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The use of filler samples moderates the effect of contextual information on forensic match decisions

Adele Quigley-McBride
Iowa State University

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Adele Quigley-McBride

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Dr. Gary L. Wells, Major Professor
Dr. Christian A. Meissner
Dr. Stephanie Madon

The student author and the program of study committee are solely responsible for the content of this thesis. The Graduate College will ensure this thesis is globally accessible and will not permit alterations after a degree is conferred.

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ABSTRACT

The criminal justice system is susceptible to errors that can lead to wrongful conviction of innocent people, sometimes caused by faulty forensic evidence presented at trial. Among the problems is the fact that contextual information can bias forensic examiners to make "match" decisions when the materials are ambiguous (Dror, Peron, Hind, & Charlton, 2005; Dror, Charlton, & Peron, 2006). It is unlikely that contextual information could ever be eliminated from police investigations and the forensic examination procedure. Instead, the current experiment suggests that providing examiners with evidence lineups—analogous to eyewitness identification lineups where the suspect is embedded among similar-looking, known innocent fillers—can reduce the effect of contextual bias. This paper describes the first experiment conducted to demonstrate the effectiveness of evidence lineups, called the *filler-control procedure* (Wells, Wilford, & Smalarz, 2013). Participants were trained and then examined eight sets of fingerprint materials. The materials were either more ambiguous or less ambiguous, and some of the sets had an actual match present and some did not. Furthermore, some participants received the filler-control procedure, and some the *standard procedure*—only one comparison print to compare to the crime print, as is standard in forensic examination procedures. The final manipulation was the presence or absence of related contextual information, in the form of a police case report suggesting that the suspect in the case is guilty. The results showed a contextual bias effect in the standard procedure when the materials were more ambiguous, but only when there was no actual fingerprint match present. So, the innocent suspect is in the most danger when the materials are degraded or difficult to compare, and the innocent suspect's print is the only print presented to compare to the crime sample. The filler-control procedure, however, eliminated

the effect of contextual information. Although the number of affirmative match decisions increased when using the filler-control method, these match decisions were spread across the lineup to the filler prints rather than loading onto the innocent suspect. These results mirror the results found in eyewitness identification, and show promise for use in the real world as a means to reduce wrongful conviction and improve forensic testing accuracy.

Keywords: forensics, fingerprints, contextual bias, heuristics, lineups, filler-control method, evidence lineups.

CHAPTER 1. INTRODUCTION

Lana Canen was charged with murder in 2004. The main evidence supporting her conviction was a latent fingerprint analysis matching her fingerprints to prints found at the crime scene. A local detective with minimal training in fingerprint examination performed the analysis and testified that her prints matched those found at the crime scene. This, combined with confession evidence from another man implicating her as his accomplice, lead to her eight-year imprisonment for a crime she did not commit. On appeal, the fingerprints were re-examined and it was discovered that they did not match—even the original examiner agreed that the prints did not match when the original examiner was allowed to re-analyze the prints (CBS News, 2012). How does a mistake like this occur? We know that the criminal justice system is fallible, but law enforcement professionals and the public view forensic science as reliable and credible. The Innocence Project (Innocence Project, 2016) has exonerated 330 people who were wrongfully convicted and, of these, 155 have involved some form of forensic examination error. Furthermore, these numbers only represent the cases that have been found and resolved—the problem is likely much more prevalent (Charman, 2013). There is a need for a systematic investigation of forensic techniques and potential solutions to the errors seen in forensic examination.

The Problem of Contextual Bias in Forensic Contexts

The National Academy of Sciences (2009) released a report highlighting the need for more research into forensic examination error rates, their causes, and how to prevent error in forensic science. Of particular concern in the National Academy report was the impact of confirmation bias and contextual bias on forensic analysis, which the current study seeks to address. There is already some literature that speaks to the nature of contextual bias effects

and how they arise. To date, most of the empirical research seeking to find a solution to contextual bias has focused on finding the conditions under which contextual bias occurs, and then attempting to shield examiners from contextual information (Dror, Peron, Hind, & Charlton, 2005) or control when the contextual information is revealed (Dror et al., 2015; Dror, 2016). The current work, in contrast, assumes that it is almost impossible to fully shield forensic examiners from contextual information and therefore examines a method for neutralizing or diluting the impact of contextual information for a class of forensic tests that constitute "match" or "source" tests. In a match or source test, the examiner is typically presented with a crime scene sample (e.g., a latent fingerprint, fibers, shoeprint) and a suspect sample (prints from the suspect, fibers associated with the suspect, shoes of the suspect) and asked if the suspect sample was the source for the crime sample or if they "match." The current study used fingerprints, but the same general principles and findings should apply to other source or match tests as well.

How Contextual Information Influences Judgments

So, what does the literature tell us about why contextual information might bias examiners to think that two fingerprints look alike when they are not? The answer lies in ordinary cognition and decision-making processes. When people make decisions, two kinds of cognitive processing are used. Bottom-up processing is a data-driven analysis where details of a stimulus are analyzed in a systematic way, without drawing on any other information (Chaiken & Maheswaran, 1994). For example, fingerprint examiners use bottom-up processing when they analyze the pattern of ridges and pores in a fingerprint to compare to another fingerprint.

But bottom-up processing is most useful when the stimuli provided are unambiguous and there is sufficient time to undergo a detailed analysis of all the material available. As a result, people often rely on top-down processing or heuristics—making a judgment based the likelihood of each potential outcome when the resources available are inconclusive (Chaiken & Maheswaran, 1994; Saks, Risinger, Rosenthal, & Thompson, 2003). Lack of a clear answer is not the only reason why someone might start to rely on top-down processing, but these conditions will push people towards heuristic processing. One way heuristics can operate is by using prior knowledge, beliefs, or expectations to form a base-rate—an idea about the relative frequency of an outcome within a given set of circumstances (Tversky & Kahneman, 1974). This kind of processing occurs in situations of uncertainty, when the available resources are limited, unclear, or there are time constraints, such as a rushed analysis of a partial fingerprint (Dror, et al., 2005; Neth & Gigerenzer, 2015).

Heuristics can be most helpful in ambiguous situations and heuristics often lead to efficient and accurate decision-making for everyday situations (Neth & Gigerenzer, 2015). But, heuristics can also result in biased or erroneous decisions. For example, if the other information we draw on to help inform our judgment is inaccurate; our final decision might also be inaccurate. If people look for evidence to support an expected outcome and ignore the evidence against that outcome, our final decisions will be biased towards our expectations (confirmation and contextual bias; Einhorn & Hogarth, 1981; Saks et al., 2003; Tversky & Kahneman, 1974). Contextual bias in a forensic setting can take on many forms, because there are many kinds of information that can be interpreted as incriminating. Maybe the examiner saw the crime described in the paper, with all the evidence against the suspect described in detail, or the examiner saw the press conference put together by the police on

television. What if the examiner overheard at the local hangout after work that the suspect tried to flee when they were approached initially for questioning? Or maybe the police officer that brings the evidence to the examiner is highly respected and is fairly sure "this is their guy".

To make this idea more concrete, think about the case of Lana Canen again. When the examiner performed the analysis of the fingerprints, he knew that another person had confessed and named her as his accomplice. So, the examiner probably did not begin the examination with a neutral starting point, open to being swayed equally by incriminating or exculpatory evidence. Rather, the examiner likely began the examination with the expectation that the prints would probably match, an expectation that could have been guided by the contextual information about the confession. Subsequently, he might have been more likely to look for aspects of the prints that confirmed his expectation, and ignore the aspects of the prints that disconfirmed. In addition, much more disconfirming evidence would have been required to override the examiner's expectation that the prints should match once the examiner had formed the idea (Nickerson, 1998). Expectations can be formed by any number of different sources—police case reports, communication with police, and media can all change a fingerprint examiner's view about the likelihood that a set of prints should match.

This is problematic for the presentation of forensic evidence in court. Forensic experts are hired to testify about their analysis of the prints using the bottom-up process only. They are not hired to evaluate the credibility of a confession, the suspicions of the police investigator, a media slant, or interpret suspect behavior. These are all aspects of the case that will be analyzed and, if admissible, presented in court by people with that expertise, such as psychologists, police investigators, and interrogators. If the forensic analyst uses contextual

information available to them to inform their decision, their testimony in court may involve double counting of evidence or be based on inaccurate or inadmissible evidence. Of course, contextual information can be accurate information, so contextual information could help the examiner make a correct decision. Nevertheless, contextual information is not for the examiner to weigh; another expert or a direct witness should be the one to present contextual information in court if it is probative and admissible. Therefore, contextual information does not need to be, and should not be, allowed to influence the forensic examiner's evaluation. So, we need to find a solution to the problem of contextual bias to protect the independence of forensic expert testimony at trial.

Current Research Addressing Forensic Contextual Bias

There is research demonstrating that contextual bias is a problem in forensic fingerprint examination, for ordinary people (Dror, Peron, Hind, & Charlton, 2005; Osborne & Zajac, 2016) and forensic experts (Dror, Charlton, & Peron, 2006). Other forensic materials have also been used, including handwriting (Kukucka & Kassin, 2014), bitemarks (Osborne et al., 2014), shoe impressions (Kerstholt, Paahuis, & Sjerps, 2007), and ballistics (Kerstholt et al., 2010). However, the results of studies using materials other than fingerprints have been mixed, maybe because forensic techniques with fewer known protocols are more difficult to manipulate in a way that is appropriate for empirical testing, and replicate with expert participants.

Dror and colleagues (2005) created a paradigm for testing contextual bias in fingerprints with lay people. Participants were trained briefly to make fingerprint comparisons. Then, participants determined whether the fingerprints matched. Sometimes the fingerprints were ambiguous so whether they matched was very unclear, and sometimes the

fingerprints were clearer meaning that people could be more certain that they matched or did not match. In addition, sometimes participants made the decision with the help of additional, contextual information, and sometimes there was no extra information. There were four contextual information conditions: people received no context, photos with low emotion content (e.g. a hammer), photos with high emotional content (e.g. a bloody crime scene), and subliminal priming of emotional content paired with high emotion photos. Dror and colleagues found that participants made significantly more match decisions for pairs of fingerprints that were accompanied by highly emotional images that suggested incrimination. However, this pattern was only found when the fingerprints were poor quality, rendering the decision more ambiguous and uncertain. Similar patterns have been found in more recent studies with ordinary people making judgments about pairs of fingerprints (Langenburg, Champod, & Wertheimer, 2009), and in a replication of Dror and colleagues' study (Osborne & Zajac, 2016).

There is an obvious concern that arises from using lay people rather than experts and the concern relates to how comparable the results will be and whether undergraduate data is generalizable to experts. Experts are better able to discriminate between similar fingerprints (Thompson & Tangen, 2014), but novice examiners tend to be no better than lay people at matching fingerprints (Thompson, Tangen, & McCarthy, 2014), and lay people can discriminate between prints at an above-chance level (Vokey, Tangen, & Cole, 2009). Although there may be differences between experts and novices in their ability to perform fingerprint analysis and maybe even differences in contextual bias susceptibility, contextual bias effects appear to be robust to expertise level. For example, Dror and colleagues (2006) presented five experts with sets of fingerprints that they had determined were a match in

previous cases. However, this time the researchers told the experts that these prints were from a high profile case involving the FBI and Brandon Mayfield. The experts were familiar with the case and therefore knew that if the prints were from this case, they should not match. Dror and colleagues found that only one expert determined the prints to be a match now, as they had in the past. The remaining experts all said that the prints either did not match now, or that the crime sample was too degraded to decide. These results also show that contextual bias can work against finding a match when the context suggests that a match is unlikely.

Dror and Charlton (2006) demonstrated similar results with a different group of experts, but this time there was a control group where examiners were shielded from additional contextual information. Expert fingerprint examiners were asked to assess fingerprint materials from eight past cases. The examiners had judged half of these past cases as individualizations (they were a match), or exclusions (they were not a match). For the study, the examiners either received no contextual information (4 cases), context suggesting the prints *should* match (Incriminating evidence; 2 cases), or context suggest the prints *should not* match (Exculpatory evidence; 2 cases) along with each set of prints. Exculpatory evidence was found to influence fingerprint experts by making the examiner's decisions more conservative. In three cases where the examiners had said the prints matched in the past, the exculpatory evidence lead to the examiners to conclude that the prints did not match now, and in one case the examiner said the materials were inconclusive. However, there was no effect of incriminating evidence on expert decision-making found in this study, and in two cases the experts made a decision inconsistent with their past determination in the absence of context. So, inconsistencies can occur even without the influence of context.

Is There a Solution to the Problem of Contextual Bias in Forensic Examination?

What have researchers recommended to combat contextual bias in forensic contexts? In the empirical papers on this issue of forensically-relevant contextual bias, authors have typically suggested shielding forensic examiners from contextual information (Dror et al., 2005) or gradually introducing levels of contextual information to examiners (Dror et al., 2015; Dror, 2016). But an examiner can never be totally insulated from contextual information. Explicit exposure to contextual information through police communication or case information included when the evidence is handed over is not the only form of biasing information. Some forms of contextual information are almost impossible to prevent. Consider, for example, that forensic examiners are members of the community and are likely to be exposed to media reports on crimes in their area. Evidence from these cases may end up on their desk for examination. In addition, forensic experts and police tend to socialize in the same circles, as well as with each other. In fact, even the presentation of a single sample to be compared with the crime sample suggests that there is good evidence that the prints from this person should match the crime print (Wells, Wilford, & Smalarz, 2013).

Evidence Lineups Versus Evidence Showups

In this study, I tested a different type of potential solution to the problem of contextual bias—one that is designed to moderate the effect of contextual bias, while accepting that contextual information will always be available to examiners. Instead of shielding examiners from contextual information, Wells, Wilford, and Smalarz (2013) proposed the use of evidence lineups as a way to dilute the effect of bias. This idea draws on the already well-developed research in eyewitness identification that seeks to reduce the

chances that innocent people who become suspects in an investigation will be mistakenly identified by an eyewitness. One of the main ideas to come out of eyewitness research is the idea that a lineup is more protective of innocent suspects than is a showup (Steblay, Dysart, Fulero, and Lindsay, 2003). A showup is where an eyewitness is shown a single individual, who is a suspect, and asked to determine whether they are the culprit. A showup would be equivalent to the current, standard procedure for forensic examination—the crime sample is presented with a sample obtained from a single suspect and the examiner is asked to decide if the samples are a match. A lineup is different from a showup because a lineup embeds the suspect among other people who, although known to be innocent, fit the description of the culprit that was obtained from the eyewitness (Wells, 1993). These non-suspect lineup members are called lineup fillers. So, now the test is not simply whether the eyewitness can tell if the individual is similar to the culprit, but rather the eyewitness needs to be able to pick the culprit out of a number of people who could plausibly be the culprit. Importantly, if the eyewitness picks someone from the lineup who is known to be innocent (a *filler*), there are no incriminating consequences of this incorrect identification for the filler. After all, filler are known-innocents in a lineup.

How would lineups work in a forensic context such as with fingerprints materials? If the suspect sample is embedded in a lineup of other highly-similar samples, contextual information still cannot tell the examiner which of the samples is a match to the crime sample. Although the contextual information can raise expectations that one of the samples should be a match to the crime sample, contextual information cannot point the examiner to any one sample if the filler-control method is used. Thus, the examiner cannot simply use the contextual information and instead must perform a bottom-up analysis of the prints. In fact,

an expert examiner may simply decide not to rely on the contextual information at all because it is largely useless with respect to the task at hand. This aspect of the lineup procedure is what makes this solution qualitatively different from the other recommendations that attempt to shield examiners from contextual information. An evidence lineup does not rely on contextual information being hidden from examiners, or examiners using their "willpower" to be objective. Instead, the use of fillers should tend to neutralize or dilute the contextual information due to the fact that the contextual information is not specific to one of the samples but instead applies to the set of samples as a whole.

To test the viability of the filler-control procedure, I had undergraduate participants learn about fingerprint examination, and then decide whether a single fingerprint matched a crime print (standard forensic procedure), or whether one of six fingerprints matched a crime print (filler-control procedure). Sometimes, the prints were presented with an incriminating police case report, and sometimes they were not.

Predictions Based on Eyewitness Identification and Contextual Bias Literatures

The first prediction was that the standard (i.e., no fillers) forensic match procedure would show a contextual bias effect. That is, there would be significantly more affirmative match decisions made by participants when they received incriminating contextual information prior to examining the fingerprint materials than when they did not receive such contextual information. Also, this effect of incriminating contextual information should be most pronounced when the prints are more ambiguous. Under ambiguous situations the bottom-up analysis does not give a clear answer, and so people are more susceptible to influence from top-down processes (Chaiken & Maheswaran, 1994). This pattern of results

would conceptually replicate experiments completed by other research laboratories using fingerprint materials (Dror et al., 2005; Zajac & Osborne, 2016).

A number of additional hypotheses were derived from the eyewitness identification literature regarding lineups and showups because of their close analogy to the filler-control procedure and the standard procedure, respectively, in a forensic match test. First, the eyewitness identification literature shows more affirmative choosing for lineups than for showups. This is due to the fact that there are more faces that could potentially resemble an eyewitness's memory of the culprit when viewing a lineup than when viewing a showup. Similarly, it was predicted that there would be more affirmative match decisions for the fingerprint lineup than for the fingerprint showup due to the fact that there are more possible prints to resemble the latent print.

The eyewitness literature shows, however, that this higher rate of affirmative responding for lineups than for showups does not result in more mistaken affirmative responses on the innocent suspect. This is because, although there is more choosing for lineups because there are more options, the innocent suspect is no longer the only plausible choice. In fact, there are a number of other fillers that match the description of the culprit as well. Because the innocent suspect is not actually the culprit and therefore not a great match to the eyewitness' memory, choosing will spread out to the fillers, thereby reducing the false positives on the innocent suspect to a level that is significantly lower than the rate observed for showups (filler siphoning; Wells, Smalarz, & Smith, 2015; Wells, Smith, & Smalarz, 2015). Fillers will also siphon some positive identifications away from the actual culprit, but to a lesser extent because the culprit is a good match to memory. This phenomenon is called *differential filler siphoning* as the fillers have a differential effect contingent on whether the

actual culprit is in the lineup. Good fillers will siphon away from an innocent suspect more than they will from a guilty suspect, and this is the mechanism through which the ratio of innocent suspect identifications and actual culprit identifications (as well as d' values) improves when lineups are used. Based on this consistent result in the eyewitness literature, it was predicted that this same differential filler siphoning would occur when comparing fingerprint lineups to fingerprint showups.

Another hypothesis for the current study was that contextual bias effects would be diluted in the filler-control procedure when compared to the standard procedure. In effect, this dilution prediction is closely related to the idea of filler siphoning. For example, if incriminating contextual information increases false affirmative match decisions by 12%, then the entire 12% increase would fall on the innocent suspect sample for the standard (showup type) procedure. For the filler-control procedure, however, the 12% increase in false affirmative responding that results from incriminating contextual information would dilute (spread) across the six samples, producing (on average) a mere 2% increase in false affirmative match decisions on the innocent suspect. An alternative hypothesis was that contextual information would have little or no effect at all on affirmative match decisions when using the filler-control method. This is because, although the contextual information suggests to the examiner that there should be a match, contextual information does not assist the examiner at all on being able to determine *which* of the six samples matches the crime sample. Accordingly, the contextual information does not relieve any of the examiner's burden of relying as much as possible on the bottom-up approach. Hence, when given the fingerprint lineup (rather than the fingerprint showup) the examiner might simply dismiss the

contextual information as being irrelevant or unhelpful and rely almost totally on characteristics of the prints themselves.

Finally, predictions were made about the confidence that the examiners expressed in their decisions. First, confidence should be overall lower in the filler-control procedure because the task is more difficult. Furthermore, when people make an incorrect decision, confidence should be lower compared with when they make a correct decision. This is expected because there is typically a confidence-accuracy relation seen in eyewitness identification studies (Wixted & Wells, 2017) as well as other tasks for which people perform above chance levels. Also, the more ambiguous materials should result in lower confidence in the decisions too—this hypothesis functions as a manipulation check as well. Furthermore, when people make a decision that is incongruent with the suggestion in the contextual information (e.g. the context implies guilt but the participant says there is no match), confidence should be reduced compared with when the contextual information agrees with their match decision. Additionally, it was anticipated that there may be stronger evidence of contextual bias in the confidence measure rather than the binary match decision because the measure is much more sensitive (scores ranging from 0 to 100% confidence compared with a two-option forced choice measure).

CHAPTER 2. METHOD

Participants and Design

A total of 244 undergraduate participants from a Midwestern University took part in the study for partial course credit. All participants were fluent English speakers and over the age of 18 years. Nine participants were excluded from analyses due to experimenter error, or unusual participant behavior. There were four independent variables in this study: what procedure was used, whether contextual information was provided, how difficult the task was, and whether or not one of the samples actually did match the crime sample. The design was a 2 (context: context vs. no context) x 2 (procedure: standard vs. filler-control method) x 2 (ambiguity: more ambiguous vs. less ambiguous) x 2 (match presence: match present vs. match absent) mixed factorial model.

Context, procedure, and ambiguity were manipulated between subjects and match presence manipulated within subjects. Participants were randomly assigned to ambiguity, procedure, and context conditions, and half of the fingerprints that each participant saw matched, and half did not, presented in a random order. Refer to Table 1 for a breakdown of the numbers in the between subjects groups.

Materials

The session began with a training video on fingerprint analysis (*Introduction to Fingerprint Analysis*, 8:00), created using information about FBI standards and training for fingerprint analysis. The video consists of a series of informative Power Point slides with a voice over and contains information about the background of fingerprint analysis, how an analysis is performed, and then a number of working examples for the participants. Participants watched the video on the computer screen with headphones on. The training

video and response questions were all presented on a desktop computer using MediaLab software.

The fingerprint samples were from a previous study by Marcon (2009), using fingerprints from 125 students at the University of Texas at El Paso. There were three different levels of print quality. Rolled fingerprints include the entire print from the tip of the finger and are rolled slowly and deliberately from one side of the finger to the other to ensure the print is clear. Plain fingerprints are not rolled, so they do not include as much detail from the sides of the finger and can sometimes be unclear or smudged. Partial fingerprints, or latent fingerprints, occur when someone quickly touches a surface, not attempt to leave a deliberate print. Partial fingerprints typically lack detail, are smudged, or unclear. Marcon also had 60 undergraduates rate how distinct and typical each print is from all the other prints. The final library of fingerprint sets that are rated consists of fingerprints from 113 undergraduates.

Crime scene samples in the more ambiguous condition were drawn from the less clear plain prints, or partial print samples. In the less ambiguous condition, in contrast, the crime prints were drawn from rolled or plain prints, and were complete, with sharper lines and no smudging. Fillers samples for the filler-control procedure were selected based whether they had the same fingerprint pattern (loop, whorl, or arch) and came from the same finger (index, thumb, etc). In the more ambiguous condition, the filler samples were also pulled from partial or less clear plain fingerprint samples, whereas the less ambiguous condition the fillers are clearer. The fingerprints were selected so that the fingerprints were representative of the range of typicality and distinctiveness ratings collected by Marcon (2009).

Each set of fingerprints consisted of one crime sample, and then a different impression of the print from that same finger was used as the "match" sample. Then, six other fingerprints were selected with the same type of pattern, from the same finger, with the same level of clarity at the matching sample. Then, from these six fingerprints, one was randomly selected to be the "innocent suspect" print. This print appeared in the standard procedure for that fingerprint set as the "no match" sample. In the filler-control procedure, the matching sample or the "innocent suspect" print was embedded amongst the other five fingerprints which were ordered randomly in to a 2 by 3 lineup configuration. Refer to Appendix A for all of the fingerprint materials used in this experiment. Prior to running the full experiment, the filler-control materials were tested on a smaller sample of participants (*N* = 68) with contextual information (the condition that would be the most time consuming) to determine how much time participant's would take to make match decisions concerning four cases, ensure that there were no ceiling or floor effects, ensure that the filler samples were plausible options, and test whether the more ambiguous condition was more difficult. See Table 2 for a break down of these pilot data with the 16 sets of fingerprints in the filler-control method, eight of which were more ambiguous.

The average amount of time taken to run through the instructions and the training video, complete four cases with evidence lineups and a police case report (contextual information) to read, and receive the oral debriefing was 29 minutes (rounded to the nearest minute). Therefore, it was concluded that it was feasible for each participant to analyze eight cases in an hour to increase the power of the study. There were no ceiling or floor effects—when there was an actual match present, participants matched that print to the crime sample approximately half of the time (50% of the time for less ambiguous materials, and 44% for

more ambiguous materials). When no match was present, people were picking the innocent suspect sample some of the time (15% of the time for less ambiguous materials, and 10% for more ambiguous materials). These proportions were also consistent with expectations regarding the ambiguity level—there were less correct matches in the more ambiguous materials, and people's confidence in their match decisions were lower in the more ambiguous materials condition (72.5% confident for less ambiguous materials, and 65.5% in the more ambiguous materials). Finally, participants were matching filler samples to the crime print some of the time, and more often when there was no actual match present (27% fillers when there was a match present, and 55% of the time when there was not), which is what would be expected according to the eyewitness literature (Wells, Smith, & Smalarz, 2015; Wells, Smalarz, & Smith, 2015). When people picked fillers, choosing was spread across the lineups, rather than one of the fillers standing out in the lineup. Therefore, these materials appeared to be appropriate for testing the hypotheses in the current study.

Procedure

Participants signed up for the study using an online recruitment system, and came into the laboratory to complete the experiment. The session began with the experimenter briefly describing the task and providing a consent form that the participant could ask questions about and sign. First, participants were instructed to put on their headphones and pay attention to the training video presented on the computer screen. Next, participants read through a series of instructions (Refer to the Appendix B for the complete instructions). They were told that these materials are from real cases and that each case has a suspect, who may or may not be the actual perpetrator. Participants were told that they would see materials from eight real cases, to be analyzed one at a time. For each case, participants were asked to

make an assessment about whether or not the comparison print(s) matched the crime print, and how confident they were in their decision. Participants were asked if they had any questions about the task. If they did not, they were given a scientific-grade magnifying glass with an LED light to aid their examination and more closely mimic a real expert's experience.

When the task began, participants would either see fingerprint sets that were all from the more ambiguous materials (eight total), or fingerprint sets from the less ambiguous materials (eight total), always randomly ordered. Half of these always had a match present, and half always had a match absent, and this was also randomly ordered. Those who were assigned to the condition where they were provided with contextual information were told in the instructions that they would also receive extra information in the form of a police case. Each case report was given to the participants for them to read prior to examining each set of fingerprint materials. There were eight different police case reports containing details about different types of crimes—kidnapping, extortion, armed robbery, bomb threat, homicide, rape, arson, and identity theft. Each report was highly suggestive of guilt, for example one reported that DNA evidence found under the victims nails was a match to the suspect. We randomly ordered each of the eight police case reports to be presented with any one of the eight fingerprint sets each person in the context condition received. Refer to Appendix C for all of the case reports used in this experiment. If they were not assigned to the contextual information group, they never saw a police case report.

The cases were handed to the participants one-by-one by the experimenter in a manila folder, with the fingerprint materials enclosed, laminated, and labeled as if it were real evidence. Participants responded to questions about the materials on the computer screen

about each case. Participants who were assigned to the standard procedure received one comparison print for each case. For these participants, the instructions clearly stated that, although there is a suspect in each case, this does not mean that they are the person who committed the crime—the fingerprint may or may not match the crime print. They were asked to respond to the question "*Do the samples match?*" with a "*Yes*" or a "*No*". For the participants who were assigned to the filler-control procedure, they received a lineup of six comparison prints in each pack. Participants in the filler-control condition, like those in the standard condition, were told that although there is a suspect in each case, this does not mean that they are the person who committed the crime. However, participants were also told that they would see six sample fingerprints for each case and that five of the samples they will see were definitely not matches. So, if participants select one of the filler fingerprints then they have selected an innocent person's prints. Filler-control participants were asked "*Does one of these samples match the crime sample?*" If participants responded yes, they needed to then indicate which of the samples was a match (the samples were numbered on the sheet "*Sample 1*" through to "*Sample 6*"). Finally, for all cases, participants were asked "*How confident are you in your decision in this case?*" and rated their confidence on an 11-point scale from 0% (point "1"; *not at all confident*) to 100% (point 11; *completely confident*). The computer prompted them after each confidence rating to ask for the next set of case materials from the experimenter and the questions on screen were repeated. Once the participants had completed their judgments for all eight cases, participants were told that is the end of the experiment and the experimenter thanked the participant and gave them an oral debriefing.

CHAPTER 3. RESULTS

Overview of Analyses

Multilevel model analyses, using the LMER package in R Studio, were used to analyze these data to account for the nested nature of the design—each observation was nested within Fingerprint Set ($N = 64$) and each person assessed eight different fingerprint sets, so observations were also nested within Participant ($N = 234$). These two grouping variables were included at Level 2 in the multilevel models, and the relevant intraclass correlations can be found in Table 9. The predictors entered in the model were Ambiguity Level (*more ambiguous = 1, less ambiguous = 0*), Context Presence (*context present = 1, no context = 0*), Procedure Type (*standard procedure = 0, filler-control procedure = 1*), and Match Presence (*match present = 1, match absent = 0*). Finally, the Context Type was entered as a categorical control variable to allow for any variation due to the eight different case reports used as contextual information here. Each trial or case analyzed represented one data point in these analyses, and each participant provided eight data points. The use of Participant as a Level 2 grouping variable accounted for the repeated measures nature of these data, and any variation that could be attributed to a single person's unique biases and perceptions was allowed for in the model (see Figures 1 and 2 for graphical representations of the models).

For the full model of each analysis, a marginal R^2 is reported, which is the amount of variation in the outcome explained by the predictors in the model, and the conditional R^2 is also reported which represents the amount of variation in the outcome explained by all variables in the model, including higher-level, grouping variables. The dependent measure was determined by the research question being addressed. Any outcome variables associated

with participants' match decisions were binary, so these models used logistic multilevel regression models. A full breakdown of the terminology used to describe the different outcome decisions can be found in Table 3. Affirmative "Match" decisions can be either correct ("Hits") or incorrect ("False alarms"), and different effects were hypothesized for these two kinds of "match" decision. These were coded as binary variables—the presence of a "hit" or "false alarm" is coded as "1" and absence coded as "0". False alarms can also fall on a filler sample in the filler-control procedure, but unless specifically mentioned, fillers are not included in the analyses. "Choosing" refers to "Match" (*coded 1*) decisions, as oppose to "No Match" (*coded 0*) decisions, and includes situations where people match the crime sample to a filler sample in the filler-control procedure. "Suspect choosing" refers to a "match" decision where the correct sample is selected ("hits"), or the innocent suspect's print is selected ("false alarms"). "No match" decision can be incorrect (a "miss") or correct (a "correct rejection"). The confidence measure will also feature as the dependent measure in some analyses, and because confidence is a continuous measure, logistic regression analyses were not used when analyzing the confidence measure.

Overview of Results

There were a number of interesting results in these data that were consistent with my predictions. First, the context bias effects found in previous work (e.g. Dror et al., 2005) were replicated under the specific conditions that were anticipated to produce the strongest effects. Specifically, the presence of incriminating contextual information resulted in significantly more false alarms when the materials were very ambiguous and the standard procedure (only one sample was compared to the crime sample) was used. In contrast, there was no evidence of contextual bias when hits were assessed, or when the fingerprint materials were less

ambiguous. Furthermore, no contextual bias effects were observed in the filler-control conditions. That is, whether or not incriminating contextual information was presented to participants, there was no significant change in hit rates or false alarm rates in the filler-control procedure.

Interestingly, the filler-control procedure appeared to be superior to the standard procedure even for participants in the no-context conditions. Although the filler-control procedure reduce the rate of hits compared to the standard procedure, the filler-control procedure resulted in a much larger drop in false alarms compared with the reduction in hits. In addition, there was no significant increase in "no match" decisions in the filler-control procedure. In fact, there was no significant difference in either the number of misses or in the number of correct rejections in the filler-control when compared to the standard procedure. So, fingerprint lineups did not result in people to choosing to "back off" and refrain from saying there was a match compared to the standard procedure. Instead, the filler-control procedure led these match decisions to land on filler samples rather than suspect samples, particularly when the evidence lineup did not contain an actual match. Therefore, these data show evidence of the differential filler siphoning mechanism that occurs in eyewitness lineups—good fillers surrounding a suspect will draw choices away from the suspect, but will draw proportionately more choices away from an innocent suspect than from a guilty one (Wells, Smalarz, & Smith, 2015; Wells, Smith, & Smalarz, 2015).

There was no support for the hypothesis that people's confidence in their decisions would be boosted by contextual information when that information was consistent with their judgments (i.e. the participants says there is a match when the contextual information also suggests that there should be a match). Nevertheless, the confidence measure did serve as a

useful manipulation check to see if people found the filler-control procedure more difficult and whether they found the match in the more ambiguous materials less clear. Now, the data analyses, beginning with a full multilevel model of all the data and predictors, will be presented. I will explain how these results were obtained, and what they mean in a question and answer format with each question representing the hypotheses of the current study.

Analysis of the Full Multilevel Model

It was predicted that contextual bias effects would be found in the standard procedure, particularly when the materials were ambiguous, but these effects would be reduced in the filler-control procedure. Statistically speaking, a contextual bias effect would be characterized by a significant increase in "match" decisions, and this increase should be largest for "false alarms" (incorrect "match" decisions). Ideally, to show support for this hypothesis, a significant four-way interaction between Match Presence, Ambiguity Level, Context Presence, and Procedure Type should be demonstrated.

To test for the four-way interaction, a model was run with "suspect choosing" as the outcome variable (so that filler fingerprint samples were excluded from the analysis), and all possible interactions between Match Presence, Ambiguity Level, Context Presence, and Procedure Type included. In addition, Context Type was included as a control variable, and the data was nested within Participant, and Fingerprint Set. The model failed to converge[1]. In an attempt to make the model merge, the model was reduced by removing Context Type as a control variable, given that there was no significant impact of any types of contextual information on suspect choosing in the full model. In addition, all the interactions that were

[1] 29% of the variation in "false alarms" is explained by the predictors and interactions (Marginal $R^2 = 0.285$) and 43% of the variation in "false alarms" is explained by all predictors in the model, including higher-level grouping variables (Conditional $R^2 = 0.428$). Goodness of Fit: χ^2 (8) = 24.785, p=0.002.

not approaching significance ($p<.10$) were removed from the analysis. But the model still did not converge.

At this point, I concluded this full model was not going to be useful for answering the research questions of this experiment. Clearly with this many predictors, a control variable with eight categories, and a binary outcome, the model is not going to converge, so interpreting any effects from the full model is not appropriate. The validity of the full model is questionable and, therefore, should not be interpreted. Hence, the data analysis strategy was driven by specific tests of the a priori hypothesis that motivated this research. These predictions were sound, and based on previous literature in the forensic psychology and eyewitness psychology domain. The following statistical analyses address each of the hypotheses driving this research.

Was There a Contextual Bias Effect in the Standard Procedure?

The first hypothesis was that the contextual bias effects found in previous research would be replicated (for example, Dror et al., 2005). When contextual information indicates that a particular outcome is more likely, people are more likely to make decisions consistent with the expectation created by that information (Chaiken & Maheswaran, 1994; Saks et al., 2003). The case reports were highly suggestive of guilt, which should have created an expectation that the prints should match. Accordingly I hypothesized that participants who received the standard procedure would make more affirmative "match" decisions—hits and false alarms—when an incriminating police case report was presented with the fingerprints. This effect was expected to be most prominent when the materials were more ambiguous (as was found in Dror et al., 2005), and when there was no actual match present (supported by eyewitness identification research e.g. Steblay, Dysart, Fulero, and Lindsay, 2003).

All standard procedure data. Initially a model was run using the data from participant who received the standard procedure. Ambiguity Level (*more ambiguous = 1, less ambiguous = 0*) and Context Presence (*context presence = 1, context absent = 0*) were entered into the model as predictors. The initial analysis with "Suspect choosing" (*culprit/innocent suspect print chosen = 1, any other decision = 0*) as the outcome variable in this model, and Match Presence (*true match = 1, no match = 0*) included as a predictor suffered from similar issues to the full model and failed to converge. Accordingly, hits (*hit = 1, any other decision = 0*) and false alarms (*false alarm = 1, any other decision = 0*) were assessed as outcome variables in separate models so that the Match Presence factor could be removed from the analysis. In both models, the effect of Context Presence (hits: $B = 0.099$, $p = 0.767$, false alarms: $B = 0.054$, $p = 0.897$), Ambiguity Level (hits: $B = -0.727$, $p = 0.519$; false alarms: $B = -0.293$, $p = 0.767$), and the interaction (hits: $B = -0.076$, $p = 0.862$, false alarms: $B = 0.916$, $p = 0.117$) did not reach significance. This was not surprising, because contextual bias effects were expected to be strongest for more ambiguous materials and for false alarms, which is only a small subset of these data. Therefore, the data were split into two subsets—people who received the less ambiguous materials, and people who received the more ambiguous materials.

Separate analyses of more and less ambiguous materials. When the data from the participants who received the less ambiguous materials were examined separately, there was no effect of context on hits ($B = 0.666$, $p = 0.355$), or false alarms ($B = 0.577$, $p = 0.531$). So, as predicted, I concluded that there is no evidence of contextual bias in the data from those who received the less ambiguous materials. Next, the data from participants who received the more ambiguous fingerprint materials were analyzed. Again, hits and false alarms were

assessed separately as outcome variable. As expected based on the proportions observed in Table 5, there was no significant effect of context on hits ($B = 0.032$, $p = 0.916$). However, there was a significant effect of context on false alarms ($B = 0.769$, $p = 0.018$)[2]. Refer to Table 10 for a summary of these results.

Conclusion. There was evidence of contextual bias in these data, but the effect of contextual bias only occurred under very specific circumstances—the circumstances that were predicted to be the most conducive to a contextual bias effect based on previous literature. When materials were very ambiguous, and there was no actual match present, contextual information influenced the number of match decisions in the standard procedure for forensic examination. In other words, when people received incriminating contextual information, there were significantly more incorrect match decisions (42% match decisions) made compared with when participants received no contextual information (25% incorrect match decisions). There was a striking 17% difference due to the presence of contextual information, which was statistically significant. Refer to Tables 4 and 5 for a summary of proportions of participants who made each type of decision separated by procedure, ambiguity, and context conditions.

Was There a Contextual Bias Effect in the Filler-Control Procedure?

Having established the conditions under which contextual bias occurs in the standard procedure, the next hypothesis to address was that the filler-control procedure would moderate the contextual bias effect seen in the standard procedure. That is, it was anticipated that there would be a smaller difference or no difference in affirmative "match" decisions when there was context present versus context absent in the filler-control procedure. If there

[2] 1% of the variation in "suspect choosing" is explained by the predictors and interactions (Marginal R^2 = 0.008) and 82% of the variation in "suspect choosing" is explained by all predictors in the model, including higher-level grouping variables (Conditional R^2 = 0.816). Goodness of Fit: χ^2 (8) =3.052, p=.931 (good fit).

was no significant main effect of context on "suspect choosing" decisions (hits and false alarms), this hypothesis would be supported by these data.

All filler-control procedure data. As for the analysis in the previous section, a model was run with "suspect choosing" as the outcome variable with only the data obtained from participant who received the filler-control procedure. All possible interactions between Match Presence, Context Presence, and Ambiguity Level were included, as well as Context Type as a control variable. Fingerprint Set and Participant were included as higher-level grouping variables. The full model failed to converge, and there were no significant interactions[3]. When, hits and false alarms were examined separately, there were no significant effects (Context Presence, Ambiguity Level, and the two-way interaction). However, because the contextual bias effects were only found under very specific conditions in the standard procedure, the data were split into less and more ambiguous subsets to confirm there was no evidence of contextual bias.

Separate analyses of more and less ambiguous materials. As anticipated, there were no significant effects of Context Presence for hit rates (B = 0.339, p = 0.748), or false alarm rates (B = -0.163, p = 0.721) when the materials were less ambiguous. Therefore, contextual bias did not appear to have an impact on less ambiguous materials, whether or not the standard procedure or an evidence lineup was used. But any contextual bias effects in the filler-control procedure were most likely to be found under circumstances where the evidence lineup decision is ambiguous, as was found in the standard procedure. The more ambiguous materials were analyzed next to see whether there was any evidence of contextual bias. Was there any evidence of an effect of context presence? Was the effect of context presence

[3] 26% of the variation in "suspect choosing" is explained by the predictors and interactions (Marginal R^2 = 0.258) and 43% of the variation in "suspect choosing" is explained by all predictors in the model, including higher-level grouping variables (Conditional R^2 = 0.426). Goodness of Fit: χ^2 (8) = 11.52, p=0.174 (good fit).

reduced compared to the same conditions in the standard procedure? When the model was run, there was no significant effect of context on hits (B = -0.221, p = 0.486) or false alarms (B = 0.140, p = 0.753) when the fingerprint materials were very ambiguous**.**

Conclusion. There was no evidence of contextual bias in the filler-control procedure. The hypothesis that evidence lineups would reduce the influence of contextual information on affirmative "match" decisions was supported. In fact, the contextual bias affect appeared to be totally eliminated for false alarms (10% false alarm rate for both context present and context absent conditions), and hits actually appeared to *reduce* in the context condition compared with the no context condition (40% versus 47% respectively; refer to Table 5).

Does the Filler-Control Procedure Decrease "False Alarms" Compared with the Standard Procedure?

Some of the analyses have already indicated that the filler-control procedure reduces the number of "false alarms" that occur, for example the filler-control procedure eliminated the boost in false alarms that occurred in the presence of incriminating contextual information. The observed proportions, found in Tables 4 and 5, also show that the filler-control procedure seems to consistently reduce the average false alarm rate to approximately 8 to 10%, regardless of ambiguity of the materials and whether context is present. False alarm rates in the standard procedure are consistently higher in these data—an average of 33.5% of the time, which is 23.5% higher than that highest false alarm rate in the filler-control procedure. So, the following analyses examined the significance of this observed difference.

First, a model was run with false alarms as the outcome variable (*false alarm = 1, any other decision = 0*) and all possible interactions between Context Presence, Ambiguity Level,

and Procedure Type, and with data from both procedure types. The model failed to converge, so the model was reduced to only the main effects. In this final, reduced model, there was only one significant effect: Procedure Type (B = -1.905, p = 0.011)[4]. That is, the standard procedure resulted in significantly more false alarms overall (M = 33.5%) than did the fill-control procedure (M = 9.25%), as was hypothesized. None of the other variables in the model (Ambiguity Level, or Context Presence) had a significant effect false alarms overall. Refer to Table 11 for a summary of these results.

Does the Filler-control Procedure Reduce the Number of Correct Match Decisions Compared with the Standard Procedure?

I expected that the filler-control method might also result in a reduction in correct match decisions (hits) because this is the typical pattern observed in lineups when they are compared to showups. Specifically, in eyewitness identification research showups result in more innocent suspect identifications, but also more correct identifications, when compared with lineups (Steblay, Dysart, Fulero, & Lindsay, 2003). Did this pattern also hold in the current experiment? The full model run on "suspect choosing" could have helped to address this question, but it failed to converge. Therefore, a multilevel model was run with hits *(hit = 1, any other decision = 0)* as the outcome variable, and data from both procedure types included in the model. Procedure Type, Context Presence, and Ambiguity Level were included as predictors and Fingerprint Set and Participant were, again, included as a higher-level grouping variables. However, none of the predictors resulted in significant effects. In particular, there was no evidence of a significant difference in hits based on procedure type

[4] 8% of the variation in "false alarms" is explained by the predictors and interactions (Marginal R^2 = 0.081) and 71% of the variation in "false alarms" is explained by all predictors in the model, including higher-level grouping variables (Conditional R^2 = 0.713). Goodness of Fit: χ^2 (8) = 19.203, p=0.014.

(B = -0.990, p = 0.392), even when interactions and the control variable were excluded. Refer to Table 11 for a summary of these results.

Even though the multilevel analysis did not show a significant difference in hit rates, the observed proportions clearly show that the hit rate is reduced in the filler-control procedure. In the filler-control procedure there was a mean percentage of 44.5% of participants correctly matching the suspect print to the crime print, which was significantly fewer than the 65% of participants correctly matching the suspect print to the crime print in the standard procedure (20.5% decrease overall; %; χ^2 = 39.98, p<0.001, 95% CI [14.07%, 26.74%]). The presence of context did not change this pattern, but the ambiguity of materials had a small impact. The more ambiguous materials resulted in 15.5% fewer correct match decisions for the filler-control procedure (filler-control: 43.5%; standard: 59%; χ^2 = 11.61, p=0.001, 95% CI [6.32%, 24.41%]) compared with the 26% decrease observed in the less ambiguous materials (filler-control: 46%; standard: 72%; χ^2 = 32.37, p<0.001, 95% CI [16.80%, 34.79]).

Although these differences were not significant in the multilevel model, there was a drop in correct "matches" when the filler-control procedure was used. However, the observed drop in hits appears to be far less than the drop in false alarms, seen in Tables 4 and 5. The next section will specifically test the tradeoff between a small reduction in hits and a large reduction in false alarms—is the reduction in false alarms proportionately larger than the reduction in hits?

Does the Filler-Control Procedure Result in Better, Applied Outcomes?

The findings presented so far show that the filler-control procedure reduced the number of times people were able to correctly identify the print that is actually a match

("hits"). But, these results also indicated that the filler-control procedure vastly reduced the number of incorrect match decisions on an innocent suspect's print ("false alarms"). However, the question remains—does the reduction in false alarms in the filler-control procedure outweigh any loss of hits that also results? Forensic policy makers do not want to reduce examiner's chances of identifying a true match, but a slight reduction in hits might be justifiable if the reduction in false alarms is large enough, as false alarms contribute to wrongful conviction (equivalent to innocent suspect identifications in eyewitness literature). The observed reduction in false alarms was much larger than the reduction in hits, particularly in the more ambiguous condition—there was a 15.5% reduction in hits compared with a 23.5% reduction in false alarms overall. As mentioned previously, this difference was even more pronounced when contextual information effects are considered. When context was present, false alarms were reduced by 32% when the filler-control procedure was used, compared with a 15% reduction in false alarms when context was not present.

Use of signal detection theory measures. One way to look at data where there is a proportion of correct affirmative decisions, and a proportion of incorrect affirmative decisions is Signal Detection Theory using a measure called d'. There was both a decrease in incorrect match decisions ("false alarms") and correct match decisions ("hits") in the filler-control procedure. So, the filler-control method reduced the number of incorrect matches made, but also reduced the correct matches people made. This is similar to the patterns observed in showups and lineups (Steblay et al., 2003). Situations in which a manipulation produces the same directional change in both hits and false alarms (i.e., both increase or both decrease) can be analyzed using d'.

Whereas *d′* is generally used as a measure of psychological discriminability, it is not presumed to be a measure of psychological discriminability when it is used on lineup data (see Wells, Smalarz, & Smith, 2015; Wells, Smith, & Smalarz, 2015). The reason that *d′* is not a measure of memory discriminability for lineup data is because it ignores a large share of false positive responses (on fillers), thereby violating assumptions of Signal Detection Theory. However, as an applied measure of performance, it has been argued that a *d′* analysis on suspect identifications in lineups is a reasonable way to assess whether the trade-off in reduced identifications of the culprit is compensated by the reduction in mistaken identifications of innocent suspects (see Mickes, et al., 2014). See Table 8 for the *d′* values for each condition, separated by ambiguity, procedure, and context conditions. Higher *d′* values indicate that the number of innocent suspect picks is low relative to the number of correct match decisions, and lower *d′* value indicate that the number of innocent suspect picks is high when compared with the number of correct matches. So, when thinking about the trade-off between hits and false alarms, the better procedure should yield a higher *d′* value.

Analyses using *d′* values. For the ambiguous materials, the lowest *d′* value was obtained in the context-present condition with the standard procedure ($d' = 0.691$), followed by the context-absent condition with the standard procedure ($d' = 0.939$). However, the filler-control method obtained higher *d′* values than both of the standard procedure conditions, regardless of the context presence manipulation (context: $d' = 1.156$; no context: $d' = 1.190$). Table 8 shows that the less ambiguous materials achieved higher average *d′* in each condition than the more ambiguous materials too, as expected. But in all conditions, the filler-control method proved to be superior, even over and above simply removing contextual information

from the procedure. An analysis with *d′* was run with the full dataset, to examine whether there was a three-way interaction between Ambiguity Level, Procedure Type, and Context Presence on *d′* values. A three-way ANOVA was used to analyze these data (refer to Table 13 for a summary of all *d′* inferential analyses). There was no significant three-way interaction ($F(1, 229) = 0.659$, $p = 0.418$), but there was an interaction between Ambiguity Level and Procedure Type ($F(1, 229) = 16.447$, $p < .001$). So, the filler-control procedure had the most benefit when the materials were ambiguous.

To confirm, a two-way ANOVA with context and procedure as factors was used to determine whether the *d′* values for participants who received more ambiguous materials only were significantly different from one another. The interaction between context and procedure had a nonsignificant effect on *d′*values ($F(1, 115) = 1.437$, $p = 0.233$). There was also no main effect of context, suggesting that shielding people from contextual information had no significant impact on *d′* or improving the ratio of incorrect and correct match decisions ($F(1, 115) = 2.310$, $p = 0.131$). But there was a main effect of procedure, indicating that the filler-control procedure significantly improved *d′* ($F(1, 115) = 34.661$, $p < 0.001$). These data suggest that shielding examiners from contextual information as much as possible would not be as effective as evidence lineups at maximizing the trade-off between incorrect and correct match decisions in a forensic context (Dror et al., 2015; Saks et al., 2003; Wells, Wilford, & Smalarz, 2013).

Is the Increase in *d′* from the Filler-Control Procedure due to Differential Filler Siphoning?

In the eyewitness identification literature, the reduction in innocent suspect identifications that is observed when a lineup is used comes as a result of filler siphoning

(Wells, Smalarz, & Smith, 2015; Wells, Smith, & Smalarz, 2015). In other words, good fillers effectively draw (siphon) false positives, or "choosing", away from an innocent suspect. These same fillers, however, draw fewer choices away from the culprit because the culprit (having been the source of the witnesses' memories) tends to be the best choice. But when the actual culprit is not in the lineup, then all of the options in the lineup are equally plausible with regard to matching the eyewitnesses' memory. Hence, these fillers tend to strongly compete with the innocent suspect for choices by the eyewitness.

The filler-control method was anticipated to mirror the patterns seen in eyewitness lineups and show differential filler siphoning effects. Previous analyses reported in the current paper showed that the filler-control method (compared to the standard method) decreased false match decisions on the innocent suspect prints. But, there are two possible ways that the presence of fillers can decrease false match decisions on the innocent suspect samples. First, the presence of fillers might have increased correct rejections. Alternatively, the presence of fillers might have spread the false match decisions to false match decisions the fillers (filler siphoning). The previous analyses on incorrect match decisions on the innocent suspect sample did not tell us which of these occurred. This same question can be asked about the reduction in correct match decisions in the filler-control procedure versus the standard procedure. Was this reduction the result of filler siphoning or was this reduction the result of an increase in incorrect rejections?

Analysis of all "choosing". If filler siphoning was underlying reason for the reduction in incorrect match decisions observed in the filler-control procedure, then there should be no increase in the number of "no match" decisions ("correct rejections") as a function of the introduction of fillers. Likewise, if filler siphoning was underlying reason for

the reduction in correct match decisions observed in the filler-control procedure, then there should be no increase in the number of "no match" decisions ("misses") as a function of the introduction of fillers. A full model was run with "choosing" (*match decision = 1, no match decision = 2*) as the outcome variable. This was different from the full model analysis run on "suspect choosing" as now occasions where people said match, but selected a filler, are coded as "match" decisions. Match Presence, Procedure Type, Context Presence, and Ambiguity Level were included as predictors, but the model failed to converge. The model was reduced to include only the interactions that were approaching significance (Match Presence by Procedure Type, and Context Presence and Ambiguity Level). This model did converge, and the results revealed a significant Match Presence by Procedure Type interaction (B = -0.801, p = 0.041; Table 11)[5].

The nature of this interaction can be seen by looking at the proportions reported in Table 4—in the filler-control procedure, people said that there was a "match" to the crime print significantly more often than people in the standard procedure. Furthermore, this difference in the number of "match" decisions between procedures was more pronounced when there was no match present. But, what is most interesting is that this increase in "match" decisions in the filler-control procedure did not result in more incorrect match decisions (false alarms), or more correct match decisions (hits). In fact, the analyses presented earlier in this paper show that hits and false alarms were reduced in the filler-control procedure, even though the current analyses show that choosing is boosted overall in the filler-control procedure. But were these decreases in hits and false alarms are due to filler siphoning? People who would have chosen the culprit or innocent suspect print if they had

[5] 11% of the variation in "choosing" is explained by the predictors and interactions (Marginal R^2 = 0.105) and 25% of the variation in "choosing" is explained by all predictors in the model, including higher-level grouping variables (Conditional R^2 = 0.251). Goodness of Fit: χ^2 (8) = 428.14, p<.001.

received the standard procedure must be either "backing off" now that they need to choose the match from a lineup of fingerprints. Alternatively, people in the filler-control procedure may be still choosing to say there was a match, but now incorrectly selecting filler print samples. Specifically, I needed to show if people were making fewer hits and false alarms because they were now "missing" true matches, or "correctly rejecting" match absent trials more often, or they were selecting filler print samples that because they thought the fillers were a true "match" to the crime print instead.

Separate analyses of "miss" and "correct rejection" rates. To address this question, the "miss" rates and the "correct rejection" rates were assessed between procedures in two separate models. Initially for both, full models were run with all possible interactions between Procedure Type, Context Presence, and Ambiguity, and Context Type as a control variable. The two higher-level grouping variables were included (Fingerprint Set and Participant). Neither of these converged, so the interactions and control variables were excluded. The final models (refer to Table 11) had no significant predictors, and showed that there was no significant effect of Procedure Type, and therefore no difference between the standard and filler-control procedure for either "misses" (B = -0.203, p = 0.791[6]) or "correct rejections" (B = -0.222, p = 0.828[7]), suggesting that people incorrectly chose a "no match" decision equally often in both procedures. This was the same pattern has been consistently observed when comparing eyewitness lineups and showups. These results indicated that the

[6] 0.3% of the variation in "misses" is explained by the predictors and interactions (Marginal R^2 = 0.003) and 69% of the variation in "misses" is explained by all predictors in the model, including higher-level grouping variables (Conditional R^2 = 0.691). Goodness of Fit: χ^2 (8) = 19.413, p=0.013.

[7] 0.2% of the variation in "correct rejections" is explained by the predictors and interactions (Marginal R^2 = 0.002) and 85% of the variation in "correct rejections" is explained by all predictors in the model, including higher-level grouping variables (Conditional R^2 = 0.846). Goodness of Fit: χ^2 (8) = 30.041, p<.001.

decrease in incorrect and correct match decisions (hits and false alarms) observed here was due to filler siphoning, not an increase in "no match" decisions.

Are the Contextual Bias Effects and the Effect of the Filler-Control Procedure Reflected in the Confidence Measures?

It was expected that the confidence measures would show that the filler-control method and more ambiguous materials would decrease confidence overall. The reasoning behind this hypothesis was that lineups and ambiguity makes it more difficult to determine the correct answer, and therefore should lower confidence in decisions. In addition, it was anticipated that contextual information congruent with a person's decision (i.e., when the contextual information suggested the prints should match and the participant chose match), the contextual information should act as additional evidence in favor of their decision and boost their confidence. A full multilevel model was run initially with the data nested within Fingerprint Set and Participant (Level 2 grouping variables), allowing the variation in confidence that was due to fingerprint materials, and participants' unique biases. Context Presence, Ambiguity Level, Procedure Type, and Match Presence were added as predictors, and Context Type as a control variable. Participants' subjective confidence in their decision was the outcome variable.

The model was first run with all possible interactions. No interaction terms were significant, but there was a significant effect of Ambiguity Level (B =-1.457, p = 0.002), and Procedure Type (B =-0.913, p = 0.050) was approaching significance. In addition, unlike in the binary models in the rest of the analyses, there was a significant effect of some Context Types so this control variable would be retained in future models. To help reduce the model, the "step" program in the LMER package in R was used to retrieve the best fitting model.

The model with the best fit included Ambiguity Level and Procedure Type as predictors, and no interactions. So, this reduced model was used to examine the confidence levels of participants (refer to Table 12 for a summary of these results)[8].

As hypothesized, the filler-control procedure (B = -0.4681, p=0.031), more ambiguity (B = -0.902, p<.001) resulted in significantly lower average confidence levels overall. The confidence results were largely consistent with our expectations and fit well with the contextual bias results described earlier. The materials that were less clear (more ambiguous) resulted in lower confidence. The more difficult task (filler-control procedure) also led to lower confidence levels. However, there was no consistent increase in confidence in participant's decisions when the contextual information was congruent with the decision being made, indexed by a nonsignificant Context by Match Presence interaction. Refer to Tables 6 and 7 for summaries of the confidence levels for the decisions.

[8] 6% of the variation in confidence is explained by the predictors and interactions (Marginal R^2 = 0.121) and 44% of the variation in confidence is explained by all predictors in the model, including higher-level grouping variables (Conditional R^2 = 0.259).

CHAPTER 4. DISCUSSION

Consistent with previous literature, these data demonstrate that the standard forensic examination procedures can lead to contextual bias effects when the samples are ambiguous. Using the standard procedure with the more ambiguous fingerprint materials, people who received information suggesting the suspect is guilty made more incorrect match decisions on the innocent suspect sample compared with people who received no contextual information (25% versus 42%). These results are consistent with previous literature showing contextual bias effects in fingerprint analysis (Dror et al., 2005; Dror et al., 2006; Obsorne & Zajac, 2015) and add weight to the National Academy of Science's concerns regarding forensic examination procedures (National Academy of Science, 2009).

In addition, this paper breaks new ground. The research community and the National Academy of Science (2009) have been calling for a solution to the effect of contextual bias in forensic judgments. Previous literature has typically suggested shielding examiners from contextual information (Saks et al., 2003), but Wells, Wilford, and Smalarz (2013) argued that this was insufficient—examiners can never be completely shielded from contextual information because even a single sample presented alone suggests that there is evidence to indicate that this sample is from the true culprit. Instead, Wells and colleagues (2013) asked whether contextual bias could be reduced or eliminated in a forensic context with an evidence lineup procedure. The current experiment suggests that the answer is yes. When people received evidence lineups rather than the standard procedure, people matched the crime print to the innocent suspect print 10% of the time on average, whether they received contextual information or not. So, there was a 32% reduction in people matching the crime print to the innocent suspect when people received an evidence lineup as well as contextual

information compared with the standard procedure with no lineup (42% versus 10%). These data also indicate that evidence lineups offer a benefit not only when contextual information is present, but also outperform the standard procedure even in the absence of additional contextual information. Without contextual information, there was a 15% reduction in people incorrectly matching the crime print to innocent suspect prints in the filler-control procedure compared with the standard procedure (25% versus 10%).

Furthermore, these results showed identical patterns to those described in the eyewitness literature. Generally, showups are characterized by higher innocent suspect identifications, but lower choosing rates than lineups. Eyewitness lineups result in higher choosing rates than showups, but also lower innocent suspect identification rates (Steblay et al, 2003). In the current study, there was a higher rate of affirmative match decisions in the filler-control procedure (72% in match present, and 58% in match absent trials) compared with the standard procedure (65% in match present, and 33.5% in match absent). But in match-absent filler-control trials, the majority of these match decisions were filler picks (48.5% of the time people selected a filler; see Table 2). Therefore, only 9.5% of the time people selected the innocent suspect in the filler-control procedure compared with 33.5% of the time in the standard procedure. This result can be attributed to the eyewitness identification filler siphoning mechanism—when no actual match is present, good fillers can spread a large share of false positive errors out to the fillers (Wells, Smalarz, & Smith, 2015; Wells, Smith, & Smalarz, 2015). But there is a trade-off—the innocent suspect is more protected in a lineup, yet there is also a loss in culprit identifications. As is found in eyewitness literature, people selected fillers in match-present trials too (27.5% of the time), but the observed reduction in hits is smaller than the magnitude of the benefit to the innocent

suspect, making lineups the better choice (see Wells, 1993 for a summary of the eyewitness literature). Accordingly, there is a benefit of evidence lineups over evidence showups in a forensic examination context, just as has been observed in an eyewitness context. Future research on evidence lineups can draw on the theory and methods in the eyewitness literature to move forward and further explain and develop these findings.

In addition, the patterns in the confidence judgments were consistent with my hypotheses, the underlying theoretical framework of this project, and the other results obtained in this study. People were less confident when the materials were more ambiguous, indicating that they found the task more difficult, in line with the increase in incorrect decisions when the materials were more ambiguous. It also makes theoretical sense that contextual bias effects were found in the trials with ambiguous materials only. When the information in a bottom-up process is ambiguous and seems to not provide a clear answer, people look for other information to help them, such as contextual information, which will influence decisions via top-down processing (Tversky & Kahneman, 1974; Saks et al., 2003). People tended to have lower confidence when they use the filler-control procedure, indicating that this task maybe also felt more difficult or made people less sure of their selection because there were other, plausible options. In fact, the lower confidence is probably due to a combination of these factors, given the high number of people deciding that a filler was a plausible match.

But what is the mechanism by which fingerprint lineups reduce the impact of contextual information on decision-making? When faced with a single sample, the question is whether or not someone is sure that this print resembles the crime print enough to say they came from the same person's finger. When contextual information is available that suggests

that a match is likely, people start with an expectation that the prints are likely to match and search for evidence of this. This is a different starting point to someone who begins with no information to help the decision-maker assess likelihood of guilt—the search for confirming and disconfirming evidence is unbalanced and therefore more likely to fall in favor of his or her expectation.

However, as suggested by Wells, Wilford, and Smalarz (2013), even presenting a single sample suggests that there is reason to believe this person committed the crime. So, whereas I found evidence in this study that the additional information contained in the police case report increased innocent suspect match decisions when the task was more difficult, this does not mean that there was not some contextual bias occurring with the standard procedure in the condition where participants received no contextual information. These data can speak to the effect of the additional contextual information and how it increased the likelihood of an incorrect match decision when the suspect sample was presented alone. Specifically, because the evidence lineups reduced innocent suspect match decisions even when comparing the procedures that were absent of contextual information, it is possible that even the single sample presentation was having a small contextual bias effect in the standard procedure that was removed with the presence of additional filler samples.

How did the evidence lineups eliminate the contextual bias effect? When faced with six plausible samples, one of which may be a match, the decision is now more difficult. Is there one that looks more like it matches than the others? If so, then the decision is whether that sample is actually a match or just very similar? In addition, people know that if they do not do a proper bottom-up analysis there is a five out of six chance that they will pick a filler, and they will be incorrect. Even when provided with information suggesting that the suspect

sample should match the crimple sample, they still need to be able to pick out which one is the suspect. In the evidence lineups, unless the person can perform the *bottom-up processing task* of identifying the print that matches the crime print, the addition information cannot assist them in their decision via *top-down processing*. Importantly, the filler-control procedure is not only a test of the suspect's guilty, it is also a test of examiners' abilities to perform the task they are trained to do. The task can be failed if the examiner picks a filler, feedback that they would get very soon after performing the examination. If an examiner cannot perform the fingerprint-matching task proficiently, then they will begin to accumulate a high rate of filler picks during the course of their work.

To illustrate, let's return to the example of Lana Canen again, introduced at the beginning of this paper. If Lana Canen's print had been embedded in a lineup of six fingerprints, the examiner would have needed to pick out her fingerprint before he could use the other information he had concerning another man's confession, which implicated her in the crime. As such, if the filler-control procedure had been used in Lana Canan's case, the examiner would have had a five out of six chance of picking a known-innocent filler rather than picking Lana's prints. Furthermore, the examiner would have known that picking a filler was a possibility, which might have pushed the examiner into a more conservative decision-making style and diluted the effect of contextual information. Because her prints did not actually match the prints at the crime scene, our data suggest that a procedure where her print was presented alone for comparison put her in the most danger of being matched to the crime print, especially if other contextual information was available. But, if her print had been examined in a fingerprint lineup, that had good fillers, her prints would have had no more of a chance of being selected as a match than would the prints of a filler. If one extrapolated

from the current data, the chance of Lana's prints being picked out as matching the crime print would have been 32% lower in the filler-control procedure (10% innocent suspect match decisions in the filler-control procedure compared with 42% in the standard procedure). So, the filler-control procedure might have revealed that the examiner was biased in this case. Other reasons that an examiner might pick a filler are that they cannot adequately perform the bottom-up task, or are lying about their fingerprint analysis abilities. Lana Canen may have avoided 8 years in prison if the filler-control procedure had been used.

The obvious application for this research is to move this procedure to the field to help prevent wrongful convictions, uncover fraudulent or incompetent examiners, and improve the quality and independence of forensic evidence in court. It may be that this procedure need not be utilized in every case, but it should certainly be used whenever a second opinion is required, especially where the previous examiners decision is known, or for high-profile cases where contextual information is readily available. In addition, if a police investigator wishes to provide the examiner with additional information about the case besides the samples themselves, then a filler-control procedure should be used to ensure that this extra information does not impact the decision. Finally, this procedure could be used as a way to calibrate individual examiners and score the reputation of laboratories. The filler-control procedure allows examiners to receive feedback about their performance in real cases, which is useful and currently not available. If an examiner makes in incorrect affirmative determination, this error might never be discovered or not discovered until many years later if the innocent suspect is exonerated. And, as Wells et al. (2013) noted, the frequency with which analysts select fillers in real cases can inform the legal system about the competencies of individual examiners and the reliability of various techniques based on actual cases

submitted to analysis. As such, the filler-control method can provide the legal system with the ability to calculate error rates for examiners and their laboratories using the actual cases that are submitted to their labs. Therefore, not only can we identify examiners performing poorly, but we can also establish a general error rate in fingerprint examination based on the actual cases that they are routinely analyzing.

There are likely to be practical difficulties involved in creating evidence lineups for real cases. The selection of fillers would take time and man hours, and there would need to be a clear selection strategy in place to ensure that each evidence lineup is fair. Evidence lineups would need to be created in a timely fashion to ensure they do not exacerbate the backlog that is already an issue in many forensic laboratories. So, before these findings can be applied in the real world, they need to be tested further and policy-related questions would need to be answered. Who will create the evidence lineups? How will they be created and verified as fair? How will this additional task be funded? What forensic materials benefit most from evidence lineups and under what situations is it most beneficial to use the filler-control procedure? For example, fiber analysis is a good example of a evidence material that could benefit from the filler-control procedure—if an examiner cannot say with certainly that one fiber in the lineup is the same as the fibers associated with a crime, then the examiner cannot testify that these fibers are incriminating evidence, but they may corroborate other evidence in the case.

It may be that evidence lineups are not appropriate for routine cases that come through a laboratory. But maybe verification evaluations should use evidence lineups to weed out incompetent or dishonest examiners, and add another level of protection to the innocent suspect. In addition, it would be valuable to require the filler-control procedure to

be used for any new forensic techniques. Police investigators are frequently looking for new kinds of evidence to present to help secure convictions, so new techniques emerge fairly regularly, for example, matching the wear on a pair of jeans to a pair of jeans belonging to the suspect. Until examiners for these techniques have demonstrated that they can reliably discriminate between fillers and the suspect sample with these new techniques, the filler-control procedure should be required in all cases.

It is important to note, also, that our participants were not fingerprint examination experts. Whereas studies have shown that laypersons and novice examiners are able to distinguish between matching and non-matching prints (Tangen, Thompson, & McCarthy, 2011; Vokey, Tangen & Cole, 2009), experts show different patterns to novices and laypersons. Experts consistently outperform novice examiners, particularly in situations where the two fingerprints to be analyzed do not match, but are extremely similar (Experts were correct 99.32% of the time and novices only 44.82% of the time). However, when the prints do match, or when the prints do not match and are very dissimilar, experts typically achieve more than 90% accuracy, and novices between 70 and 80% accuracy (Tangen, Thompson, & McCarthy, 2011). Experts do not achieve perfect accuracy, but their error rate is much lower than novices. The other significant difference between experts and novices is that experts tend to make conservative errors more often, rather than the kinds of errors that could lead to wrongful convictions. So, these data suggest that if the current study was run with an expert population, the contextual bias effects may be slightly smaller, and the error rates in the standard procedure not so high if experts tended to be conservative in their evaluations. But, experts will still make these kinds of errors that endanger innocent suspect on rare occasions. However, to this day, there has never been a systematic test to obtain an

actual measure of the error rate in the field for fingerprint examiners, so whether these patterns translate to the field remains to be seen (Busey & Parada, 2010; Cole, 2005). In addition, some studies suggest that the technology available to experts now results in an increased susceptibility to bias and error in real world cases, such as the use of the large AFIS database that is used to find highly similar prints for later examination by forensic experts (Dror & Mnookin, 2010; Marcon, 2009). By its very design, AFIS creates very ambiguous comparisons for experts to inspect, the circumstances under which contextual bias was found in the current study. Although experts tend towards more conservative errors and have a smaller error rate, they are not immune to contextual bias effects (Dror et al., 2006), so it is anticipated that the filler-control procedure would be beneficial for experts too and would still improve their already superior performance.

Because this finding is novel, the effects should be replicated with fingerprints, as well as other forensic materials to determine how generalizable the evidence lineups solution is. In addition, we should see if other forms of contextual information produce contextual bias in a similar way too. Currently, my laboratory is investigating how having knowledge of another person's determination about the same set of fingerprints can influence people's own match decision. This procedure can be likened to an examiner who knows what another examiner concluded. If knowing what another person thought was correct impacts people's decisions, then there should be significantly more decisions that are consistent with the previous person's evaluation. For example, if a participant has information telling them that the previous participant determined that the prints matched, then this would create an expectation that the prints will match and they should be biased to also find a match. People should also make consistent decisions when they believe the previous participant thought the

prints did not match, biasing them to determine no match as well. In addition, we are looking at the influence of exculpatory information on fingerprint decisions, such as a DNA mismatch, or a solid alibi.

Furthermore, in the real world, experts are allowed to conclude that crime samples are not of sufficient quality for them to determine a "*match*" or "*no match*". Therefore, a study should be run where participants are also given the option to say that the prints are "*not suitable for analysis*". Choosing this option would allow a participant, or fingerprint examiner, to forgo making a match decision on the grounds that the prints are too degraded or ambiguous to decide whether the prints came from the same person who left the print at the crime scene. This option may change the pattern of results for lay people, but in the real world there may be too much pressure to make a match decision from the police investigators. Accordingly, the last goal would be to test the filler-control procedure (with and without the "*not suitable for analysis option*") with real examiners too. Once data with experts has been obtaining, it would be possible to determine the situations in which using this procedure would be most efficient.

Although the filler-control procedure may require some additional resources and examiner time, it would be extremely beneficial to the legal system to make use of this to improve forensics. Given that there are some practical drawbacks to constructing and examining a lineup versus a single sample, future research should find the conditions under which contextual bias is most prevalent, and the phases in an investigation when it would be most useful to introduce an evidence lineups, such as a second opinion examination or when there is a lack of other evidence in the case to corroborate the fingerprint examiners conclusion.

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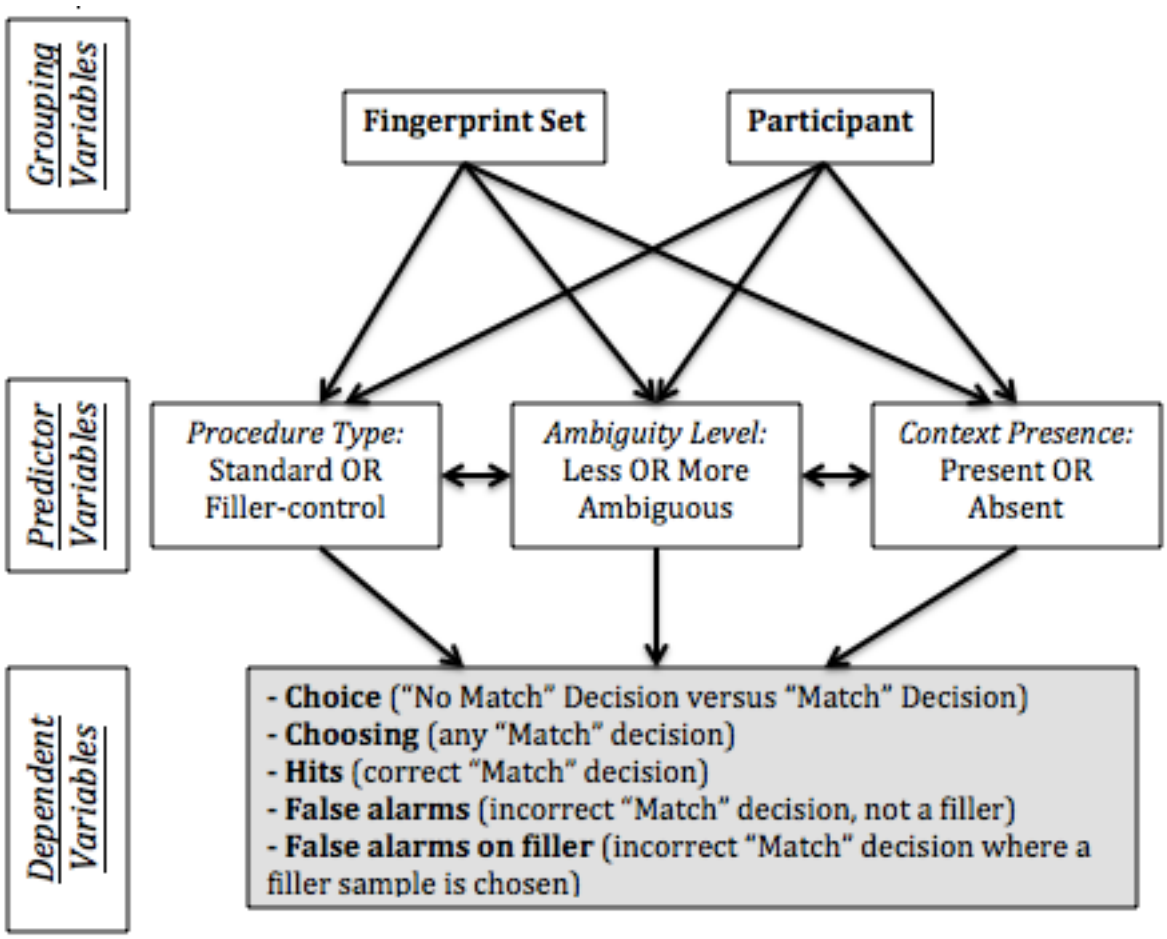


Figure 1. A graphical representation of the multilevel logistic regression models that used binary sample choice variables as the dependent measure, with three predictors, and two higher level grouping variables.

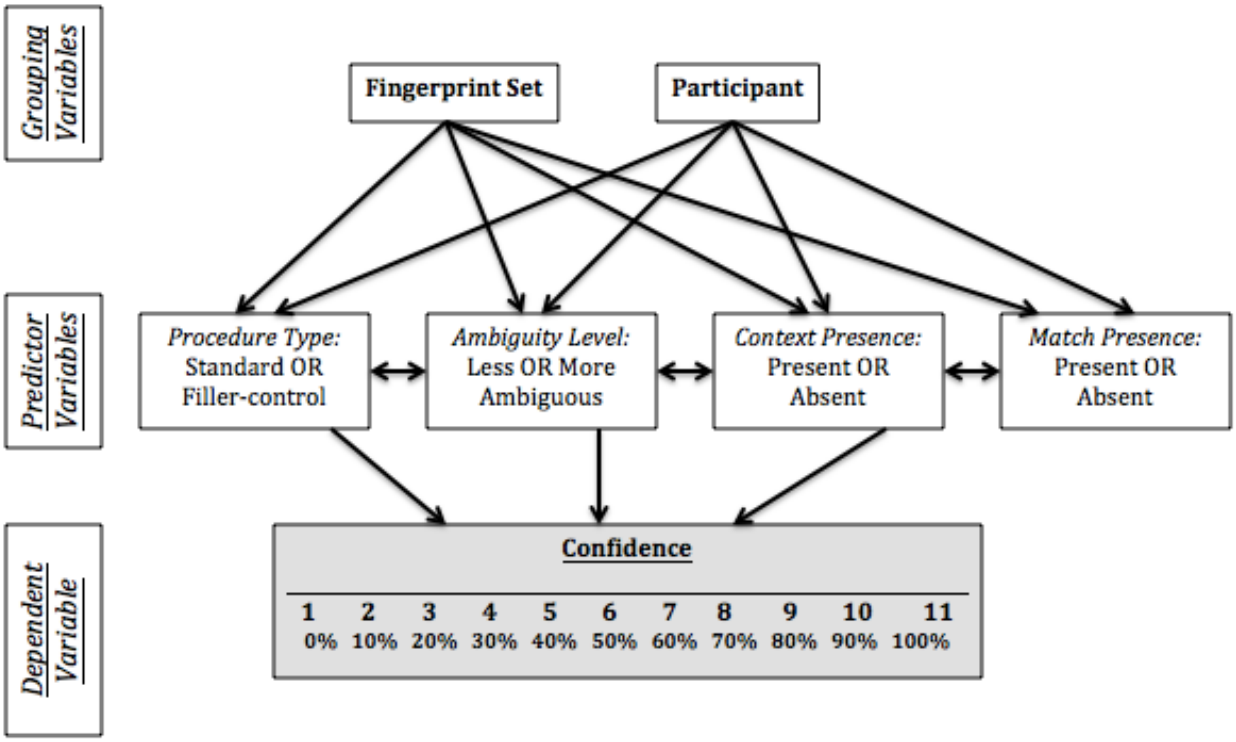


Figure 2. A graphical representation of the multilevel model used in the analyses with participant's confidence in their decisions as the dependent measure.

Table 1. *A table summarizing of the number of participants in each between subjects condition.*

Between Subjects Group	Number of Participants
Less Ambiguous Materials	116
More Ambiguous Materials	119
Standard Procedure *without* Context	57
Standard Procedure *with* Context	53
Filler-control Procedure *without* Context	61
Filler-control Procedure *with* Context	64

Table 2. *Summary of the mean proportion of people in each between-subjects condition who selected match (suspect or filler) or no match, and the mean confidence for each decision in the pilot data.*

Ambiguity	Actual match	Selected correct print or innocent suspect		Selected a filler		Selected no match	
		Proportion	Confidence	Proportion	Confidence	Proportion	Confidence
Less ambiguous materials	Match	0.50	74%	0.29	65%	0.21	70%
	No Match	0.15	71%	0.54	65%	0.31	70%
More ambiguous materials	Match	0.44	65%	0.25	59%	0.31	60%
	No Match	0.10	66%	0.56	61%	0.34	62%

Notes. Proportion refers to the number of people in that condition who selected that sample, e.g. the innocent suspect when there was no match, for the correct print when there was a match. Confidence refers to the average confidence level for that choice e.g. people who were in the condition with less ambiguous materials and correctly identified the print that matched the crime print were 74% confident in their decision on average.

Table 3. *A summary of the terminology for the dependent measures in the logistic multilevel regression analyses.*

Procedure	Match Presence	Match decision – "Choosing"		No match decision
		Suspect sample	Filler sample	
Standard	Match	"Hit"	-	"Miss"
	No Match	"False Alarm"	-	"Correct Rejection"
Filler-Control	Match	"Hit"	"False alarm on a filler sample"	"Miss"
	No Match	"False alarm"	"False alarm on a filler sample"	"Correct Rejection"

Table 4. *Summary of the mean proportion of people in each between-subjects condition who selected match or no match.*

Procedure	Context present or absent	Actual match	Selected true match or innocent suspect	Selected filler	Selected no match
Standard	No Context	Match	0.65	-	0.35
		No Match	0.29	-	0.71
	Context	Match	0.65	-	0.35
		No Match	0.38	-	0.62
Filler Control	No Context	Match	0.45	0.25	0.30
		No Match	0.10	0.48	0.42
	Context	Match	0.44	0.30	0.26
		No Match	0.09	0.49	0.42

Notes. Proportion refers to the number of people in that condition who selected that sample, e.g. the innocent suspect when there was no match, for the correct print when there was a match.

Table 5. *Summary of the mean proportion of people in each between-subjects condition who selected match or no match, separated by ambiguity condition.*

	Ambiguity condition	Context present or absent	Actual match	Selected true match or innocent suspect	Selected filler	Selected no match
Standard Procedure	Less ambiguous materials	No Context	Match	0.72	-	0.28
			No Match	0.34	-	0.66
		Context	Match	0.72	-	0.26
			No Match	0.34	-	0.66
	More ambiguous materials	No Context	Match	0.59	-	0.41
			No Match	0.25	-	0.75
		Context	Match	0.59	-	0.41
			No Match	0.42	-	0.58
Filler-Control Procedure	Less ambiguous materials	No Context	Match	0.44	0.22	0.34
			No Match	0.09	0.48	0.43
		Context	Match	0.48	0.31	0.21
			No Match	0.08	0.48	0.44
	More ambiguous materials	No Context	Match	0.47	0.28	0.25
			No Match	0.10	0.48	0.42
		Context	Match	0.40	0.30	0.30
			No Match	0.10	0.50	0.40

Notes. Proportion refers to the number of people in that condition who selected that sample, e.g. the innocent suspect when there was no match, for the correct print when there was a match.

Table 6. *Summary of the mean confidence level of people in each between-subjects condition who selected match or no match, separated by procedure and context presence.*

Procedure	Context present or absent	Actual match	Selected true match or innocent suspect	Selected filler	Selected no match
Standard	No Context	Match	72%	-	62%
		No Match	67%	-	68%
	Context	Match	72%	-	63%
		No Match	67%	-	70%
Filler Control	No Context	Match	74%	60%	63%
		No Match	61%	63%	65%
	Context	Match	69%	64%	63%
		No Match	67%	62%	64%

Notes. Confidence refers to the average confidence level for that choice for that combination of between-subjects factors e.g. people who were in the standard procedure condition with no context, and also correctly identified the print that matched the crime print were 72% confident in their decision on average.

Table 7. *Summary of the mean confidence level of people in each between-subjects condition who selected match or no match, separated by procedure, ambiguity, and context presence.*

	Ambiguity condition	Context present or absent	Actual match	Selected true match or innocent suspect	Selected filler	Selected no match
Standard Procedure	Less ambiguous materials	No Context	Match	78%	-	68%
			No Match	71%	-	78%
		Context	Match	73%	-	66%
			No Match	67%	-	74%
	More ambiguous materials	No Context	Match	64%	-	59%
			No Match	63%	-	61%
		Context	Match	71%	-	61%
			No Match	68%	-	67%
Filler-Control Procedure	Less ambiguous materials	No Context	Match	76%	62%	72%
			No Match	54%	66%	72%
		Context	Match	72%	67%	67%
			No Match	65%	64%	69%
	More ambiguous materials	No Context	Match	71%	54%	51%
			No Match	67%	59%	57%
		Context	Match	64%	61%	61%
			No Match	69%	61%	60%

Notes. Confidence refers to the average confidence level for that choice for that combination of between-subjects factors e.g. people who were in the standard procedure condition with less ambiguous materials, and no context, and also correctly identified the print that matched the crime print were 78% confident in their decision on average.

Table 8. *Table comparing the d′ values in each procedure, with and without context, with all fingerprint materials, and then separated by ambiguity condition.*

Ambiguity Condition	Procedure	Context	*d′*
All materials	Standard	No Context	.939
		Context	.691
	Filler control	No Context	1.156
		Context	1.190
Less ambiguous	Standard	No Context	.995
		Context	.995
	Filler control	No Context	1.190
		Context	1.355
More ambiguous	Standard	No Context	.902
		Context	.420
	Filler control	No Context	1.206
		Context	1.028

Notes. D prime = *d′*. The parameter d′ is not being used as a measure of discriminability, rather it is being used as an indication of how much the innocent suspect is incorrectly identified relative to correct match decisions. So, lower d′ values indicate more danger of incorrect identification of the innocent suspect.

Table 9. *Table showing the intraclass correlation values (ICC) for Fingerprint Set and Participant grouping variables in the current data.*

Outcome variable	ICC—Fingerprint Set		ICC—Participant	
	Mean	95% Confidence Interval	Mean	95% Confidence Interval
Choosing	16%	[0.11, 0.23]	5%	[0.02, 0.08]
Suspect Choosing	26%	[0.20, 0.35]	6%	[0.03, 0.09]
False Alarms	27%	[0.20, 0.36]	4%	[0.11, 0.07]
Misses	23%	[0.17, 0.31]	-	-
Correct Rejections	47%	[0.39, 0.57]	-	-
Confidence	9%	[0.06, 0.14]	39%	[0.34, 0.45]

Notes. All values rounded to 2dp. ICC = intraclass correlation, which is the percentage of variation in the outcome variable attributable to the higher-level grouping variable alone. For example, an ICC of 0.16 or 16% for “choosing” means that 16% of the variation in “choosing” is attributable to the Fingerprint Set grouping variable.

Table 10. *A summary of the multilevel models assessing contextual bias in the data obtained from participants who received the* ***standard procedure*** *and* ***more ambiguous materials****.*

Outcome	Fixed effect	Estimate	*S.E.*	*z* value	*p* value
Hits	Intercept	-4.014	1.945	-2.064	0.039
	Context	0.032	0.301	0.105	0.916
False Alarms	Intercept	-4.088	1.434	-2.851	0.004
	Context Presence	0.769	0.324	2.369	0.018

Notes. All values rounded to 3 dp. *S.E.* = Standard Error of the mean. Level 2 grouping variables: Participant ($N = 234$), and Fingerprint Set ($N = 64$).

Table 11. *A summary of the two level logistic multilevel model results to assess the affects of predictors on each decision type.*

Outcome	Fixed effects	Estimate	S.E.	*z* value	*p* value
Choosing	Intercept	-0.779	0.241	-3.228	0.001
	Match Presence	1.513	0.283	5.352	<.001
	Procedure Type	1.085	0.281	3.856	<.001
	Context Presence	0.182	0.169	1.074	0.282
	Ambiguity Level	-0.102	0.229	-0.446	0.656
	Match x Procedure	-0.801	0.393	-2.040	0.041
	Context x Ambiguity	-0.031	0.239	-0.129	0.897
Hits	Intercept	-2.916	0.982	-2.970	0.003
	Procedure Type	-0.990	1.556	-0.857	0.392
	Context Presence	0.032	0.146	0.219	0.827
	Ambiguity Level	-0.434	0.645	-0.672	0.502
False Alarms	Intercept	-3.330	0.680	-4.895	<.001
	Procedure	-1.889	0.749	-2.521	0.012
	Ambiguity	-0.075	0.307	-0.246	0.806
	Context Presence	-1.179	0.621	-0.289	0.773
	Context x Ambiguity	0.609	0.431	1.412	0.158
Misses	Intercept	-3.352	0.687	-4.881	<.001
	Context Presence	-0.169	0.160	-1.057	0.291
	Ambiguity Level	0.203	0.568	0.357	0.721
	Procedure Type	-0.203	0.768	-0.265	0.791
Correct Rejections	Intercept	-3.372	1.004	-3.358	<.001
	Context Presence	-0.170	0.174	-0.976	0.329
	Ambiguity Level	-0.282	0.576	-0.490	0.624
	Procedure Type	-0.222	1.022	-0.217	0.828

Notes. All values rounded to 3 dp. *S.E.* = Standard Error of the mean. Level 2 grouping variables: Participant ($N = 234$), and Fingerprint Set ($N = 64$). Goodness of fit (misses): χ^2 (8) = 19.413, $p<.0128$. Goodness of fit (correct rejections): χ^2 (8) = 30.041, $p<.001$.

Table 12. *A summary of the two level logistic multilevel model results to what predictors influence the confidence level participants' had in their decisions.*

Fixed effect	Estimate	*S.E.*	*df*	*t* value	*p* value
Intercept	8.093	1.059	241.7	7.642	<.001
Procedure	-0.463	0.217	221.4	-2.135	0.034
Ambiguity	-0.902	0.216	223.1	-4.172	<.001

Notes. All values rounded to 3 dp. *S.E.* = Standard Error of the mean. Context Type as a categorical control variable. Level 2 grouping variables: Participant ($N = 234$), and Fingerprint Set ($N = 64$).

Table 13. *A summary of the three way ANOVA with Context Presence, Ambiguity Level, and Procedure Type as factors with two levels, and d′ as the outcome variable.*

Subset	Parameter	*F* value	*p* value
Full dataset	Context Presence	2.113	.147
	Procedure Type	12.664	<.001
	Ambiguity Level	4.616	0.033
	Context x Procedure	0.545	0.461
	Context x Ambiguity	0.262	0.609
	Procedure x Ambiguity	16.447	<.001
	Three way interaction	0.659	0.418
More Ambiguous Materials only	Context Presence	2.310	0.131
	Procedure Type	34.661	<.001
	Two way interaction	1.437	0.233
Less Ambiguous Materials only	Context Presence	0.379	0.539
	Procedure Type	0.106	0.746
	Two way interaction	0.002	0.962

Notes. All values rounded to 3 dp. Adj. $R^2 = 0.116$.

APPENDIX A. FINGERPRINT SETS

Crime Sample #4905

Comparison sample #7899

Comparison sample #2775

Figure 1. These are materials in the Set 1 fingerprints for the standard procedure, which are in the more ambiguous condition. The match is on the left and the no match comparison sample is on the right.

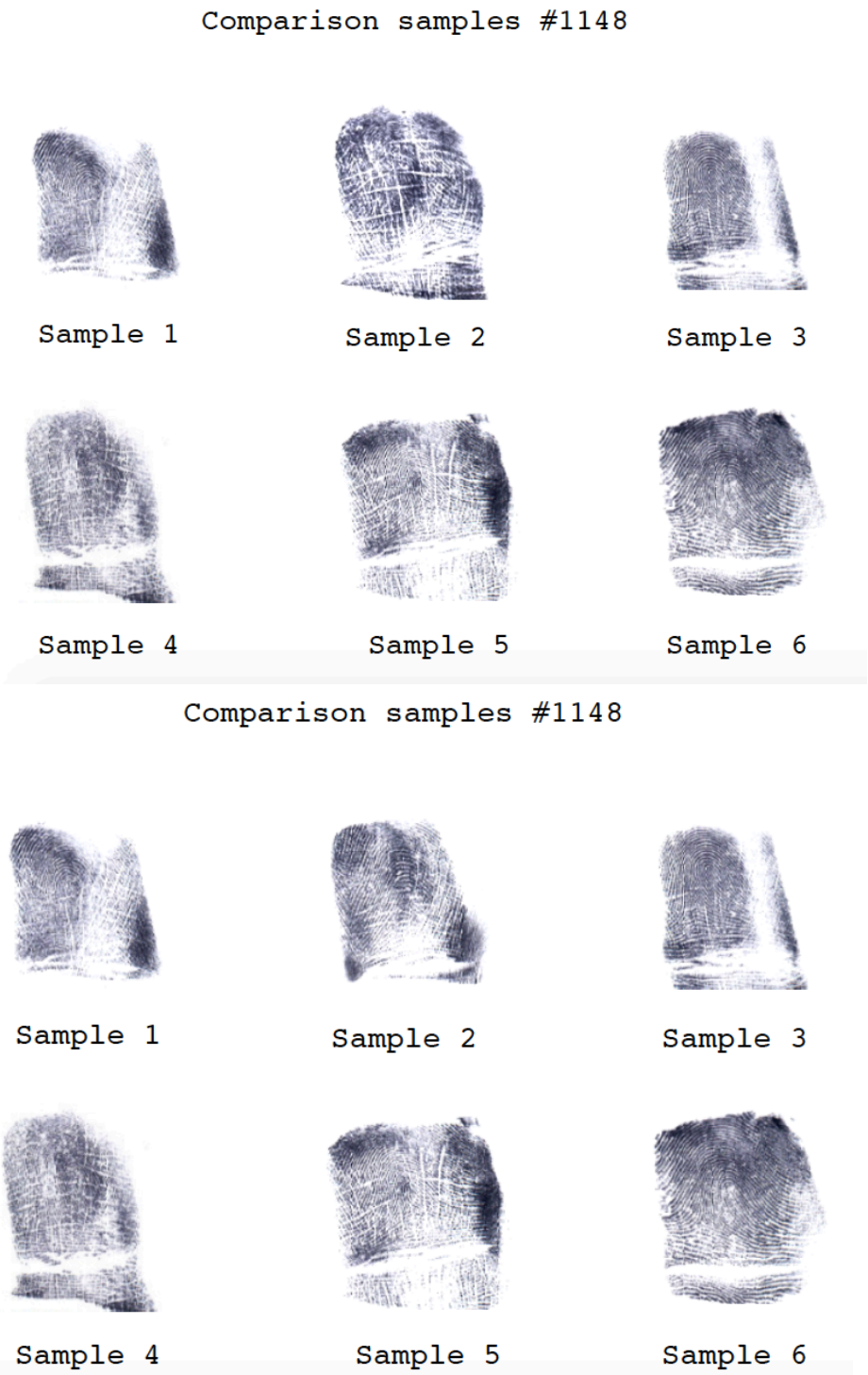


Figure 2. These are materials in the Set 1 fingerprints for the filler-control procedure, which are in the more ambiguous condition. The match is in the top lineups (Sample 2) and the no match comparison sample is in the bottom lineup (Sample 2).

Crime Sample #0339

Comparison Sample #3470

Comparison Sample #3240

Figure 3. These are materials in the Set 2 fingerprints for the standard procedure, which are in the more ambiguous condition. The match is on the left and the no match comparison sample is on the right.

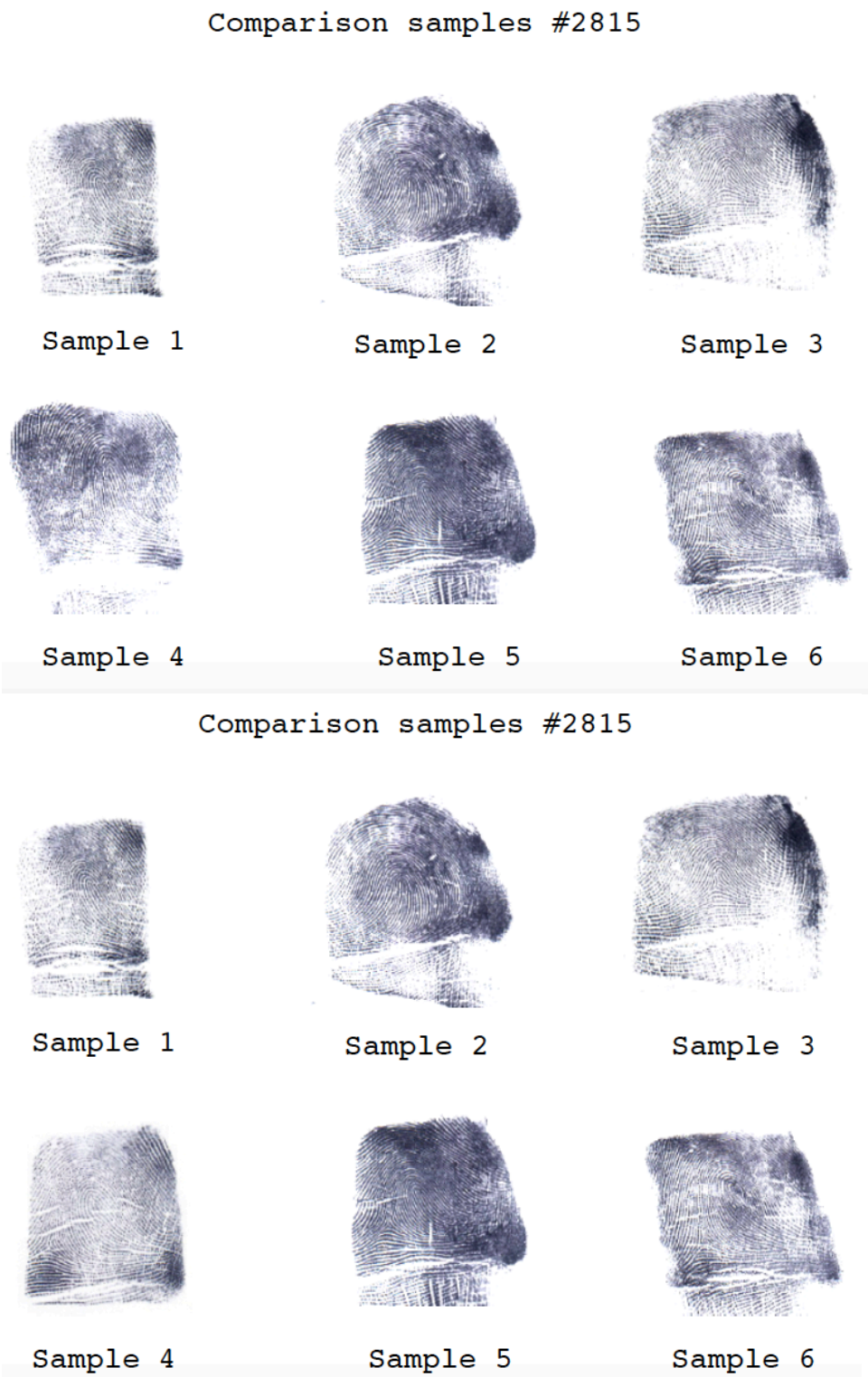


Figure 4. These are materials in the Set 2 fingerprints for the filler-control procedure, which are in the more ambiguous condition. The match is in the top lineups (Sample 4) and the no match comparison sample is in the bottom lineup (Sample 4).

Crime Sample #9533

Comparison Sample #3341 Comparison Sample #1955

Figure 5. These are materials in the Set 3 fingerprints for the standard procedure, which are in the less ambiguous condition. The match is on the left and the no match comparison sample is on the right.

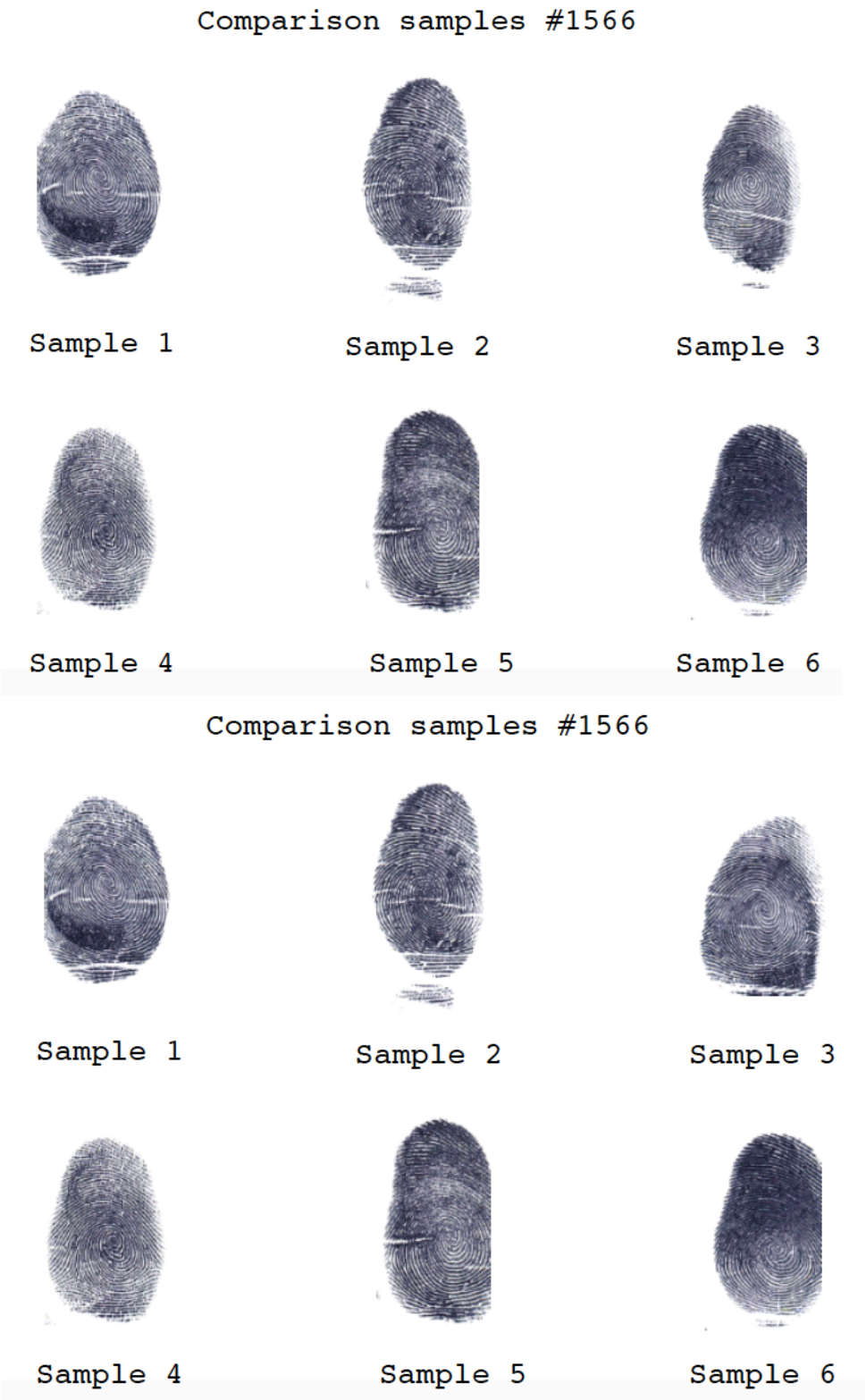


Figure 6. These are materials in the Set 3 fingerprints for the filler-control procedure, which are in the less ambiguous condition. The match is in the top lineups (Sample 3) and the no match comparison sample is in the bottom lineup (Sample 3).

Crime Sample #5322

Comparison Sample #3277 Comparison Sample #1894

Figure 7. These are materials in the Set 4 fingerprints for the standard procedure, which are in the less ambiguous condition. The match is on the left and the no match comparison sample is on the right.

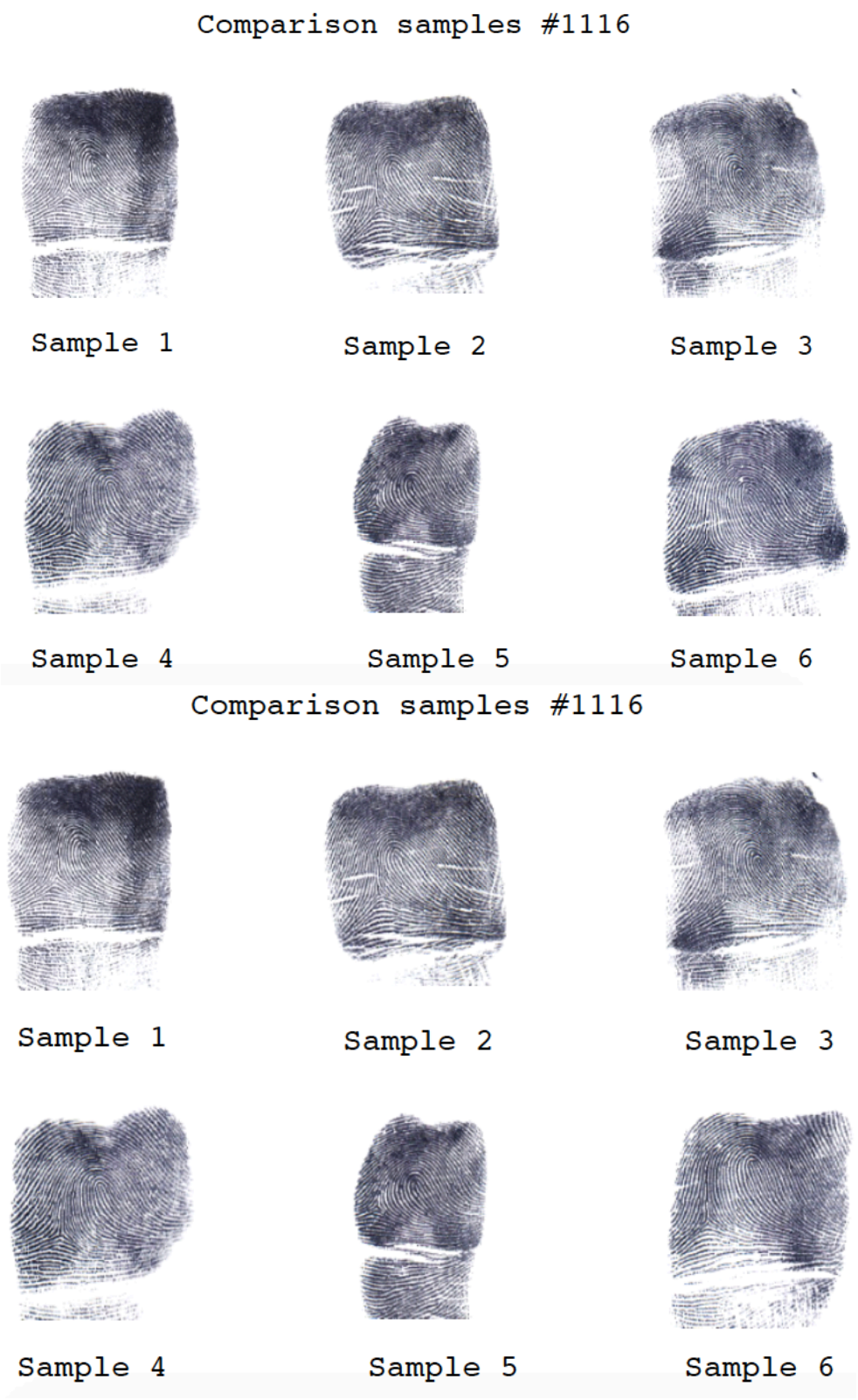


Figure 8. These are materials in the Set 4 fingerprints for the filler-control procedure, which are in the less ambiguous condition. The match is in the top lineups (Sample 6) and the no match comparison sample is in the bottom lineup (Sample 6).

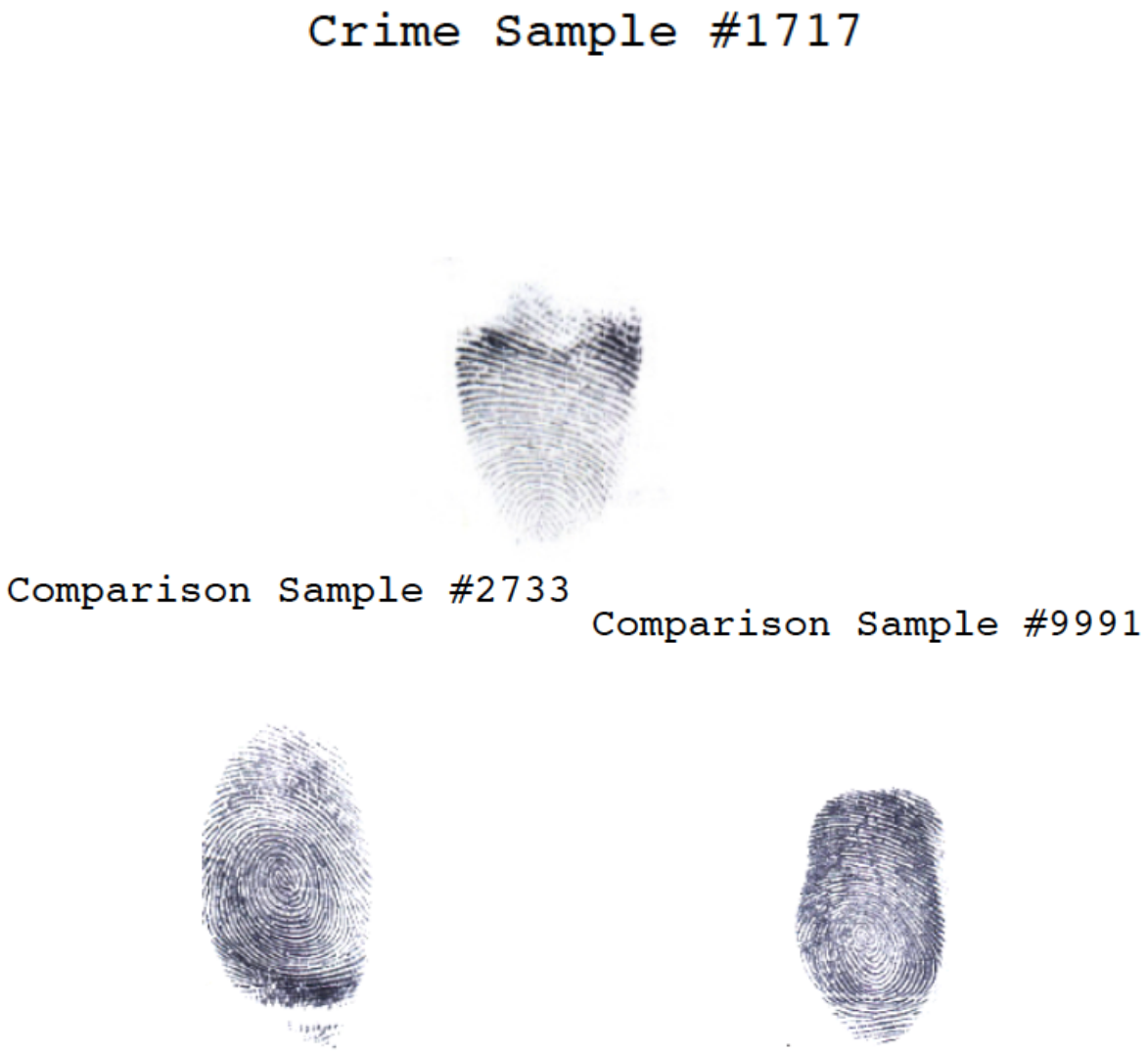
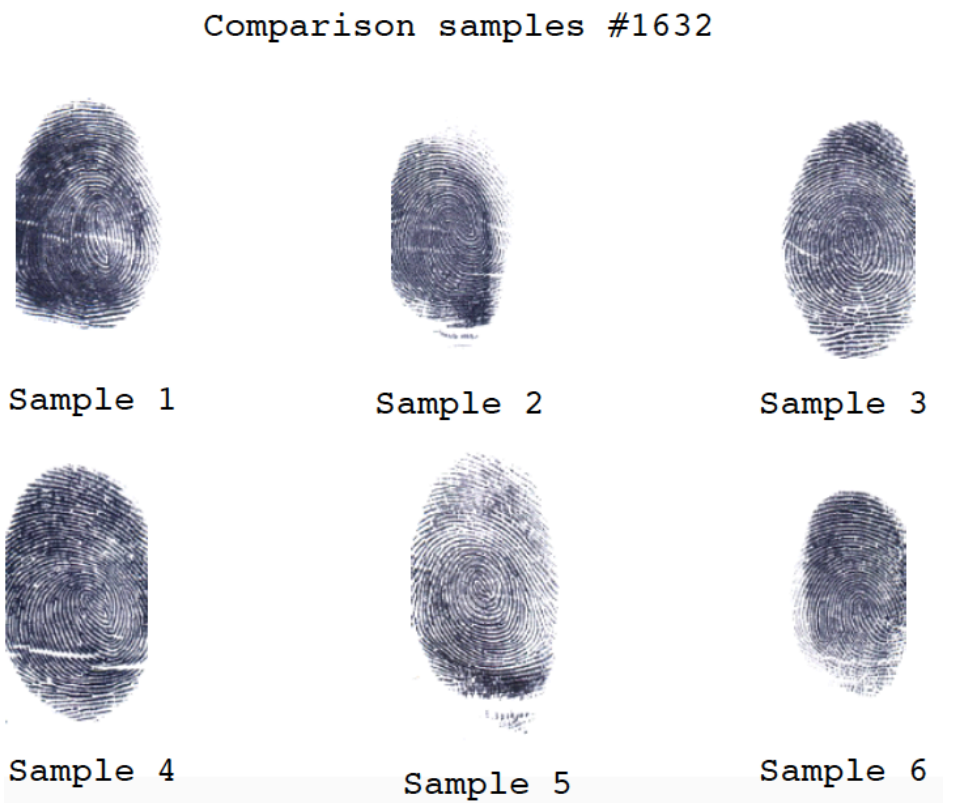


Figure 9. These are materials in the Set 5 fingerprints for the standard procedure, which are in the more ambiguous condition. The match is on the left and the no match comparison sample is on the right.



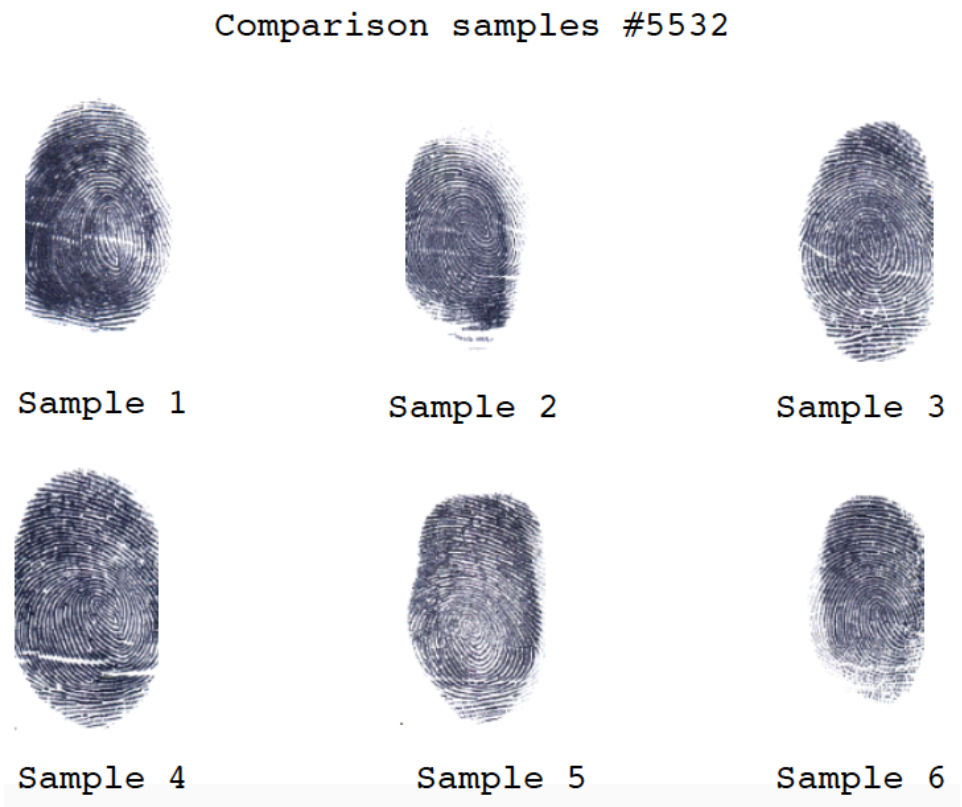


Figure 10. These are materials in the Set 5 fingerprints for the filler-control procedure, which are in the more ambiguous condition. The match is in the top lineups (Sample 5) and the no match comparison sample is in the bottom lineup (Sample 5).

Crime Sample #7883

Comparison Sample #3193

Comparison Sample #9322

Figure 11. These are materials in the Set 6 fingerprints for the standard procedure, which are in the more ambiguous condition. The match is on the left and the no match comparison sample is on the right.

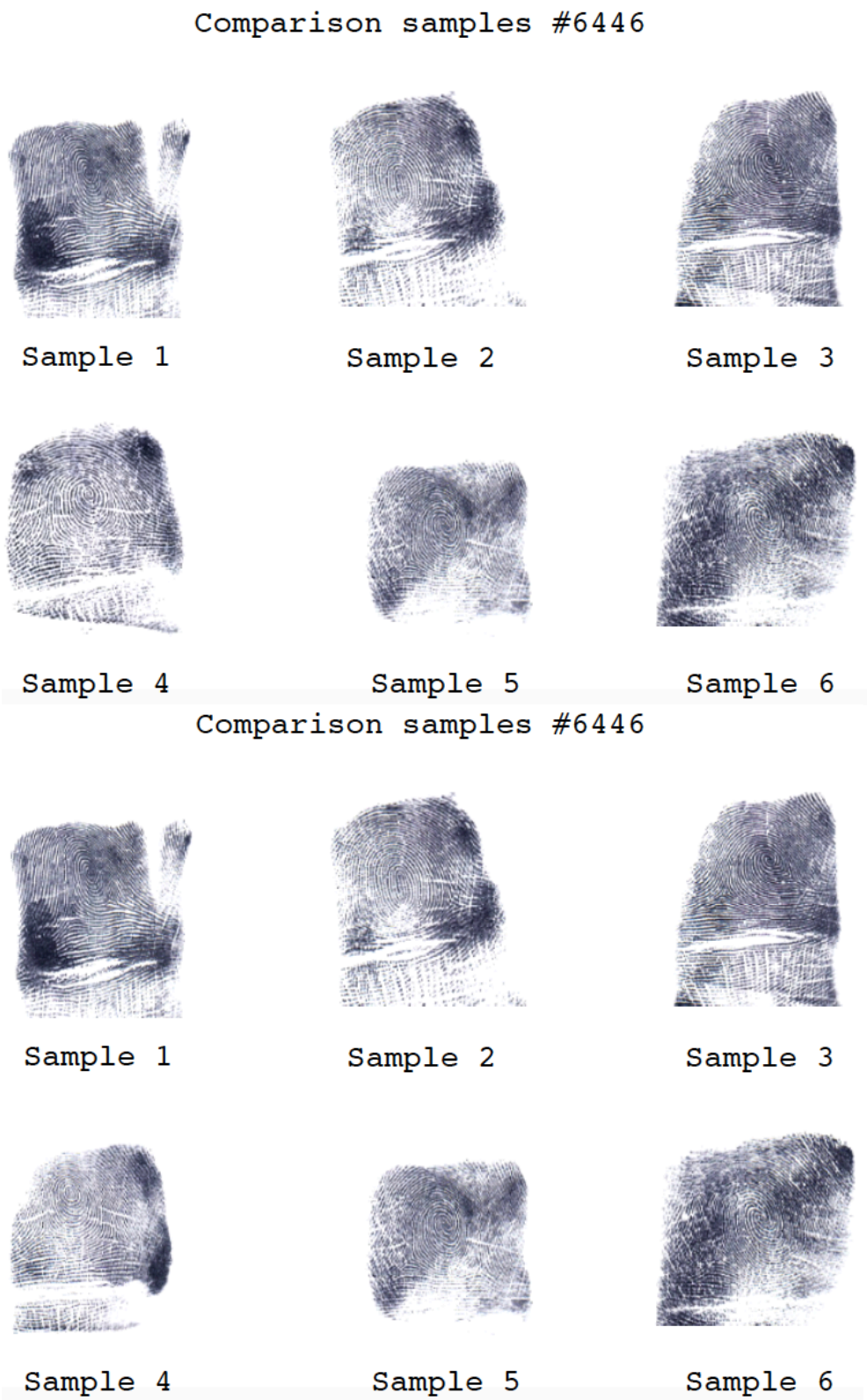


Figure 12. These are materials in the Set 6 fingerprints for the filler-control procedure, which are in the more ambiguous condition. The match is in the top lineups (Sample 4) and the no match comparison sample is in the bottom lineup (Sample 4).

Crime Sample #8311

Comparison Sample #1993 Comparison Sample #8885

Figure 13. These are materials in the Set 7 fingerprints for the standard procedure, which are in the less ambiguous condition. The match is on the left and the no match comparison sample is on the right.

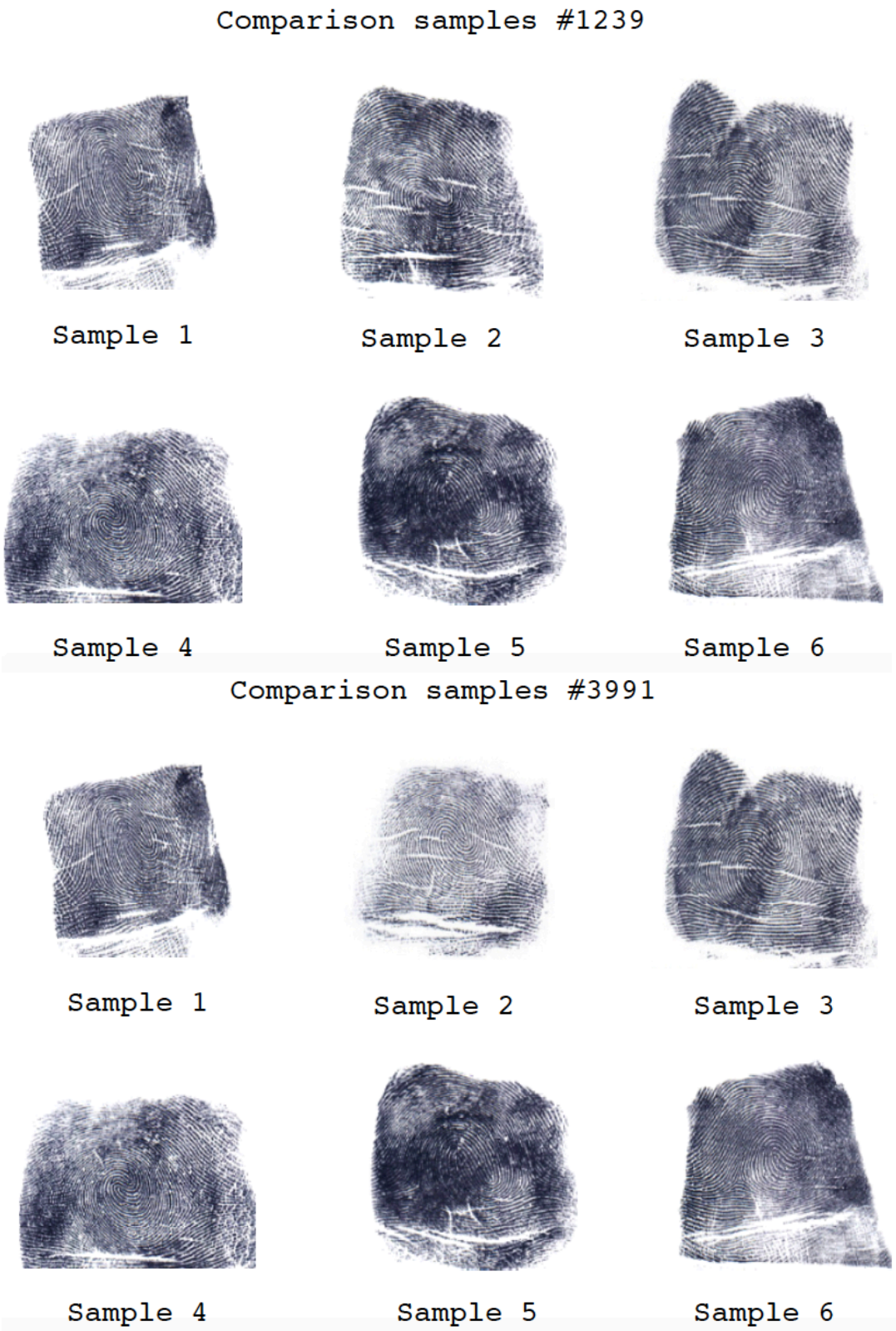


Figure 14. These are materials in the Set 7 fingerprints for the filler-control procedure, which are in the less ambiguous condition. The match is in the top lineups (Sample 2) and the no match comparison sample is in the bottom lineup (Sample 2).

Crime Sample #1127

Comparison Sample #1943

Comparison Sample #4344

Figure 15. These are materials in the Set 8 fingerprints for the standard procedure, which are in the less ambiguous condition. The match is on the left and the no match comparison sample is on the right.

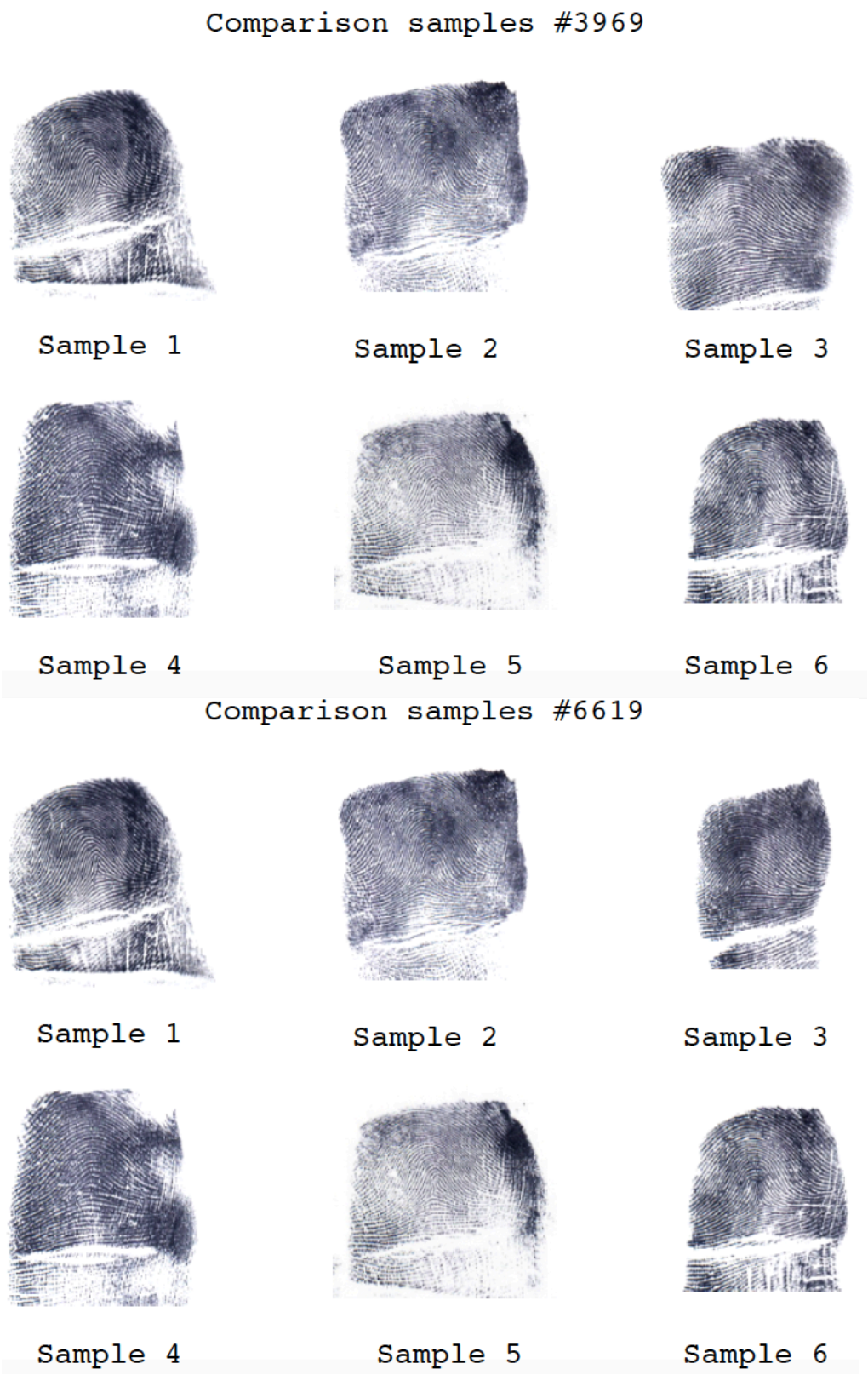


Figure 16. These are materials in the Set 8 fingerprints for the filler-control procedure, which are in the less ambiguous condition. The match is in the top lineups (Sample 3) and the no match comparison sample is in the bottom lineup (Sample 3).

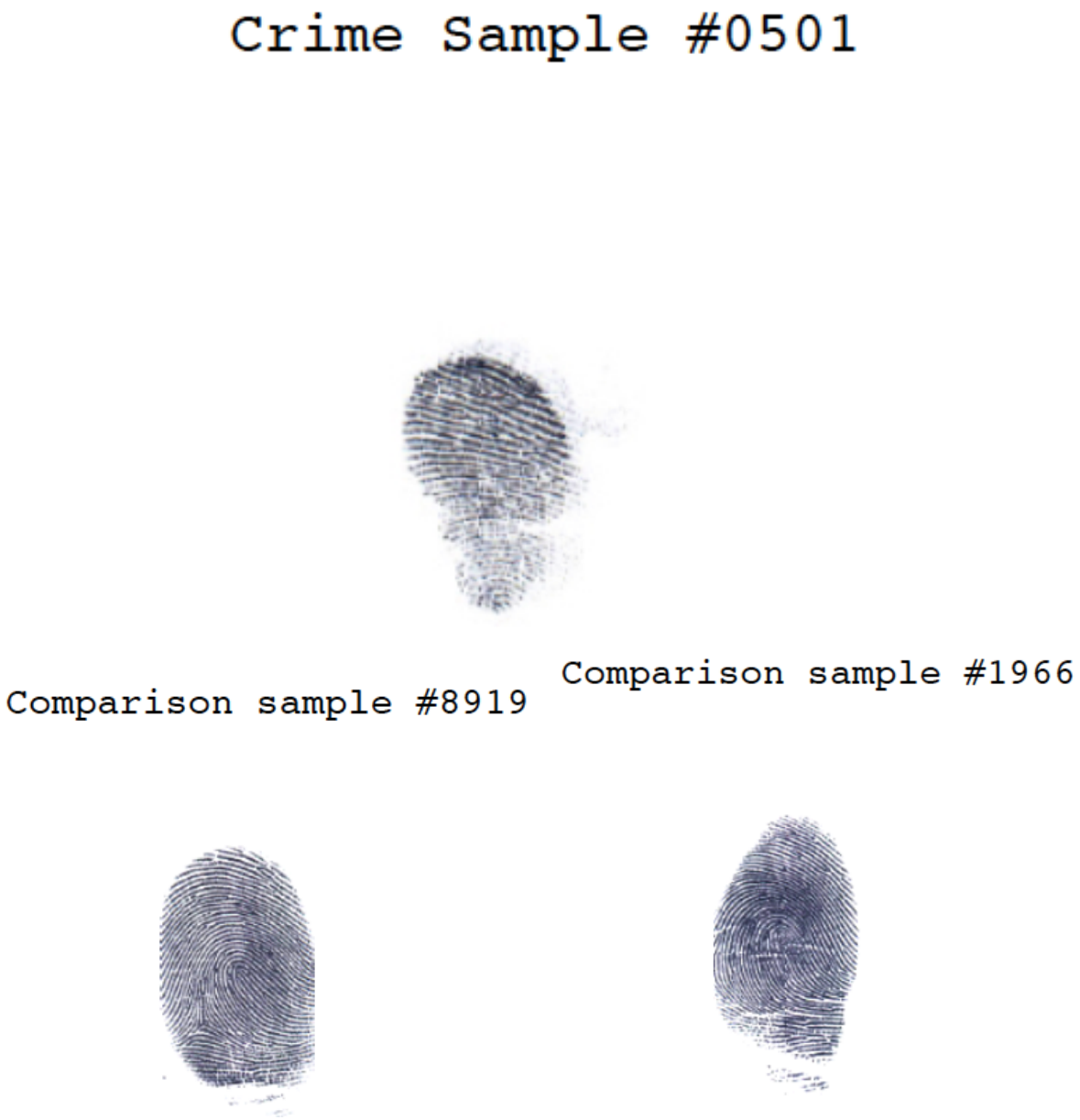


Figure 17. These are materials in the Set 9 fingerprints for the standard procedure, which are in the more ambiguous condition. The match is on the left and the no match comparison sample is on the right.

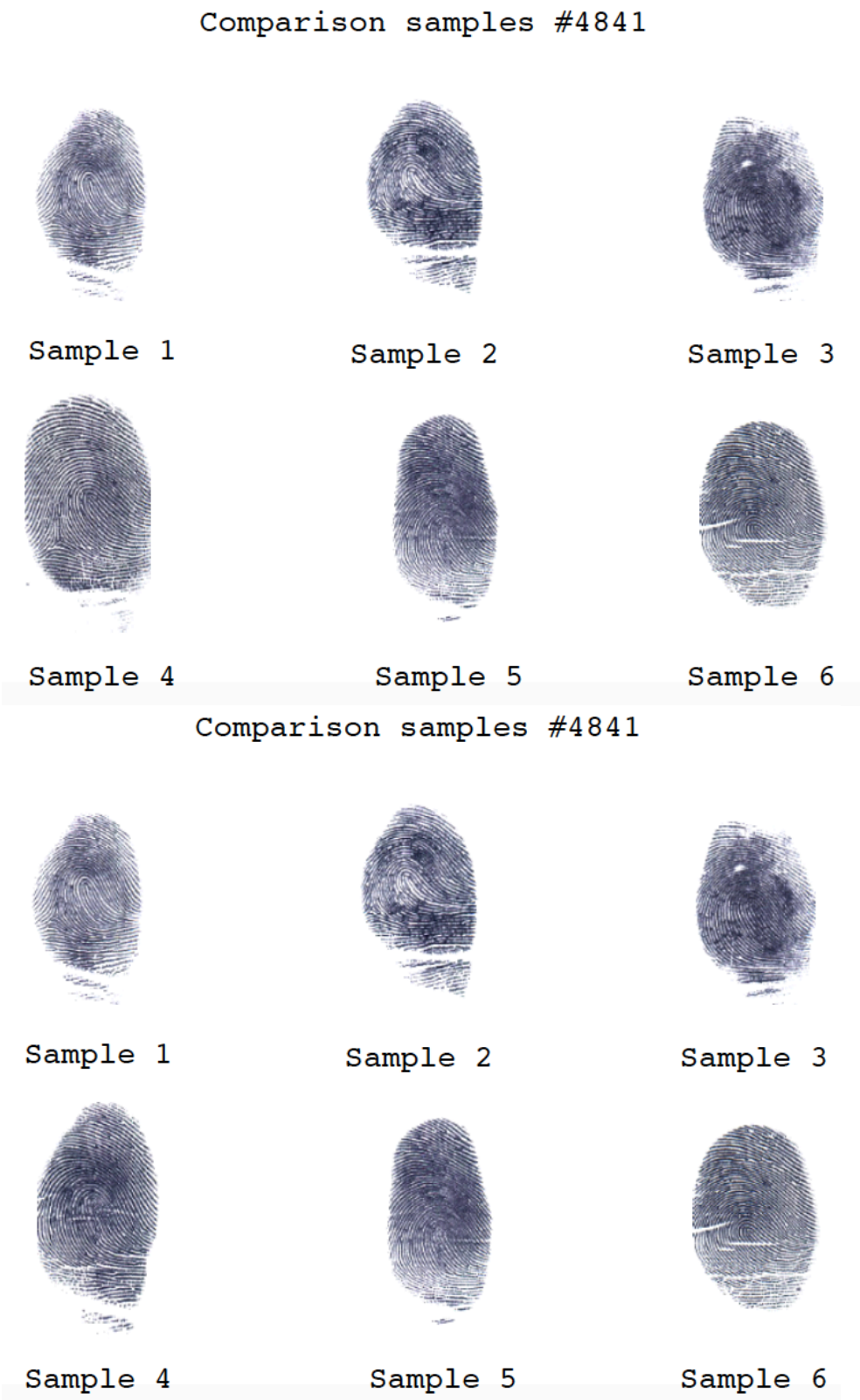


Figure 18. These are materials in the Set 9 fingerprints for the filler-control procedure, which are in the more ambiguous condition. The match is in the top lineups (Sample 4) and the no match comparison sample is in the bottom lineup (Sample 4).

Crime Sample #0509

Comparison sample #1922

Comparison sample #2242

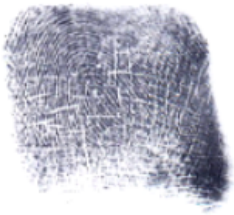
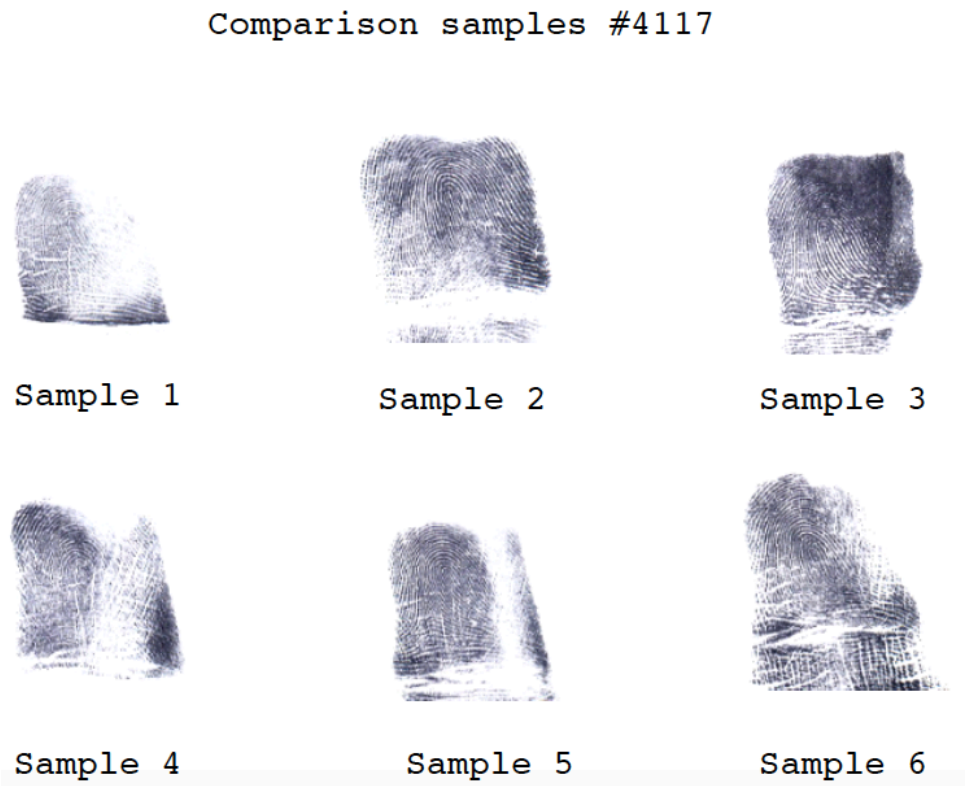


Figure 19. These are materials in the Set 10 fingerprints for the standard procedure, which are in the more ambiguous condition. The match is on the left and the no match comparison sample is on the right.



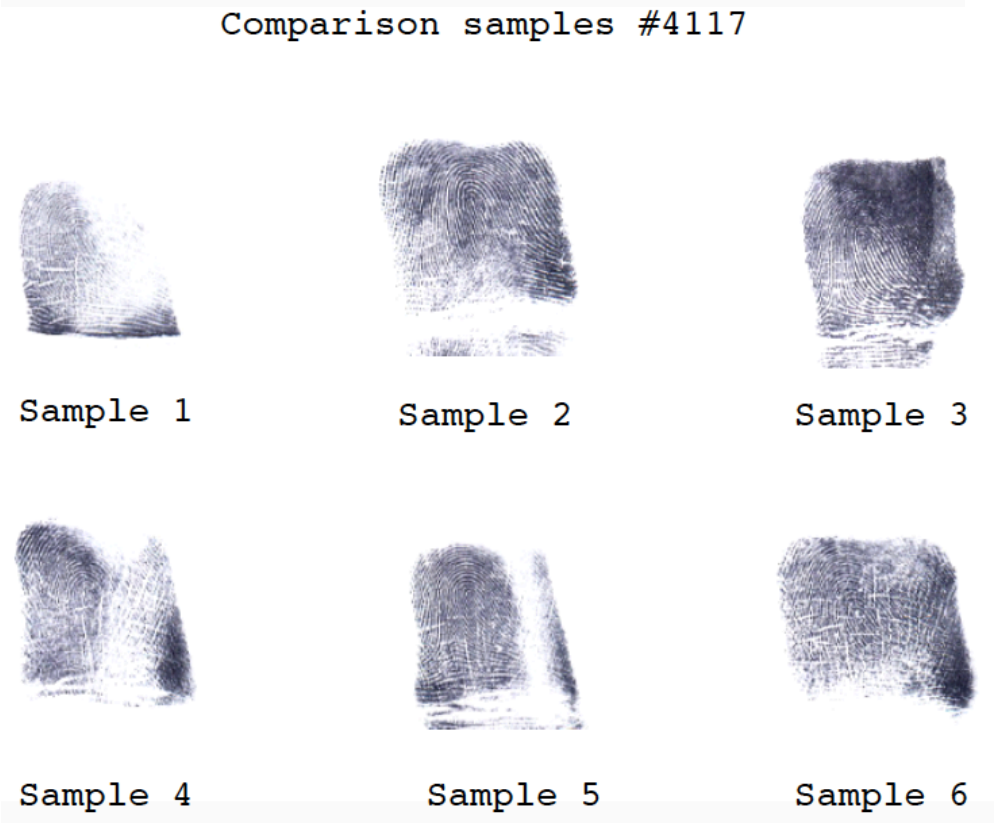


Figure 20. These are materials in the Set 10 fingerprints for the filler-control procedure, which are in the more ambiguous condition. The match is in the top lineups (Sample 6) and the no match comparison sample is in the bottom lineup (Sample 6).

Crime Sample #5091

Comparison sample #2212 Comparison sample #4345

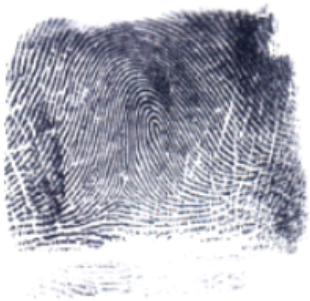


Figure 21. These are materials in the Set 11 fingerprints for the standard procedure, which are in the less ambiguous condition. The match is on the left and the no match comparison sample is on the right.

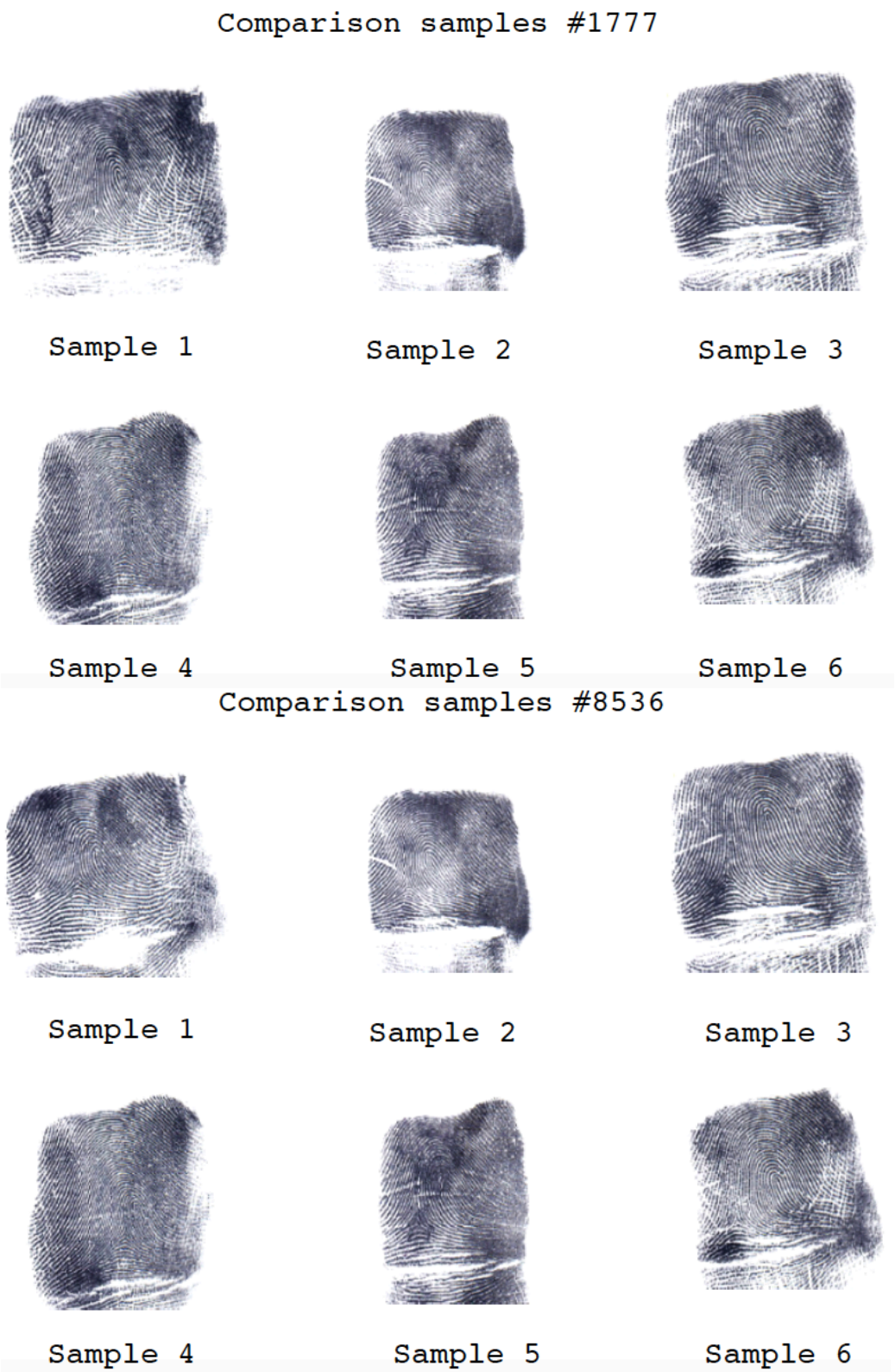


Figure 22. These are materials in the Set 11 fingerprints for the filler-control procedure, which are in the less ambiguous condition. The match is in the top lineups (Sample 1) and the no match comparison sample is in the bottom lineup (Sample 1).

Crime Sample #0291

Comparison sample #3132 Comparison sample #2517

Figure 23. These are materials in the Set 12 fingerprints for the standard procedure, which are in the less ambiguous condition. The match is on the left and the no match comparison sample is on the right.

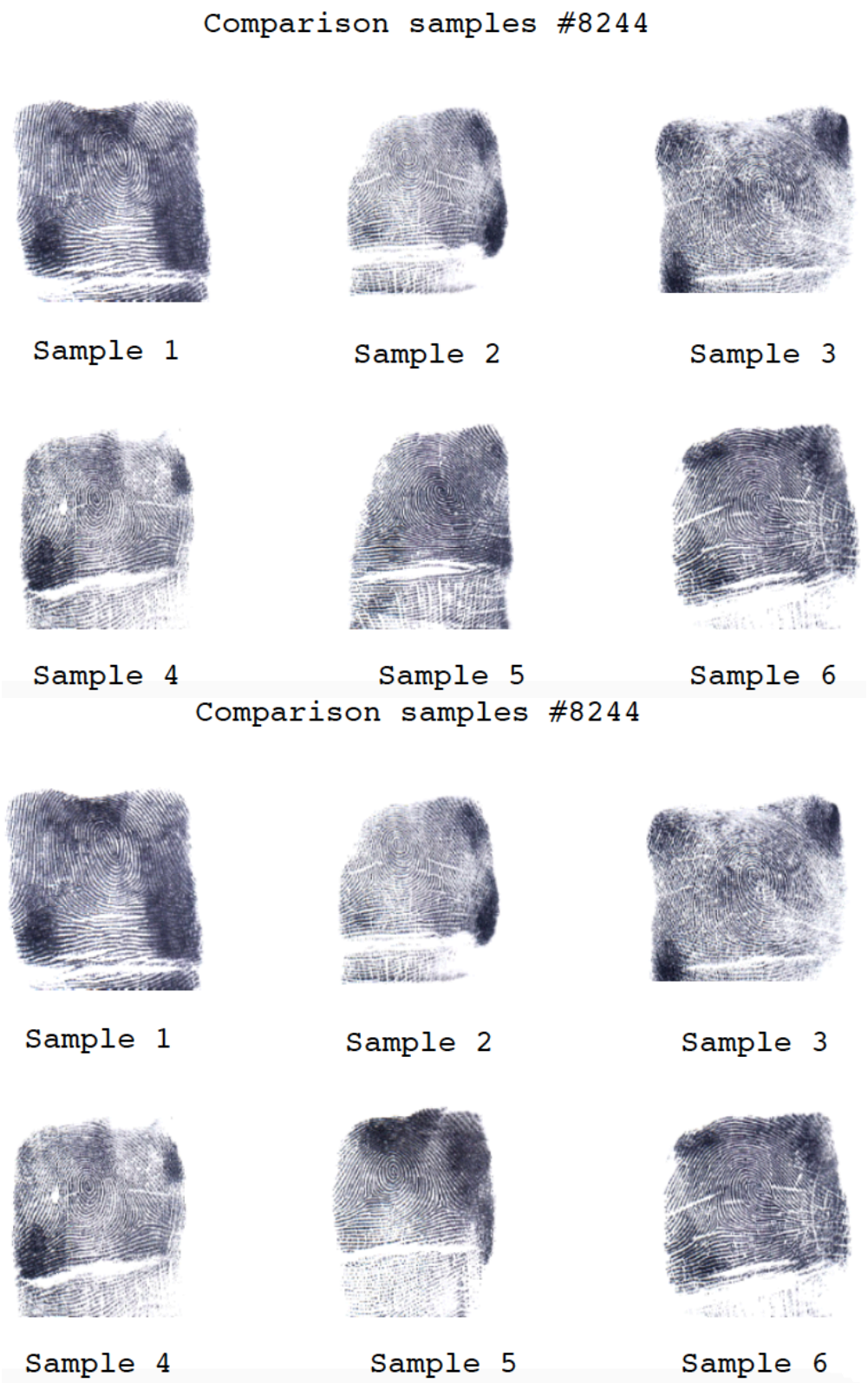


Figure 24. These are materials in the Set 12 fingerprints for the filler-control procedure, which are in the less ambiguous condition. The match is in the top lineups (Sample 5) and the no match comparison sample is in the bottom lineup (Sample 5).

Crime Sample #7723

Comparison sample #1342 Comparison sample #4217

Figure 25. These are materials in the Set 13 fingerprints for the standard procedure, which are in the more ambiguous condition. The match is on the left and the no match comparison sample is on the right.

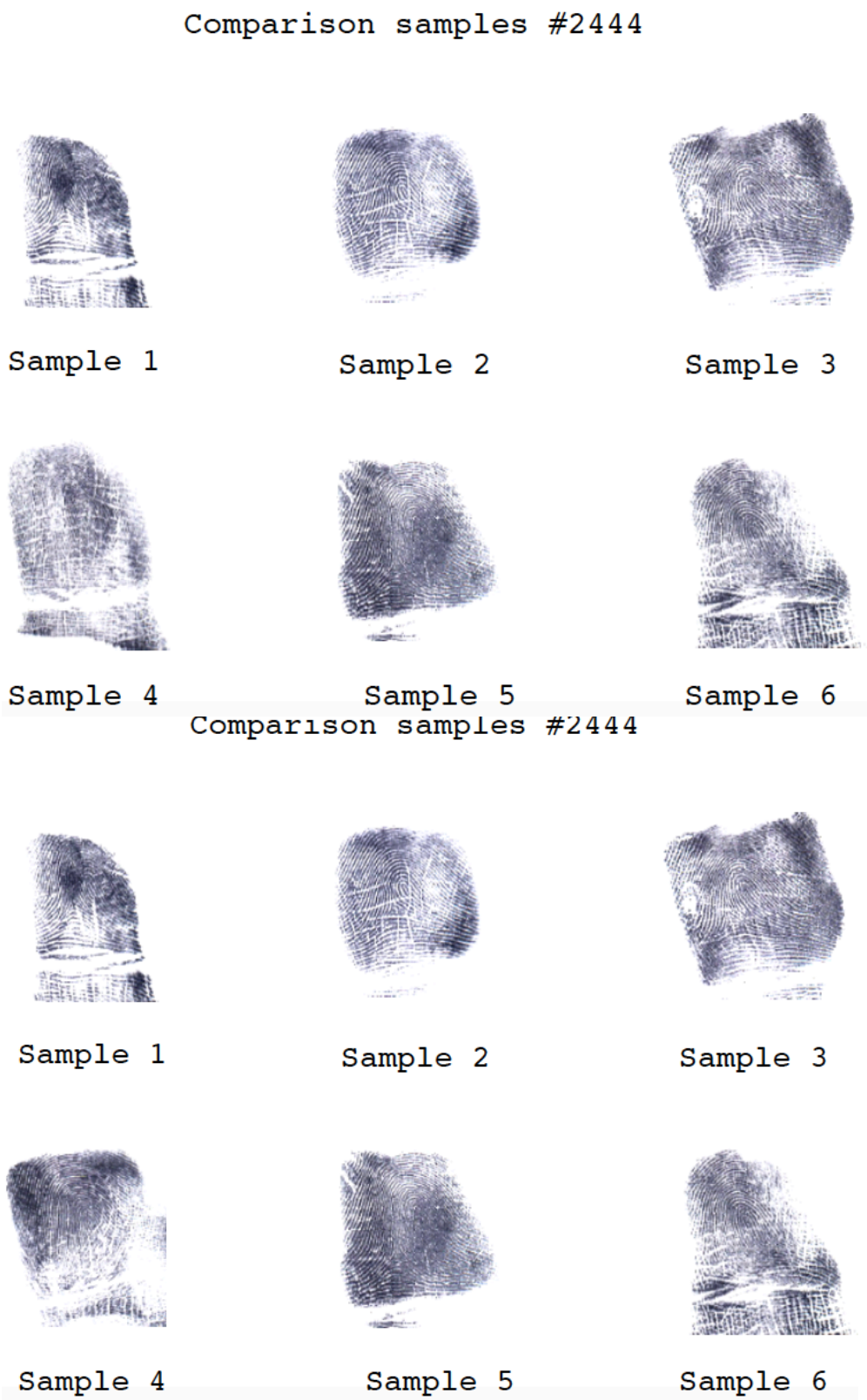


Figure 26. These are materials in the Set 13 fingerprints for the filler-control procedure, which are in the more ambiguous condition. The match is in the top lineups (Sample 4) and the no match comparison sample is in the bottom lineup (Sample 4).

Crime Sample #6676

Comparison sample #3432 Comparison sample #4112

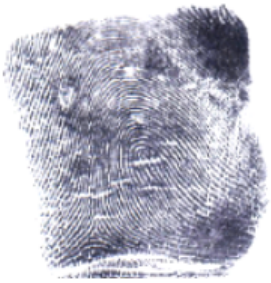


Figure 27. These are materials in the Set 14 fingerprints for the standard procedure, which are in the more ambiguous condition. The match is on the left and the no match comparison sample is on the right.

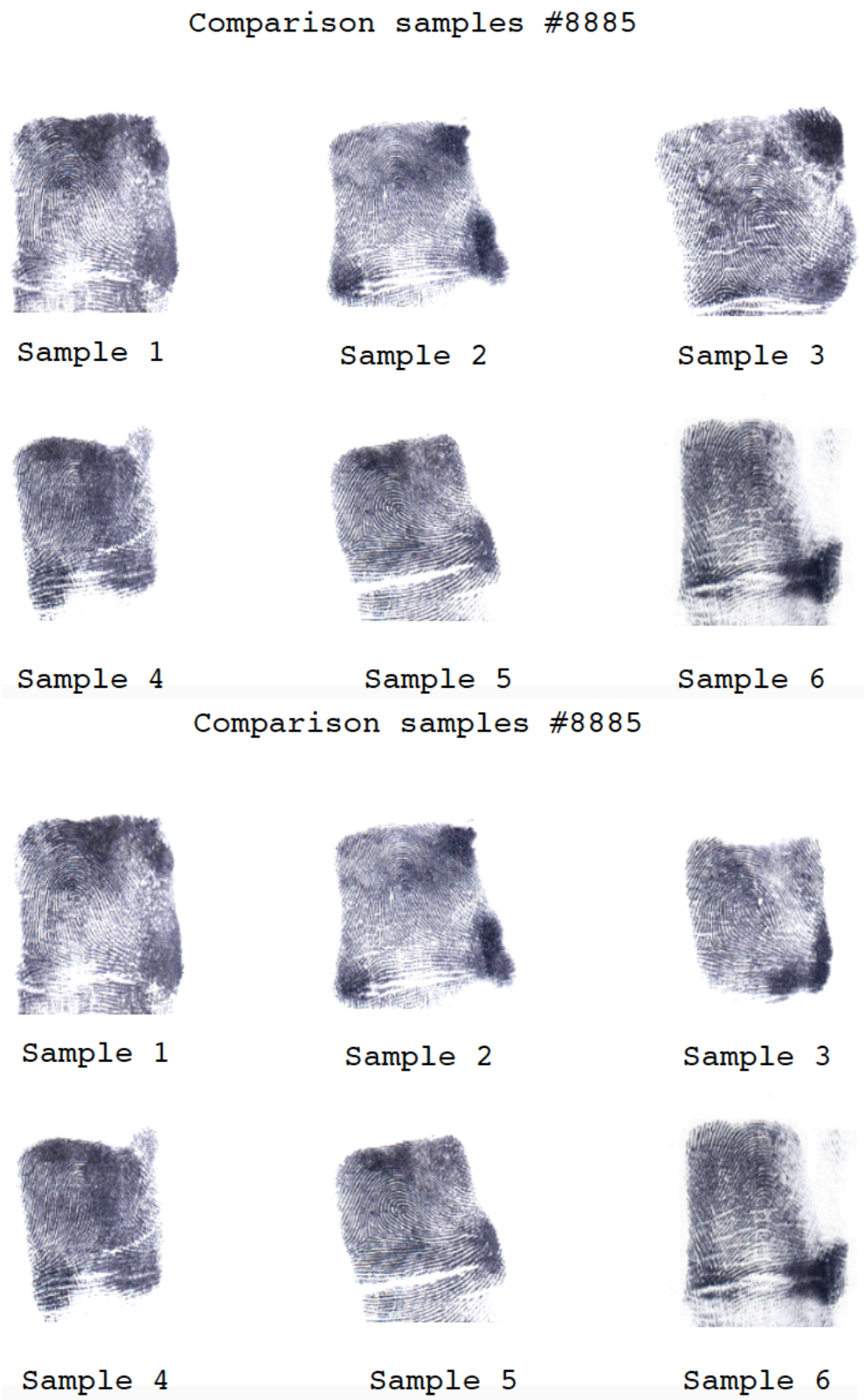


Figure 28. These are materials in the Set 14 fingerprints for the filler-control procedure, which are in the more ambiguous condition. The match is in the top lineups (Sample 3) and the no match comparison sample is in the bottom lineup (Sample 3).

Crime Sample #5515

Comparison sample #3288 Comparison sample #2898

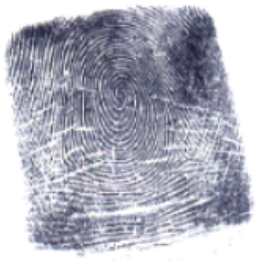


Figure 29. These are materials in the Set 15 fingerprints for the standard procedure, which are in the less ambiguous condition. The match is on the left and the no match comparison sample is on the right.

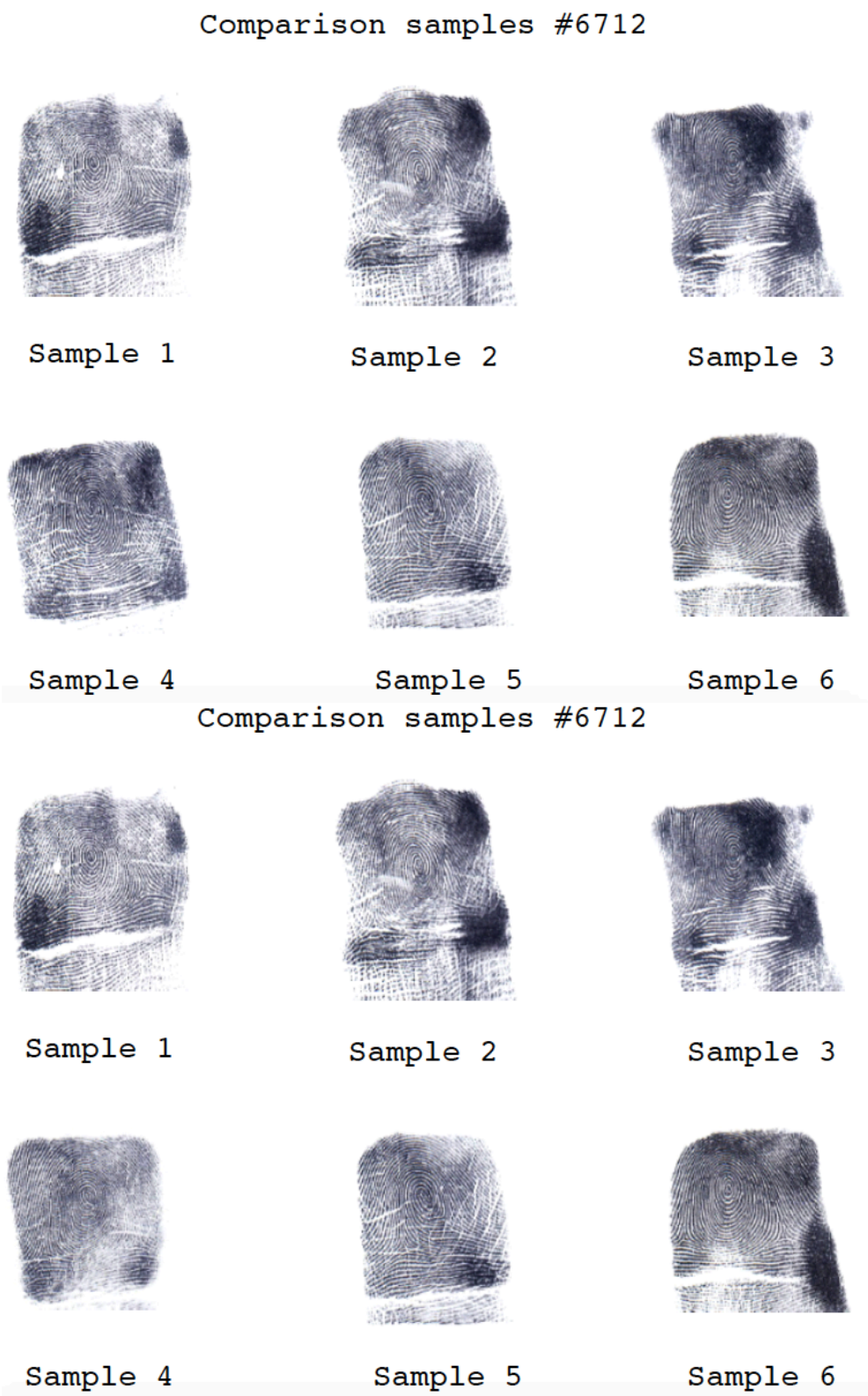


Figure 30. These are materials in the Set 15 fingerprints for the filler-control procedure, which are in the less ambiguous condition. The match is in the top lineups (Sample 4) and the no match comparison sample is in the bottom lineup (Sample 4).

Crime Sample #1560

Comparison sample #8280 Comparison sample #8280

Figure 31. These are materials in the Set 16 fingerprints for the standard procedure, which are in the less ambiguous condition. The match is on the left and the no match comparison sample is on the right.

Figure 32. These are materials in the Set 16 fingerprints for the filler-control procedure, which are in the less ambiguous condition. The match is in the top lineups (Sample 3) and the no match comparison sample is in the bottom lineup (Sample 3).

APPENDIX B. INSTRUCTIONS

Instructions given to participants in the standard procedure:

"You will receive eight folders from eight different criminal cases.

Each folder will contain all the materials you will need for your analysis.

For each case there will be a fingerprint that was lifted from the crime scene.

In addition to the print lifted from the crime scene, there will be one other fingerprint labeled "Comparison sample".

The comparison sample is the suspect. Keep in mind that the suspect might or might not be the culprit – that is what you are trying to help determine.

Your task, for each case, is to decide if the comparison print matches the one from the crime scene."

Instructions given to participants in the filler-control procedure:

"You will receive eight folders from eight different criminal cases.

Each folder will contain all the materials you will need for your analysis.

For each case there will be a fingerprint that was lifted from the crime scene.

In addition to the print lifted from the crime scene, there will be six other fingerprints labeled "Sample 1", "Sample 2" and so on.

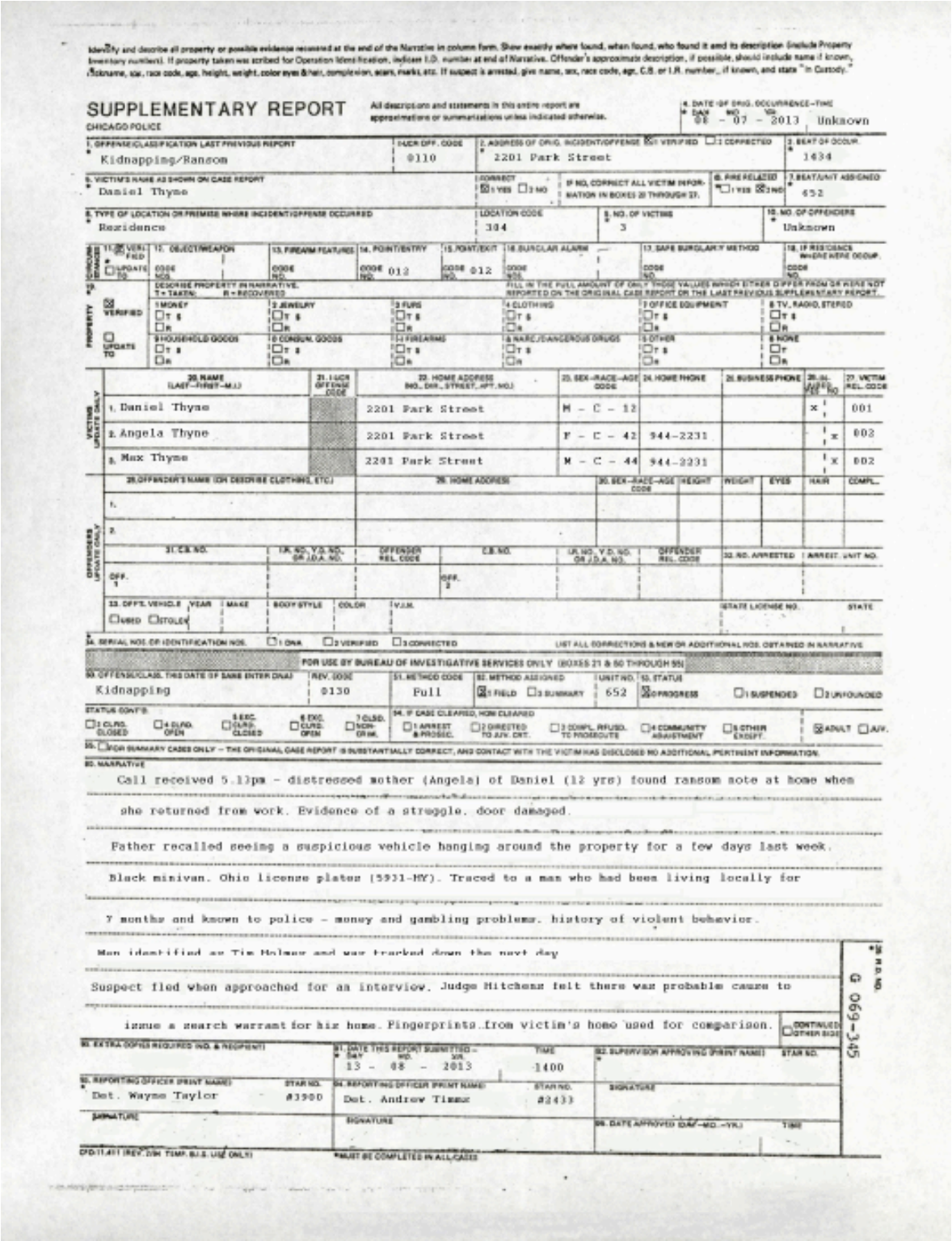
Only one of the six sample prints is from someone who is the suspect in that case. For comparison purposes, the other five prints are from people who we know did not commit the crime in question. You are not told which of the six prints is from the suspect. Keep in mind that the suspect might or might not be the culprit – that is what you are trying to help determine.

Your task, for each of the eight cases, is to decide if any one of those six prints matches the one from the crime scene and, if so, which one matches."

Additional instructions for those in the *Context-present* condition:

"You will also receive a police case report containing details and some background of each case to help with your decision."

APPENDIX C. CONTEXTUAL BIAS MATERIALS



SUPPLEMENTARY REPORT
CHICAGO POLICE

1. OFFENSE/CLASSIFICATION LAST PREVIOUS REPORT: Kidnapping/Ransom
2. ADDRESS OF ORIG. INCIDENT/OFFENSE: 2201 Park Street
4. DATE OF ORIG. OCCURRENCE–TIME: 08 – 07 – 2013 Unknown
5. VICTIM'S NAME AS SHOWN ON CASE REPORT: Daniel Thyne
6. TYPE OF LOCATION OR PREMISE WHERE INCIDENT/OFFENSE OCCURRED: Residence
LOCATION CODE: 304
9. NO. OF VICTIMS: 3
10. NO. OF OFFENDERS: Unknown
14. POINT/ENTRY: 012
15. POINT/EXIT: 012

26. NAME (LAST–FIRST–M.I.)	22. HOME ADDRESS	23. SEX–RACE–AGE CODE	24. HOME PHONE	26. BUSINESS PHONE	27. VICTIM REL. CODE
1. Daniel Thyne	2201 Park Street	M – C – 12			001
2. Angela Thyne	2201 Park Street	F – C – 42	944-2231		002
3. Max Thyne	2201 Park Street	M – C – 44	944-2231		002

34. SERIAL NOS. OR IDENTIFICATION NOS.
FOR USE BY BUREAU OF INVESTIGATIVE SERVICES ONLY (BOXES 21 & 50 THROUGH 55)
50. OFFENSE/CLASS. THIS DATE OF SAME ENTER ONAJ: Kidnapping
REV. CODE: 0130
51. METHOD CODE: Full
52. METHOD ASSIGNED
UNIT NO.: 652
53. STATUS
54. IF CASE CLEARED, HOW CLEARED
55. FOR SUMMARY CASES ONLY – THE ORIGINAL CASE REPORT IS SUBSTANTIALLY CORRECT, AND CONTACT WITH THE VICTIM HAS DISCLOSED NO ADDITIONAL PERTINENT INFORMATION.

50. NARRATIVE

Call received 5.13pm - distressed mother (Angela) of Daniel (12 yrs) found ransom note at home when she returned from work. Evidence of a struggle. door damaged.

Father recalled seeing a suspicious vehicle hanging around the property for a few days last week.

Black minivan. Ohio license plates (5931-MY). Traced to a man who had been living locally for 7 months and known to police - money and gambling problems. history of violent behavior.

Man identified as Tim Holmes and was tracked down the next day

Suspect fled when approached for an interview. Judge Hitchens felt there was probable cause to issue a search warrant for his home. Fingerprints from victim's home used for comparison.

61. DATE THIS REPORT SUBMITTED: 13 – 08 – 2013 TIME 1400
62. SUPERVISOR APPROVING (PRINT NAME)
63. REPORTING OFFICER (PRINT NAME): Det. Wayne Taylor STAR NO. #3900
64. REPORTING OFFICER (PRINT NAME): Det. Andrew Timmr STAR NO. #2433
G 069-345

Figure 33. Contextual information in the form of a mock police case report describing incriminating information relating to a kidnapping.

SUPPLEMENTARY REPORT
CHICAGO POLICE

All descriptions and statements in this entire report are approximations or summarizations unless indicated otherwise.

4. DATE OF DRIG. OCCURRENCE–TIME: DAY 21 – MO. 03 – YR. 12

1. OFFENSE/CLASSIFICATION LAST PREVIOUS REPORT: Rape/ Sexual assault
UCR OFF. CODE: 0061
2. ADDRESS OF DRIG. INCIDENT/OFFENSE: ☒1 VERIFIED ☐2 CORRECTED: Cnr. Park and Beach
3. BEAT OF OCCUR.: 0132

5. VICTIM'S NAME AS SHOWN ON CASE REPORT: Laura Gideon
CORRECT ☒1 YES ☐2 NO — IF NO, CORRECT ALL VICTIM INFORMATION IN BOXES 20 THROUGH 27.
6. FIRE RELATED ☐1 YES ☒2 NO
7. BEAT/UNIT ASSIGNED: 92043

8. TYPE OF LOCATION OR PREMISE WHERE INCIDENT/OFFENSE OCCURRED: Vehicle
LOCATION CODE: 029
9. NO. OF VICTIMS: 1
10. NO. OF OFFENDERS: 1

CIRCUMSTANCES
11. ☒ VERIFIED ☐ UPDATE TO
12. OBJECT/WEAPON: CODE 001 NO. 021
13. FIREARM FEATURES: CODE 01290 NO.
14. POINT/ENTRY: CODE NO.
15. POINT/EXIT: CODE NO.
16. BURGLAR ALARM: CODE NO.
17. SAFE BURGLARY METHOD: CODE NO.
18. IF RESIDENCE WHERE WERE OCCUP.: CODE NO.

PROPERTY
9. ☐ VERIFIED ☐ UPDATE TO
DESCRIBE PROPERTY IN NARRATIVE. T = TAKEN R = RECOVERED
FILL IN THE FULL AMOUNT OF ONLY THOSE VALUES WHICH EITHER DIFFER FROM OR WERE NOT REPORTED ON THE ORIGINAL CASE REPORT OR THE LAST PREVIOUS SUPPLEMENTARY REPORT.
1 MONEY ☐T $ ☐R
2 JEWELRY ☐T $ ☐R
3 FURS ☐T $ ☐R
4 CLOTHING ☐T $ ☐R
5 OFFICE EQUIPMENT ☐T $ ☐R
6 TV, RADIO, STEREO ☐T $ ☐R
7 HOUSEHOLD GOODS ☐T $ ☐R
8 CONSUM. GOODS ☐T $ ☐R
9 FIREARMS ☐T $ ☐R
10 NARC./DANGEROUS DRUGS ☐T $ ☐R
11 OTHER ☐T $ ☐R
12 NONE ☐T ☐R

VICTIMS UPDATE ONLY

20. NAME (LAST–FIRST–M.I.)	21. UCR OFFENSE CODE	22. HOME ADDRESS (NO., DIR., STREET, APT. NO.)	23. SEX–RACE–AGE CODE	24. HOME PHONE	25. BUSINESS PHONE	26. AL. VICT. NO.	27. VICTIM REL. CODE
1. Laura Gideon		3041 Park	F – H – 21	312-5543		X	7821
2.							
3.							

OFFENDERS UPDATE ONLY

28. OFFENDER'S NAME (OR DESCRIBE CLOTHING, ETC.)	29. HOME ADDRESS	30. SEX–RACE–AGE CODE	HEIGHT	WEIGHT	EYES	HAIR	COMPL.
1. Maceo Roberts	N/A – Transient	M – ? – 32	6'1"	190	Br.	Bl.	
2.							

31. C.B. NO.	I.R. NO., Y.D. NO., OR J.D.A. NO.	OFFENDER REL. CODE	C.B. NO.	I.R. NO., Y.D. NO., OR J.D.A. NO.	OFFENDER REL. CODE	32. NO. ARRESTED	ARREST. UNIT NO.
OFF. 1			OFF. 2				

33. OFFT. VEHICLE ☐USED ☐STOLEN | YEAR 2002 | MAKE Ford | BODY STYLE Truck | COLOR Red | V.I.N. Unknown | STATE LICENSE NO. 271 – 6589 | STATE IL

34. SERIAL NOS. OR IDENTIFICATION NOS. ☒1 DNA ☐2 VERIFIED ☐3 CORRECTED — LIST ALL CORRECTIONS & NEW OR ADDITIONAL NOS. OBTAINED IN NARRATIVE

FOR USE BY BUREAU OF INVESTIGATIVE SERVICES ONLY (BOXES 21 & 50 THROUGH 55)

50. OFFENSE/CLASS. THIS DATE (IF SAME ENTER DNA): Rape
REV. CODE: 04765
51. METHOD CODE: Full
52. METHOD ASSIGNED: ☒1 FIELD ☐2 SUMMARY
UNIT NO.: 9709
53. STATUS: ☒0 PROGRESS ☐1 SUSPENDED ☐2 UNFOUNDED

STATUS CONT'D: ☐1 CLRD. CLOSED ☐4 CLRD. OPEN ☐5 EXC. CLRD. CLOSED ☐6 EXC. CLRD. OPEN ☐7 CLSD. NON-CRIM.
54. IF CASE CLEARED, HOW CLEARED: ☐1 ARREST & PROSEC. ☐2 DIRECTED TO JUV. CRT. ☐3 COMPL. RFUSD. TO PROSECUTE ☐4 COMMUNITY ARBITRATION ☐5 OTHER EXCEPT. ☒ADULT ☐JUV.

55. ☐ FOR SUMMARY CASES ONLY – THE ORIGINAL CASE REPORT IS SUBSTANTIALLY CORRECT, AND CONTACT WITH THE VICTIM HAS DISCLOSED NO ADDITIONAL PERTINENT INFORMATION.

60. NARRATIVE

Victim was held at gunpoint and forced into a vehicle walking home from a friend's party approx.1.30am

Victim was blindfolded and driven to an unknown location. She was raped 3 times and beaten.

Victim was found unconscious in a local park by a city worker at 5.45am.

DNA from the rape kit was matched to Maceo Roberts, who had been arrested previously for domestic

assault against his ex wife. A traffic camera also caught his car running a red light near the

abduction location at approx 1am the day of the incident.

Judge Williams saw probable cause for a warrant and signs of a struggle were found in his

car, as well as hair resembling the victim's hair.

☐ CONTINUED OTHER SIDE

61. EXTRA COPIES REQUIRED (NO. & RECIPIENT)
61. DATE THIS REPORT SUBMITTED – DAY 10 – MO. 04 – YR. 12 — TIME 11:45
62. SUPERVISOR APPROVING (PRINT NAME): Dennis Rogers — STAR NO. #2156
63. REPORTING OFFICER (PRINT NAME): Rachel Mendoza — STAR NO. #5512
64. REPORTING OFFICER (PRINT NAME): Sarah Robinson — STAR NO. #8172 — SIGNATURE
SIGNATURE — SIGNATURE
66. DATE APPROVED (DAY–MO.–YR.) — TIME

RD NO. G 069-345

CPD-11.411 (REV. DIM TEMP. B/J.S. USE ONLY) *MUST BE COMPLETED IN ALL CASES

Figure 34. Contextual information in the form of a police case report describing incriminating information relating to a rape/sexual assault.

SUPPLEMENTARY REPORT
CHICAGO POLICE

All descriptions and statements in this entire report are approximations or summarizations unless indicated otherwise.

4. DATE OF ORIG. OCCURRENCE–TIME: 01 – 08 – 2012 16:03

1. OFFENSE/CLASSIFICATION LAST PREVIOUS REPORT: Extortion
UCR OFF. CODE: 0231
2. ADDRESS OF ORIG. INCIDENT/OFFENSE: 2564 Goldhunter Road
3. BEAT OF OCCUR.: 2244

5. VICTIM'S NAME AS SHOWN ON CASE REPORT: Benjamin Wickmark
CORRECT: ☒ 1 YES ☐ 2 NO — IF NO, CORRECT ALL VICTIM INFORMATION IN BOXES 20 THROUGH 27.
6. FIRE RELATED: ☐ 1 YES ☒ 2 NO
7. BEAT/UNIT ASSIGNED: 576

8. TYPE OF LOCATION OR PREMISE WHERE INCIDENT/OFFENSE OCCURRED: Office Building – Private Office
LOCATION CODE: 225
9. NO. OF VICTIMS: 1
10. NO. OF OFFENDERS: Unknown

CIRCUMSTANCES
11. ☒ VERIFIED ☐ UPDATE TO
12. OBJECT/WEAPON — CODE NO.
13. FIREARM FEATURES — CODE NO.
14. POINT/ENTRY — CODE NO. 005
15. POINT/EXIT — CODE NO. 005
16. BURGLAR ALARM — CODE NO.
17. SAFE BURGLARY METHOD — CODE NO.
18. IF RESIDENCE WHERE WERE OCCUP. — CODE NO.

PROPERTY
19. ☒ VERIFIED ☐ UPDATE TO
DESCRIBE PROPERTY IN NARRATIVE. T = TAKEN, R = RECOVERED
FILL IN THE FULL AMOUNT OF ONLY THOSE VALUES WHICH EITHER DIFFER FROM OR WERE NOT REPORTED ON THE ORIGINAL CASE REPORT OR THE LAST PREVIOUS SUPPLEMENTARY REPORT.
1 MONEY ☐ T $ ☐ R
2 JEWELRY ☐ T $ ☐ R
3 FURS ☐ T $ ☐ R
4 CLOTHING ☐ T $ ☐ R
7 OFFICE EQUIPMENT ☐ T $ ☐ R
8 TV, RADIO, STEREO ☐ T $ ☐ R
9 HOUSEHOLD GOODS ☐ T $ ☐ R
0 CONSUM. GOODS ☐ T $ ☐ R
14 FIREARMS ☐ T $ ☐ R
6 NARC./DANGEROUS DRUGS ☐ T $ ☐ R
5 OTHER ☐ T $ ☐ R
6 NONE ☐ T ☐ R

VICTIM UPDATE ONLY

	20. NAME (LAST–FIRST–M.I.)	21. I.UCR OFFENSE CODE	22. HOME ADDRESS (NO., DIR., STREET, APT. NO.)	23. SEX–RACE–AGE CODE	24. HOME PHONE	25. BUSINESS PHONE	26. IN-JURED YES NO	27. VICTIM REL. CODE
1.	Benjamin Wickmark		1114 Greenleaves Ave	M – C – 33	988-8856	971-6577	X	001
2.								
3.								

OFFENDERS UPDATE ONLY

	28. OFFENDER'S NAME (OR DESCRIBE CLOTHING, ETC.)	29. HOME ADDRESS	30. SEX–RACE–AGE CODE	HEIGHT	WEIGHT	EYES	HAIR	COMPL.
1.								
2.								

	31. C.B. NO.	I.R. NO., Y.D. NO., OR J.D.A. NO.	OFFENDER REL. CODE	C.B. NO.	I.R. NO., Y.D. NO., OR J.D.A. NO.	OFFENDER REL. CODE	32. NO. ARRESTED	ARREST. UNIT NO.
OFF. 1				OFF. 2				

33. OFF'S. VEHICLE ☐ USED ☐ STOLEN — YEAR | MAKE | BODY STYLE | COLOR | V.I.N. | STATE LICENSE NO. | STATE

34. SERIAL NOS. OR IDENTIFICATION NOS. ☐ 1 DNA ☐ 2 VERIFIED ☐ 3 CORRECTED — LIST ALL CORRECTIONS & NEW OR ADDITIONAL NOS. OBTAINED IN NARRATIVE

FOR USE BY BUREAU OF INVESTIGATIVE SERVICES ONLY (BOXES 21 & 50 THROUGH 55)

50. OFFENSE/CLASS. THIS DATE OF SAME ENTER DNA: Extortion
REV. CODE: 0228
51. METHOD CODE: Full
52. METHOD ASSIGNED: ☒ 1 FIELD ☐ 3 SUMMARY
UNIT NO.: 652
53. STATUS: ☒ 0 PROGRESS ☐ 1 SUSPENDED ☐ 2 UNFOUNDED

STATUS CONT'D. ☐ 3 CLRD. CLOSED ☐ 4 CLRD. OPEN ☐ 5 EXC. CLRD. CLOSED ☐ 6 EXC. CLRD. OPEN ☐ 7 CLSD. NON-CRIM.
54. IF CASE CLEARED, HOW CLEARED: ☐ 1 ARREST & PROSEC. ☐ 2 DIRECTED TO JUV. CRT. ☐ 3 COMPL. REFUSD. TO PROSECUTE ☐ 4 COMMUNITY ADJUSTMENT ☐ 5 OTHER EXCEPT. — ☒ ADULT ☐ JUV.

55. ☐ FOR SUMMARY CASES ONLY – THE ORIGINAL CASE REPORT IS SUBSTANTIALLY CORRECT, AND CONTACT WITH THE VICTIM HAS DISCLOSED NO ADDITIONAL PERTINENT INFORMATION.

60. NARRATIVE

Letter opened by the victim (Benjamin Wickmark) at 4.03pm. He proceeded to call the police at 4.44pm after talking briefly with his lawyer. Wickmark indicated that a man had been stalking him for some time and had made threats to expose information about him to the public, as well as trying to enter the office building on several occasions, needing to be escorted out. Police compiled the emails, letters, and video footage of this man, identified as Mark Lepper. Judge Driscoll saw probable cause for a warrant. Suspect was not home at the time but a large quantity of sophisticated computer systems and technology were seized, along with a handwriting sample. Multiple photographs of the victim were found, taken without the victim's knowledge.

☐ CONTINUED OTHER SIDE

90. EXTRA COPIES REQUIRED (NO. & RECIPIENT)
91. DATE THIS REPORT SUBMITTED – DAY MO. YR.: 05 – 08 – 2012 TIME: 11.30
92. SUPERVISOR APPROVING (PRINT NAME) STAR NO.
93. REPORTING OFFICER (PRINT NAME): Det. Tim Janir STAR NO.: #3765
94. REPORTING OFFICER (PRINT NAME): Det. Tracey Simons STAR NO.: #4505
SIGNATURE
SIGNATURE
SIGNATURE
95. DATE APPROVED (DAY–MO.–YR.) TIME

96. R.D. NO.: G 069-345

CPD-11.411 (REV. 3/94 TEMP. B.I.S. USE ONLY) *MUST BE COMPLETED IN ALL CASES

Figure 35. Contextual information in the form of a police case report describing incriminating information relating to an extortion case.

Identify and describe all property or possible evidence recovered at the end of the Narrative in column form. Show exactly where found, when found, who found it and its description (include Property Inventory number). If property taken was scribed for Operation Identification, indicate I.D. number at end of Narrative. Offender's approximate description, if possible, should include name if known, nickname, sex, race code, age, height, weight, color eyes & hair, complexion, scars, marks, etc. If suspect is arrested, give name, sex, race code, age, C.B. or I.R. number, if known, and state "In Custody."

SUPPLEMENTARY REPORT
CHICAGO POLICE

All descriptions and statements in this entire report are approximations or summarizations unless indicated otherwise.

4. DATE OF ORIG. OCCURRENCE–TIME: DAY 13 – MO. 03 – YR. 13 | 14:33

1. OFFENSE/CLASSIFICATION LAST PREVIOUS REPORT: Bomb Threat
1-UCR OFF. CODE: 1144
2. ADDRESS OF ORIG. INCIDENT/OFFENSE: ☒ 1 VERIFIED ☐ 2 CORRECTED — 1112 Toomes Street
3. BEAT OF OCCUR.: 3433
5. VICTIM'S NAME AS SHOWN ON CASE REPORT: Occupants of 1112 Toomes Street
CORRECT: ☒ 1 YES ☐ 2 NO — IF NO, CORRECT ALL VICTIM INFORMATION IN BOXES 20 THROUGH 27.
6. FIRE RELATED: ☒ 1 YES ☐ 2 NO
7. BEAT/UNIT ASSIGNED: 688
8. TYPE OF LOCATION OR PREMISE WHERE INCIDENT/OFFENSE OCCURRED: Office Building
LOCATION CODE: 235
9. NO. OF VICTIMS: 114
10. NO. OF OFFENDERS: Unknown

CIRCUMSTANCES
11. ☒ VERIFIED ☐ UPDATE TO
12. OBJECT/WEAPON — CODE NOS. 002 | 112
13. FIREARM FEATURES — CODE NO.
14. POINT/ENTRY — CODE NO.
15. POINT/EXIT — CODE NO.
16. BURGLAR ALARM — CODE NOS.
17. SAFE BURGLARY METHOD — CODE NO.
18. IF RESIDENCE WHERE WERE OCCUP. — CODE NO.

19. PROPERTY — DESCRIBE PROPERTY IN NARRATIVE. T = TAKEN; R = RECOVERED. FILL IN THE FULL AMOUNT OF ONLY THOSE VALUES WHICH EITHER DIFFER FROM OR WERE NOT REPORTED ON THE ORIGINAL CASE REPORT OR THE LAST PREVIOUS SUPPLEMENTARY REPORT.
☒ VERIFIED ☐ UPDATE TO
1 MONEY ☐ T $ ☐ R
2 JEWELRY ☐ T $ ☐ R
3 FURS ☐ T $ ☐ R
4 CLOTHING ☐ T $ ☐ R
7 OFFICE EQUIPMENT ☐ T $ ☐ R
8 TV, RADIO, STEREO ☐ T $ ☐ R
9 HOUSEHOLD GOODS ☐ T $ ☐ R
10 CONSUM. GOODS ☐ T $ ☐ R
11 FIREARMS ☐ T $ ☐ R
15 NARC./DANGEROUS DRUGS ☐ T $ ☐ R
16 OTHER ☐ T $ ☐ R
99 NONE ☐ T ☐ R

VICTIMS UPDATE ONLY

	20. NAME (LAST–FIRST–M.I.)	21. I-UCR OFFENSE CODE	22. HOME ADDRESS (NO., DIR., STREET, APT. NO.)	23. SEX–RACE–AGE CODE	24. HOME PHONE	25. BUSINESS PHONE	26. (a) CONSENT YES NO	27. VICTIM REL. CODE
1.								
2.								
3.								

OFFENDERS UPDATE ONLY

	28. OFFENDER'S NAME (OR DESCRIBE CLOTHING, ETC.)	29. HOME ADDRESS	30. SEX–RACE–AGE CODE	HEIGHT	WEIGHT	EYES	HAIR	COMPL.
1.	Tall male. black hoodie. jeans	Unknown	M – ? – ?	6ft	180	?	?	?
2.								

	31. C.B. NO.	I.R. NO., Y.D. NO., OR J.D.A. NO.	OFFENDER REL. CODE	C.B. NO.	I.R. NO., Y.D. NO., OR J.D.A. NO.	OFFENDER REL. CODE	32. NO. ARRESTED	ARREST. UNIT NO.
OFF. 1				OFF. 2				

33. OFF'S. VEHICLE ☐ USED ☐ STOLEN | YEAR | MAKE | BODY STYLE | COLOR | V.I.N. | STATE LICENSE NO. | STATE

34. SERIAL NOS. OR IDENTIFICATION NOS. ☐ 1 DNA ☐ 2 VERIFIED ☐ 3 CORRECTED — LIST ALL CORRECTIONS & NEW OR ADDITIONAL NOS. OBTAINED IN NARRATIVE

FOR USE BY BUREAU OF INVESTIGATIVE SERVICES ONLY (BOXES 21 & 50 THROUGH 55)

50. OFFENSE/CLASS. THIS DATE (SAME ENTER DNA): Bomb Threat
REV. CODE: 1199
51. METHOD CODE: Full
52. METHOD ASSIGNED: ☒ 1 FIELD ☐ 3 SUMMARY
UNIT NO.: 652
53. STATUS: ☒ 0 PROGRESS ☐ 1 SUSPENDED ☐ 2 UNFOUNDED

STATUS CONT'D. ☐ 3 CLRD. CLOSED ☐ 4 CLRD. OPEN ☐ 5 EXC. CLRD. CLOSED ☐ 6 EXC. CLRD. OPEN ☐ 7 CLSD. NON-CRIM.
54. IF CASE CLEARED, HOW CLEARED: ☒ 1 ARREST & PROSEC. ☐ 2 DIRECTED TO JUV. CRT. ☐ 3 COMPL. REFUSD. TO PROSECUTE ☐ 4 COMMUNITY ADJUSTMENT ☐ 5 OTHER EXCEPT. ☒ ADULT ☐ JUV.

55. ☐ FOR SUMMARY CASES ONLY – THE ORIGINAL CASE REPORT IS SUBSTANTIALLY CORRECT, AND CONTACT WITH THE VICTIM HAS DISCLOSED NO ADDITIONAL PERTINENT INFORMATION.

60. NARRATIVE

A man with a black hoodie. jeans - approx. 6ft 180 pounds - was seen leaving a black gym bag in the foyer.

Receptionist (Ashley Stanton) called the police immediately at 2.33pm and was told to pull the fire alarm.

Interviews with HR and management revealed that an employee (Johann Sellis) had recently been fired.

He had been escorted from the premises twice since then and had made written and oral threats.

CCTV footage confirmed these reports, and aggressive behavior in these instances.

A warrant was executed to search his apartment. Evidence found that a bomb was constructed

and blueprints of the building. Fingerprints from the bomb were obtained for comparison.

☐ CONTINUED OTHER SIDE

90. EXTRA COPIES REQUIRED (NO. & RECIPIENT)
91. DATE THIS REPORT SUBMITTED – DAY 17 – MO. 03 – YR. 2013 | TIME 10:00
92. SUPERVISOR APPROVING (PRINT NAME) | STAR NO.
93. REPORTING OFFICER (PRINT NAME): Det. Grant Wert | STAR NO. #3341 | SIGNATURE
94. REPORTING OFFICER (PRINT NAME): Det. Hamish Spade | STAR NO. #4112 | SIGNATURE
95. DATE APPROVED (DAY–MO.–YR.) | TIME

*M.R.D. NO. G 069-345

CPD-11.411 (REV. 2/94 TEMP. B.I.S. USE ONLY) *MUST BE COMPLETED IN ALL CASES

Figure 36. Contextual information in the form of a police case report describing incriminating information relating to a bomb threat.

Identify and describe all property or possible evidence recovered at the end of the Narrative in column form. Show exactly where found, when found, who found it and its description (include Property Inventory number). If property taken was scribed for Operation Identification, indicate I.D. number at end of Narrative. Offender's approximate description, if possible, should include name if known, (Nickname, sex, race code, age, height, weight, color eyes & hair, complexion, scars, marks, etc. If suspect is arrested, give name, sex, race code, age, C.B. or I.R. number, if known, and state "In Custody."

SUPPLEMENTARY REPORT
CHICAGO POLICE

All descriptions and statements in this entire report are approximations or summarizations unless indicated otherwise.

4. DATE OF ORIG. OCCURRENCE—TIME: 04 – 07 – 13

1. OFFENSE/CLASSIFICATION LAST PREVIOUS REPORT: Arson | UCR OFF. CODE: 6873 | 2. ADDRESS OF ORIG. INCIDENT/OFFENSE ☒1 VERIFIED ☐2 CORRECTED: 1495 Walnut | 3. BEAT OF OCCUR.: 7092

5. VICTIM'S NAME AS SHOWN ON CASE REPORT: Hugh Bosen | CORRECT ☒1 YES ☐2 NO | IF NO, CORRECT ALL VICTIM INFORMATION IN BOXES 20 THROUGH 27. | 6. FIRE RELATED ☒1 YES ☐2 NO | 7. BEAT/UNIT ASSIGNED: 944

8. TYPE OF LOCATION OR PREMISE WHERE INCIDENT/OFFENSE OCCURRED: Private Residence | LOCATION CODE: 019 | 9. NO. OF VICTIMS: 2 | 10. NO. OF OFFENDERS: Unknown

CIRCUMSTANCES: 11. ☒ VERIFIED ☐ UPDATE TO

12. OBJECT/WEAPON	13. FIREARM FEATURES	14. POINT/ENTRY	15. POINT/EXIT	16. BURGLAR ALARM	17. SAFE BURGLARY METHOD	18. IF RESIDENCE WHERE WERE OCCUP.
CODE 910 / NO. 112	CODE / NO.	CODE 018 / NO.	CODE 018 / NO.	CODE 0459 / NO. 01	CODE / NO.	CODE / NO.

PROPERTY: ☒ VERIFIED ☐ UPDATE TO

DESCRIBE PROPERTY IN NARRATIVE. T = TAKEN; R = RECOVERED. FILL IN THE FULL AMOUNT OF ONLY THOSE VALUES WHICH EITHER DIFFER FROM OR WERE NOT REPORTED ON THE ORIGINAL CASE REPORT OR THE LAST PREVIOUS SUPPLEMENTARY REPORT.

1 MONEY	2 JEWELRY	3 FURS	4 CLOTHING	7 OFFICE EQUIPMENT	8 TV, RADIO, STEREO
☐T $ ☐R	☒T $ 5,700 ☐R	☐T $ ☐R	☐T $ ☐R	☐T $ ☐R	☒T $ 3,400 ☐R

9 HOUSEHOLD GOODS	10 CONSUM. GOODS	11 FIREARMS	5 NARC./DANGEROUS DRUGS	6 OTHER	0 NONE
☐T $ ☐R	☐T $ ☐R	☐T $ ☐R	☐T $ ☐R	☐T $ ☐R	☐T ☐R

VICTIMS UPDATE ONLY

	20. NAME (LAST–FIRST–MI.)	21. I-UCR OFFENSE CODE	22. HOME ADDRESS (NO., DIR., STREET, APT. NO.)	23. SEX–RACE–AGE CODE	24. HOME PHONE	25. BUSINESS PHONE	26. IN-JURED YES	NO	27. VICTIM REL. CODE
1.	Hugh Bosen		1495 Walnut	M – C – 36				X	
2.	Patricia Bosen		1495 Walnut	F – C – 27			X		9075
3.									

OFFENDERS UPDATE ONLY

	28. OFFENDER'S NAME (OR DESCRIBE CLOTHING, ETC.)	29. HOME ADDRESS	30. SEX–RACE–AGE CODE	HEIGHT	WEIGHT	EYES	HAIR	COMPL.
1.	Riley Steen	Unknown	M – C – 24	5'8"	180	Br.	Br.	
2.								

31. C.B. NO.	I.R. NO., Y.D. NO. OR J.D.A. NO.	OFFENDER REL. CODE	C.B. NO.	I.R. NO., Y.D. NO. OR J.D.A. NO.	OFFENDER REL. CODE	32. NO. ARRESTED	ARREST. UNIT NO.
OFF. 1			OFF. 2			1	5655

33. OFF'S. VEHICLE ☒USED ☐STOLEN | YEAR 1999 | MAKE Buick | BODY STYLE | COLOR Black | V.I.N. | STATE LICENSE NO. | STATE

34. SERIAL NOS. OR IDENTIFICATION NOS. ☐1 DNA ☐2 VERIFIED ☐3 CORRECTED — LIST ALL CORRECTIONS & NEW OR ADDITIONAL NOS. OBTAINED IN NARRATIVE

FOR USE BY BUREAU OF INVESTIGATIVE SERVICES ONLY (BOXES 21 & 50 THROUGH 55)

50. OFFENSE/CLASS. THIS DATE (IF SAME ENTER ONA): Arson | REV. CODE: 4021 | 51. METHOD CODE: Full | 52. METHOD ASSIGNED ☒1 FIELD ☐3 SUMMARY | UNIT NO. | 53. STATUS ☒0 PROGRESS ☐1 SUSPENDED ☐2 UNFOUNDED

STATUS CONT'D. ☐3 CLRD. CLOSED ☒4 CLRD. OPEN ☐5 EXC. CLRD. CLOSED ☐6 EXC. CLRD. OPEN ☐7 CLSD. NON-CRIM.

54. IF CASE CLEARED, HOW CLEARED ☒1 ARREST & PROSEC. ☐2 DIRECTED TO JUV. CRT. ☐3 COMPL. RFUSD. TO PROSECUTE ☐4 COMMUNITY ADJUSTMENT ☐5 OTHER EXCEPT. ☒ADULT ☐JUV.

55. ☐ FOR SUMMARY CASES ONLY — THE ORIGINAL CASE REPORT IS SUBSTANTIALLY CORRECT, AND CONTACT WITH THE VICTIM HAS DISCLOSED NO ADDITIONAL PERTINENT INFORMATION.

60. NARRATIVE

Mr. Bosen woke at approx. 3.40am and could smell smoke. He had fallen asleep on the ground level of the house. and his wife was upstairs in her bed. He called the fire department but could not get upstairs due to the fire. Mrs. Bosen was retrieved with only minor injuries by fire department. Extensive property damage.

Forensics lifted 3 latent fingerprints from the back door handle and window. AFIS search returned 3 potential matches and 2 examiners narrowed these possibilities down to Riley Steen.

Previous arrests for burlary and property damage, and accelerant/lighters found in his vehicle.

☐ CONTINUED OTHER SIDE

*K.R.D. NO. G 069-345

90. EXTRA COPIES REQUIRED (NO. & RECIPIENT)

91. DATE THIS REPORT SUBMITTED – DAY 28 – MO. 07 – YR. 13 | TIME 13:00

92. SUPERVISOR APPROVING (PRINT NAME): Randy Eton | STAR NO. #3312

93. REPORTING OFFICER (PRINT NAME): Det. Adam Lorenz | STAR NO. #4599 | SIGNATURE

94. REPORTING OFFICER (PRINT NAME) | STAR NO. | SIGNATURE

SIGNATURE | 96. DATE APPROVED (DAY–MO.–YR.) | TIME

CPD-11.411 (REV. 2/94 TEMP. B.I.S. USE ONLY) *MUST BE COMPLETED IN ALL CASES

Figure 37. Contextual information in the form of a police case report describing incriminating information relating to an arson case.

SUPPLEMENTARY REPORT
CHICAGO POLICE

1. OFFENSE/CLASSIFICATION LAST PREVIOUS REPORT: Identity theft
2. ADDRESS OF ORIG. INCIDENT/OFFENSE: 3020 Rosewood Avenue
3. BEAT OF OCCUR.: 8924
4. DATE OF ORIG. OCCURRENCE–TIME: 08 – 02 – 13
5. VICTIM'S NAME AS SHOWN ON CASE REPORT: Michael Pehl
7. BEAT/UNIT ASSIGNED: 8394
8. TYPE OF LOCATION OR PREMISE WHERE INCIDENT/OFFENSE OCCURRED: Private Residence
LOCATION CODE: 019
9. NO. OF VICTIMS: 1
10. NO. OF OFFENDERS: 1

19. PROPERTY — DESCRIBE PROPERTY IN NARRATIVE. T = TAKEN; R = RECOVERED
1 MONEY: T $ 26,800
FILL IN THE FULL AMOUNT OF ONLY THOSE VALUES WHICH EITHER DIFFER FROM OR WERE NOT REPORTED ON THE ORIGINAL CASE REPORT OR THE LAST PREVIOUS SUPPLEMENTARY REPORT.

VICTIM UPDATE ONLY

20. NAME (LAST–FIRST–M.I.)	21. UCR OFFENSE CODE	22. HOME ADDRESS (NO., DIR., STREET, APT. NO.)	23. SEX–RACE–AGE CODE	24. HOME PHONE	25. BUSINESS PHONE	26. IL. DRIVER NO.	27. VICTIM REL. CODE
1. Michael Pehl		3020 Rosewood Ave	M – C – 38	569-1412		X	
2.							
3.							

OFFENDERS UPDATE ONLY

28. OFFENDER'S NAME (OR DESCRIBE CLOTHING, ETC.)	29. HOME ADDRESS	30. SEX–RACE–AGE CODE	HEIGHT	WEIGHT	EYES	HAIR	COMPL.
1. Marcus Evans	1030 Rosewood Avenue	M – C – 24	5'7"	170	Bl.	Br.	Fair
2.							

31. C.B. NO.	I.R. NO., Y.D. NO. OR J.D.A. NO.	OFFENDER REL. CODE	C.B. NO.	I.R. NO., Y.D. NO. OR J.D.A. NO.	OFFENDER REL. CODE	32. NO. ARRESTED	ARREST. UNIT NO.
OFF. 1			OFF. 2				

33. OFF'S. VEHICLE: YEAR | MAKE | BODY STYLE | COLOR | V.I.N. | STATE LICENSE NO. | STATE
34. SERIAL NOS. OF IDENTIFICATION NOS.

FOR USE BY BUREAU OF INVESTIGATIVE SERVICES ONLY (BOXES 21 & 50 THROUGH 55)

50. OFFENSE/CLASS. THIS DATE OF SAME (ENTER ONLY): Identity theft
REV. CODE: 0436
51. METHOD CODE: Full
52. METHOD ASSIGNED: 2 FIELD
UNIT NO.: 5463
53. STATUS: 0 PROGRESS
54. IF CASE CLEARED, HOW CLEARED
55. FOR SUMMARY CASES ONLY – THE ORIGINAL CASE REPORT IS SUBSTANTIALLY CORRECT, AND CONTACT WITH THE VICTIM HAS DISCLOSED NO ADDITIONAL PERTINENT INFORMATION.

60. NARRATIVE

Pehl noticed that his spare credit card was missing from the kitchen drawer on January 20th. but did not know how long it had been missing. He cancelled the credit card but it had been maxed out ($8000USD). His bank informed him that he had supposedly started another credit line over the phone in January. At this point, Pehl called the police and they discovered more forms of identity theft.

Video footage was obtained from outside the bank on a day that Pehl alleged came in to activate a a new credit card. The man pretending to be Pehl was traced using his licence plate #.

Marcus Evans was the owner of the vehicle and in Pehl's neighborhood. Judge Johnson saw probable cause for a warrant and credit cards and letters in Pehl's name were found in Evans's home.

61. DATE THIS REPORT SUBMITTED: 20 – 03 – 13 TIME: 15:30
62. SUPERVISOR APPROVING (PRINT NAME): Martin Castillo
59. REPORTING OFFICER (PRINT NAME): Det. Paul Butger STAR NO. #9820
64. REPORTING OFFICER (PRINT NAME): Det. Colby Saks STAR NO. #4451
66. DATE APPROVED: 22 – 03 – 13 TIME: 14:00

*MUST BE COMPLETED IN ALL CASES

Figure 38. Contextual information in the form of a police case report describing incriminating information relating to an identity theft case.

Identify and describe all property or possible evidence recovered at the end of the Narrative in column form. Show exactly where found, when found, who found it and its description (include Property Inventory number). If property taken was scribed for Operation Identification, indicate I.D. number at end of Narrative. Offender's approximate description, if possible, should include name if known, nickname, sex, race code, age, height, weight, color eyes & hair, complexion, scars, marks, etc. If suspect is arrested, give name, sex, race code, age, C.B. or I.R. number, if known, and state "In Custody."

SUPPLEMENTARY REPORT
CHICAGO POLICE

All descriptions and statements in this entire report are approximations or summarizations unless indicated otherwise.

4. DATE OF ORIG. OCCURRENCE–TIME: DAY 14 – MO. 05 – YR. 12

1. OFFENSE/CLASSIFICATION LAST PREVIOUS REPORT: Homicide
UCR OFF. CODE: 2252
2. ADDRESS OF ORIG. INCIDENT/OFFENSE: ☒1 VERIFIED ☐2 CORRECTED — 1770 Elm Grove
3. BEAT OF OCCUR.: 7671

5. VICTIM'S NAME AS SHOWN ON CASE REPORT: Jessie Michaels
CORRECT: ☒1 YES ☐2 NO — IF NO, CORRECT ALL VICTIM INFORMATION IN BOXES 20 THROUGH 27.
6. FIRE RELATED: ☐1 YES ☒2 NO
7. BEAT/UNIT ASSIGNED: 816

8. TYPE OF LOCATION OR PREMISE WHERE INCIDENT/OFFENSE OCCURRED: Apartment building
LOCATION CODE: 006
9. NO. OF VICTIMS: 1
10. NO. OF OFFENDERS: 1

CIRCUMSTANCES — 11. ☒ VERIFIED ☐ UPDATE TO
12. OBJECT/WEAPON: CODE NOS. 001 233
13. FIREARM FEATURES: CODE NO.
14. POINT/ENTRY: CODE NO.
15. POINT/EXIT: CODE NO.
16. BURGLAR ALARM: CODE NOS.
17. SAFE BURGLARY METHOD: CODE NO.
18. IF RESIDENCE WHERE WERE OCCUP.: CODE NO.

PROPERTY — 19. ☐ VERIFIED ☐ UPDATE TO
DESCRIBE PROPERTY IN NARRATIVE. T = TAKEN R = RECOVERED
FILL IN THE FULL AMOUNT OF ONLY THOSE VALUES WHICH EITHER DIFFER FROM OR WERE NOT REPORTED ON THE ORIGINAL CASE REPORT OR THE LAST PREVIOUS SUPPLEMENTARY REPORT.
1 MONEY ☐T $ ☐R
2 JEWELRY ☐T $ ☐R
3 FURS ☐T $ ☐R
4 CLOTHING ☐T $ ☐R
7 OFFICE EQUIPMENT ☐T $ ☐R
8 TV, RADIO, STEREO ☐T $ ☐R
9 HOUSEHOLD GOODS ☐T $ ☐R
10 CONSUM. GOODS ☐T $ ☐R
11 FIREARMS ☐T $ ☐R
12 NARC./DANGEROUS DRUGS ☐T $ ☐R
13 OTHER ☐T $ ☐R
14 NONE ☐T ☐R

VICTIMS UPDATE ONLY

20. NAME (LAST–FIRST–M.I.)	21. I-UCR OFFENSE CODE	22. HOME ADDRESS (NO., DIR., STREET, APT. NO.)	23. SEX–RACE–AGE CODE	24. HOME PHONE	25. BUSINESS PHONE	26. INJURED YES NO	27. VICTIM REL. CODE
1.							
2.							
3.							

OFFENDERS UPDATE ONLY

28. OFFENDER'S NAME (OR DESCRIBE CLOTHING, ETC.)	29. HOME ADDRESS	30. SEX–RACE–AGE CODE	HEIGHT	WEIGHT	EYES	HAIR	COMPL.
1. Tall, white male, black suit	Unknown	M – C – ?	6'2"	210	?	Bl.	?
2.							

31. C.B. NO.	I.R. NO., Y.D. NO., OR J.D.A. NO.	OFFENDER REL. CODE	C.B. NO.	I.R. NO., Y.D. NO., OR J.D.A. NO.	OFFENDER REL. CODE	32. NO. ARRESTED	ARREST. UNIT NO.
OFF. 1			OFF. 2				

33. OFF'S. VEHICLE ☐USED ☐STOLEN — YEAR — MAKE — BODY STYLE — COLOR — V.I.N. — STATE LICENSE NO. — STATE

34. SERIAL NOS. OR IDENTIFICATION NOS. ☐1 DNA ☐2 VERIFIED ☐3 CORRECTED — LIST ALL CORRECTIONS & NEW OR ADDITIONAL NOS. OBTAINED IN NARRATIVE

FOR USE BY BUREAU OF INVESTIGATIVE SERVICES ONLY (BOXES 21 & 50 THROUGH 55)

50. OFFENSE/CLASS. THIS DATE OF SAME ENTER DNA?: Homicide
REV. CODE: 0020
51. METHOD CODE: Full
52. METHOD ASSIGNED: ☒1 FIELD ☐3 SUMMARY
UNIT NO.
53. STATUS: ☒0 PROGRESS ☐1 SUSPENDED ☐3 UNFOUNDED

STATUS CONT'D. ☐3 CLRD. CLOSED ☐4 CLRD. OPEN ☐5 EXC. CLRD. CLOSED ☐6 EXC. CLRD. OPEN ☐7 CLSD. NON-CRIM.
54. IF CASE CLEARED, HOW CLEARED: ☐1 ARREST & PROSEC. ☐2 DIRECTED TO JUV. CRT. ☐3 COMPL. REFUSD. TO PROSECUTE ☐4 COMMUNITY ADJUSTMENT ☐5 OTHER EXCEPT. — ☒ADULT ☐JUV.

55. ☐FOR SUMMARY CASES ONLY – THE ORIGINAL CASE REPORT IS SUBSTANTIALLY CORRECT, AND CONTACT WITH THE VICTIM HAS DISCLOSED NO ADDITIONAL PERTINENT INFORMATION.

60. NARRATIVE

2.15pm approx. resident of building saw a man leaving the building in a hurry with blood on his shirt.

Witness reported that he was a white male, approximately 6'2", solid build, and blonde, wearing a suit.

The witness called the police when she reached level 3 and saw the victim lying outside her door

bleeding from several stab wounds. The victim died in hospital later from blood loss/her injuries.

DNA from skin under the victims fingernails was linked to Jacob Hitchens, who was romantically

linked to the victim. He was intercepted trying to leave the state the next day.

Interviews with family and friends of the victim indicate that he had jealousy issues and

had been violent towards to the victim in the past (doctors visits and photos of bruises).

☐CONTINUED OTHER SIDE

R.D. NO. G 069-345

60. EXTRA COPIES REQUIRED (NO. & RECIPIENT)
61. DATE THIS REPORT SUBMITTED – DAY 10 – MO. 06 – YR. 12 — TIME 16:30
62. SUPERVISOR APPROVING (PRINT NAME) — STAR NO.
63. REPORTING OFFICER (PRINT NAME): Det. Tom Richards — STAR NO. #1645 — SIGNATURE
64. REPORTING OFFICER (PRINT NAME): Det. Shauna Betts — STAR NO. #4465 — SIGNATURE
65. DATE APPROVED (DAY–MO.–YR.) — TIME

CPD-11.411 (REV. 2/94) TEMP. B.I.S. USE ONLY) *MUST BE COMPLETED IN ALL CASES

Figure 39. Contextual information in the form of a police case report describing incriminating information relating to a homicide.

Identify and describe all property or possible evidence recovered at the end of the Narrative in column form. Show exactly where found, when found, who found it and its description (include Property Inventory number). If property taken was scribed for Operation Identification, indicate I.D. number at end of Narrative. Offender's approximate description, if possible, should include name if known, nickname, sex, race code, age, height, weight, color eyes & hair, complexion, scars, marks, etc. If suspect is arrested, give name, sex, race code, age, C.B. or I.R. number, if known, and state "In Custody."

SUPPLEMENTARY REPORT
CHICAGO POLICE

All descriptions and statements in this entire report are approximations or summarizations unless indicated otherwise.

4. DATE OF ORIG. OCCURRENCE–TIME: DAY 21 – MO. 04 – YR. 12 09:30

1. OFFENSE/CLASSIFICATION LAST PREVIOUS REPORT: Armed Robbery
UCR OFF. CODE: 5551
2. ADDRESS OF ORIG. INCIDENT/OFFENSE: ☒ 1 VERIFIED ☐ 2 CORRECTED — 3340 14th Street
3. BEAT OF OCCUR.: 2765
5. VICTIM'S NAME AS SHOWN ON CASE REPORT: Dairy Queen
CORRECT: ☒ 1 YES ☐ 2 NO — IF NO, CORRECT ALL VICTIM INFORMATION IN BOXES 20 THROUGH 27.
6. FIRE RELATED: ☐ 1 YES ☒ 2 NO
7. BEAT/UNIT ASSIGNED: 211
8. TYPE OF LOCATION OR PREMISE WHERE INCIDENT/OFFENSE OCCURRED: Shop – Business District
LOCATION CODE: 142
9. NO. OF VICTIMS: 14
10. NO. OF OFFENDERS: 1

CIRCUMSTANCES
11. ☒ VERIFIED ☐ UPDATE TO
12. OBJECT/WEAPON: CODE NOS. 445 111
13. FIREARM FEATURES: CODE NO. 234
14. POINT/ENTRY: CODE NO. 002
15. POINT/EXIT: CODE NO. 004
16. BURGLAR ALARM: CODE NOS. 1123 005
17. SAFE BURGLARY METHOD: CODE NO. 8872-309
18. IF RESIDENCE WHERE WERE OCCUP.: CODE NO.

PROPERTY
19. DESCRIBE PROPERTY IN NARRATIVE. T = TAKEN, R = RECOVERED. FILL IN THE FULL AMOUNT OF ONLY THOSE VALUES WHICH EITHER DIFFER FROM OR WERE NOT REPORTED ON THE ORIGINAL CASE REPORT OR THE LAST PREVIOUS SUPPLEMENTARY REPORT.
☒ VERIFIED ☐ UPDATE TO
1 MONEY: ☒ T $ 867.55 ☐ R
2 JEWELRY: ☐ T $ ☐ R
3 FURS: ☐ T $ ☐ R
4 CLOTHING: ☐ T $ ☐ R
5 OFFICE EQUIPMENT: ☐ T $ ☐ R
6 TV, RADIO, STEREO: ☐ T $ ☐ R
7 HOUSEHOLD GOODS: ☐ T $ ☐ R
8 CONSUM. GOODS: ☐ T $ ☐ R
9 FIREARMS: ☐ T $ ☐ R
10 NARC./DANGEROUS DRUGS: ☐ T $ ☐ R
11 OTHER: ☐ T $ ☐ R
12 NONE: ☐ T ☐ R

VICTIMS UPDATE ONLY

20. NAME (LAST–FIRST–M.I.)	21. UCR OFF. CODE	22. HOME ADDRESS (NO., DIR., STREET, APT. NO.)	23. SEX–RACE–AGE CODE	24. HOME PHONE	25. BUSINESS PHONE	26. INJ. (YES, NO)	27. VICTIM REL. CODE
1.							
2.							
3.							

OFFENDERS UPDATE ONLY

28. OFFENDER'S NAME (OR DESCRIBE CLOTHING, ETC.)	29. HOME ADDRESS	30. SEX–RACE–AGE CODE	HEIGHT	WEIGHT	EYES	HAIR	COMPL.
1. Male, blue balaclava, white sweater, jeans	Unknown	M – ? – ?	5 8"	170	?	?	?
2.							

31. C.B. NO.	I.R. NO., Y.D. NO. OR J.D.A. NO.	OFFENDER REL. CODE	C.B. NO.	I.R. NO., Y.D. NO. OR J.D.A. NO.	OFFENDER REL. CODE	32. NO. ARRESTED	ARREST. UNIT NO.
OFF. 1			OFF. 2				

33. OFF'S. VEHICLE ☐ USED ☐ STOLEN | YEAR | MAKE | BODY STYLE | COLOR | V.I.N. | STATE LICENSE NO. | STATE

34. SERIAL NOS. OR IDENTIFICATION NOS. ☐ 1 DNA ☐ 2 VERIFIED ☐ 3 CORRECTED — LIST ALL CORRECTIONS & NEW OR ADDITIONAL NOS. OBTAINED IN NARRATIVE

FOR USE BY BUREAU OF INVESTIGATIVE SERVICES ONLY (BOXES 21 & 50 THROUGH 55)

50. OFFENSE/CLASS. THIS DATE OF SAME ENTER DNA: Armed Robbery
REV. CODE: 2333
51. METHOD CODE: Pull
52. METHOD ASSIGNED: ☒ 1 FIELD ☐ 3 SUMMARY
UNIT NO.: 652
53. STATUS: ☒ 0 PROGRESS ☐ 1 SUSPENDED ☐ 2 UNFOUNDED

STATUS CONT'D. ☐ 3 CL/RD. CLOSED ☐ 4 CLRD. OPEN ☐ 5 EXC. CLRD. CLOSED ☐ 6 EXC. CLRD. OPEN ☐ 7 CLSD. NON-CRIM.
54. IF CASE CLEARED, HOW CLEARED: ☐ 1 ARREST & PROSEC. ☐ 2 DIRECTED TO JUV. CRT. ☐ 3 COMPL. REFUSD. TO PROSECUTE ☐ 4 COMMUNITY ADJUSTMENT ☐ 5 OTHER EXCEPT. ☐ ADULT ☐ JUV.

55. ☐ FOR SUMMARY CASES ONLY – THE ORIGINAL CASE REPORT IS SUBSTANTIALLY CORRECT, AND CONTACT WITH THE VICTIM HAS DISCLOSED NO ADDITIONAL PERTINENT INFORMATION.

60. NARRATIVE

A male with a balaclava, white sweater, and jeans entered the Dairy Queen at 9.30am with a gun. He handed the cashier a note and held her at gun point. She gave him the money in the register.

She called the police immediately after the incident and indicated the direction he ran in.

Police found a man matching the general description nearby and, when he was presented to the witness she was "80% certain" this the same man the robbed the store. A gun similar to the one used in armed robbery was found in a dumpster near the location the suspect. Jay Thomas. was found.

Thomas confessed to the crime at the police station after an interview.

☐ CONTINUED OTHER SIDE

56. W.R.D. NO. G 069-345

60. EXTRA COPIES REQUIRED (NO. & RECIPIENT)
61. DATE THIS REPORT SUBMITTED – DAY 02 – MO. 05 – YR. 2012 TIME 3.45pm
62. SUPERVISOR APPROVING (PRINT NAME) STAR NO.
63. REPORTING OFFICER (PRINT NAME): Det. James Naylor STAR NO. #4098
64. REPORTING OFFICER (PRINT NAME): Det. Frank Bradley STAR NO. #3488
SIGNATURE
SIGNATURE
SIGNATURE
66. DATE APPROVED (DAY–MO.–YR.) TIME

CPD-11.411 (REV. 2/94 TEMP. B.I.S. USE ONLY) *MUST BE COMPLETED IN ALL CASES

Figure 40. Contextual information in the form of a police case report describing incriminating information relating to an armed robbery.

APPENDIX D. IRB ETHICS APPROVAL

IOWA STATE UNIVERSITY
OF SCIENCE AND TECHNOLOGY

Institutional Review Board
Office for Responsible Research
Vice President for Research
1138 Pearson Hall
Ames, Iowa 50011-2207
515 294-4566
FAX 515 294-4267

Date: 10/27/2015

To: Adele Quigley-McBride
475C Science I

CC: Dr. Gary L Wells
W112 Lagomarcino
Sara Davis
W112 Lagomar

From: Office for Responsible Research

Title: Forensic Testing Procedures 1

IRB ID: 15-561

Approval Date: 10/27/2015 **Date for Continuing Review:** 10/26/2017

Submission Type: New **Review Type:** Expedited

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 <u>any</u> changes** to the study by submitting a Modification Form for Non-Exempt Research or Amendment for Personnel Changes form, as necessary.
- **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.
- **Stop all research activity if IRB approval lapses**, unless continuation is necessary to prevent harm to research participants. Research activity can resume once IRB approval is reestablished.
- **Complete a new continuing review form** at least three to four weeks prior to the **date for continuing review** 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 be aware that 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.**

Upon completion of the project, please submit a Project Closure Form to the Office for Responsible Research, 1138 Pearson Hall, to officially close the project.

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