 0.259$). As in Experiment 1, I found no evidence that commitment processes contribute to these choosing patterns. Participants who identified the innocent suspect earlier in the paradigm did not report feeling compelled to select that person. These data are consistent with the explanation that what has been called a commitment effect is merely consistent preference for a lineup member, across different lineups.
Hypotheses Set 5: Social Influence

Analytic plan

First, the number of participants reporting social influence in each condition was obtained (coded as 1 = “felt influenced”, 0 = “did not feel influenced”). Then, a logistic regression was run to determine whether particular intervening task conditions were associated with higher numbers of participants feeling influenced. The number of intervening lineups and six the specific combinations of intervening tasks were run in separate models as predictors of social influence reporting. Next, the open responses were gathered from participants who reported feeling influenced and were organized based on the reason that was provided for feeling influenced. The nature of these responses and the themes that were most common in the responses are discussed.

Binary response

Refer to Table 15 for a breakdown of the proportion of individuals in each intervening task condition who reported feeling as though the experimenter was trying to influence their responses. As these numbers indicate, the number of people who felt this was low overall. However, reports of feeling influenced were more common when participants received more intervening lineups (zero lineups: 0%; one lineup: 6%; two lineups: 9%). In fact, the number of lineups had a significant effect on the rate at which participants reported feeling influenced ($B = 0.82, p = 0.047, \theta = 2.27, 95\% CI [1.06, 5.44]$). Logistic regression analyses were not appropriate with these data across the six intervening task combinations due to low reporting of influence. However, the proportions in Table 14 suggest a similar pattern—intervening lineups increase the number of people reporting feeling influenced. This seems to be particularly common when participants received a biased intervening lineup first, followed by a fair intervening lineup (13% of participants reported feeling influenced). There were no reports of feeling influence for participants who did not receive any intervening lineups.
Table 15. *A summary of the proportion of participants in each intervening task condition who reported feeling like the experimenter was trying to influence them during Experiment 2.*

<table>
<thead>
<tr>
<th>Intervening Task Condition</th>
<th>N</th>
<th>Proportion reporting influence</th>
</tr>
</thead>
<tbody>
<tr>
<td>No Lineups</td>
<td>45</td>
<td>0.00</td>
</tr>
<tr>
<td>One Lineup</td>
<td>142</td>
<td>0.06</td>
</tr>
<tr>
<td>Two Lineups</td>
<td>116</td>
<td>0.09</td>
</tr>
<tr>
<td>No Lineup</td>
<td>45</td>
<td>0.00</td>
</tr>
<tr>
<td>Biased Lineup</td>
<td>62</td>
<td>0.13</td>
</tr>
<tr>
<td>Biased Lineup</td>
<td>63</td>
<td>0.05</td>
</tr>
<tr>
<td>Fair Lineup</td>
<td>54</td>
<td>0.04</td>
</tr>
<tr>
<td>Fair Lineup</td>
<td>44</td>
<td>0.11</td>
</tr>
<tr>
<td>No Lineup</td>
<td>35</td>
<td>0.00</td>
</tr>
</tbody>
</table>

*Notes.* All proportions rounded to 2dp.

**Open response**

A total of 18 written responses from participants who reported feeling influenced by the experimenter were obtained. The full list of responses can be found in Appendix G. The responses were organized by theme and also intervening lineup condition to determine whether there were any consistent themes or patterns. Table 16 contains a list of 10 responses (56% of participants reporting feeling influenced), all of which refer to the repetition of a person throughout the procedure as the reason they felt influenced. The majority of these participants were in the intervening task condition with an initial biased intervening lineup, followed by a fair intervening lineup. This supports the conclusion that more than one intervening lineup, particularly if one lineup is a biased, makes the repeated individual very salient. As a result, participants notice the repetition, and they interpret this to mean that the repeated individual is the suspect and the person that they should identify. This supports the hypothesis that repetition of the innocent suspect is, in itself, a form of social influence, and that people who are acting as an eyewitness will interpret the repetition as a nudge from the administrator to identify the repeated person.
Table 16. Table of open responses from participants who reported feeling influenced by the experimenter due to the repetition of the innocent suspect in Experiment 2.

<table>
<thead>
<tr>
<th>Intervening Task Condition</th>
<th>Open Response</th>
</tr>
</thead>
<tbody>
<tr>
<td>Biased Lineup, Fair Lineup</td>
<td>“One photo was present all 3 times. I was prompted to choose.”</td>
</tr>
<tr>
<td></td>
<td>“The same one guy popped up on every single lineup which made me think that I should have choose him but I did not.”</td>
</tr>
<tr>
<td></td>
<td>“In the first lineup, photo 5 looked the most similar and then lineup 2 he went to photo 4 and then during the last lineup he went back to photo 5.”</td>
</tr>
<tr>
<td></td>
<td>“Some of the pictures were consistent throughout. One, as far as I could tell, changed based on the brightness of the picture.”</td>
</tr>
<tr>
<td></td>
<td>“The same person was placed in all three lineups, making it clear that that was their suspect.”</td>
</tr>
<tr>
<td></td>
<td>“Some of the backgrounds in the individual’s pictures were different colors, at least one picture was present in two or more of the lineups.”</td>
</tr>
<tr>
<td></td>
<td>“The same man in all 3 lineups.”</td>
</tr>
<tr>
<td>Biased Lineup, No Lineup</td>
<td>“I am not completely sure. But if I had to guess, the research wanted me to choose #5 the first time and #6 the second time by keeping ONLY that picture for both times I was asked.”</td>
</tr>
<tr>
<td>Fair Lineup, Fair Lineup</td>
<td>“As I continued to pick not present in the lineup there were a few individuals who kept showing up in the lineup multiple times.”</td>
</tr>
<tr>
<td>Fair Lineup, No Lineup</td>
<td>“They put in the same person I chose in the first lineup in the second lineup to see whether or not I would check the same one.”</td>
</tr>
</tbody>
</table>

Notes. For a table with all open responses from participants reporting feeling influenced, refer to Appendix F. Responses have been altered from the original quotes to address spelling errors.

**Experiment 2 Discussion**

The results from Experiment 2 were largely consistent with the results found in Experiment with regard to research questions that applied to both studies. As in Experiment 1, the repeated-suspect effect was found consistently for all groups who received at least one intervening lineup, regardless of the type of intervening lineup. However, the repeated-suspect effect was stronger when one of the lineups that participants saw was a biased lineup, and when participants received two intervening lineups, rather than one. In addition, people who identified the innocent suspect from the final lineup tended to be more confident in that decision than the more
intervening lineups they received—thus, the number of times they saw the innocent suspect was related to their confidence in their final misidentification.

These findings suggest that the more lineups a person is presented with, the more problematic the effect of a repeated-innocent suspect will be, and this is true even if the lineups are all fair. Furthermore, this provides further evidence that the impact of a biased lineup cannot be correct by a subsequent fair lineup, as was suggested by the dissenting judges in *Manson v. Braithwaite* (1977)—the biased lineups consistently produced the worst outcomes along with higher levels of confidence in innocent suspect identifications. In fact, following a biased lineup by *two* different fair lineups containing the innocent suspect always produced the highest number of misidentifications of the innocent suspect. Thus, even two lineups administered according to recommendations cannot correct for a prior, biased lineup. Also, it is impossible to achieve an uncontaminated identification in situations involving a single eyewitness attempting multiple identifications of the same suspect.

To evaluate some of the mechanisms that feed into repeated-suspect effects, Experiment 2 included the same post-identification questions as Experiment 1. These analyses were, however, underpowered again. Typically, R-K-G judgments are used in cognitive psychology experiments where repeated-measure are used to overcome the statistical power issue. The current studies confirm that a traditional eyewitness paradigm is unsuitable for these types of measures unless an extremely large sample is obtained. However, even though none of the results were significant, there were some interesting patterns. “Know” judgments were more common among participants who identified the innocent suspect from the final lineup and whenever a participant received an intervening lineup (biased or fair). “Remember” judgments were somewhat more common when a lineup was seen during the second intervening task phase.
rather than a reading task. Finally, both “remember” and “know” judgments were more frequent for participants who identified the innocent suspect from the final lineup and at least one intervening lineup when compared with participants who only identified the culprit from the final lineup. This is partially consistent with the “false recall” patterns found in Haw et al. (2007). However, because none of these patterns were significant, no conclusions can be made about the role of familiarity and recollection processes in Experiment 2.

The source-monitoring measures, however, produced some very interesting results. Participants who identified the innocent suspect from the final lineup, and received at least one intervening lineup, reported that they felt that the video and the lineup were sources of recognition to a greater extent than participants who did not identify the innocent suspect or receive intervening lineups. Similarly, biased lineups and two lineups tended to be associated with reports that the lineups and the video were sources of recognition. This results is noteworthy as it suggests that participants were aware of the repetition of the innocent suspect throughout the lineups, as they reported the lineups as a source. Interestingly, though, they also undertook a faulty decision-making process that resulted in the conclusion that their feeling of recognition and the presence of the innocent suspect in the lineups was sufficient evidence that the innocent suspect was the person in the video.

As in Experiment 1, there was no evidence that commitment processes played a role in producing the repeated-suspect effects in Experiment 2. Participants who selected the innocent suspect from at least one intervening lineup and the final lineup did not indicate that they were doing so because they were motivated to appear consistent and commit to their prior choice, even if it was wrong. Therefore, commitment effects, as defined by social psychologists, did not seem to be responsible for the correlation between choosing the innocent suspect from an intervening
lineup and also the final lineup, a pattern that is typically seen in repeated-suspect paradigms including the current studies. Rather, the more parsimonious explanation of a consistent preference for a particular lineup member, even when that person is embedded among different fillers, seems to be the best explanation for higher rate of innocent suspect misidentifications from the final lineup among those who chose the innocent suspect from an intervening lineup.

Finally, Experiment 2 investigated the potential for social influence (such as demand characteristics) to affect participants’ decisions across multiple identification procedures containing a repeated individual. First, the repetition of the innocent suspect was manipulation of a type of informational social influence, because participants might interpret the repetition as an indication that they should identify the repeated person. Second, the experimenter was in the room while the participant completed the task and appeared to have control over which lineup or task the participant received next. These design features created demand characteristics—encouraged participants to infer that a particular decision was what the experimenter wanted.

Although only a small portion of participants reporting feeling like the experimenter was trying to influence their decisions, such reports were more frequent when the participant received more intervening lineups (and, thus, more repetitions of the innocent suspect). The open responses collected also referred to the repetition frequently, with participants indicating that they felt that this was the experimenter trying to influence them. Therefore, this experiment demonstrates the important role that social influence can play in eyewitness decisions when multiple identification procedures including a single suspect are presented to an eyewitness, and how the repetition alone could lead eyewitnesses to infer that the repeated person is guilty.

In-person data collection was interrupted by the coronavirus pandemic that occurred in 2020, and this experiment relied on the participant being able to attend an in-person session due
to the social influence hypotheses. Although the target sample size was not met and sample sizes were uneven across conditions, Experiment 2 still produced some very interesting results.
CHAPTER 4. GENERAL DISCUSSION

This dissertation opened with a problem exemplified by wrongful conviction case of John Jerome White (Innocence Project, 2019). At first glance, White’s case appears to be a classic demonstration of the issue that arises when the same suspect is included in multiple lineups—repeating a suspect in a second lineup with all new fillers inflates the chances of a mistaken identification. The White case is not unusual in this sense—many high-profile wrongful convictions involved multiple identifications of the same suspect (e.g., Ronald Cotton; Innocence Project, 2020), and it is almost certainly more prevalent than the available data show. However, what was unique about the White case was that the final lineup also, inadvertently, contained the true culprit as a filler. Of course, this was not discovered until many years later when White was exonerated and DNA testing was available. But this fact distinguishes the White case from other wrongful conviction cases because, although the eyewitness was faced with the person who actually committed the offence against her, she chose to identify the innocent person who had appeared in a previous lineup, White.

The White case and other, systematic evaluations of exoneration cases show that repeated identification attempts are a common theme in cases of wrongful conviction (Garrett, 2011), and that presenting multiple identification procedures to an eyewitness is common in police practice (e.g., Behrman & Davey, 2001; Steblay, 2011). Despite this, the effect of repeating a suspect across multiple identification procedures has received comparatively little attention in the literature when compared to other factors that affect eyewitness identification (Wells et al., 2020). This dissertation presented two studies designed to examine the increase in misidentifications that occurs after presenting an eyewitness with multiple identification procedures that all contain a repeated, innocent suspect—called the repeated-suspect effect.
Experiment 1 also sought to determine whether the memory for the true culprit, or participants’ willingness to identify the true culprit, was altered by intervening lineups. In addition, I incorporated a series of experimental manipulations that were expected to increase the number of misidentifications that occurred after intervening identification procedures and potentially change the relative contribution of specific cognitive and social psychological mechanisms that are believed to produce repeated-suspect effects.

The most significant finding was that biased intervening lineups or more than one intervening lineup containing a repeated, innocent person exacerbated the rate at which that person is incorrectly identified in a final lineup. All results are discussed here organized according to the specific predictions made at the beginning of this paper. Each prediction and the associated results will be discussed, along with potential reasons for any unusual results or unsupported hypotheses and the implications of the findings. The discussion then moves to a more general analysis of what these studies can tell us about the behavior of eyewitnesses during identification procedures and what this work contributes to our current knowledge of the processes involved in repeated-suspect paradigms. This dissertation finishes with a discussion of the practical implications of the current work for improving identification procedures in the field and protecting innocent suspects from wrongful conviction.

**Hypotheses Set 1: Repeated-Suspect Effects**

Across both experiments presented here, it was predicted that participants who received intervening lineups containing the innocent suspect would show a higher innocent suspect misidentification rate in final lineup when compared to participants who completed a non-lineup intervening task (the classic, repeated-suspect effect). Two additional manipulations were also expected to result in larger repeated-suspect effects: when participants received an intervening
Consistent with the previous literature and my hypotheses, participants were significantly more likely to misidentify the innocent suspect after seeing the innocent suspect’s face in a previous lineup compared with participants who did not receive an intervening lineup (Experiment 1 and 2). Moreover, intervening biased lineups increased innocent suspect misidentifications in a later lineup to a greater extent than did fair lineups (a larger repeated-suspect effect), both when only one intervening lineup was presented (Experiment 1), and when the biased lineup was the first of two intervening lineups (Experiment 2). Two intervening lineups also produced a higher misidentification rates than did a single intervening lineup or no intervening lineup (Experiment 2). Hence, all of my hypotheses about the influence of a repeated, innocent suspect on identification decisions were supported in both experiments.

These results support the idea that multiple identification procedures involving the same suspect is a suggestive identification procedure that can taint eyewitness testimony and reduce an eyewitness’ ability to discriminate between a true culprit and someone they have merely seen previously. However, this conclusion could have been made using the results from previous repeated-suspect studies (see Steblay & Dysart, 2016 for a review). The more nuanced conclusions that these data support relate to the impact of biased intervening lineups and more than one intervening lineup containing a repeated person—these conditions have not been explored in previous research. Now, there is clear empirical data to show that the dissenting opinion in *Manson v. Braithwaite* (1977) suggested an ineffective solution to a suggestive lineup procedure. The dissenting judges encouraged prosecutors to simply conduct a subsequent, fair procedure with the same suspect if an eyewitness had already participated in a suggestive
identification procedure. Here, I clearly demonstrate that this claim is incorrect and any previous
lineup, fair or biased, will in increase the chance that an eyewitness will misidentify an innocent
person from a subsequent, fair lineup—there is no evidence supporting the notion of a remedy
for a biased lineup once an eyewitness has been “contaminated” in this way.

Furthermore, these studies suggest that the repeated-suspect effect increases with the
number of repetitions (as a participant is shown more intervening lineups containing the same
person). This is another, unique finding from Experiment 2. Future research could investigate the
boundary conditions of this effect, for instance is each repetition associated with the same
average increase in misidentifications, or is each repetition associated with smaller and smaller
increases? In addition, it seems that procedures that draw attention to the repeated individual
tend to exacerbate the repeated-suspect effect. If the salience of the innocent suspect during the
intervening phase is responsible for the larger effect, logic would suggest that the repeated-
suspect effect would be stronger when other methods are used to draw attention to the innocent
suspect. Common examples of conditions that can draw attention to the suspect and artificially
increase identifications include non-blind lineup administration, providing the eyewitness with
positive feedback, or a different approach to biasing the lineup (e.g., a different background on
the photo of the suspect) than was used in the current study (Wells et al., 2020). Future research
should investigate some of these other ways to manipulate how noticeable the innocent suspect is
during the intervening lineups to confirm this logic.

**Hypotheses Set 2: Dual-Process Recognition and Source Monitoring**

**Remember-Know-Guess Judgments (R-K-G)**

Self-reported, categorical assessments of participants’ recognition processes have been
used in some past studies to determine the conditions in which familiarity (a “know” judgment)
and recollection processes contribute to repeated-suspect effects (e.g., Haw et al., 2007). Based
on previous work using R-K-G judgments, it was hypothesized that fair intervening lineups, more than one intervening lineup, and innocent suspect would be associated with more “know” judgments. These conditions are likely to make the innocent suspect face more familiar, but may not create a recognition experience that is detailed enough for participants to decide that this is the person saw in the crime video specifically. Larger proportions of “remember” judgments were anticipated for biased intervening lineups, for more than one intervening lineup, when participants chose the innocent suspect in more than one lineup, and for true culprit identifications. These hypotheses were based on the idea that biased lineups, more than one intervening lineup, and correct identifications were expected to produce stronger recognition experiences, and hence more experience that felt like recollection.

The current design presented a challenge for assessing these predictions, however. Analytic conditions were all determined by participants—participants self-selected into conditions by identifying the suspect from the final lineup or not, and by self-reporting their recognition experience on the R-K-G measure. Thus, these data were correlational and the statistical tests were underpowered with uneven cell sizes. In the past, researchers have circumvented this issue by adopting a repeated-measures design (e.g., Haw et al., 2007) which allows participants to calibrate their R-K-G self-reports over the course of the experiment and increase statistical power. But eyewitness researchers who wish to use a traditional eyewitness identification design and assess dual-process recognition should plan to collect many more participants than were collected here, or take a different approach.

Though the tests were underpowered, particularly in Experiment 1, some of the conditions in the experiment changed the distribution of “remember” and “know” in interesting ways. In Experiment 1, identifications of the true culprit after a biased intervening lineup were
associated with a higher percentage of “remember” judgments and a lower proportion of “know” judgments than participants who identified the innocent suspect. However, when participants received a fair intervening lineup, the distribution of “remember” and “know” judgments was relatively equal regardless of whether the culprit or innocent suspect was identified. In addition, participants who received intervening lineups demonstrated a larger proportion of both “remember” and “know” judgments when with the control condition (Experiment 1 and 2). Finally, participants who chose the innocent suspect from the final lineup as well as at least one intervening lineup appeared to report “remember” more often than participants who only selected the innocent suspect from the final lineup (Experiment 1 and 2). However, because none of the statistical tests were significant, none of these patterns can be interpreted with confidence.

**Source Monitoring Judgments**

Participants were also asked post-identification questions about the source of their memory for the person they identified in the final lineup. In situations like those seen in the current experimental designs, participants who are able to accurately evaluate the source of recognition are more likely to be accurate. For instance, if a participant was able to parse that a face was familiar only because it was in a previous lineup, not because it ever appeared in the video, that participant may successfully avoid misidentifying the innocent suspect. However, it is well-established that people are generally poor at monitoring the source of a memory, though they are very skilled at determining whether something, like a face, has been seen before (e.g., Brown et al., 1977; see Johnson et al., 1993, Lindsay, 2008, and Macpherson, 2015 for overviews of source monitoring research). It was predicted that source monitoring failures would be associated with some experimental condition more than others in this repeated-suspect paradigm. Biased intervening lineups (Experiments 1 and 2) and more than one intervening lineup (Experiment 2) were expected to make the innocent suspect’s presence in the intervening
lineups obvious and, thus, increase reports that the lineups were a source of recognition. Fair intervening lineups do not draw attention to the innocent suspect and, therefore, were expected to be linked to low reports of the lineups as a source, and more source attributions to the video. People who made culprit identifications or received no intervening lineups were hypothesized to make high source attributions to the video only because no one was repeated across lineups in these conditions.

In Experiment 1, biased intervening lineups and no intervening lineups were associated with higher scores for the video as a source of recognition. Attributions to the intervening lineup as a source were fairly consistent regardless of condition, though higher scores were found for participants who made an identification from the intervening lineup. Thus, when participants chose someone from the intervening lineup, they were more likely to cite the lineup as a source of recognition. Experiment 2 also had some particularly interesting source monitoring results. Participants who received any number of intervening lineups were more likely to attribute their recognition to both the lineups and the video, especially when the first intervening lineup was biased. This was not hypothesized, but is a fascinating finding—it suggests that people acknowledged that someone from the lineups was repeated in the final lineup, but also incorrectly inferred that their recognition experience was, at least in part, due to that person appearing in the video. Is this a case of genuine source confusion? Or are participants making a conscious misattribution (Brown et al., 1977; Lindsay & Johnson, 1989)? In other words, maybe these participants truly believed that they saw the innocent suspect in the video. Alternatively, maybe participants knew that they could not remember seeing the person they identified in the crime video—they only remembered seeing them in the lineups—but still chose to report that the person they identified was in the video. The latter explanation is not a memory effect. Rather, the
cause of this type of conscious misattribution is a demand characteristic (Cialdini, 2009) or attempting to relieve any cognitive dissonance (Festinger, 1957) participants felt as a result of identifying someone they could not recall being in the video.

**Hypotheses Set 3: Commitment Effects**

Participants who chose an innocent suspect from an intervening procedure also tended to be more likely to choose that person from the final lineup, and past researcher have called this a “commitment effect”. That pattern of identifications was clearly replicated in both experiments. However, there was no evidence to support the contention that this pattern was the result of psychological commitment. The commitment explanation implies that eyewitnesses make the same decision that they made earlier at a later time because they are motivated to appear consistent (Foote, 1951; Burke & Reitzes, 1991). However, none of the existing repeated-suspect effect data, including the current studies, suggests that this is the motivation underlying the correlational association between identifying the innocent suspect from an intervening lineup and identifying that same innocent suspect in a final lineup.

To address this research question, post-identification questions were included in the current study that to assess how important participants felt it was to commit to their decisions and choose consistently across lineups. These measures relied on participants’ self-report accuracy and participants’ willingness to report their motivation truthfully. Thus, the use of these post-identification questions assumes that people can and will report their motivations to appear consistent to others. However, the questions were fairly straightforward and did not ask for details about the use of any complex cognitive processes. These are the kinds of judgments that people are able to self-report on fairly accurately—retrospective reports about an experience or feeling during a task. It was expected that, if commitment processes contribute to repeated-suspect effects, participants would report feeling it was important to commit to their earlier
identifications if they identified the innocent suspect more than once. However, there was no
difference between people who chose the innocent suspect from at least one intervening lineup
and the final lineup, and people who only identified the innocent suspect from the final lineup on
these commitment questions. Hence, I found no support for the commitment concept. A simpler
explanation for the patterns found so consistently in these paradigms is that witnesses who
preferred the innocent suspect in one lineup would prefer that same person in a later lineup.

To illustrate why this explanation is also logical, consider an example with a culprit-
present intervening lineup and a later culprit-present lineup. Almost certainly one would observe
that those who identified the culprit from the first lineup would also identify the culprit from the
second lineup. There is no need to posit that this consistency was motivated by a commitment to
their first identification of the culprit because it is clear that preferring the same person in both
lineups is not evidence of psychological commitment. It is likely that there are conditions,
especially in actual cases, where eyewitnesses might feel commitment to their prior
identification. But the consistency effect observed in repeated-suspect experiments should not, in
itself, be construed as a commitment effect when there is no evidence of a motivational
mechanism consistent with commitment processes and self-consistency theory (Kiesler et al.,
1968; Swann & Bosson, 2010). To the extent that eyewitness researchers want to explore the
construct of psychological commitment, it is possible to create experiments to test the idea.
Social psychologists who study commitment, for instance, typically have some participants make
decisions that are then revealed publicly to others whereas other participants are led to believe
that their decisions are known only to them (e.g., Schienker, Dlugolecki, & Doherty, 1994).
Manipulating how publicly participants make their decisions has been done in the context of
mugshot-exposure effects, but not repeated-suspect effects (Brigham & Cairns, 1988).
Hypotheses Set 4: Memory for the Culprit

The design in Experiment 1 made use of a “modified test” design (McCloskey & Zaragoza, 1985) to analyze whether intervening identification procedures influenced participants’ abilities to identify the culprit. Half of the participants in Experiment 1 were randomly assigned to receive a target-present final lineup after either a biased intervening lineup, a fair intervening lineup, or no intervening lineup. If the face appearing in the intervening lineups was encoded separately from the memory for the true culprit, although both memory traces would be associated with the crime event, the “modified test” design was expected to show no evidence that participants’ abilities to identify the culprit were hindered by the intervening lineups. However, if the faces from the intervening lineups (particularly a biased lineup that narrows attention to one face) change the participants’ memory for the culprit’s face somehow, this would produce lower hit rates for intervening lineup conditions. The main comparisons for these hypotheses were between correct identification rates of the true culprit after no intervening lineups or after either a biased or fair intervening lineup for the forced-choice, final, culprit-present identification. In addition to presenting the culprit alone, the forced-choice aspect of this final lineup is critical to this test because it eliminates the possibility that shifts in decision criterion are responsible for any differences, or lack thereof.

The findings were consistent with previous work (Hinz & Pezdek, 2001) and the theory that intervening lineups form a new, separate memory that is related to, but does not impose upon, the memory for the true culprit. Simply put, there was very little difference in the hit rates across the three intervening task conditions—regardless of what intervening task participants were given, participants were equally able to identify the true culprit from the final culprit-present lineup. In fact, their choosing rates across conditions were fairly consistent both before and after being forced to choose a lineup member, so neither their willingness to choose the
culprit, nor their ability to choose the correct person even if they were uncertain, was changed by the intervening lineups. Thus, it appears that the memory for the culprit was maintained in the face of misleading lineup information.

Although consistent with the theory that misleading, post-event information, such as a target-absent lineup, creates a second memory that does not alter the original memory, these results do not mean that intervening lineups cannot ever impact an eyewitness’s ability to identify the culprit. One situation where the culprit is identified less often after intervening lineups is when the true culprit and the repeated innocent suspect both appear in the final lineup, as occurred in the White case. This situation was assessed in many previous repeated-suspect studies (e.g., Gorenstein & Ellsworth, 1980; Haw et al., 2007; Hinz & Pezdek, 2001; Pezdek & Blandon-Gitlin, 2005). When the two faces are pitted against one another at retrieval, some participants are misled and select the innocent suspect rather than the true culprit. Participants may have also remembered the true culprit—this type of test cannot determine whether that was the case—but found the repeated individual to be more familiar than the culprit.

Two other factors can alter people’s ability to correctly identify the perpetrator that were not tested in the current experiment: feedback, and the similarity between the misleading lineup member and the culprit. Research shows that when an eyewitness receives confirming feedback about an incorrect, intervening lineup decision, this can impair participants’ abilities to correct identify the culprit in a later culprit-present, forced-choice lineup when compared to participant who receive no feedback (Smalarz & Wells, 2014). That is, when a participant is told that an incorrect identification was right, but this is subsequently retracted by the experimenter and they are presented with a new lineup, identification accuracy for the actual culprit was impaired. In
addition, this effect was most pronounced when the person from the intervening lineup looked very different from the culprit.

It is, therefore, possible that if participants had been given feedback about their intervening lineup decisions or if similarity had been manipulated in a systematic way, hit rates on the critical lineups may have been affected by the intervening task conditions. However, as it stands, the results from Experiment 1 do not suggest that a fair or biased intervening lineup can hinder true culprit identifications at a later time. These findings suggest that the mere fact that the witness in the White case received an intervening lineup might not have been enough to prevent her from identifying the true culprit when she saw him in the second, live lineup if White had not been in that lineup. However, including the person who the witness previously identified (White) as well as the actual culprit (Parham) in the live lineup prevents us from knowing if the witness could have identified Parham. Furthermore, because we know nothing about the intervening lineup, it is possible that the witness received feedback after she identified White. Smalarz and Wells (2014) also suggests that feedback in this case would be particularly problematic given how dissimilar White and the true culprit, Parham, look (see Figure 1).

**Hypotheses Set 5: Social Influence and Demand Characteristics**

Experiment 2 investigated a factor that has typically received very little attention in eyewitness identification research as a whole, and almost no consideration in the repeated-suspect effect literature. Although memory processes tend to be the central focus of eyewitness identification research, there are many non-memory factors that can lead eyewitnesses to mistakenly identify someone from a lineup. A vivid and shocking real-life example of this is the case of Franky Carillo, an innocent man who was convicted of murder based exclusively on the eyewitness testimony of five people (Innocence Project, 2020). In this case, although the eyewitnesses had no memory due to impossible witnessing conditions, they ended up confidently
identifying Carillo through a combination of demand characteristics and conformity. None of the witnesses ever developed a false memory and every one of them always knew that they never saw the shooter. But they figured out which person the police thought was the shooter and made their identification based on that knowledge. For Experiment 2, the focus was on demand characteristics that are created by the nature of the repeated-suspect paradigm itself.

First, I expected that participants who noticed the repetition of the innocent suspect across the lineups would consider the reason for the repetition. In the context of a lineup, the most obvious inference is that the repeated person is the culprit, the person creating the lineups knows this, and the repetition is a clue about who the participant should pick from the lineup. Although there was an interest in social influence driving these experiments, there was no direct manipulation of social influence other than that some witnesses were in fact manipulated by the repeated showing of an innocent suspect. A post-identification question was included to determine whether participants felt like the experimenter was trying to influence their decisions. Also, participants who thought the experimenter was trying to influence their decisions were asked to explain why.

As hypothesized, with each additional intervening lineup, participants were significantly more likely to report that they felt like the experimenter was trying to communicate that they should select a particular lineup member. So, participants seemed to infer that the presence of a repeated person throughout the lineups was a hint from the experimenter about who the suspect was. Furthermore, when the open responses were evaluated, more than half of the participants who reported feeling like the experimenter was trying to influence them referred to the repeated individual as the reason for this feeling. Free responses about the repeated individual were also most common when one of the intervening lineups was biased, which would have made the
repeated person particularly salient.

This study presents the first empirical investigation into the role of demand characteristics in repeated-suspect effects. Furthermore, it adds to the growing body of literature demonstrating that there are many non-memory factors that can have profound effects on eyewitness decision-making. However, social influence factors are still underappreciated in the eyewitness literature. There are a number of reasons for this, only some of which I will mention here. Social influence manipulations are difficult to implement and typically require in-person participation. Experiment 2 was modified from Experiment 1 to include an experimenter’s presence for the duration of the task so as to make it clear to the participant that the experimenter was explicitly making decisions about the lineups that were presented to them. This is more time consuming and resource intensive than online research or tasks that are purely computer-based, which deters researchers. In fact, this was a real challenge for data collection in the current Experiment 2. Due to the coronavirus pandemic, data collection needed to stop earlier than was planned, and the social influence manipulation prevented moving the study online. Though the pandemic was an anomaly, the situation does demonstrate the relative inflexibility of social influence experiments.

Conclusions Relevant to Eyewitness Identification Policies

On Existing Recommendations for Multiple Identification Procedures

The current study adds to the existing literature recommending against multiple identification procedures with the same suspect and eyewitness (e.g., Steblay & Dysart, 2016; Wells et al., 2020). In fact, in the recent comprehensive review of eyewitness identification research by Wells and colleagues (2020), the recommendation against such practices is very strong. Multiple identification attempts are discouraged globally “no matter how compelling the argument in favor of a second identification might seem” (Wells et al., 2020, pp. 25). Unlike
other forms of evidence, such as physical, forensic evidence, repeated tests involving the same eyewitness will not improve their decisions—eyewitness identification is one situation where extra tests actually make the evidence less reliable. The only situation where multiple eyewitness identifications may be desirable is if multiple different eyewitness identify the same suspect independently from one another. Those circumstances would give rise to converging evidence, and can be very probative in a criminal investigation.

Thus, the experiments presented here add to the existing view that there is only one opportunity to obtain an “uncontaminated” identification from an eyewitness for any particular suspect. Any subsequent identifications will be irreversibly contaminated by the first identification test (Steblay & Dysart, 2016; Wells et al., 2020). Furthermore, many other recommendations for eyewitness identification procedures center around restricting the information that the eyewitness has about the investigation and the suspect (e.g., Kovera & Evelo, 2017; Wells & Luus, 1990). Repeating a single person across multiple lineups provides participants with information that they should not have, as demonstrated in Experiment 2. When comparing the participants’ free responses, the participants who saw intervening lineups often mentioned the repeated person, explaining that they thought the experimenter was trying to signal that this was the culprit from the video.

**Novel Conclusions Regarding Multiple Lineups with a Repeated Suspect**

In addition to supporting existing recommendations, there are some additional, novel recommendations that can be made using the current results in this dissertation. First, the potential for “contamination” of an eyewitness is increased when one of the intervening lineups is biased towards an innocent suspect, or when multiple intervening lineups containing the innocent suspect are presented. Though this could have been inferred from other literature, these conditions had never been tested empirically. In particular, despite what the dissenting judgment
in *Manson v. Braithwaite* (1977) stated, the use of a biased intervening lineup is a critical error in eyewitness identification. A biased intervening lineup itself is suggestive, but also any subsequent procedure will be tainted by the information communicated by the biased lineup even if the new lineup is, when assessed in isolation, a fair procedure. Finally, the current studies show that repetition alone leads participants to infer that the experimenter was trying to get them to pick this person. This is a demand characteristic that would occur in the real world too. Eyewitnesses would infer that the police chose to include this person in both lineups because that is the suspect. In the same way that a biased lineup cannot be fixed, there is no solution once the repetition has occurred, so the practice of presenting the same suspect on multiple occasions should always be avoided in real cases.

Another interesting finding relates to the Experiment 1, in which some participants had the opportunity to identify the true culprit in the final lineup. It appeared that correct identifications were unaffected by previous lineups containing a different suspect so, theoretically, if a subsequent lineup could be guaranteed to include the true culprit, then an eyewitness’s decision for the lineup could be reliable. Although this is theoretically possible, there would be no way to know when the true culprit is present in an actual lineup. In addition, as already mentioned, past studies show that they are many ways that accurate retrieval can be impaired in this type of procedure. For instance, by providing the eyewitness with confirming feedback for an incorrect pick before a final, target-present lineup (Smalarz & Wells, 2014).

**Considerations for Eyewitness Identification Procedures in the Field**

In the real world, research shows that eyewitnesses evaluating simultaneous lineups fail to identify the police suspect 59.2% of the time (35.5% rejections, 23.7% filler identifications; Wells et al. 2020, Table 1). Thus, the vast majority of lineups cannot be used to secure a conviction. If the eyewitness picks a filler or rejects the lineup, the eyewitness’s reliability may
be questioned (Smalarz et al., 2019). The police officer may feel quite certain about their suspect, though, and consider other reasons for the eyewitness’s decision. What if there was a problem with that lineup and that is why the eyewitness made that decision? Was the photo of the suspect poor quality and that is the reason that the eyewitness did not recognize them? The police may undergo similar reasoning if the eyewitness reluctantly identifies the suspect or does so with low confidence. Under these circumstances, it would be common practice to arrange another lineup and give the eyewitness “another chance.” Given the high proportion of lineups that are rejected, presenting multiple identification procedures is likely quite common.

The current work demonstrates that this practice is ill-advised. When an eyewitness does not choose the suspect from a lineup, the current data suggests that a subsequent lineup with the same suspect endangers innocent suspects and may derail an investigation if the suspect is not guilty. However, the practice of “burning” eyewitnesses who select a filler is also generally unhelpful for an investigation. Once an eyewitness has seen one identification procedure containing a suspect, though, that eyewitness cannot make reliable identifications concerning that suspect at a later time in a different identification procedure. Thus, as established in previous work, the best solution is to make sure the first identification attempt is well-constructed so that the identification will be useful and admissible in court.

One way to achieve this, in addition to adhering to the various recommendations in Wells et al. (2020), is by requiring a reasonable level of suspicion before putting someone in an identification procedure. There is significant variation in the standard required before a suspect can be presented to an eyewitness in a lineup, so the base rate of true culprits appearing in lineups will also vary. If there is very little evidence required by a particular precinct before a suspect is placed in a lineup, the base rate of true culprits placed in identification procedures will
be lower than a precinct where firm evidence from other investigative work is necessary before administering a lineup. However, police sometimes use lineups as a means to obtain incriminating evidence, rather than to confirm their suspicions based on other evidence (Wells & Quigley-McBride, 2016). Given the risk associated with being placed in any lineup procedure, let alone multiple lineups, more than a hunch should be required before someone is subjected to a lineup. Furthermore, if there is sufficient evidence available that a person is guilty, ensuring the lineup is properly constructed and administered the first time will secure reliable, informative, and admissible eyewitness evidence (Smalarz et al., 2019; Wells & Quigley-McBride, 2016).

**Revisiting the Manson v. Braithwaite (1977) Admissibility Criteria**

One important consideration for multiple identification attempts is that the current admissibility law cannot prevent subsequent identifications of the same suspect with the same eyewitness being admitted as evidence at trial. In fact, each additional identification attempt is likely to facilitate meeting the admissibility criteria even while contaminating the identification process. To explore why this is the case, I will first describe the five *Manson* criteria (originally from *Neil v Biggers*, 1972) that were formulated to determine when suggestive eyewitness evidence should be admissible in court (Wells & Quinlivan, 2009).

When determining whether or not an eyewitness identification procedure should be admissible, the court undertakes a two-step analysis. The first step is to assess whether or not the procedure used to obtain the identification was suggestive—if the procedure was *not* suggestive, the evidence is admitted. However, if the procedure is found to be suggestive (e.g., a showup or a biased lineup), the court will go on to assess whether or not the eyewitness identification evidence is, nevertheless, reliable using the five criteria from *Manson*. To do this, the judge will consider the circumstances surrounding the eyewitness’s experience during the crime, and information obtained after the crime event that can speak to the reliability of the eyewitness’s
memory. The court will consider the quality of the view that the eyewitness had of the culprit during the crime and how much attention the eyewitness paid to the culprit during the crime. They will also evaluate whether the description the eyewitness gave of the culprit matches the suspect, how much time has passed between the crime and the lineup procedure in question, and how certain the eyewitness was in their identification decision.

Before I critique these criteria in light of multiple identification procedure situations, I will note that researchers have already criticized these criteria for being out of date given the empirical data available now concerning eyewitness identification decisions (Wells & Quinlivan, 2009). For instance, certainty can indicate an eyewitness is reliable only in very specific circumstances, and will change as a function of the quality of the identification procedure as well as numerous other factors (Wixted & Wells, 2017). Furthermore, assessment of these criteria will rely on self-reports from the eyewitness in almost every case. By the time a prosecutor is ready to address admissibility concerns at trial, the eyewitness has received confirmatory feedback regarding their identification. Confirmatory, post-identification feedback inflates eyewitness confidence (the “certainty” criterion) and retrospectively alters eyewitnesses’ recollection of the crime in ways that are consistent with a correct identification—eyewitnesses report believing that they had a better view and paid closer attention during the crime than they would have reported had they received no feedback (Steblay, Wells, & Douglass, 2014).

The irony of this is that the Manson approach to admissibility might actually incentivize prosecutors and police investigators to perform multiple identification procedures. Police investigators might feel the need to conduct another lineup with the same suspect and eyewitness to ensure they have a confident and compelling eyewitness decision that can support the conviction. Police and lawyers will often coach their eyewitnesses to ensure their testimony
comes across in a way that meets the *Manson* criteria. If the first time the eyewitness saw the suspect, though, they rejected the lineup, no amount of coaching can make this decision helpful in court. Similarly, if the first identification attempt was a showup, police might follow it up with a lineup to make certain that the eyewitness evidence is persuasive and admissible. If the follow-up procedure is not suggestive, it will likely pass the first step of the admissibility test, without requiring an analysis of the five criteria in the second step of the legal test.

Let us consider the White case again to demonstrate. There is some information about the conditions during the crime, such as the eyewitness’s view and attention during the crime, and her description of the perpetrator. The victim was not wearing her prescription glasses during the crime and could only provide the police with a vague description of her attacker. All that is known about the first lineup is that it was a photo lineup, and the victim selected White from that lineup. However, something about the identification decision led the police investigator to conduct another, live lineup containing White. Given the nature of the victim’s experience during the crime, the prosecutor was likely going to rely on the eyewitness’s certainty to ensure their testimony was admissible at trial. So, if the eyewitness was uncertain when selecting White the first time, the police may have felt the need to secure a more confident identification using a second lineup. Although research suggests that the second lineup was suggestive and unreliable, that evidence was admissible at trial and led to the wrongful conviction of White.

In sum, even if the law recognizes multiple identification procedures with a repeated individual as suggestive, the final identification in string of identifications could still pass the admissibility test. The repetition itself provides a form of feedback—as demonstrated in Experiment 2 of the current dissertation. Participants who notice the repeated person will infer that this is the suspect and therefore the person they should identify and should have identified in
the previous lineup. So, the mere repetition of a lineup member will make an eyewitness appear more certain, and potentially result in eyewitnesses retrospectively altering their reports of the view they had and the amount of attention paid during the crime to better align with their “correct” identification (Steblay, Wells, & Douglass, 2014). Thus, even if the subsequent identification with the repeated individual was deemed suggestive under the first step of the test, it can still pass the five criteria under the second step and be rules “nevertheless reliable”. Any case in which an eyewitness has seen the suspect in multiple lineups, it is the first lineup decision that should be considered in light of the Manson criteria or the eyewitness’s testimony should be inadmissible. In addition to the current dissertation and other repeated-suspect effect studies, a recent analysis of eyewitness confidence by Wixted and Wells (2017) found that the only reliable confidence statement from an eyewitness is one taken immediately after the first identification attempt—any confidence associated with a later procedure is not a reliable indicator of eyewitness identification accuracy. This is also consistent with the nature of the association between confidence, innocent suspect misidentifications, and recognition strength reports in Experiments 1 and 2—the patterns seen for correct identifications in which there was no repetition of the suspect across lineups looked extremely similar to the trends associated with identifications of repeated innocent suspects.

The Importance of Non-Memory Factors in Eyewitness Identification Research

The final message that should be taken away from this dissertation is the importance of including non-memory factors in eyewitness identification research. I have already discussed some of the challenges associated with experiments that manipulate social influence variables such as demand characteristics or cognitive dissonance. However, the current work demonstrates the value of investigating the social cognitive aspects of eyewitness errors.

It is widely recognized that there are myriad factors that are operating on eyewitnesses in
any given identification procedure, some of which have a measurable impact on decision-making and others that do not. Previous articles have summarized the various mechanisms typically referred to in repeated-suspect effect articles. For instance, when compiling the key, research-based recommendations for eyewitness identification protocols, Wells and colleagues (2020) focused on source misattribution, commitment effects, and the potential for the repetition to provide the eyewitness with information they should not have. Similarly, the review by Steblay and Dysart (2016) highlighted the role of source confusion, commitment, and the inherent suggestibility associated with repeating someone across procedures as key mechanisms. Here, I drew from cognitive and social psychology to identify five potential mechanisms that might contribute to misidentifications in a repeated-suspect paradigm three of which are memory-related processes (dual-process recognition, source monitoring, and memory for the true culprit) and two that were social-influence processes (commitment and demand characteristics).

The non-memory, social-influence processes that were explored in this work are not the only non-memory processes that could influence eyewitnesses in eyewitness identification, or even in the more specific context of repeated-suspect effects. Obedience to authority (Milgram, 1967), for example, is likely to play a significant role in the interactions between a police officer or prosecutor, and an eyewitness. Cognitive dissonance (in addition to tradition misinformation and source monitoring effects) could explain some situations where eyewitnesses report seeing something that was not true or retrospectively change their account of their experience during the crime. The goal here was not to precisely indicate what processes were occurring and the nature of their effects. Rather, the goal was to provide a more complete explanation of the processes involved in repeated-suspect effects than was seen in previous work, and to not limit those processes to memory and cognition theories.
Final Remarks

In effect, the perspective driving the current dissertation is that it is likely that there are multiple processes responsible for the repeated-suspect effect and exploring a wider variety of mechanisms was expect to provide a greater understanding of the patterns in repeated-suspect paradigms. Like so many real-world problems, there are likely to be both cognitive (e.g., memory confusions) and social (e.g., demand characteristics) factors at play for repeated-suspect effects and which of these factors will dominate at any given time is likely to depend on various situational factors. Under some circumstances, repeated showing of a suspect to an eyewitness is likely to communicate to the eyewitness that they ought to be picking that person, which is a form of social influence. Under other circumstances, repeated showing of the suspect is likely to produce an identification based purely on familiarity or based on a source misattribution, which are memory processes. Rather than trying to attribute the repeated-suspect effect to only one process, future research might be able to establish more clearly the conditions under which each of these processes plays a larger or smaller role in producing error, as well as how the processes might work together to alter the magnitude of the repeated-suspect effect.
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Manson v Braithwaite. 432 U.S. 98 (1977)


Details Regarding the Creation of the Lineups

Suspect Photos

First, two individuals that matched a similar, vague description were identified. They were both young, Caucasian men with a slender build, short hair, and no facial hair. Two white long-sleeved undershirts and two dark blue, short-sleeved, oversized scrubs were purchased for each of our suspects to wear for the lineup photographs. These clothes were used to ensure that their photographs matched the filler photographs I obtained from the Florida Inmate Database (www.dc.state.fl.us). On five separate occasions, approximately one week apart and at different times of day, the suspects were asked to come to photograph sessions that took place in an office with a blue wall—again, with the goal of matching the photos in the Florida Inmate Database. Multiple photos were taken at each session with different poses, expressions, and lighting to achieve a variety of photos of the same individuals. As a result, even though participants were shown multiple lineups containing the same individual, they never saw the same photo of the same individual twice.

Filming the Crime Event

Two different crime events were filmed for use in these experiments, each lasting 20 seconds. These were filmed using a Canon handheld camera and the videos were edited in iMovie. One event involved staging a theft in an office. The culprit entered the room, looked around, took money out of a wallet, picked up a computer, phone, and iPod off the desk, and then left. The second event was a staged drug deal in which the culprit was standing by a tree looking at his phone. Then, a woman approached and a small bag was exchanged for money. After she left, the culprit resumed looking at his phone. These events were filmed on different
days, but both culprits were filmed for each event at the same time so that lighting and other items in the shot would be the same. The event was filmed multiple times, and from three different angles. One shot was from far away and to the left of the culprit, another from far away to the right, and another closer to the culprit in the middle. The videos were edited so that most of the crime was seen from far away but there was approximately 3 seconds where there was a close up of the suspects face. Three versions of each video were made—one with normal lighting (best quality video), one with reduced color quality (medium quality), and one with increased exposure (lowest quality) in case the difficulty of the task needed to be increased. For the Experiments described in this document, the medium quality videos were used.

**Filler Photos**

My research assistants spent time searching the Florida Inmate Database to find individuals that would match the same description as the two suspects used to create our videos and suspect photos. They search for individuals who were young, Caucasian, and with no distinguishing features (e.g., face tattoos). Some of the photographs would be used to created biased lineups too, so the research assistants were told that young, Caucasian men with glasses, a heavier stature, or facial hair should be found too. From that list, 110 were identified by the principal investigator as similar enough to the suspect photos to be used in pilot testing. These photographs were used to create a Qualtrics survey that was administered on Amazon’s Mechanical Turk. For this survey, each potential filler appeared with one of the suspect photos and the participant was asked to rate how similar these two individuals looked. Once data collection was complete, each of these filler photos was associated with a mean similarity rating for each of our two suspects.

**Creating the Lineups**
Once similarity data between the potential fillers and the two suspects had been obtained, these were used to create five fair lineups in which the average similarity between the fillers and the two suspects was approximately equal. The aim of this was to create five sets of fillers that created lineups with the same filler similarity regardless of which suspect was used. In addition, two biased lineups were created in which the suspects stood out—the fillers were all heavy set, wore glasses, had thick facial hair, or were distinctive in some other way that meant they were not good choice regardless of which suspect was in the video. These lineups can be found in below. To ensure that the fair lineups were achieving adequate filler siphoning and the biased lineups were not, these materials were pilot tested on Mechanical Turk. Participants were randomly assigned to view one of the four videos of the crimes and then saw one target-absent lineups at random. This was followed by a random target-present lineup (though, this lineup was never the lineup with the same fillers as the target-absent lineup). These data are included below in Tables 1a-g to 2a-g. Fair lineups 1 and 3 did not work well for at least one of the suspects—in each case, a filler was receiving more identifications than the actual suspect. The other fair lineups (2, 4, and 5), though, demonstrated appropriate levels of filler siphoning and hits for both suspects. These data also confirmed that the biased lineups were, in fact, biasing people to choose the suspects, both when target present and when target absent.
Pilot testing data for lineups used in the Experiments 1 and 2

Table 1a. *Table summarizing the choosing rates for Fair Lineup 1 containing Suspect 1.*

<table>
<thead>
<tr>
<th>Lineup</th>
<th>Photo 1</th>
<th>Photo 2</th>
<th>Photo 3*</th>
<th>Photo 4</th>
<th>Photo 5</th>
<th>Photo 6</th>
</tr>
</thead>
<tbody>
<tr>
<td>Target Present</td>
<td>0.03</td>
<td>0.13</td>
<td>0.27</td>
<td>0.13</td>
<td>0.17</td>
<td>0.27</td>
</tr>
<tr>
<td>Target Absent</td>
<td>0.04</td>
<td>0.20</td>
<td>0.20</td>
<td>0.16</td>
<td>0.16</td>
<td>0.24</td>
</tr>
</tbody>
</table>

*Notes.* Fair Lineup 1 with *Suspect 1 is displayed above, and would be target present when a participant saw this suspect in the video crime event. All values are rounded to 2dp.

Table 1b. *Table summarizing the choosing rates for Fair Lineup 2 containing Suspect 1.*

<table>
<thead>
<tr>
<th>Lineup</th>
<th>Photo 1</th>
<th>Photo 2</th>
<th>Photo 3</th>
<th>Photo 4</th>
<th>Photo 5*</th>
<th>Photo 6</th>
</tr>
</thead>
<tbody>
<tr>
<td>Target Present</td>
<td>0.04</td>
<td>0.19</td>
<td>0.00</td>
<td>0.08</td>
<td>0.46</td>
<td>0.23</td>
</tr>
<tr>
<td>Target Absent</td>
<td>0.06</td>
<td>0.06</td>
<td>0.19</td>
<td>0.10</td>
<td>0.29</td>
<td>0.29</td>
</tr>
</tbody>
</table>

*Notes.* Fair Lineup 2 with *Suspect 1 is displayed above, and would be target present when a participant saw this suspect in the video crime event. All values are rounded to 2dp.
Table 1c. *Table summarizing the choosing rates for Fair Lineup 3 containing Suspect 1.*

<table>
<thead>
<tr>
<th>Lineup</th>
<th>Photo 1</th>
<th>Photo 2*</th>
<th>Photo 3</th>
<th>Photo 4</th>
<th>Photo 5</th>
<th>Photo 6</th>
</tr>
</thead>
<tbody>
<tr>
<td>Target Present</td>
<td>0.13</td>
<td>0.28</td>
<td>0.03</td>
<td>0.06</td>
<td>0.50</td>
<td>0.00</td>
</tr>
<tr>
<td>Target Absent</td>
<td>0.11</td>
<td>0.11</td>
<td>0.19</td>
<td>0.22</td>
<td>0.30</td>
<td>0.07</td>
</tr>
</tbody>
</table>

*Notes.* Fair Lineup 3 with *Suspect 1* is displayed above, and would be target present when a participant saw this suspect in the video crime event. All values are rounded to 2dp.

Table 1d. *Table summarizing the choosing rates for Fair Lineup 4 containing Suspect 1.*

<table>
<thead>
<tr>
<th>Lineup</th>
<th>Photo 1</th>
<th>Photo 2</th>
<th>Photo 3</th>
<th>Photo 4*</th>
<th>Photo 5</th>
<th>Photo 6</th>
</tr>
</thead>
<tbody>
<tr>
<td>Target Present</td>
<td>0.03</td>
<td>0.25</td>
<td>0.06</td>
<td>0.41</td>
<td>0.06</td>
<td>0.19</td>
</tr>
<tr>
<td>Target Absent</td>
<td>0.11</td>
<td>0.25</td>
<td>0.11</td>
<td>0.25</td>
<td>0.21</td>
<td>0.07</td>
</tr>
</tbody>
</table>

*Notes.* Fair Lineup 4 with *Suspect 1* is displayed above, and would be target present when a participant saw this suspect in the video crime event. All values are rounded to 2dp.
Table 1e. *Table summarizing the choosing rates for Fair Lineup 5 containing Suspect 1.*

<table>
<thead>
<tr>
<th>Lineup</th>
<th>Photo 1</th>
<th>Photo 2</th>
<th>Photo 3</th>
<th>Photo 4</th>
<th>Photo 5</th>
<th>Photo 6*</th>
</tr>
</thead>
<tbody>
<tr>
<td>Target Present</td>
<td>0.04</td>
<td>0.04</td>
<td>0.10</td>
<td>0.18</td>
<td>0.10</td>
<td>0.54</td>
</tr>
<tr>
<td>Target Absent</td>
<td>0.10</td>
<td>0.07</td>
<td>0.16</td>
<td>0.27</td>
<td>0.20</td>
<td>0.20</td>
</tr>
</tbody>
</table>

*Notes.* Fair Lineup 5 with *Suspect 1 is displayed above, and would be target present when a participant saw this suspect in the video crime event. All values are rounded to 2dp.

Table 1f. *Table summarizing the choosing rates for Biased Lineup 1 containing Suspect 1.*

<table>
<thead>
<tr>
<th>Lineup</th>
<th>Photo 1</th>
<th>Photo 2*</th>
<th>Photo 3</th>
<th>Photo 4</th>
<th>Photo 5</th>
<th>Photo 6</th>
</tr>
</thead>
<tbody>
<tr>
<td>Target Present</td>
<td>0.04</td>
<td>0.68</td>
<td>0.04</td>
<td>0.00</td>
<td>0.12</td>
<td>0.12</td>
</tr>
<tr>
<td>Target Absent</td>
<td>0.18</td>
<td>0.35</td>
<td>0.06</td>
<td>0.03</td>
<td>0.29</td>
<td>0.09</td>
</tr>
</tbody>
</table>

*Notes.* Biased Lineup 1 with *Suspect 1 is displayed above, and would be target present when a participant saw this suspect in the video crime event. All values are rounded to 2dp.
Table 1g. Table summarizing the choosing rates for **Biased** Lineup 2 containing Suspect 1.

<table>
<thead>
<tr>
<th>Lineup</th>
<th>Photo 1</th>
<th>Photo 2</th>
<th>Photo 3</th>
<th>Photo 4</th>
<th>Photo 5*</th>
<th>Photo 6</th>
</tr>
</thead>
<tbody>
<tr>
<td>Target Present</td>
<td>0.05</td>
<td>0.08</td>
<td>0.03</td>
<td>0.05</td>
<td>0.76</td>
<td>0.03</td>
</tr>
<tr>
<td>Target Absent</td>
<td>0.19</td>
<td>0.13</td>
<td>0.03</td>
<td>0.16</td>
<td>0.50</td>
<td>0.00</td>
</tr>
</tbody>
</table>

*Notes.* Biased Lineup 2 with *Suspect 1 is displayed above, and would be target present when a participant saw this suspect in the video crime event. All values are rounded to 2dp.

Table 2a. Table summarizing the choosing rates for **Fair** Lineup 1 containing Suspect 2.

<table>
<thead>
<tr>
<th>Lineup</th>
<th>Photo 1</th>
<th>Photo 2</th>
<th>Photo 3*</th>
<th>Photo 4</th>
<th>Photo 5</th>
<th>Photo 6</th>
</tr>
</thead>
<tbody>
<tr>
<td>Target Present</td>
<td>0.07</td>
<td>0.04</td>
<td>0.33</td>
<td>0.15</td>
<td>0.11</td>
<td>0.30</td>
</tr>
<tr>
<td>Target Absent</td>
<td>0.06</td>
<td>0.11</td>
<td>0.17</td>
<td>0.20</td>
<td>0.03</td>
<td>0.43</td>
</tr>
</tbody>
</table>

*Notes.* Fair Lineup 1 with *Suspect 2 is displayed above, and would be target present when a participant saw this suspect in the video crime event. All values are rounded to 2dp.
Table 2b. **Table summarizing the choosing rates for Fair Lineup 2 containing Suspect 2.**

<table>
<thead>
<tr>
<th>Lineup</th>
<th>Photo 1</th>
<th>Photo 2</th>
<th>Photo 3</th>
<th>Photo 4</th>
<th>Photo 5*</th>
<th>Photo 6</th>
</tr>
</thead>
<tbody>
<tr>
<td>Target Present</td>
<td>0.03</td>
<td>0.10</td>
<td>0.06</td>
<td>0.29</td>
<td>0.39</td>
<td>0.13</td>
</tr>
<tr>
<td>Target Absent</td>
<td>0.09</td>
<td>0.17</td>
<td>0.04</td>
<td>0.13</td>
<td>0.22</td>
<td>0.35</td>
</tr>
</tbody>
</table>

*Notes.* Fair Lineup 2 with *Suspect 2 is displayed above, and would be target present when a participant saw this suspect in the video crime event. All values are rounded to 2dp.

Table 2c. **Table summarizing the choosing rates for Fair Lineup 3 containing Suspect 2.**

<table>
<thead>
<tr>
<th>Lineup</th>
<th>Photo 1</th>
<th>Photo 2*</th>
<th>Photo 3</th>
<th>Photo 4</th>
<th>Photo 5</th>
<th>Photo 6</th>
</tr>
</thead>
<tbody>
<tr>
<td>Target Present</td>
<td>0.14</td>
<td>0.43</td>
<td>0.10</td>
<td>0.07</td>
<td>0.24</td>
<td>0.02</td>
</tr>
<tr>
<td>Target Absent</td>
<td>0.07</td>
<td>0.32</td>
<td>0.07</td>
<td>0.14</td>
<td>0.36</td>
<td>0.04</td>
</tr>
</tbody>
</table>

*Notes.* Fair Lineup 3 with *Suspect 2 is displayed above, and would be target present when a participant saw this suspect in the video crime event. All values are rounded to 2dp.
Table 2d. *Table summarizing the choosing rates for Fair Lineup 4 containing Suspect 2.*

<table>
<thead>
<tr>
<th>Lineup</th>
<th>Photo 1</th>
<th>Photo 2</th>
<th>Photo 3</th>
<th>Photo 4*</th>
<th>Photo 5</th>
<th>Photo 6</th>
</tr>
</thead>
<tbody>
<tr>
<td>Target Present</td>
<td>0.12</td>
<td>0.12</td>
<td>0.08</td>
<td>0.52</td>
<td>0.04</td>
<td>0.12</td>
</tr>
<tr>
<td>Target Absent</td>
<td>0.12</td>
<td>0.12</td>
<td>0.15</td>
<td>0.42</td>
<td>0.04</td>
<td>0.15</td>
</tr>
</tbody>
</table>

*Notes.* Fair Lineup 4 with *Suspect 2 is displayed above, and would be target present when a participant saw this suspect in the video crime event. All values are rounded to 2dp.

Table 2e. *Table summarizing the choosing rates for Fair Lineup 5 containing Suspect 2.*

<table>
<thead>
<tr>
<th>Lineup</th>
<th>Photo 1</th>
<th>Photo 2</th>
<th>Photo 3</th>
<th>Photo 4*</th>
<th>Photo 5</th>
<th>Photo 6*</th>
</tr>
</thead>
<tbody>
<tr>
<td>Target Present</td>
<td>0.06</td>
<td>0.11</td>
<td>0.11</td>
<td>0.17</td>
<td>0.06</td>
<td>0.49</td>
</tr>
<tr>
<td>Target Absent</td>
<td>0.12</td>
<td>0.09</td>
<td>0.44</td>
<td>0.12</td>
<td>0.00</td>
<td>0.23</td>
</tr>
</tbody>
</table>

*Notes.* Fair Lineup 5 with *Suspect 2 is displayed above, and would be target present when a participant saw this suspect in the video crime event. All values are rounded to 2dp.
Table 2f. *Table summarizing the choosing rates for Biased Lineup 1 containing Suspect 2.*

<table>
<thead>
<tr>
<th>Lineup</th>
<th>Photo 1</th>
<th>Photo 2*</th>
<th>Photo 3</th>
<th>Photo 4</th>
<th>Photo 5</th>
<th>Photo 6</th>
</tr>
</thead>
<tbody>
<tr>
<td>Target Present</td>
<td>0.04</td>
<td>0.68</td>
<td>0.00</td>
<td>0.00</td>
<td>0.16</td>
<td>0.02</td>
</tr>
<tr>
<td>Target Absent</td>
<td>0.08</td>
<td>0.81</td>
<td>0.00</td>
<td>0.00</td>
<td>0.03</td>
<td>0.08</td>
</tr>
</tbody>
</table>

*Notes.* Biased Lineup 1 with *Suspect 2 is displayed above, and would be target present when a participant saw this suspect in the video crime event. All values are rounded to 2dp.

Table 2g. *Table summarizing the choosing rates for Biased Lineup 2 containing Suspect 2.*

<table>
<thead>
<tr>
<th>Lineup</th>
<th>Photo 1</th>
<th>Photo 2</th>
<th>Photo 3</th>
<th>Photo 4</th>
<th>Photo 5*</th>
<th>Photo 6</th>
</tr>
</thead>
<tbody>
<tr>
<td>Target Present</td>
<td>0.00</td>
<td>0.04</td>
<td>0.04</td>
<td>0.04</td>
<td>0.88</td>
<td>0.00</td>
</tr>
<tr>
<td>Target Absent</td>
<td>0.06</td>
<td>0.03</td>
<td>0.00</td>
<td>0.17</td>
<td>0.74</td>
<td>0.00</td>
</tr>
</tbody>
</table>

*Notes.* Biased Lineup 2 with *Suspect 2 is displayed above, and would be target present when a participant saw this suspect in the video crime event. All values are rounded to 2dp.
APPENDIX B. INSTRUCTIONS FOR EXPERIMENT 1

Consent Process

Welcome to the experiment! Please read through and sign the consent form at your own pace. Feel free to ask the experimenter if you have any questions. Give the completed form to the experimenter.

Video: Crime Event

Thank you for taking part in this study.

The first part of this experiment session involves watching a video.

When you proceed to the next page, the video will start to play. The video is not very long, but it is relevant to your next task, so please do your best to pay close attention.

If you have any questions, please ask the experimenter now. Otherwise, when you are ready to see the video, click “Continue”.

{Crime video plays - program will automatically advance to the next screen}

Filler Task 1

Your next task is to count the number of syllables in a series of words.

Please enter in the number of syllables for as many words as you can in the next 10 minutes.

Click “Continue” to begin.

Please enter the number of syllables in each word in the textbox provided.

{Screen contains a list of words with textboxes to enter in the number of syllables}
{Screen will automatically advance after 10 minutes}

Intervening Task: Biased Lineup, Fair Lineup, or Reading Comprehension.

Please read the instructions for the next phase of the experiment.
Soon, you will be shown six photographs of individuals. This is called a lineup, which is a procedure used by police to gather evidence when they find a person that they think committed a crime. This person is called the “suspect.” If there were any eyewitnesses to the crime, the police will test their suspicions about this person by asking an eyewitness to view a lineup containing this suspect.

However, the police are sometimes incorrect in their suspicions and the suspect is not the culprit. So, a lineup will sometimes contain the person that the eyewitness saw committing the crime, and sometimes that person will not be among those in the lineup.

Your task is to determine if one of the people in this lineup is the person that you saw in the video viewed at the start of this session. Then, you will be asked to answer some more questions about your lineup decision.

The person from the video may or may not be one of the people in the lineup. If you think that the person from the video is not there, do not feel like you need to make an identification.

If you do think that the person from the video is in the lineup, please select the relevant photo number, e.g., “Photo 1”.
If you do not think that the person from the video is in the lineup, please select “Not Present”.

Click “Continue” to view the lineup.

(Lineup Displayed – either Biased, or fair, always containing the innocent suspect)

Please click on the photo number of the individual that you think you recognize from the video, or select “Not Present” if you do not recognize anyone in the lineup.

Photo 1  Photo 2  Photo 3
Photo 4  Photo 5  Photo 6
Not Present

Why did you make the decision you did about the lineup?

{textbox written entry}

How confident are you in your decision about this lineup?

0% - not at all confident  10%  20%  30%  40%  50%  60%  70%  80%  90%  100% - completely confident
Filler Task 2

Your next task is to count the number of vowels contained in this passage. You will have 10 minutes for this task.

If you finish counting, enter the number of vowels in the text box provided and then click “Continue” for a new passage.

Click “Continue” to begin this task.

Please count the number of vowels in the passage below.

{There will be 4 passages about 500 words each, which will be shown to the participants in a random order with a textbox below each to enter the number of vowels}
{Screen will automatically advance to Screen 10 after 10 minutes}

Final Fair Lineup: Target present or target absent.

For the next task, you will be asked to view another lineup and decide if one of the people in the lineup is from the video you watched at the start of the session. You will also answer some questions about your decision.

Remember that the person from the video may or may not be one of the people in the lineup. If you think that the person from the video is not there, do not feel like you need to make an identification.

If you do think that the person from the video is in the lineup, please select the relevant photo number, e.g., “Photo 1”.
If you do not think that the person from the video is in the lineup, please select “Not Present”.

Click “Continue” to view the lineup.

{Lineup Displayed – Fair and containing the innocent suspect}

Please click on the photo number of the individual that you recognize from the video, or select “Not Present” if you do not recognize anyone in the lineup.
Why did you make the decision you did about the lineup?

{textbox written entry}

How confident are you in your decision about this lineup?

0% - not at all confident 10% 20% 30% 40% 50% 60% 70% 80% 90% 100% - completely confident

{if they indicate “Not Present”}
If you had to pick someone from this lineup, which photograph would be your first choice?

Photo 1  Photo 2  Photo 3
Photo 4  Photo 5  Photo 6

Why would this photo be your choice if you had to identify someone?
{textbox written entry}

How confident are you in this decision about the lineup?

0% - not at all confident 10% 20% 30% 40% 50% 60% 70% 80% 90% 100% - completely confident

Post-identification Questions

What are the mechanisms involved in the repeated suspect effect?

1. Remember-Know-Guess Questions

You will now be asked to provide information about your memory performance—specifically, to tell us about some qualitative aspects of your decision.

For example, if you selected a face from the lineup, you will be asked to describe your memory using one of several descriptors—REMEMBER, KNOW, or GUESS.

You should say that you REMEMBER the face if you can remember any specific detail of having seen the face before. It could be that you remember what it looked like on the screen, or what you thought about when you saw it, or something you noticed in the room. Any specific detail will do.

At other times in your memory, you may simply KNOW that something happened, but you cannot remember any details about it. So a photograph might look familiar, but you cannot remember any details of seeing that face before, or the reaction you had to this face. This is similar to what happens when you see a photograph of someone who looks familiar without being able to remember when or where you have seen them or met them before.
Keep in mind that a KNOW response does not necessarily mean you are unsure. You can have a strong feeling that the face is familiar, but not remember any specific details about having encountered it previously. We are interested in whether you REMEMBER the person you selected from the lineup, or just KNOW you have seen the person you selected before.

If you realize that your answer was just a guess, say GUESS. That is, even though you cannot remember any details and the face does not seem overly familiar to you, you made a guess as to whether this person was in the video. Guessing is not a bad thing—it is a normal process and we are interested in when people choose from a lineup because they made a GUESS, and when people choose because they REMEMBER or KNOW the face.

Finally, if you did not select a face from the lineup, please select the button labeled NOT PRESENT, thereby indicating that you did not select a face from the lineup.

Please provide some information about the quality of your memory. If you selected a face from the lineup, choose one of the REMEMBER, KNOW, or GUESS options below. If you did not select a face, please select the NOT PRESENT option.

- **REMEMBER** -- I remember details about what the face looked like or what I thought about as I saw the face the first time I saw it.

- **KNOW** -- I do not remember details, but I have a strong feeling that the face is familiar to me.

- **GUESS** -- I do not remember details or have a strong feeling of familiarity. Instead, I am just guessing that about whether I have seen this face before.

- **NOT PRESENT** -- I did not select a face from the lineup.

**[If they select R]**

How much contextual detail do you remember from your first encounter with this face? e.g., can you bring to mind details about the circumstances in which you first saw this face?

1 - Nothing  
2 - A little  
3 - Some  
4 - Quite a lot  
5 - A great deal

**[If they selected R, K or G]**

What about your experience led you to select the response that you did? Describe your experience when you were viewing this lineup and why you chose the photo that you did.

**[OPEN RESPONSE BOX]**
2. Source Monitoring Framework Questions

Please rate how true the following statements are when you think about your experience when you saw the photo that you selected from the lineup.

*(Participants will assign ratings from “1 – completely false” to “6 – completely true”).*

- I can recall seeing this person’s face in the video.
- I felt like that person’s face was familiar.
- I thought that I recognized them, but I did not know why.
- When I saw their face in the lineup, other information came to mind from the first time I saw their face.
- I know that I have seen them before but I don’t know where.
- I recall seeing them in a previous lineup.
- I was just guessing and this person seemed like the best choice.
- I could recall other details about the first time I saw their face.
- I was really sure this was the culprit from the video.
- I knew I had seen them before, but no other information came to mind.
- I felt hesitant to identify them.
- I could have picked any of the photos—they all look similar to me.

3. Commitment Effect Questions

Please rate how important it felt to you that you made consistent decisions about the lineups throughout the session.

1 - Not at all important
2 – Unimportant
3 – Somewhat unimportant
4 – Somewhat important
5 – Important
6 – Extremely important

Did you select someone in the initial lineup? If yes, how important was it to pick that person again in the last lineup if you saw them?

1 - Not at all important
2 – Unimportant
3 – Somewhat unimportant
4 – Somewhat important
5 – Important
6 – Extremely important

To what extent was this because you knew for sure you were correct?

1 - Not at all
2 – Somewhat
3 – A moderate amount
4 – A considerable amount
To what extent was this because you felt that you should commit to your earlier decision?

1 - Not at all
2 – Somewhat
3 – A moderate amount
4 – A considerable amount

4. Social Influence Questions

Did you feel like the experimenter was trying to get you to make a particular decision at any time?

Yes  No

[If yes] What about the procedure or experimenter’s behavior made you think that there was a particular decision or outcome that was preferred over the others?

[OPEN RESPONSE BOX]

End Survey

Thank you very much for your participation. Please let the experimenter know that you are finished with the tasks.
APPENDIX C. INSTRUCTIONS FOR EXPERIMENT 2

Consent Process

Welcome to the experiment! Please read through and sign the consent form at your own pace. Feel free to ask the experimenter if you have any questions. Give the completed form to the experimenter.

Video: Crime Event

Thank you for taking part in this study.

The first part of this experiment session involves watching a video.

When you proceed to the next page, the video will start to play. The video is not very long, but it is relevant to your next task, so please do your best to pay close attention.

If you have any questions, please ask the experimenter now. Otherwise, when you are ready to see the video, click “Continue”.

Filler Task 1

You will now spend 10 minutes on a task of your choosing.

Please let the experimenter know that you are ready to do the 10-minute task and tell them which of the following tasks you would like to do:

1. Crossword Puzzle
2. Sudoku Puzzle
3. Word Find Puzzle

Please go on to the next page to start the 10-minute timer.

Please work on your chosen task for 10 minutes.

{A clock counting down 10 minutes will be on the screen}
{Screen will automatically advance after 10 minutes}
Intervening Task 1: Biased Lineup, Fair Lineup, or Reading Comprehension

Please read the instructions for the next phase of the experiment.

Soon, you will be shown six photographs of individuals. This is called a lineup, which is a procedure used by police to gather evidence when they find a person that they think committed a crime. This person is called the “suspect.” If there were any eyewitnesses to the crime, the police will test their suspicions about this person by asking an eyewitness to view a lineup containing this suspect.

However, the police are sometimes incorrect in their suspicions and the suspect is not the culprit. So, a lineup will sometimes contain the person that the eyewitness saw committing the crime, and sometimes that person will not be among those in the lineup.

Your task is to determine if one of the people in this lineup is the person that you saw in the video viewed at the start of this session. Then, you will be asked to answer some more questions about your lineup decision.

The person from the video may or may not be one of the people in the lineup. If you think that the person from the video is not there, do not feel like you need to make an identification.

If you do think that the person from the video is in the lineup, please select the relevant photo number, e.g., “Photo 1”.
If you do not think that the person from the video is in the lineup, please select “Not Present”.

Click “Continue” to view the lineup.

{Lineup Displayed – either Biased, or fair, always containing the innocent suspect}

Please click on the photo number of the individual that you think you recognize from the video, or select “Not Present” if you do not recognize anyone in the lineup.

Photo 1  Photo 2  Photo 3
Photo 4  Photo 5  Photo 6
Not Present

Why did you make the decision you did about the lineup?

{textbox written entry}

How confident are you in your decision about this lineup?

0% - not at all confident  10%  20%  30%  40%  50%
Filler Task 2

As before, you will now spend 10 minutes on a task of your choosing.

Please let the experimenter know that you are ready to do the 10-minute task and tell them which of the following tasks you would like to do:

1. Crossword Puzzle
2. Sudoku Puzzle
3. Word Find Puzzle

You may also continue with the puzzle you were working on during the last 10 minute period.

Please go on to the next page to start the 10-minute timer.

Please work on your chosen task for 10 minutes.

{A clock counting down 10 minutes will be on the screen}
{Screen will automatically advance after 10 minutes}

Intervening Task 2: Fair Lineup or Reading Comprehension

Now, you will view another lineup and decide if one of the people in the lineup is from the video you watched at the start of the session. You will also answer some questions about your decision.

Remember that the person from the video may or may not be one of the people in the lineup. If you think that the person from the video is not there, do not feel like you need to make an identification.

If you do think that the person from the video is in the lineup, please select the relevant photo number, e.g., “Photo 1”.
If you do not think that the person from the video is in the lineup, please select “Not Present”.

Click “Continue” to view the lineup.

{Fair Lineup Displayed - always containing the innocent suspect}

Please click on the photo number of the individual that you recognize from the video, or select “Not Present” if you do not recognize anyone in the lineup.
Photo 1    Photo 2    Photo 3
Photo 4    Photo 5    Photo 6
Not Present

Why did you make the decision you did about the lineup?

{textbox written entry}

How confident are you in your decision about this lineup?

<table>
<thead>
<tr>
<th>0% - not at all confident</th>
<th>10%</th>
<th>20%</th>
<th>30%</th>
<th>40%</th>
<th>50%</th>
</tr>
</thead>
<tbody>
<tr>
<td>60%</td>
<td>70%</td>
<td>80%</td>
<td>90%</td>
<td>100% - completely confident</td>
<td></td>
</tr>
</tbody>
</table>

**Filler Task 3**

As before, you will now spend 10 minutes on a task of your choosing.

Please let the experimenter know that you are ready to do the 10-minute task and tell them which of the following tasks you would like to do:

1. Crossword Puzzle
2. Sudoku Puzzle
3. Word Find Puzzle

You may also continue with the puzzle you were working on during the last 10 minute period.

Please go on to the next page to start the 10-minute timer.

Please work on your chosen task for 10 minutes.

{A clock counting down 10 minutes will be on the screen}
{Screen will automatically advance after 10 minutes}

**Final Lineup Task: A fair, target-absent lineup.**

For the next task, you will be asked to view another lineup and decide if one of the people in the lineup is from the video you watched at the start of the session. You will also answer some questions about your decision.

Remember that the person from the video may or may not be one of the people in the lineup. If you think that the person from the video is not there, do not feel like you need to make an identification.
If you do think that the person from the video is in the lineup, please select the relevant photo number, e.g., “Photo 1”.
If you do not think that the person from the video is in the lineup, please select “Not Present”.

Click “Continue” to view the lineup.

-Lineup Displayed – Fair and containing the innocent suspect-

Please click on the photo number of the individual that you recognize from the video, or select “Not Present” if you do not recognize anyone in the lineup.

<table>
<thead>
<tr>
<th>Photo 1</th>
<th>Photo 2</th>
<th>Photo 3</th>
</tr>
</thead>
<tbody>
<tr>
<td>Photo 4</td>
<td>Photo 5</td>
<td>Photo 6</td>
</tr>
<tr>
<td>Not Present</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Why did you make the decision you did about the lineup?

-textbox written entry-

How confident are you in your decision about this lineup?

<table>
<thead>
<tr>
<th>0% - not at all confident</th>
<th>10%</th>
<th>20%</th>
<th>30%</th>
<th>40%</th>
<th>50%</th>
<th>60%</th>
<th>70%</th>
<th>80%</th>
<th>90%</th>
<th>100% - completely confident</th>
</tr>
</thead>
</table>

-if they indicate “Not Present”-

If you had to pick someone from this lineup, which photograph would be your first choice?

<table>
<thead>
<tr>
<th>Photo 1</th>
<th>Photo 2</th>
<th>Photo 3</th>
</tr>
</thead>
<tbody>
<tr>
<td>Photo 4</td>
<td>Photo 5</td>
<td>Photo 6</td>
</tr>
</tbody>
</table>

Why would this photo be your choice if you had to choose?

-textbox written entry-

How confident are you in this decision about the lineup?

<table>
<thead>
<tr>
<th>0% - not at all confident</th>
<th>10%</th>
<th>20%</th>
<th>30%</th>
<th>40%</th>
<th>50%</th>
<th>60%</th>
<th>70%</th>
<th>80%</th>
<th>90%</th>
<th>100% - completely confident</th>
</tr>
</thead>
</table>

Post-identification Questions
What are the mechanisms involved in the repeated suspect effect?

5. Remember-Know-Guess Questions

You will now be asked to provide information about your memory performance—specifically, to tell us about some qualitative aspects of your decision.

For example, if you selected a face from the lineup, you will be asked to describe your memory using one of several descriptors—REMEMBER, KNOW, or GUESS.

You should say that you REMEMBER the face if you can remember any specific detail of having seen the face before. It could be that you remember what it looked like on the screen, or what you thought about when you saw it, or something you noticed in the room. Any specific detail will do.

At other times in your memory, you may simply KNOW that something happened, but you cannot remember any details about it. So a photograph might look familiar, but you cannot remember any details of seeing that face before, or the reaction you had to this face. This is similar to what happens when you see a photograph of someone who looks familiar without being able to remember when or where you have seen them or met them before.

Keep in mind that a KNOW response does not necessarily mean you are unsure. You can have a strong feeling that the face is familiar, but not remember any specific details about having encountered it previously. We are interested in whether you REMEMBER the person you selected from the lineup, or just KNOW you have seen the person you selected before.

If you realize that your answer was just a guess, say GUESS. That is, even though you cannot remember any details and the face does not seem overly familiar to you, you made a guess as to whether this person was in the video. Guessing is not a bad thing—it is a normal process and we are interested in when people choose from a lineup because they made a GUESS, and when people choose because they REMEMBER or KNOW the face.

Finally, if you did not select a face from the lineup, please select the button labeled NOT PRESENT, thereby indicating that you did not select a face from the lineup.

Please provide some information about the quality of your memory. If you selected a face from the lineup, choose one of the REMEMBER, KNOW, or GUESS options below. If you did not select a face, please select the NOT PRESENT option.

- REMEMBER -- I remember details about what the face looked like or what I thought about as I saw the face the first time I saw it.

- KNOW -- I do not remember details, but I have a strong feeling that the face is familiar to me.
- **GUESS** -- I do not remember details or have a strong feeling of familiarity. Instead, I am just guessing that about whether I have seen this face before.

- **NOT PRESENT** -- I did not select a face from the lineup.

---

**[If they select R]**

How much contextual detail do you remember from your first encounter with this face? e.g., can you bring to mind details about the circumstances in which you first saw this face?

1 - Nothing  
2 - A little  
3 - Some  
4 - Quite a lot  
5 - A great deal

---

**[If they selected R, K or G]**

What about your experience led you to select the response that you did? Describe your experience when you were viewing this lineup and why you chose the photo that you did.

**[OPEN RESPONSE BOX]**

---

6. **Source Monitoring Framework Questions**

Please rate how true the following statements are when you think about your experience when you saw the photo that you selected from the lineup.

*Participants will assign ratings from “1 – completely false” to “6 – completely true”.*

- I can recall seeing this person’s face in the video.
- I felt like that person’s face was familiar.
- I thought that I recognized them, but I did not know why.
- When I saw their face in the lineup, other information came to mind from the first time I saw their face.
- I know that I have seen them before but I don’t know where.
- I recall seeing them in a previous lineup.
- I was just guessing and this person seemed like the best choice.
- I could recall other details about the first time I saw their face.
- I was really sure this was the culprit from the video.
- I knew I had seen them before, but no other information came to mind.
- I felt hesitant to identify them.
- I could have picked any of the photos—they all look similar to me.

---

7. **Commitment Effect Questions**

Please rate how important it felt to you that you made consistent decisions about the lineups throughout the session.
1 - Not at all important
2 – Unimportant
3 – Somewhat unimportant
4 – Somewhat important
5 – Important
6 – Extremely important

Did you select someone in the initial lineup? If yes, how important was it to pick that person again in the last lineup if you saw them?

1 - Not at all important
2 – Unimportant
3 – Somewhat unimportant
4 – Somewhat important
5 – Important
6 – Extremely important

To what extent was this because you knew for sure you were correct?

1 - Not at all
2 – Somewhat
3 – A moderate amount
4 – A considerable amount

To what extent was this because you felt that you should commit to your earlier decision?

1 - Not at all
2 – Somewhat
3 – A moderate amount
4 – A considerable amount

____________________________

8. Social Influence Questions

Did you feel like the experimenter was trying to get you to make a particular decision at any time?

Yes

No

[If yes] What about the procedure or experimenter’s behavior made you think that there was a particular decision or outcome that was preferred over the others?

[OPEN RESPONSE BOX]

____________________________

End Survey

Thank you very much for your participation. Please let the experimenter know that you are finished with the tasks.
ARTICLE ONE: Cyclone, hurricane, typhoon: What's the difference?
Whatever you choose to call them, these monster storms are powerful natural events with the capacity to wreak incredible havoc.

June 12, 2019
By Ker Than

As Cyclone Vayu rages in the Indian ocean, you may be wondering what a cyclone even is. But if you've ever survived a hurricane or typhoon, you already know the answer. That's because hurricanes, cyclones, and typhoons are all the same weather phenomenon. Scientists just call these storms different things depending on where they occur.

In the Atlantic and northern Pacific, the storms are called "hurricanes," after the Caribbean god of evil, named Hurrican. In the northwestern Pacific, the same powerful storms are called "typhoons." In the southeastern Indian Ocean and southwestern Pacific, they are called "severe tropical cyclones." In the northern Indian Ocean, they're called "severe cyclonic storms." In the southwestern Indian Ocean, they're just "tropical cyclones."

To be classified as a hurricane, typhoon, or cyclone, a storm must reach wind speeds of at least 74 miles per hour (119 kilometers per hour). If a hurricane's winds reach speeds of 111 miles per hour (179 kilometers per hour), it is upgraded to an "intense hurricane." If a typhoon hits 150 miles per hour (241 kilometers per hour) then it becomes a "supertyphoon."

Link:

Comprehension Questions
Bold answer = correct

Q1: Which of the following statements is true based on the article above?
   a. The hurricanes are different from cyclones and typhoons.
   b. Typhoons are different from cyclones and hurricanes.
   c. **Hurricanes, cyclones, and typhoons are different names for the same phenomenon.**
   d. Hurricanes, cyclones, and typhoons are all different phenomenon.

Q2: According to the article, which of the following is associated with the fastest wind speeds?
   a. Severe tropical cyclone.
   b. Intense hurricane.
   c. Hurrican.
   d. **Supertyphoon.**
ARTICLE TWO: T. rex had an amazing sense of smell, gene study suggests
Fresh analysis of modern genes and ancient brains backs up the notion that the meat-eating
dinosaur had an especially powerful nose.
       June 12, 2019
       By Michael Greshko

Talk about inhaling your food: The iconic predator *Tyrannosaurus rex* and its kin had
some of the keenest senses of smell among all extinct dinosaurs, a new study finds. The
work, published yesterday in *Proceedings of the Royal Society B*, attempts to roughly quantify
how many genes would have been involved in *T. rex*’s sniffing skills, tens of millions of years
after any traces of its DNA have decayed away.

The idea that tyrannosaurs had good noses is not new. In 2008, for instance, researchers
showed that *T. rex* and its siblings devoted large portions of their brains to processing smell.
But the new study marks the latest in a growing movement to correlate living animals’ DNA
with their bodies and sensory abilities, with the goal of better understanding the capabilities
and behaviors of their long-extinct relatives. “It’s not *Jurassic Park,*” says lead study
author Graham Hughes, a computational biologist at University College Dublin, referring to the
famous fictional effort to reconstruct dino DNA. “It’s trying to look at how sensory evolution
is really a major player [in] whether or not you become an apex predator.”

*Link:*  

*Comprehension Questions*
Bold answer = correct.

Q1: How did scientists discover the strength of the T.Rex’s smell, according to this article?
   a. **Studying the genes of the T.Rex**
   b. Studying the Jurassic era
   c. Studying the nose of the T.Rex.
   d. Studying the extinction of the T.Rex

Q2: How could these scientists tell that the T.Rex had a really great sense of smell?
   a. The nose was really big.
   b. The parts of the brain that were linked to the nose.
   c. **The number of genes that were used for smell perception.**
   d. Sensory evolution.
APPENDIX E. DUAL-PROCESS RECOGNITION COMPOSITE SCORE ANALYSES.

Experiment 1

Graded Questions about Source and Subjective Memory Experience

This section will address the mechanisms that people use to determine whether they should identify someone from the lineup using a new approach. Instead of a forced choice, multiple choice question as is typically used in the literature, I have asked a series of questions that participants will respond to on a scale. From their answers, I hope to obtain a more sensitive measure how well participants in different experimental conditions can effectively monitor the source of any familiarity or recollection experienced in the final lineup.

Analytic Plan. During the design stage of this study, 12 questions were created with a priori groupings of these item to assess source monitoring and memory processes using a graded scale rather than a forced choice format. There were four a priori groupings for these questions, which are summarized in Table 3. Composite scores were calculated for each by obtaining the average for each person, for each item group. These scores were entered as predictors in a multinomial analysis with R-K-G judgment as the outcome variable. The results showed effects that were extremely similar to the effects from the analysis of the three factors. However, the a priori item groups resulted in a better fit to these data (test comparing model fit: $D = 32.18, p < .001$), so these are the results that have been used to assess the association between the composite scores and the R-K-G measure.

The analyses were organized in a similar way to the R-K-G analyses, but the composites were continuous variables. So, multiple linear regression models were run with the composite scores with the Familiarity and Recollection Composites as outcome variables, in separate models. Intervening lineup condition (Biased or Fair, with Control condition as the reference
category) and participants selection from the final lineup (“hit” or “false alarm” = 1, “not a hit” or “not a false alarm” = 0) were used as predictors. The Target-Present and Target-Absent final lineup conditions were analyzed separately. A null model, main effects model, and interaction model was run, but if the interaction did not improve model fit, the main effects model was used.

*Association between questionnaire items and R-K-G measure.* A summary of the results assessing the ability of each composite score (see Table 3) to predict participant’s R-K-G judgments for the forced-choice decisions are in Table 4. Significance of parameters was determined by examining 95% confidence intervals of the odd ratios. Each one unit increase in the Recollection Composite resulted in three times more “know” judgments than one of the “other” categories (“Guess” or “Not Present”; $\theta = 2.75$). One unit more in the Recollection Composite was associated eight times more “remember” judgments than “other” judgments ($\theta = 7.89$), which was again significant.

Higher Familiarity Composite scores were associated with a significant increase in the likelihood that participants would report “know” rather than “other”—in fact, a “know” judgment was two times more likely than “other” with every increase in the Familiarity Composite score ($\theta = 2.18$). A one unit increase in the Familiarity Composite was also linked with a 44% decrease in the chance that participants would report “remember” rather than “other” ($\theta = 0.56$). Thus, the Familiarity and Recollection Composites discriminate fairly well between participants who report “remember” or “know” compared with those reporting “other”.

Increases in the Guess Composite were related to three times more “know” judgments, and five times more “remember” judgments, compared with “other” judgments. The Certainty Composite was not helpful for predicting which of the categorical R-K-G options participants chose. Therefore, these Composite scores measure an similar construct to the categorical R-K-G
question, but with more variability. However, the relation between the Familiarity Composite and “know” judgments was not as clear as between the Recollection Composite and “remember” judgments. “Know” judgments seemed to be related to the Recollection Composite and the Guess Composite to a similar degree as the “Familiarity Composite”. Thus, this questionnaire may be less helpful for separating guessers from those relying on familiarity, but can help to isolate individuals who feel like they remembered the person that they identified.

Table 3. Source monitoring framework items and a priori group they were associated with.

<table>
<thead>
<tr>
<th>Item Group (determined a priori)</th>
<th>Item</th>
</tr>
</thead>
<tbody>
<tr>
<td>Familiarity Questions/Composite Score</td>
<td>- I felt like that person’s face was familiar.</td>
</tr>
<tr>
<td></td>
<td>- I thought that I recognized them, but I did not know why.</td>
</tr>
<tr>
<td></td>
<td>- I know that I have seen them before, but I do not know where.</td>
</tr>
<tr>
<td></td>
<td>- I knew I had seen them before, but no other information came to mind.</td>
</tr>
<tr>
<td>Recollection Questions/Composite Score</td>
<td>- I can recall seeing this person’s face in the video.</td>
</tr>
<tr>
<td></td>
<td>- When I saw their face in the lineup, other information came to mind</td>
</tr>
<tr>
<td></td>
<td>- from the first time I saw their face.</td>
</tr>
<tr>
<td></td>
<td>- I recall seeing them in a previous lineup.</td>
</tr>
<tr>
<td></td>
<td>- I could recall other details about the first time I saw their face.</td>
</tr>
<tr>
<td>Guess Questions/Composite Score</td>
<td>- I was just guessing and this person seemed like the best choice.</td>
</tr>
<tr>
<td></td>
<td>- I could have picked any of the photos—they all look similar to me.</td>
</tr>
<tr>
<td>Certainty Questions/Composite Score</td>
<td>- I was really sure this was the culprit from the video.</td>
</tr>
<tr>
<td></td>
<td>- I felt hesitant to identify them.</td>
</tr>
</tbody>
</table>

Target-Present Final Lineup. The Remember Composite model was not a good fit to these data, as neither the main effects model nor the interaction model was a significantly better fit than the null model; $F(3, 107) = 1.41, p = 0.244$, $F(2, 105) = 2.04, p = 0.135$, respectively ($R^2_{Adj} = 0.03$). There was a significant interaction ($B = -0.23, p = 0.046$) indicating that participants in the biased lineup condition had a lower mean score for the Recollection Composite than the control condition when the culprit was identified (Hit: $M_{biased} = 3.09, SD_{biased} = 1.17; M_{control} = 3.38, SD_{control} = 0.78$), but the opposite was true for non-hit decisions in the
final lineup (Not a hit: $M_{biased} = 3.36, SD_{biased} = 0.94; M_{control} = 2.76, SD_{control} = 0.79$). However, because model fit was poor, this result should be interpreted with caution.

For the Familiarity Composite, the main effect model was the best fit to these data, as it was a better fit than the null model ($F(3, 107) = 4.77, p = 0.004; R^2_{\text{Adj}} = 0.10$), but the addition of interactions did not improve the fit ($F(2, 105) = 0.05, p = 0.952$). Participant who received a biased lineup did not have a significantly different score than those who were in the control condition ($M_{biased} = 3.25, SD_{biased} = 0.80; M_{control} = 2.94, SD_{control} = 0.79; B = 0.16, p = 0.161$), and the fair intervening lineup condition was associated with scores only marginally higher than the control condition ($M_{biased} = 3.27, SD_{biased} = 0.80; B = 0.19, p = 0.085$). When comparing those who selected the culprit from the final lineup and those who did not ($B = -0.30, p = 0.001$), results showed that participants who selected the culprit had significantly higher Familiarity scores than those who did not ($M_{Hit} = 3.65, SD_{Hit} = 0.66; M_{notHit} = 3.30, SD_{notHit} = 0.82$).

Target-Absent Final Lineup. For the Recollection Composite, the main effect model fit better than the null model ($F(3, 96) = 9.51, p <.001; R^2_{\text{Adj}} = 0.21$), and the interaction did not improve fit ($F(2, 94) = 0.08, p = 0.919$). Which intervening lineup condition a participant was in did not significantly influence their Recollection Composite score, with neither the biased intervening lineup ($B = -0.02, p = 0.863; M_{biased} = 3.72, SD_{biased} = 1.01$) nor the fair intervening lineup ($B = -0.13, p = 0.259; M_{fair} = 3.24, SD_{fair} = 0.83$) producing scores significantly different from the control condition ($M_{control} = 3.35, SD_{control} = 0.63$). However, whether or not participants selected the innocent suspect did result in significant changes to the Recollection scores ($B = 0.46, p <.001$). Participants who made a false alarm decision on the final lineup had significantly higher Recollection scores on average ($M_{FA} = 4.14, SD_{FA} = 0.89$) than those who made any other type of decision ($M_{notFA} = 3.20, SD_{notFA} = 0.73$).
For the Familiarity Composite, the main effects model was again the best fitting model (vs. Null: $F(3, 96) = 2.66, p = 0.05$; vs. Interaction: $F(2, 94) = 0.07, p = 0.931$; $R^2_{Adj} = 0.05$).

There was no significant difference between participants who saw a biased intervening lineup and the control condition ($B = -0.10, p = 0.482$; $M_{biased} = 3.56$, $SD_{biased} = 0.99$; $M_{control} = 3.40$, $SD_{control} = 0.87$). There was, however, a significant difference in Familiarity scores when participants saw a fair intervening lineup compared with when they had the control task ($B = -0.28, p = 0.029$; $M_{biased} = 3.11$, $SD_{biased} = 0.95$)—the fair intervening lineup was associated with significantly lower scores on average. Whether the participant chose the innocent suspect or not, though, had no effect on participants Familiarity Composite scores ($B = 0.15, p = 0.156$; $M_{FA} = 3.65$, $SD_{FA} = 0.94$; $M_{notFA} = 3.30$, $SD_{notFA} = 0.96$).
APPENDIX F. ADDITIONAL ANALYSES FOR CORRECT IDENTIFICATIONS

Experiment 1

Composite scores were analyzed next (see Table 5 for the means and Table 6 for a summary of the results), and it was found that people who received a biased intervening lineup and identified the culprit tended to have lower scores on the Recollection Composite. In contrast, higher Recollection Composite scores were associated with participants in the Control Condition who selected the true culprit from the final lineup (Interaction between Biased Intervening Lineup [vs. Control Condition] and identification outcome: $B = -0.23, p = 0.046$). There were no other significant effects for the Recollection Composite. Higher scores on the Familiarity Composite were associated with identifications that were not hits ($B = -0.30, p = 0.001$), and there was a marginally significant difference between the fair intervening lineup condition and control condition ($B = 0.19, p = 0.085$).

Table 5. A summary of the Familiarity and Recollection Composite scores for each intervening task condition, according final lineup decision in Experiment 1.

<table>
<thead>
<tr>
<th>Intervening Task Condition</th>
<th>Decision</th>
<th>Final Lineup Outcome</th>
<th>Familiarity Composite</th>
<th>Recollection Composite</th>
</tr>
</thead>
<tbody>
<tr>
<td>Control (No Lineup)</td>
<td>Initial</td>
<td>Hit</td>
<td>2.63 (0.43)</td>
<td>3.38 (0.78)</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Not a Hit</td>
<td>3.14 (0.91)</td>
<td>2.76 (0.79)</td>
</tr>
<tr>
<td></td>
<td>Forced-Choice</td>
<td>Hit</td>
<td>2.59 (0.41)</td>
<td>3.25 (0.79)</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Not a Hit</td>
<td>3.24 (0.92)</td>
<td>2.79 (0.83)</td>
</tr>
<tr>
<td>Biased Lineup</td>
<td>Initial</td>
<td>Hit</td>
<td>2.86 (0.77)</td>
<td>3.09 (0.17)</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Not a Hit</td>
<td>3.42 (0.77)</td>
<td>3.36 (0.94)</td>
</tr>
<tr>
<td></td>
<td>Forced-Choice</td>
<td>Hit</td>
<td>3.02 (0.81)</td>
<td>3.16 (1.01)</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Not a Hit</td>
<td>3.61 (0.67)</td>
<td>3.46 (1.02)</td>
</tr>
<tr>
<td>Fair Lineup</td>
<td>Initial</td>
<td>Hit</td>
<td>2.98 (0.71)</td>
<td>3.44 (0.80)</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Not a Hit</td>
<td>3.43 (0.82)</td>
<td>3.32 (0.68)</td>
</tr>
<tr>
<td></td>
<td>Forced-Choice</td>
<td>Hit</td>
<td>3.09 (0.76)</td>
<td>3.50 (0.76)</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Not a Hit</td>
<td>3.40 (0.82)</td>
<td>3.26 (0.68)</td>
</tr>
</tbody>
</table>

Notes. Mean scores are reported with standard deviations in parentheses, rounded to 2 dp.
In addition, I examined whether selecting the innocent suspect during the intervening lineup task was associated with reduced Recollection or Familiarity Composite scores and culprit identifications. There was an interaction between Biased Intervening Lineup (vs. Control Condition) and identification outcome ($B = -0.25$, $p = 0.029$). That is, people who selected the wrong suspect in a previous lineup reported a weaker memory experience when identifying the culprit later. For the Familiarity Composite scores, there was no effect of intervening lineup choice here, so there was no evidence of weaker memory experiences in different Intervening Task Conditions based on whether they correctly identified the culprit. Hits were associated with lower Familiarity Composite scores overall ($B = -0.31$, $p = 0.001$), though, and Biased lineups were associated with significant higher Familiarity scores on average ($B = 0.22$, $p = 0.045$, see 5). Thus, biased lineups seem to make people feel like their memory is weaker, regardless of their accuracy.

Table 6. Summary of the multinomial analysis used to determine how well each group of items predicts participants forced choice R-K-G judgments.

<table>
<thead>
<tr>
<th>R-K-G Judgment</th>
<th>Question Group</th>
<th>$M$</th>
<th>$SD$</th>
<th>$\theta^*$</th>
<th>95% CI [LL, UL]^</th>
</tr>
</thead>
<tbody>
<tr>
<td>Remember</td>
<td>Recollection Composite</td>
<td>3.74</td>
<td>0.83</td>
<td>7.89</td>
<td>[4.34, 14.33]</td>
</tr>
<tr>
<td>$N = 161$</td>
<td>Familiarity Composite</td>
<td>2.98</td>
<td>0.82</td>
<td>0.56</td>
<td>[0.36, 0.88]</td>
</tr>
<tr>
<td></td>
<td>Guess Composite</td>
<td>5.00</td>
<td>1.06</td>
<td>5.14</td>
<td>[3.42, 7.71]</td>
</tr>
<tr>
<td></td>
<td>Certainty Composite</td>
<td>2.99</td>
<td>0.92</td>
<td>0.75</td>
<td>[0.49, 1.16]</td>
</tr>
<tr>
<td>Know</td>
<td>Recollection Composite</td>
<td>3.35</td>
<td>0.71</td>
<td>2.75</td>
<td>[1.62, 4.67]</td>
</tr>
<tr>
<td>$N = 165$</td>
<td>Familiarity Composite</td>
<td>3.72</td>
<td>0.80</td>
<td>2.18</td>
<td>[1.44, 3.31]</td>
</tr>
<tr>
<td></td>
<td>Guess Composite</td>
<td>4.40</td>
<td>1.06</td>
<td>3.15</td>
<td>[2.21, 4.48]</td>
</tr>
<tr>
<td></td>
<td>Certainty Composite</td>
<td>2.82</td>
<td>0.90</td>
<td>0.95</td>
<td>[0.64, 1.41]</td>
</tr>
<tr>
<td>Other</td>
<td>Recollection Composite</td>
<td>2.61</td>
<td>0.69</td>
<td></td>
<td></td>
</tr>
<tr>
<td>$N = 96$</td>
<td>Familiarity Composite</td>
<td>2.99</td>
<td>0.82</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Guess Composite</td>
<td>3.19</td>
<td>0.81</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Certainty Composite</td>
<td>2.16</td>
<td>0.87</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Notes. *Reference group for multinomial regression results is “Other.” Thus, there are no beta weights associated with this category. ^95% CIs that do not cross $\theta = 1$ indicate a significant result. All values rounded to 2 decimal places.
**APPENDIX G. SOCIAL INFLUENCES OPEN RESPONSE DATA**

<table>
<thead>
<tr>
<th>Theme</th>
<th>Condition</th>
<th>Open Response</th>
</tr>
</thead>
<tbody>
<tr>
<td>Repetition of one person throughout procedure</td>
<td>Biased LUP, Fair LUP</td>
<td>“One photo was present all 3 times. I was prompted to choose.”</td>
</tr>
<tr>
<td></td>
<td>Fair LUP, Fair LUP</td>
<td>“As I continued to pick not present in the lineup there were a few individuals who kept showing up in the lineup multiple times.”</td>
</tr>
<tr>
<td></td>
<td>Biased LUP, No LUP</td>
<td>“I am not completely sure. But if I had to guess, the research wanted me to choose #5 the first time and #6 the second time by keeping ONLY that picture for both times I was asked.”</td>
</tr>
<tr>
<td></td>
<td>Biased LUP, Fair LUP</td>
<td>“Some of the pictures were consistent throughout. One, as far as I could tell, changed based on the brightness of the picture.”</td>
</tr>
<tr>
<td></td>
<td>Biased LUP, Fair LUP</td>
<td>“The same person was placed in all three lineups, making it clear that that was their suspect.”</td>
</tr>
<tr>
<td></td>
<td>Biased LUP, Fair LUP</td>
<td>“Some of the backgrounds in the individual’s pictures were different colors, at least one picture was present in two or more of the lineups.”</td>
</tr>
<tr>
<td></td>
<td>Biased LUP, Fair LUP</td>
<td>“The same man in all 3 lineups.”</td>
</tr>
<tr>
<td></td>
<td>Biased LUP, Fair LUP</td>
<td>“In the first lineup, photo 5 looked the most similar and then line up 2 he went to photo 4 and then during the last line up he went back to photo 5.”</td>
</tr>
<tr>
<td></td>
<td>Fair LUP, No LUP</td>
<td>“They put in the same person I chose in the first lineup in the second lineup to see whether or not I would check the same one.”</td>
</tr>
<tr>
<td></td>
<td>Biased LUP, Fair LUP</td>
<td>“The same one guy popped up on every single lineup which made me think that I should have choose him but I did not.”</td>
</tr>
<tr>
<td>Forced to choose in final lineup</td>
<td>Fair LUP, No LUP</td>
<td>“Because even after choosing not present twice, I was still asked to choose who I thought the person was.”</td>
</tr>
<tr>
<td></td>
<td>Fair LUP, No LUP</td>
<td>“They made me pick someone from the lineup that would be the most similar to what I thought he looked like.”</td>
</tr>
<tr>
<td>Inferring something about the goals of the experimenter</td>
<td>Biased LUP, No LUP</td>
<td>“The experiment was set up in such a way that the second lineup seems to be more familiar than the first lineup.”</td>
</tr>
<tr>
<td></td>
<td>Biased LUP, Fair LUP</td>
<td>“I don’t think the actual dude was present in the first or third lineups and I might have picked three different guys.”</td>
</tr>
<tr>
<td></td>
<td>Fair LUP, No LUP</td>
<td>“It makes you want to pick the right one when someone is watching.”</td>
</tr>
<tr>
<td></td>
<td>Fair LUP, No LUP</td>
<td>“I think all the suspects had similar features, so the experimenter is trying to see if I would change my answer based on general features that all of them had.”</td>
</tr>
<tr>
<td></td>
<td>Fair LUP, Fair LUP</td>
<td>“I feel like choosing the right suspect was the experiment but there were different suspects every time so it was hard to come to a final decision.”</td>
</tr>
</tbody>
</table>
Experiment 1

Categorical Remember-Know-Guess Judgment

Did participants in different conditions use recollection or familiarity to a greater extent when making lineup decisions? This was examined using participants responses to the forced-choice, post-identification Remember-Know-Guess (R-K-G) question (Appendix B contains the instructions and question prompt).

**Analytic Plan.** Participants’ R-K-G judgments were used as the outcome variable in a multinomial logistic regression analysis, which is used for in cases where there is a categorical outcome variable with more than two levels. Two categorical predictors were used in each model—which intervening lineup condition the participant was in, and whether they selected the innocent suspect or culprit in the final lineup. Participants in the target-present and target-absent final lineup conditions were analyzed separately, with intervening lineup condition and whether the participant made a false alarm or hit as the predictor variables.

Three models were run for each: a model with an interaction between predictors, a model with only main effects, and a null model (no predictors). The fit of these models was compared and a final model selected to interpret. Then, I can examine these data further to determine if there are significantly more reports of “remember” when participants received an intervening biased lineup compared with no lineup or a fair lineup. Similarly, I will determine if there were significantly more “know” judgments when people received a fair, intervening lineup as compared to those who received a biased lineup or no lineup.

**Target-Present Final Lineup.** These analyses include only participants who received a final, target-present lineup containing the person they saw in the video. The main effects model
was a significantly better fit to the data than the null model (Main effects versus null model: $D = 18.92$, $p = 0.004$), indicating that both Intervening Task Condition and whether the participant identified the person from the video is useful for predicting whether participants reported remember, know, or guess. The model containing an interaction between these categorical variables, though, was the best fit to these data (Interaction versus main effects model: $D = 14.97$, $p = 0.004$). Thus, the interaction between which intervening task a participant received and whether they selected the culprit was best for sorting between those who reported remember, know, or guess. Thus, it seems that both the condition a person was in and whether they accurately identified the culprit from the lineup mattered for which R-K-G judgment they made.

Assessing the odds ratios of each predictor (main effects only) showed that if people are randomly assigned to the biased intervening lineup condition rather than the control condition, they were 16% less likely to report a “familiarity” process ($\theta = 0.84$) than to report that they guessed. However, other participants in this condition were 22% more likely to report “remembering” the person they identified than they were to saying they were “guessing” ($\theta = 1.22$). So, seeing a biased intervening lineup resulted in more “remember” and “guess” judgments, and fewer “know” judgments than when participants saw no intervening lineup.

If participants saw a fair intervening lineup rather than completing the control task, they were 38% more likely to report a “familiarity” process than making a “guess” ($\theta = 1.38$). Participants in this condition also reported “remember” 78% more than they reported “guess” ($\theta = 1.78$). Therefore, “know” judgments and “remember” judgments were more common than “guess” judgments for participants who received a fair intervening lineup rather than no lineup.

When someone accurately identified the culprit from the final lineup (a hit) rather than any other decision, this was associated with 84% more “know” judgments than “guess”
judgments ($\theta = 1.84$) and almost six times more “remember” judgments than “guess” judgments ($\theta = 5.7479$). Thus, people who made accurate identifications were much more likely to say that they remembered seeing that person in the video and also remembered details about the encoding experience. Refer to Table 8 to compare the proportion of participants who selected the culprit in each Intervening Lineup Condition, separated by their post-identification R-K-G judgment.

**Target-Absent Final Lineup.** These analyses pertain to participants who received a final, target-absent lineup containing the innocent suspect only. The main effects model was a significantly better fit to the data than the null model (Main effects versus null model: $D = 36.46$, $p < .001$), indicating that both Intervening Task Condition and whether the participant identified the innocent suspect are helpful for predicting whether a participant said that they remembered, knew, or guessed. The test comparing the interaction model and the main effects model was only marginally significant (Interaction versus main effects model: $D = 3.15$, $p = 0.053$). Thus, the interaction between which intervening task a participant received and whether they selected the innocent was probably useful for sorting between those who reported remember, know, or guess, but not much better than the model just looking at the effects of these categorical variables independently. Although only marginally significant, this interaction would suggest that which condition a participant is in and whether they selected the innocent suspect in the final lineup would influence their R-K-G judgments.

The odds ratios of each predictor in this multinomial model were examined too. People are randomly assigned to the biased intervening lineup condition rather than the control condition, they were 79% more likely to report a “familiarity” process ($\theta = 1.79$) than to report that they guessed. Though, other participants in this same condition were 9% less likely to report a “remember” process than “guessing” ($\theta = 0.91$). Thus, reporting a feeling of “familiarity” as
their memory experience was most common if a participant saw a biased intervening lineup rather than no intervening lineup.

Table 8. A summary of the proportion of false alarms/hits in each intervening lineup and final lineup condition, separated by the remember-know-guess judgment the participant made.

<table>
<thead>
<tr>
<th>Intervening Lineup Condition</th>
<th>Target-Present Final Lineup *</th>
<th>Target-Absent Final Lineup ^</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Remember</td>
<td>Know</td>
</tr>
<tr>
<td>Control</td>
<td>0.73</td>
<td>0.31</td>
</tr>
<tr>
<td>Biased</td>
<td>0.36</td>
<td>0.18</td>
</tr>
<tr>
<td>Fair</td>
<td>0.50</td>
<td>0.25</td>
</tr>
</tbody>
</table>

Notes. * Proportions indicate the proportion of people in that cell who selected the culprit that appeared in the video (a hit). ^ Proportions indicate the proportion of people in that cell who selected the innocent suspect (a false alarm). All values rounded to 2 decimal places.

For those who received a fair intervening lineup rather than the intervening control task, they were almost three times more likely to report “knowing” than “guessing” ($\theta = 2.75$). Similarly, participants in this condition were almost two times more likely to say they “remembered” the person they select than say they “guessed” ($\theta = 1.75$). It seems, therefore, that both “know” and “remember” judgments are more frequent than “guess” judgments when people received a fair intervening lineup versus those who received a non-lineup intervening task.

Finally, when comparing people who selected the innocent suspect from the final lineup to those who made another type of decision, the effects were very large. When someone selected the innocent suspect from the final lineup, they were 25 times more likely to report a “familiarity” experience when viewing the final lineup rather than say that is was a “guess” ($\theta = 25.21$). Similarly, if a participant selected the innocent suspect from the final lineup, they were 49 times more likely to judge their memory experience as “remembering” rather than “guessing” ($\theta = 49.25$). So, people are extremely unlikely to report that they were “guessing” when they selected the innocent suspect from the final lineup—many more of these participants attributed
their selection to a familiarity process or recollection. Refer to Table 8 again for the proportion innocent suspect identifications in each Intervening Lineup Condition and R-K-G judgment.

**Did participants who chose the innocent suspect twice show higher rates of false recall?** In Haw and colleagues’ (2007) study, higher rates of false recognition were found for trials where participants choose the innocent suspect again in a final lineup after identifying them in a previous showup. Of those who received an intervening lineup and a target-absent final lineup ($N = 110$), only 20% chose the innocent suspect from both of the lineups. However, of the people who reported “remembering” as their memory experience during the final lineup, 39% had chosen the innocent suspect from both lineups. Only 4% of those who “guessed” and 26% of those using familiarity identified the innocent suspect from both of the lineups they received.

These differences were exacerbated when the Intervening Task Condition was included. In fact, 62% of those who received a biased lineup, and made a “remember” judgment, chose the innocent suspect twice. A multinomial analysis revealed an interaction between Intervening Task Condition and whether or not a participant chose the innocent suspect twice, for predictin participant’s post-identification R-K-G judgment ($B_{know} = -18.30; B_{remember} = -9.06$; Interaction model vs. main effects model: $D = 206.54, p = 0.002$). Similar to Haw and colleagues’ (2007), participants who choose the innocent suspect twice were over-represented in the “remember” category. Picking the innocent suspect in a previous lineup increased the rate of false recognition compared with when the innocent suspect was not identified in an intervening lineup (refer to Table 9). These patterns are consistent with “preference” rather than “commitment.” The act of choosing seems similar to a biased lineup, as choosing narrows the attention onto the innocent suspect and, consequently, increases the rate of false recognition, especially when the first identification was made from a biased lineup (in which the innocent suspect already stands out).
Table 9. Summary of the proportion if participants in the target-absent final lineup condition who selected the innocent suspect, separated by intervening lineup condition and RKG judgment.

<table>
<thead>
<tr>
<th>Intervening Lineup Condition</th>
<th>R-K-G Post-identification Judgment</th>
<th>N</th>
<th>Proportion of people in this group who identified the IS* from both lineups</th>
</tr>
</thead>
<tbody>
<tr>
<td>Biased</td>
<td>Remember</td>
<td>13</td>
<td>0.62</td>
</tr>
<tr>
<td></td>
<td>Know</td>
<td>16</td>
<td>0.56</td>
</tr>
<tr>
<td></td>
<td>Other</td>
<td>21</td>
<td>0.00</td>
</tr>
<tr>
<td>Fair</td>
<td>Remember</td>
<td>15</td>
<td>0.20</td>
</tr>
<tr>
<td></td>
<td>Know</td>
<td>19</td>
<td>0.00</td>
</tr>
<tr>
<td></td>
<td>Other</td>
<td>16</td>
<td>0.08</td>
</tr>
</tbody>
</table>

Notes. * IS = innocent suspect. N = sample size for that group of participants. All values rounded to 2 decimal places.

Experiment 2

Categorical Remember-Know-Guess Judgment

I wanted to investigate the processes responsible for the increase in incorrect identifications of the innocent suspect seen after a participant is presented with at least one intervening lineup. To do this, various intervening task predictors were included as potential predictors of participants’ categorical R-K-G judgments. Table 10 contains a summary of the proportions relevant to these analyses.

Intervening task condition. When all six combinations of intervening task were entered as predictors in the model along with whether the participant misidentified the innocent suspect from the final lineup, the main effect model was a better fit to the data than the null model ($D = 19.13, p = 0.085$), but adding interactions did not improve the model ($D = 8.82, p = 0.55$). The main effects results demonstrated that the addition of any intervening lineup increased the chance that participants would make a “know” judgments rather than report they were “guessing” ($B_{range} = 0.49 – 1.33, \theta = 1.63 – 3.78$). In particular, biased intervening lineups (biased then fair lineup: $B = 0.98, \theta = 2.66$; biased then no lineup: $B = 1.33, \theta = 3.78$) and two intervening lineups ($B = 1.28, \theta = 3.60$) seemed to have the largest effect on R-K-G judgments.
Familiarity judgments were also more common than guess judgments when the participant selected the innocent suspect from the final lineup, rather than a filler ($B = 0.51, \theta = 1.67$).

A similar effect was found for “remember” judgments—whenever an intervening lineup was presented (rather than no lineup) there was an increase in “remember” judgments relative to “guess” judgments ($B_{\text{range}} = 0.25 – 0.88, \theta = 1.28 – 2.41$). The effect of intervening lineups on “remember” judgments appeared to be weaker overall though. The strongest effect was found when two fair intervening lineups were presented though ($B = 0.88, \theta = 2.41$), followed by when a biased then a fair intervening lineup was given ($B = 0.59, \theta = 1.80$). “Remember” judgments were also much more common than “guess” judgment for participants who selected the innocent suspect from the final lineup ($B = 0.83, \theta = 2.29$).

**Number of intervening lineups.** When the number of lineups (zero, one, or two) was used as a predictor of participants R-K-G judgments, the main effect model was a better fit to the data than the null model ($D = 12.82, p = 0.012$), but adding the interaction did not help to predict R-K-G judgments ($D = 0.26, p = 0.878$). The multinomial results showed that with each additional intervening lineup, there was a 48% increase in “know” judgments and “remember” judgments relative to “guess” judgments ($B_{\text{know}} = 0.39, \theta = 1.48; B_{\text{remember}} = 0.39, \theta = 1.48$). In addition, “know” judgments were 65% more likely than “guess” judgments when participants selected the innocent suspect from the final lineup rather than a filler ($B = 0.50, \theta = 1.65$). An innocent suspect identification rather than a filler identification was associated with approximately two times more “remember” judgments than “guess” judgments, a much larger effect ($B = 0.77, \theta = 2.16$). So, more intervening lineups and identifying a repeated innocent suspect from a final lineup were both associated with reports of stronger memory experiences and less guessing.
Table 10. A summary of the proportion of individuals within each condition in Experiment 2 who identified the innocent suspect or did not, separated by R-K-G judgment.

<table>
<thead>
<tr>
<th>Intervening Task Conditions</th>
<th>N</th>
<th>“Guess” / “Not Present” Judgments</th>
<th>“Know” Judgments</th>
<th>“Remember” Judgments</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>Innocent Suspect ID</td>
<td>Another Decision</td>
<td>Innocent Suspect ID</td>
</tr>
<tr>
<td>No Lineups</td>
<td>45</td>
<td>0.13</td>
<td>0.58</td>
<td>0.00</td>
</tr>
<tr>
<td>One Lineup</td>
<td>142</td>
<td>0.08</td>
<td>0.42</td>
<td>0.12</td>
</tr>
<tr>
<td>Two Lineups</td>
<td>116</td>
<td>0.16</td>
<td>0.30</td>
<td>0.14</td>
</tr>
<tr>
<td>No LUP</td>
<td>No LUP</td>
<td>45</td>
<td>0.13</td>
<td>0.58</td>
</tr>
<tr>
<td>Biased LUP</td>
<td>Fair LUP</td>
<td>62</td>
<td>0.24</td>
<td>0.23</td>
</tr>
<tr>
<td>Biased LUP</td>
<td>No LUP</td>
<td>63</td>
<td>0.10</td>
<td>0.37</td>
</tr>
<tr>
<td>Fair LUP</td>
<td>Fair LUP</td>
<td>54</td>
<td>0.06</td>
<td>0.39</td>
</tr>
<tr>
<td>Fair LUP</td>
<td>No LUP</td>
<td>44</td>
<td>0.07</td>
<td>0.48</td>
</tr>
<tr>
<td>No LUP</td>
<td>Fair LUP</td>
<td>35</td>
<td>0.09</td>
<td>0.46</td>
</tr>
</tbody>
</table>

Notes. LUP = Lineup. ID = identification. Rows show the proportion of N for each identification type, within each category of R-K-G, so each row totals to 1. Proportions rounded to 2dp.

Number of innocent suspect identifications in the intervening lineups. Finally, a model was run to address whether choosing the innocent suspect from a previous lineup influenced participant’s R-K-G judgments. When examining the effect of choosing the innocent suspect at least once from an intervening lineup, the main effects model was significantly better than the null model ($D = 28.50, p < .001$), but adding an interaction did not improve the model any further ($D = 3.20, p = 0.20$). Choosing appeared to have a large effect on participant’s R-K-G judgments—when a participant identified the innocent suspect from at least one intervening lineup, the chance of a “know” judgment or a “remember” judgment was approximately five times that of a guess judgment ($B_{know} = 1.76, \theta = 5.81; B_{remember} = 1.76, \theta = 5.81$). A misidentification of the innocent suspect rather than a filler had no effect on the likelihood of a “know” judgment ($B = 0.01, \theta = 1.01$), but increased the number of “remember” judgments by 34% ($B = 0.29, \theta = 1.34$). So, choosing the same person from a previous lineup seemed to greatly increase the strength of participant’s subjective memory experience—they were far less likely to judgment their decision as a guess—and choosing the innocent suspect from the final
lineup was associated with more subjective recollection processes.

**Multiple identifications of the innocent suspect and false recollection.** Was there evidence that people who selected the innocent suspect multiple times across the procedure experienced more false recollection than people who only selected the innocent suspect in the final lineup? Again, only participants who misidentified the innocent suspect from the final lineup were used in these analyses. The multinomial model that included whether the participant selected the innocent suspect from an intervening lineup as a predictor was a significantly better fit to the data than the null model ($D = 17.93, p < .001$). Refer to Table 11 for a summary of the number of people within each R-K-G category, the proportion of those individuals who selected the innocent suspect from the final lineup only, and the proportion who selected the innocent suspect from more than one lineup during the experimental procedure.

<table>
<thead>
<tr>
<th>R-K-G Judgment</th>
<th>Sample Size</th>
<th>Proportion who selected the IS* only from the final lineup</th>
<th>Proportion who selected the IS* from more than one lineup</th>
</tr>
</thead>
<tbody>
<tr>
<td>Remember</td>
<td>19</td>
<td>0.84</td>
<td>0.16</td>
</tr>
<tr>
<td>Know</td>
<td>33</td>
<td>0.37</td>
<td>0.63</td>
</tr>
<tr>
<td>Guess</td>
<td>30</td>
<td>0.37</td>
<td>0.63</td>
</tr>
<tr>
<td>Total</td>
<td>82</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

*IS = innocent suspect. R-K-G = Remember-Know-Guess. All values rounded to 2dp.

The multinomial results suggested that people who selected the innocent suspect from at least one intervening lineup were significantly more likely to judge their memory experience as “know” ($B = 2.17, \theta = 8.76$) or “remember” ($B = 2.15, \theta = 8.58$) rather than “guess.” However, there was no significant differences in the likelihood of a “remember” or “know” judgment—these judgments were equally likely and much more likely than a guess when participants chose the innocent suspect multiple times. Thus, a misidentification of the innocent suspect from an
intervening lineup increases both misattributions of familiarity and false recollection for individuals that selected the innocent suspect from a previous lineup and the final lineup, but not for people who only chose the innocent suspect from the final lineup.
APPENDIX I. IOWA STATE UNIVERSITY IRB APPROVAL LETTER.

Institutional Review Board
Office for Responsible Research
Vice President for Research
2420 Lincoln Way, Suite 202
Ames, Iowa 50014
515 394-4566

Date: 07/24/2019
To: Adele M Quigley-Mcbride
From: Office for Responsible Research
Title: Assessment of Person and Event Perception
IRB ID: 19-322
Submission Type: Initial Submission
Review Type: Expedited
Approval Date: 07/24/2019
Approval Expiration Date: N/A

The project referenced above has received approval from the Institutional Review Board (IRB) at Iowa State University according to the dates shown above. Please refer to the IRB ID number shown above in all correspondence regarding this study.

To ensure compliance with federal regulations (45 CFR 46 & 21 CFR 56), please be sure to:

- Use only the approved study materials in your research, including the recruitment materials and informed consent documents that have the IRB approval stamp.
- Retain signed informed consent documents for 3 years after the close of the study, when documented consent is required.
- Obtain IRB approval prior to implementing any changes to the study or study materials.
- Promptly inform the IRB of any addition or change in federal funding for this study. Approval of the protocol referenced above applies only to funding sources that are specifically identified in the corresponding IRB application.
- Inform the IRB if the Principal Investigator and/or Supervising Investigator end their role or involvement with the project with sufficient time to allow an alternate PI/Supervising Investigator to assume oversight responsibility. Projects must have an eligible PI to remain open.
- Immediately inform the IRB of (1) all serious and/or unexpected adverse experiences involving risks to subjects or others; and (2) any other unanticipated problems involving risks to subjects or others.
- IRB approval means that you have met the requirements of federal regulations and ISU policies governing human subjects research. Approval from other entities may also be needed. For example, access to data from private records (e.g., student, medical, or employment records, etc.) that are protected by FERPA, HIPAA, or other confidentiality policies requires permission from the holders of.
those records. Similarly, for research conducted in institutions other than ISU (e.g., schools, other colleges or universities, medical facilities, companies, etc.), investigators must obtain permission from the institution(s) as required by their policies. IRB approval in no way implies or guarantees that permission from these other entities will be granted.

- Your research study may be subject to post-approval monitoring by Iowa State University’s Office for Responsible Research. In some cases, it may also be subject to formal audit or inspection by federal agencies and study sponsors.

- Upon completion of the project, transfer of IRB oversight to another IRB, or departure of the PI and/or Supervising Investigator, please initiate a Project Closure to officially close the project. For information on instances when a study may be closed, please refer to the IRB Study Closure Policy.

If your study requires continuing review, indicated by a specific Approval Expiration Date above, you should:

- Stop all human subjects research activity if IRB approval lapses, unless continuation is necessary to prevent harm to research participants. Human subjects research activity can resume once IRB approval is re-established.

- Submit an application for Continuing Review at least three to four weeks prior to the Approval Expiration Date as noted above to provide sufficient time for the IRB to review and approve continuation of the study. We will send a courtesy reminder as this date approaches.

Please don’t hesitate to contact us if you have questions or concerns at 515-294-4566 or IRB@iastate.edu.