Putting the Microscope on Crime Labs: The Effects of Evidence Complexity and Laboratory Type on Jurors' Perceptions of Forensic Evidence

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PUTTING THE MICROSCOPE ON CRIME LABS: THE EFFECTS OF EVIDENCE COMPLEXITY AND LABORATORY TYPE ON JURORS’ PERCEPTIONS OF FORENSIC EVIDENCE

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ABSTRACT

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Miliaikeala S.J. Heen

An experiment was conducted to test the effects of evidence complexity and laboratory type on jurors’ perceptions of forensic evidence. The study specifically focused on three types of labs: public labs, private labs, and “corporate labs.” Public labs are managed by a federal, state, or local law enforcement agency, where evidence is usually analyzed internally at an agency. Private labs are those that have been formed as private businesses to provide services to federal, state, and local crime labs with overflow work. Corporate labs are managed by major retail corporations, and primarily service the needs of their store businesses, but also assist federal, state, and local agencies with overflow work and specialized cases. A national sample of mock jurors was presented with latent fingerprint evidence analyzed at 1 of the 3 types of crime labs. Evidence was presented in either a high-complexity (i.e., unfamiliar scientific language) or low-complexity (i.e., lay terms) format. Both lab type and evidence complexity were found to have significant effects on perceptions of evidence and verdict decisions. The findings are considered in the context of persuasion theories, and have implications in terms of developing best practice guidelines for forensic evidence presentation in court.
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CHAPTER 1
INTRODUCTION

Although DNA testing and the review of other forensic evidence has led to the exoneration of over 300 innocent individuals from wrongful convictions since the first case in 1989, it is important to examine the unregulated processes that have allowed these errors to occur (“DNA Exonerations Worldwide”, n.d.). Currently, there is no oversight to ensure labs are following standards and requirements, analyzing evidence objectively, and reporting accurate lab results. Many of these wrongful convictions are the product of the lack of training and standards, continued mistakes and mishandling of evidence, or instances of fraud that have occurred in U.S. forensic crime labs. Further, jurors may be heavily influenced by potentially unreliable forensic evidence presented in the courtroom.

Forensic evidence has been found to be highly persuasive, accurate, and a strong indicator of a suspect’s guilt regardless of crime type (Lieberman, Carrell, Miethe & Krauss, 2008). However, jurors can only take the expert at his word through testimony in court and must have confidence that the forensic lab that handled the evidence is viable, credible, and regulated. Unfortunately, this is not always the case. In addition, jurors often rely on inaccurate heuristic cues when attempting to understand the evidence and form an impression of the expert (Cooper & Neuhaus, 2000). When you combine these problems with the increasing number of wrongful convictions and laboratory errors, the result is a need to modify current processes.

Recent years have seen a growing call for forensic labs to become independent organizations that are more regulated, funded, accredited and autonomous from police departments or federal government agencies (DiFonzo, 2005; Giannelli, 1996; National
Research Council, 2009). The combination of the need to improve the field of forensic science and the lack of available research in the field of forensic evidence and criminal investigation, and its later effects in the courtroom, has caused experts in the field, researchers, and legislators to push for more improvement, standards, regulation, and research in the area.

This research study is considered within the context of cognitive decision-making theories, with a specific focus on juror mental processing. When information is easy to process and comprehend, individuals will adopt a systematic method of processing to carefully review the message and make a decision (Chaiken, 1980; Epstein, 1994; Petty & Cacioppo, 1981). However, when information is more complex, it has been found that individuals will rely on extra-legal factors and heuristics to make decisions. (Chaiken, 1980; Epstein, 1994; Petty & Cacioppo, 1981).

In addition, research has shown gender to be a predictor of how individuals make decisions. It has been found that males typically are more conviction prone and punitive when compared to females who are usually more empathetic towards defendants (Hurwitz & Smithey, 1998; Mills, 1980; Stephan, 1974). It has been demonstrated that males will rely on heuristics and base decisions off “subsets of available information” (Meyers-Levy, 1986; Putrevu, 2001, p. 6). Conversely, females typically engage in decision-making that is more complete, processing information objectively and subjectively and appropriately weighing all factors before making a decision (Darley & Smith, 1995; Meyers-Levy, 1986; Putrevu, 2001).

The purpose of this study was to test the effects of evidence complexity and laboratory type on jurors’ differential perceptions of forensic evidence. It specifically
focused on three types of labs: public labs (i.e., state, local and federal labs); private labs; and “corporate” labs. Public labs are those that are managed by a local or state police agency and analyze evidence that is handled internally. Labs that are considered private are those that have been formed as a private business to provide services to medical examiners and courts, provide specialized DNA testing, and assist and provide services to federal, state, and local crime labs with overflow work. Corporate labs are laboratories managed by a major corporation and service the needs of their store or business and assist federal, state, and local agencies with overflow work and specialized cases.

Testimony regarding forensic evidence was varied between a high complexity and low complexity condition. In the high complexity condition, the expert witness used scientific and technical terms while in the low complexity condition the expert witness used simpler language and lay terms. Overall, the purpose of this study was to see if jurors change their perceptions of evidence based simply on whether a public lab, private lab, or corporate lab analyzed the evidence and ultimately how this impacts verdict decisions.
CHAPTER 2

LITERATURE REVIEW

When jurors walk into a courtroom, they have expectations of what their experience will be like and what will be presented to them. Most of these expectations come from their pre-existing knowledge and experiences in the world and their beliefs about reality. Research has found that jurors typically expect to be presented with scientific evidence (Shelton, Kim & Barak, 2007). In addition, jurors develop a “chronological narrative” to make sense of the presented evidence (Devine, 2012, p. 26). This has been come to be known as the Story Model – jurors develop their own “story” of what is presented to them in court to better process it and understand it, and then later arrive at an appropriate verdict decision. To form these narratives, “jurors rely heavily on their existing knowledge and beliefs” especially when they need to fill gaps in testimony or determine the credibility of an issue (Devine, 2012, p. 27). Essentially jurors use the case-specific information given during a trial and combine it with their pre-existing knowledge and beliefs to form their own story of the trial.

Similar to this is the Commonsense Justice model, originally hypothesized by Norman Finkel (1995). The model suggests that jurors develop their own understanding of the law and the way it should be applied through their everyday experiences. Their understanding of legal concepts is based on their beliefs and what they have experienced during their lives rather than being derived from “black-letter law” or the “law on the books.” Essentially Commonsense Justice “reflects what ordinary people think is just and fair” not necessarily what the current law states (Finkel, 2000). These understandings and beliefs that jurors hold in regard to legal concepts have a heavy influence on their
understanding and evaluation of evidence, regardless of the legal definitions or boundaries provided to them (Devine, 2012). Both of these models help to explain how jurors make decisions and provide insight into the influence on their expectations and decision-making in the courtroom.

**Juror Expectations of Scientific Evidence**

Research has found that forensic evidence, especially DNA evidence, is highly valued by jurors. It has been demonstrated that jurors find forensic evidence to be more superior and persuasive in their verdict decisions than traditional types of evidence such as eyewitness or victim testimony, (Golding, Stewart, Yozwiak, Djadali, & Sanchez, 2000; Skolnick & Shaw, 2001). In a comparison of different types of forensic evidence, Lieberman, Carrell, Miethe & Krauss (2008), found jurors rated DNA evidence as being far more accurate, persuasive, and superior over other types of forensic evidence (fingerprints, blood evidence, hair samples, and witness testimony) regardless of crime type. One potential reason cited for these elevated expectations it what has been termed the “CSI effect.”

The term “CSI effect” has been coined by the media and those in the legal community that believe the popular television show *CSI: Crime Scene Investigation* has caused jurors to have unrealistic expectations of forensic evidence in the courtroom. *CSI* originally debuted in 2000 and the debate on its effects in the field of criminal justice have been featured in many mass media articles including National Geographic News, BBC News, Washington Post, and in U.S. News & World Report (Tyler, 2006). Proponents of the effect believe that the show, and other crime-drama television shows,
raise the stature of scientific evidence to virtual infallibility, thus making scientific evidence impenetrable (Podlas, 2005, p. 433).

Despite concerns regarding the CSI effect, empirical research findings have not shown any significant effects between television viewing habits and verdict decisions. Studies have typically found that individuals who watch CSI or general crime programs do not differ in their verdicts compared to individuals who report not watching these shows (Goodman-Delahunt & Tait, 2008; Holmgren & Fordham, 2011; Podlas, 2005; Schweitzer & Saks, 2006; Shelton, Kaye & Barak, 2007). There was some evidence that CSI viewers had higher expectations of evidence, and that they may have been more stringent when assessing the evidence, however, there were no significant findings regarding verdict decisions (Podlas, 2005; Schweitzer & Saks, 2006; Shelton et al., 2007). These high expectations of evidence lead jurors to believe that forensic evidence has the ability to always be extracted from items or individuals at a crime scene, the evidence is always conclusive, and that this type of evidence should always be presented in court (Podlas, 2005; Shelton et al., 2007). However, just because jurors are not influenced by the CSI effect, it does not mean that they would not be influenced by lab type heuristics.

**Juror Decision-Making and Mental Processing**

Most research that examines juror-decision making and forensic evidence largely focuses on aspects of the evidence itself and the way it is presented, specifically the complexity and statistical nature of its format. The most relevant and relatable findings to come out of the research is the discovery that jurors tend to rely on extra-legal factors unrelated to an expert’s testimony when the testimony is complex, which is a common
characteristic of forensic evidence (Cooper, Bennett, & Sukel, 1996; Cooper & Neuhaus, 2000; Ratneshawar & Chaiken, 1991).

Forensic evidence testimony is often complex and scientifically and statistically based, which may be challenging for most jurors to comprehend. When individuals lack the ability or motivation to understand a message, they use cognitive shortcuts or heuristics to help them make decisions. Petty and Cacioppo (1981) first suggested that individuals form attitudes based on two different types of mental processing. One is “central route processing”, where individuals use thorough consideration to adopt an attitude on an issue, while the other is “peripheral route processing” where an individual uses “cues” to decide on something rather than careful consideration. When there is a lack of personal relevance or a lack of motivation to understand an issue, individuals are more likely to use peripheral route processing rather than central route processing (Petty, Cacioppo, & Goldman, 1981). This model of mental processing takes into account individual differences between people and how that affects their decision-making.

This same idea of mental processing is echoed through Chaiken’s Heuristic Systematic Model (1980) of processing that maintains individuals process a message’s persuasiveness through a “systematic” or “heuristic view.” A systematic view of persuasion is used when “recipients exert considerable cognitive effort” to evaluate and comprehend a message and form a conclusion (Chaiken, 1980, p. 752). Conversely, a heuristic view of persuasion occurs when little effort is exerted to understand a message and where individuals rely more on the “source’s identity” or factors and characteristics outside of the actual message (Chaiken, 1980, p. 752). Much like Petty and Cacioppo’s central versus peripheral route processing, individuals who have high personal relevance
or involvement in a message or issue are more likely to employ systematic processing rather than heuristic processing to understand and form an opinion on a message. When there are low levels of involvement, individuals will use a heuristic point of view, which allows for a faster and more efficient mode of processing. Both models of mental processing provide some level of confirmation that individuals use different systems of thought based upon the level of personal involvement, circumstances, and overall context of a situation.

Additional support for the idea of dual routes of mental processing can be found within Epstein’s Cognitive-Experiential Self-Theory (CEST). According to the major principles of CEST, individuals process information by two independent systems. One is an experiential mode that is used to process information “automatically, rapidly, effortlessly, and efficiently” (Epstein, 1994, p. 715). This mode is a holistic based system that relies heavily on emotions, past experiences, and often stereotypical-type logic to make decisions and form opinions. Similar to the theoretical constructs previously mentioned, an experiential mode of processing operates as a default and “everyday behavior is primarily determined by it” (Donovan & Epstein, 1997, p. 3). The use of heuristics becomes a decision-making tool to arrive at more efficient and everyday determinations. Conversely, the rational mode is more analytic in nature and decisions are made in a more deliberate and effortful manner. When in a rational mode of decision-making, individuals are able to think in the abstract and provide justification for their decisions through logic and concrete evidence (Donovan & Epstein, 1997). Because of its systematic nature, Epstein (1994) describes this mode as an “inefficient system for responding to everyday events” (p. 715). The basic foundations of CEST reinforce the
assumptions found in Petty and Cacioppo’s Central Route versus Peripheral Route Processing and Chaiken’s Heuristic Systematic model. In particular, when individuals need to make a decision in a swift and timely manner they rely on an experiential mode of processing with the use of heuristics. When the decision requires a level of critical and analytical thinking individuals make decisions in a rational mode. The method in which individuals process messages helps to form a better picture of how they receive the initial message or presentation and form their subsequent attitudes and conclusions.

When taken into the context of a courtroom, these theoretical models have been used to support the notion that juror decision-making can often times be influenced by the utilization of extra-legal factors (Lieberman, 2002). Reliance on extra-legal factors and the use of heuristics has been found to exist with defendant characteristics. Empirical research conducted inside and outside of a laboratory setting has found that concentration on extra-legal factors significantly influences juror decision-making. The focus on extra-legal factors has primarily been based upon physical characteristics of the defendant such as race, age, gender, and ethnicity (Gunnell & Ceci, 2010). In addition, research has consistently shown that jurors are more lenient toward attractive defendants (Lieberman, 2002). This phenomenon has been found in the context of a multitude of factors including trial type (civil versus criminal), decision makers (judges versus jurors), and types of crime (Gunnell & Ceci, 2010). Efrain (1974) found that defendants who were physically attractive were evaluated with less certainty of guilt and were recommended less severe punishments than their unattractive counterparts. Stewart (1985) added to the physical attractiveness research and found that defendants who were perceived to be attractive were given greater leniency and less severe punishment. Meta-analytic research
conducted by Mazzella and Feingold (1994) found in general that it was advantageous for a defendant to be physically attractive, among other extra-legal factors like being a female or having high socioeconomic status (p. 1315). The aforementioned models of processing modes can be used to provide an explanation as to when physical attractiveness or other characteristics may be influential on juror decision-making. For example, Epstein’s Cognitive Experiential Self-Theory (CEST) predicts that physical attractiveness would be a determining factor in juror’s decisions when they are engaged in an experiential mode of thinking. Indeed, empirical research has found that the defendant attractiveness effect emerges when participants are in an experiential mindset, but participants will evaluate information objectively when motivated to think in a rational manner (Lieberman, 2002).

These models of decision-making become highly relevant when specifically dealing with expert testimony and forensic evidence. When jurors hear expert testimony, it is often filled with scientific and statistical jargon. Consequently, jurors may engage in heuristic-peripheral processing rather than using central-systematic processing (Cooper & Neuhaus, 2000). In addition, jurors have been found to focus on factors unrelated to an expert’s testimony rather than the content of the message itself or physical characteristics of individuals in the courtroom. For example, jurors have been found to perceive experts (and the expert’s testimony) as more or less persuasive based on their expertise, frequency of testifying, level of pay, and credentials (Cooper, Bennett, & Sukel, 1996; Cooper & Neuhaus, 2000; Ratneshawar & Chaiken, 1991). Cooper & Neuhaus (2000) found that experts, who frequently testify in cases and are paid well for that testimony, are often perceived as “hired guns.” These experts were perceived as “hired guns” when
their credentials were high (e.g., degree came from a prestigious university, author of several dozen articles, and taught at a prestigious university versus degree came from a more obscure university and published far fewer articles) and were paid well (e.g., $4,800 versus $75) for their testimony. Jurors tend to find these experts unlikeable and are not persuaded by their testimony (Cooper & Neuhaus, 2000, p. 153). Although previous research has focused on heuristics associated with the expert or defendant characteristics, it is possible that jurors hold heuristics for crime labs as well.

**Crime Lab Types and Accreditation**

There are three general types of crime labs that exist in the United States: state, local, and federal crime labs; private labs; and corporate labs. Most states have labs that fall under the umbrella of being a state, local, or federal forensic evidence crime lab which are considered public labs. Law enforcement agencies and local police departments manage these labs. These labs are the most common as each state, county, and city usually has a crime lab aligned within their police department. Examples include Las Vegas Metropolitan Police Department Forensic Laboratory, Louisiana State Police Crime Laboratory, and Federal Bureau of Investigation Digital Evidence Laboratory (ASCLD/LAB, 2013).

With an increasing amount of forensic evidence being used in the courtroom, private labs have begun to open in many states across the country. Although some private labs are affiliated with a state’s Department of Public Safety or Health, these labs are not connected or managed by a state or local county police crime lab. Instead they are run independently by licensed professionals and often act as a neutral third party. Private crime labs analyze the same types of evidence a state lab would, such as latent prints or
DNA samples. Labs also specialize in analyzing all types of forensic evidence including DNA, fingerprints, trace evidence, crime scene toxicology, and firearms.

Private labs receive work through formal means of a “request form” or a “quote” that is often found on the lab’s website. Police and law enforcement agencies, attorneys, medical examiners, and private investigators or industry professionals typically make these requests. Some private labs are also available for consultation services while some labs specialize in police evidence backlogs. Technicians in these labs come from forensic evidence and science backgrounds, with most having an advanced degree in the subject matter. These labs also receive the same accreditation through standardized and professional lab accreditation boards that state and federal crime labs and are located all over the United States.

More recently corporations have begun to develop their own crime labs. For example, Target has created forensic crime labs where they deal with theft, fraud, and personal injury cases within their stores. However, Target labs also work with state, local, and federal crime labs with overflow work or for Target’s expertise with digital multimedia evidence. There are currently two laboratories under Target Corporation Forensic Services – one in Minneapolis, Minnesota and the other in Las Vegas, Nevada. The labs employ technicians who come from all areas in the criminal justice field as well as individuals from other crime laboratories. All lab technicians are certified professionals who have specialized skills in the area of processing, examining, and cataloguing forensic evidence.

Although the corporate and “brand-name” label associated with this crime lab might lead people to believe that it would produce a lower quality of evidence analysis,
and ultimately be seen as less credible or reliable because of its connection with a major corporate store, Target crime labs receive the same accreditation that state, federal, local and private crime labs hold. The Target crime labs specialize in digital multimedia evidence, specifically video and image analysis that service in-store needs and police overflow, as well analyzing latent fingerprint evidence. Evidence analyzed for police departments make up 30% of the labs overall caseload which is all on a volunteer basis. The remaining 70% of the caseload is specific to in-store needs.

**Crime Lab Failures**

Juror heuristics about crime labs may be influenced by media reports about crime labs. An increasing number of crime laboratory scandals have recently come to light. Documented crime lab “failures” have been found in West Virginia, Oklahoma, Montana, Illinois, Virginia, New York, Massachusetts, Minnesota, Ohio, Maryland, California, Texas, Washington, and also in the FBI Crime Laboratory (Giannelli, 2011; Hansen, 2013). In most of these cases, mistakes have occurred because of the improper handling of evidence or not following proper procedures and protocol. Laboratory technicians have also been found to give false test results, forge signatures, contaminate samples, and give false or misleading testimony (Hansen, 2013). Although an accredited lab is still susceptible to fraud or observer errors and effects, being accredited would provide the foundation for some sort of laboratory regulation and would ultimately “increase the overall quality of admissible evidence” (Lieberman, Carrell, Miethe, & Krauss, 2008, p. 57). However, many issues that have arisen in labs across the country have been publicized and disseminated to the public through media sources. This creates the
potential for jurors mental processing to be influenced by heuristics that are based, in part, on media reports of crime lab failures.

**Purpose of the Current Study**

The current study will explore whether jurors hold differential perceptions of evidence that come from various types of forensic crime labs. Based on the research on heuristic and systematic mode of processing, it is possible that jurors’ perceptions of evidence complexity may lead them to focus on extra-legal factors such as whether the expert is employed by a state crime lab versus a private or corporate crime lab to make decisions about the quality of evidence. Heuristics are likely to be utilized more by a juror as the complexity of testimony increases. If a juror relies on heuristics and hears an expert witness came from a corporate lab such as Target, it is possible their attitude toward the evidence, testimony, and expert will be devalued because of the beliefs that major chains like Target are retail outlets, and do not have expertise in forensic analysis. They may have less positive perceptions of retail businesses and consequently, jurors may assume these crime labs analyzed evidence using lower standards and quality, and produced results that are less credible and less scientifically reliable. It is also possible that jurors may have more positive perceptions of public labs because of police management.

**Hypotheses**

An experimental research study was done to examine these issues. Five main hypotheses were tested.

**Hypothesis 1: Evaluation of Corporate Labs in High Complexity Condition**
When high complexity evidence is presented, jurors will evaluate evidence analyzed by corporate labs significantly lower than public or private labs leading to fewer convictions and less positive impressions of the expert witness. This is predicted to occur because of the association with a major corporation.

**Hypothesis 2: Evaluation of Public Labs in High Complexity Condition**

When high complexity evidence is presented, jurors will evaluate evidence analyzed by public labs significantly higher than private or corporate labs leading to a greater number of convictions and more positive impressions of the expert witness. This is predicted to occur because of the connection to a police department and the potential for jurors to have greater trust in police.

**Hypothesis 3: Crime Show Viewing Habits and Legal Attitudes in High Complexity Condition**

When high complexity evidence is presented, juror crime show viewing habits and legal attitudes will be significantly correlated with their verdict decision and perceptions of labs. This is predicted to occur because of an increased need for greater reliance on heuristics and the influence of pre-existing knowledge and beliefs on decision-making under high complexity.

**Hypothesis 4: Crime Lab Type in Low Complexity Condition**

When low complexity evidence is presented, crime lab type will not have a significant effect on verdict decisions or perceptions of labs. Because the testimony will be easier to understand, jurors will focus on the content of the materials rather than relying on outside factors or pre-existing knowledge and beliefs to make decisions.
Hypothesis 5: Crime Show Habits and Legal Attitudes in Low Complexity

Condition

When low complexity evidence is presented, juror crime show viewing habits and legal attitudes will not be significantly correlated with verdict decisions and perceptions of labs. Because the testimony will be easier to understand, jurors will focus on the content of the materials rather than relying on their pre-existing beliefs and attitudes to make decisions.
CHAPTER 3

METHODOLOGY

Participants

The study was administered online to 172 U.S. adults who were recruited via Amazon.com’s online data and survey collection site Mechanical Turk\(^1\). Participants were compensated $0.75 for their participation. Fourteen participants were dropped from the study for not meeting requirements for a standard jury pool (i.e., felony conviction and/or non-U.S. citizenship status) bringing the total sample size to 158 participants.

Materials and Procedure

All materials for the study were adapted from original materials developed by Carrell (2008). After agreeing to participate in the survey via Mechanical Turk, participants were given a brief introduction on the study and a consent form. Participants first completed a demographic questionnaire asking their gender, age, race/ethnicity, political affiliation, employment status, highest level of education completed, citizenship status and criminal convictions, and jury duty experience (see Appendix A).

Legal Attitudes Questionnaire

Next, participants completed a Legal Attitudes questionnaire that was designed to assess their prior beliefs regarding forensic evidence. Within the 15 item questionnaire, were six specific questions concerning crime scene investigation, crime laboratories, and

\(^1\)Mechanical Turk (https://www.mturk.com/mturk/) was created in 2005 and is an online source for data collection and conducting experimental research. The site is an “online labor market where employees (called workers) are recruited by employers (called requesters) for the execution of tasks (called HITs, acronym for Human Intelligence Tasks) in exchange for a wage (called a reward)” (Paolacci, Chandler, & Ipeirotis, 2010, p. 411-412). Workers and requesters access the site through Amazon.com and create a profile where they are assigned a unique Worker ID. Rewards can be as low as $0.01 to more than $10.00 depending on what type of task the requester is asking (Paolacci et al., 2010; Goodman, Cryder & Cheema, 2013).
forensic evidence: (a) “DNA is the most reliable type of physical evidence we have
today”; (b) “Crime laboratories never make mistakes when analyzing forensic evidence”; (c) “I would convict a defendant if the only evidence against him were fingerprints”; (d) “I would convict a defendant if the only evidence against him were DNA”; (e) “Crime laboratories run by a police agency are always reliable”; (f) “If detectives lift fingerprints from a crime scene, they can easily compare them to a suspect’s prints.” The questionnaire was designed to test the strength of participants’ prior beliefs and feelings towards forensic evidence, crime scene investigation, and crime laboratories. Participants responded to each statement using a 10-point Likert scale, ranging from 1 (strongly disagree) to 10 (strongly agree).

**Television and Reading Habits Questionnaire**

After completing the Legal Attitudes questionnaire, participants received a Television and Reading Habits questionnaire to measure the extent to which participants’ television programming preferences and reading habits influence their expectations of forensic evidence and criminal investigation. Participants were given 5 non-crime programs (The Voice, The Amazing Race, SportsCenter, Dancing With the Stars, Mad Men) and 6 crime related programs (CSI, The First 48, Cops, Dexter, Law & Order, Orange Is the New Black) to respond to using answer choices of: 0 (I have never watched that show), 1 (I have seen that show once or twice), 2 (I try to watch that show when I have time during the week), 3 (I watch that show regularly every week). Next, participants answered 13 questions on their general reading habits regarding politics, community events, crime activity, and novels with 3 questions specifically asking about crime activity (reading about crime activity online, reading crime novels, and reading
about crime activity in the newspaper). Participants responded to each statement using answer choices of: 0 (Never), 1 (Once or twice a week), 2 (When I have time during the week), 3 (Almost every day).

**Case Materials**

The research study was a 3 (lab type: public crime lab vs. private crime lab vs. corporate crime lab) x 2 design (testimony complexity: low complexity vs. high complexity) for a total of 6 conditions. All participants received the same case description of a second-degree murder that occurred in a local park (see Appendix B). The victim in the case was running at the park and was attacked from behind and stabbed to death. Police later arrested a suspect after seeing him in a bloodstained shirt at the park later that night. A knife was recovered from the crime scene and fingerprints were taken off the physical evidence. Participants were then presented with expert testimony detailing fingerprint evidence taken from the crime scene and recovered knife, and fingerprints taken from the suspect at the time of jail booking. The expert witness described the match between the fingerprints taken from the recovered knife and the suspect’s prints. Next, participants read a cross-examination of the expert witness. At the end of the case description, participants were asked to estimate the probability that the defendant was guilty of murder.

**Expert testimony manipulation.** Participants received expert testimony of two varying levels of complexity (high vs. low). The complexity of testimony was varied by the type of language used by the expert witness to describe evidence collection and the analysis of evidence. The high complexity condition had the expert witness respond with scientific and technical terms specifically relating to fingerprint evidence. The low
complexity condition had the expert witness responding with lay terms, replacing all scientific jargon used in the high complexity condition. As an example of the difference between complexity types, the expert witness gave one of these responses to a question on his method of processing prints:

**High Complexity**

Nonporous surfaces must be processed differently from porous surfaces because the absorption of various components of the fingerprint residue by porous materials. I use a chemical called Aqueous Leuco Crystal Violet that enhances and develops latent prints stained with blood porous or non-porous surfaces. It is best applied by submerging the object into the Aqueous Leuco Crystal Violet solution or by spraying the item if it cannot be dipped. Development usually appears within 30 seconds.

**Low Complexity**

Surfaces like glass must be treated differently from surfaces like paper or wood because the prints absorb differently into materials like paper or wood. I use a chemical solution that enhances and develops hidden prints stained with blood on a surface. It is best applied by dipping the object into the solution or by spraying the item if it cannot be dipped. Development usually appears within 30 seconds.

The word count of the testimony was extremely close in number for both conditions and the organization of the initial questions asked to the expert was identical in each. Each condition included a photo of a latent print and an inked impression (9 points of comparison added) taken from National Institute of Standards and Technology Special Database 27 (U.S. Department of Commerce, 2000).

**Crime lab type manipulation.** Along with manipulated levels of expert testimony complexity, participants received expert testimony of a lab technician who worked at 1 of 3 different types of labs: a public lab, a private lab, or a corporate lab. The public lab represented federal, state, and local labs that are managed by a local police department or government agency. The private lab reflected forensic labs run as private...
entities that are independent of a federal or state agency. The corporate lab represented the recently established forensic labs by the Target Corporation.

**Cross-examination of expert witness.** Following the expert witness testimony, participants were presented with a cross-examination transcript. All participants received the same cross-examination of the defense attorney questioning the expert witness on the evidence presented, experience as a lab technician and experience as an expert witness.

**Jury instructions and verdict form.** Following the case materials, participants were presented with jury instructions that described the legal definitions of second-degree murder and instructions specific to evidence presented (see Appendix C). Jurors were asked again to estimate the probability that the defendant was guilty of murder and to deliver a verdict in a dichotomous (*guilty/not guilty*) format. Using a 10-point Likert scale, participants rated their confidence in their verdict choice, ranging from 1 (*not at all confident*) to 10 (*extremely confident*). Participants were asked to briefly describe the main reason why they chose the verdict they did in an open-ended question format.

Embedded within the jury verdict form were manipulation check questions to determine whether participants paid attention to the evidence presented, specific questions relating to the crime lab (name of lab, ASCLD accreditation, and affiliation with a police department or corporation), and whether the expert identified a match between the two sets of fingerprints. After completing the jury verdict form, which included dependent measures of verdict choice and perceptions of forensic evidence by crime lab type, participants were debriefed, thanked for their participation, and given a code to enter on Mechanical Turk to receive their compensation.
CHAPTER 4
RESULTS

The initial sample consisted of 172 participants, however, as previously noted, 158 were jury eligible. Among the 158 jury eligible participants, 52.5% of whom were 18 to 34 years old, 27.2% were 35-49, and the remaining 20.2% were 50 and over. A majority of the participants were female. A little over half of the participants (51.9%) were employed full time, and a majority of the participants had some college education (44.3%) or a Bachelor’s degree (36.7%). The sample consisted largely of individuals who supported liberal viewpoints (48.7%), with the remaining participants expressing a conservative (18.4%) or independent (32.9%) identification. See Table 1 for descriptive statistics of the full sample demographics.

Checks on Testimony Comprehension

Testimony Complexity

Participants rated the complexity of the fingerprint testimony from 1 (not at all complex) to 10 (extremely complex). A total of 77 participants were randomly assigned to the low complexity conditions and 81 were in the high complexity conditions. Participants in the high complexity conditions rated the testimony as significantly more complex ($M = 6.42$) than those in the low complexity conditions ($M = 5.7$), $t(156) = -1.92, p = .05$.

Crime Lab Type

Participants were randomly assigned to a crime lab condition of a public laboratory, private laboratory, or corporate laboratory. In total there were 52 (32.9%) participants in the public crime lab condition, 51 (32.3%) in the private lab condition, and
55 (34.9%) in the corporate lab condition. A manipulation check was conducted to assess whether participants correctly recalled the type of lab that analyzed the case evidence. Out of the 158 participants in the study, 17 incorrectly identified the crime lab. These participants were not dropped from the study as they initially met standard jury pool requirements. In an actual voir dire, these participants would be included in the jury pool for selection, as jurors are not selected, or selected, based upon underlying biases that have been detected by a lawyer versus a quantified number of “right or wrong” responses. In addition, in an actual trial, it is reasonable to assume some jurors may misunderstand or forget some testimony.

**Fingerprint Testimony Comprehension**

Embedded within the juror verdict form were eight specific questions on the presented fingerprint testimony designed to ensure participants understood the scenario and were carefully reading through case materials. Participants were asked if fingerprints were presented as evidence, and if the expert lab technician said that the fingerprints taken from the defendant at booking matched the fingerprints taken from the crime scene and evidence. Almost all of the participants (98.7%, n = 156) correctly recalled that fingerprint evidence was presented in the case and that the expert witness said the fingerprints from booking matched the fingerprints taken from the crime scene and evidence (97.5%, n = 154). Across conditions, almost all participants answered correctly all, or all but one, questions on the fingerprint testimony ($M = 7.50$).

**Probability of Guilt Assessments**

Participants were asked at two different points in the study to estimate the probability that the defendant was guilty of murder from 0% (*absolutely sure he is not*
guilty) to 100% (absolutely sure he is guilty). The first assessment of guilt came directly after reading the case description and the second came after the initial case description expert testimony, cross examination, and instructions from the judge.

Overall, 52.23% of the participants considered the defendant guilty on the first assessment. On the second assessment (i.e., after reading the expert testimony and other case materials), the proportion who rated the defendant guilty increased to 80.56% guilt. Initially across both crime lab type and testimony complexity, the proportion of guilty verdict were similar for all experimental conditions. However, after reading through the case materials, the highest assessments of guilt were found in the police crime lab conditions ($M = 83.15\%$), specifically in the high complexity condition ($M = 84.93\%$).

There was a significant effect for time on guilt assessments between the first and second estimation Wilk’s Lambda = .39, $F(1,150) = 231.86, p < .05$. This effect was expected, as it was predicted that participants would change their estimation of guilt between the first assessment (after only reading the case description) and the second assessment (after reading through all materials). There were no significant differences between groups at the first assessment of guilt, which translates into successful random assignment of unique individuals to each condition from the onset. See Table 2 for guilt assessments at time one and time two for each condition.

Dependent Measures

Verdict Confidence

After indicating their verdict choice of “not guilty” or “guilty”, participants were asked to rate their confidence in their verdict on a 10-point Likert scale from 1 (not at all confident) to 10 (extremely confident). A composite measure was created after recoding
verdict responses (Not guilty, -1; Guilty, 1) and multiplying the decision with the level of confidence creating a score that could range from -10 (extremely confident defendant was not guilty) to 10 (extremely confident defendant is guilty). A 3 (lab type: public crime lab vs. private crime lab vs. corporate crime lab) x 2 (testimony complexity: low complexity vs. high complexity) x 2 (gender: male vs. female) Analysis of Covariance (ANCOVA) was performed on the verdict by confidence composite score. Gender was included as a fixed factor in the ANCOVA along with crime lab type and testimony complexity. Political affiliation and total score for pre-trial legal attitude questions that specifically asked about forensic evidence were added as covariates to the initial measures.

A significant effect was found for crime lab type on verdict decisions \(F(2,140) = 3.55, p = .03\]. Participants were more conviction prone in the private lab condition, \(M = 5.22\) and public lab condition, \(M = 4.72\) than was found in the corporate lab condition \(M = 2.01\). Main effects for verdict decisions were qualified by a significant two-way interaction effect between the lab type and testimony complexity interaction \(F(5, 140) = 2.79, p = .02\) (see Table 3 and Figure 1)]. Under conditions of low complexity, there was a trend (albeit non-significant) for participants in the public lab to be the most conviction prone \(M = 5.05\) when compared to participants in the private lab \(M = 3.56\) and corporate lab conditions \(M = 3.20\). Under conditions of high complexity, however, the guilt by confidence ratings were more varied, with participants in the private lab condition being the most conviction prone \(M = 6.88\), participants in the public lab condition \(M = 4.39\) moderately choosing guilty verdicts, and participants in the corporate lab conditions \(M = 0.82\) being far less conviction prone and less confident in their verdict decisions.
It was predicted that participants in the high complexity corporate crime lab conditions would render fewer guilty verdicts leading to fewer convictions overall compared to those in the public or private lab conditions. This was the case, with significant differences found between participants in the high complexity corporate lab condition (\(M = 0.82\)) versus the two non-corporate crime labs (\(M = 5.63\)) based formal statistical tests involving planned contrasts [\(t(140) = -3.28, p = .001\)]. Interestingly, participants in the private lab high complexity condition were the most conviction prone and most confident in their verdict decisions compared across all conditions (\(M = 6.88\)). This effect potentially could be from participants considering the private laboratory to be a typical and viable source for analyzing forensic evidence. Thus, participants had greater faith in the analyzed evidence and were more confident the defendant committed the
crime. Significant effects were also found between participants in the high complexity public crime lab condition ($M = 4.39$) and participants in the high complexity corporate lab condition ($M = 0.82$) [$t(140) = 2.10, p = .04$]. Again, this inclination to be more conviction prone in public lab conditions is similar to the previously mentioned findings where complex testimony prompted participants to rely on heuristics to make a verdict decision (i.e., more faith in police crime laboratories to provide condemning evidence). This overall trend shows a strong likelihood that the complexity of the testimony influenced participants to use outside factors when making a decision (i.e., what type of crime lab the expert witness came from) rather than focusing on the content of the testimony as originally hypothesized.

As mentioned previously, under conditions of low complexity participants in the public lab condition ($M = 5.05$) were more conviction prone than those in the private lab condition ($M = 3.56$) and corporate lab condition ($M = 3.20$), but this difference was not significant. When comparing between conditions of low and high complexity, no significant differences were found for participants in the public lab conditions [$t(140) = 1.40, p > .10 (M = 5.05, M = 4.39, respectively)$] as well as in the corporate lab conditions [$t(140) = 1.40, p > .10 (M = 3.20, M = 0.82, respectively)$]. However, differences between participants in the low ($M = 3.56$) and high ($M = 6.88$) complexity conditions of the private crime lab group approached levels of significance [$t(140) = -1.87, p = .06$]. No significant effects were found for an individual’s political affiliation to have an effect on their later verdict decisions [$p = .26$]. Effects for legal attitudes and prior beliefs regarding forensic evidence will be discussed later.
Gender Effects

Gender was found to have significant interaction effects with crime lab type for participant’s ratings of verdict confidence decisions \([F(5,140) = 2.32, p < .05\) (see Table 5 and Figure 2)]. Males were found to be the most conviction prone in the private lab condition \((M = 6.15)\) and in the public lab condition \((M = 4.29)\). However, in the corporate lab condition, the opposite was true with males being more likely to give a verdict of not guilty \((M = -0.35)\). In contrast, female participants were most conviction prone in the public lab condition \((M = 5.15)\). Females were less confident of their guilty verdicts in the private lab condition \((M = 4.29)\) and in the corporate lab condition \((M = 4.37)\). Overall, both males \((M = 3.43)\) and females \((M = 4.34)\) were conviction prone across all conditions with females showing less variability between lab types when compared to males.

![Figure 2: Significant Two-Way Lab Type x Gender Interaction Effect](image-url)
A statistically significant difference was found between males and females in the corporate lab condition, where males \((M = -0.35)\) were less conviction prone than females \((M = 4.37)\) \([p = .01]\). No significant differences were found for males in the private lab condition \((M = 6.15)\) compared to females in the private lab condition \((M = 4.29)\), as well as males in the public condition \((M = 4.29)\) and females in the public lab condition \((M = 5.15)\). The two-way testimony complexity x gender interaction and three-way testimony complexity x crime lab type x gender interaction were not significant.

Influence of Legal Attitudes

Participants were asked to complete a legal attitudes questionnaire designed to assess their prior legal attitudes, specifically regarding forensic evidence. Participants responded to a 15-item questionnaire using a 10-point Likert scale, ranging from 1 (strongly disagree) to 10 (strongly agree). Under conditions of high complexity, the total score for a participant’s prior legal attitudes was significantly correlated with their later verdict decision \([r(78) = .33, p < .05]\). In addition, the score for the questions specifically regarding forensic evidence was significantly correlated with their verdict decision \([r(79) = .26, p < .05]\). As originally hypothesized, participants in the high complexity condition were motivated to rely on their own pre-existing knowledge and beliefs in their decision-making. However, it was not hypothesized that this would occur under conditions of low complexity. Surprisingly, under conditions of low complexity, the total score for a participant’s prior legal attitudes was significantly correlated with their later verdict decisions \([r(74) = .25, p < .05]\), however the correlation was somewhat lower than the high complexity condition \([p > .05]\). Additionally, the score for the questions specifically
regarding forensic evidence was significantly correlated with their verdict decision \([r(75) = .24, p < .05]\].

**Influence of Television Programming Preferences and Reading Habits**

Participants were asked to describe their weekly television programming preferences and reading habits to measure the extent to which these behaviors influenced their expectation of forensic evidence and criminal investigation. Participants responded to a total of 11 television shows (5 non-crime programs and 6 crime programs) using the following response choices: 0 (*I have never watched that show*), 1 (*I have seen that show once or twice*), 2 (*I try to watch that show when I have time during the week*), 3 (*I watch that show regularly every week*). Half of the participants (50.6%) responded they had seen *CSI* once or twice a week and 47.5% of participants responded they had seen *Cops* once or twice a week. *Law & Order* was watched by 26.6% of participants once or twice a week and *Dexter* was watched regularly by 17.7% of participants. No significant effects were found for a participant’s television habits to influence their expectation of forensic evidence and ultimate verdict decision. The only show to approach a level of significance in terms of predicting verdict decisions was *Dancing With the Stars*. In addition, participants were asked to describe their general reading habits for content online, in novels, and in the newspaper. Overall, the majority of participants responded reading about crime only once or twice a week, or not at all, across all domains. No significant effects were found for these factors to influence verdict decisions. The results support previous research that has continually found a lack of empirical research findings to support the theorized “*CSI* effect.”
Participant Explanations for Verdict Decisions

Although verdict decisions cannot be explained by television viewing or reading habits, participants were asked to “describe the main reason why you chose the verdict you did.” Of the 31.6% (n = 50) participants that rendered a verdict of not guilty, many cited that their decision was based upon the fact that fingerprints were the only pieces of evidence submitted for the case. Because there was limited evidence presented, 46% of participants felt the suspect was not guilty, with 26% specifically stating they were not convinced beyond a reasonable doubt. Many indicated they wanted DNA evidence presented or a test of the blood from the suspect’s shirt or from the blood on the knife (28%). A lack of faith in crime laboratories was also referenced with one participant stating that they did not trust crime labs after a recent scandal involving a lab in their state and 5 participants calling into question the validity of crime labs. Specifically speaking on the crime lab that analyzed the evidence, one participant stated that they did not trust Target as a source for forensic evidence examination. Generally, participants wanted to see more evidence, particularly that of DNA, and wanted to be assured that the fingerprints absolutely matched those of the defendant.

Approximately two-thirds (68.4%) of participants believed beyond a reasonable doubt that the defendant in the case was guilty. A large majority of participants (75%) indicated that the fingerprint evidence, especially the match made by the expert witness from the crime scene to the defendant, convinced them to render a guilty verdict. Participants believed that the fingerprint evidence was a strong source of evidence and overall was reliable. Some cited their faith in science with 23.1% of participants believing in the experience, credentials, reliability, expertise, and testimony given by the
expert witness. Characteristics of the crime lab were only briefly mentioned when one participant believed the defendant was guilty and that the Target crime lab was a credible source with another believing the police testimony influenced his verdict decision. Ten participants solely cited the expert witness as their reason for choosing a guilty verdict. Taken as a whole, the fingerprint evidence was enough for a majority of the participants in the sample to render a guilty verdict. Although these descriptions offer a different perspective and examine why participants chose the verdict they did, the results are still limited because of the subjective nature of reading participant explanations.
CHAPTER 5
DISCUSSION

Summary of Major Findings

Theoretical models of cognitive decision-making, specifically focusing on juror mental processing, guided the hypotheses of this research study. It was proposed that variations of crime lab type and testimony complexity would significantly influence an individual’s verdict decision by prompting individuals to naturally use 1 of 2 methods of mental processing. When information is fairly easy to process and understand, it has been found individuals will adopt a central route of mental processing to systematically review the message and make a decision (Chaiken, 1980; Epstein, 1994; Petty & Cacioppo, 1981). However, when information is more complex, it is shown that individuals will rely on extra-legal factors, heuristics, and gut level instincts to make decisions (Chaiken, 1980; Epstein, 1994; Petty & Cacioppo, 1981).

In the low complexity conditions, testimony from the expert witness was presented using simplistic and lay terms that would be easy for a typical juror to understand. Under these conditions, public labs were the most conviction prone, followed by private labs and corporate labs respectively. The lack of significant effects found for verdict decisions in the low complexity conditions indicates individuals focused on the evidence and content of the expert testimony rather than lab type. The results support the original hypotheses of the study as well as demonstrating conditions that motivate an individual to use systematic decision-making.

Testimony in the high complexity conditions used scientific and technical language to describe fingerprint evidence. Significant differences were found between the
three crime lab types. It was originally hypothesized that participants in the high complexity corporate crime lab condition would deliver fewer guilty verdicts and fewer convictions overall due to the lab being unfamiliar and associated with a major retail corporation (Target Crime Lab) or potentially due to the lack of association to a more formal source like a police agency. This was the case as participants in the high complexity corporate crime lab condition were the least conviction prone. Conversely, participants in the high complexity private lab condition were the most conviction prone. Participants potentially could have viewed the Target Crime Lab as a less credible source for analyzed evidence, thus delivering more “not-guilty” verdicts, while participants viewed the private laboratory as a more common and formal source for evidence. The results show support for the notion that complex information, which is unfamiliar and difficult for individuals to understand, motivates individuals to rely on extra-legal information to make decisions.

The findings add further support to the results found in jury decision-making research that test different models of mental processing and a message’s persuasiveness. Much like previous research, characteristics of the expert witness (credentials, attractiveness, level of pay, etc.) have been found to influence damage awards and verdict decisions (Cooper, Bennett & Sukel, 1996; Cooper & Neuhaus, 2000; Lieberman, 2002; Ratneshawar & Chaiken 1991). The testimony was consistent and uniform across conditions, with the only manipulations being testimony complexity and crime lab type. The variability of verdict decisions in the high complexity conditions suggest reliance on factors outside of the expert testimony, specifically that of crime lab type, which resulted in significantly less convictions in the corporate crime lab condition.
Gender was found to have significant effects on verdict decisions when combined with crime lab type. Males delivered guilty verdicts overall in the more common types of crime labs (i.e., public and private labs). However, when it came to corporate crime labs, which are less familiar and less common, males were less conviction prone. The difference in verdict decisions is likely to be attributed to males focusing on the specific lab type (Target Crime Lab) rather than the evidence the expert presented. Females were fairly consistent for convictions across crime lab type, which demonstrates they were not swayed by outside factors and consistently focused on the content of the testimony. The significant gender differences fall in line with jury decision-making literature that has typically found males to be more conviction prone and punitive when compared to females who are usually more empathetic towards defendants (Hurwitz & Smithey, 1998; Mills, 1980; Stephan, 1974). Overall, the results fit the proposed theory of Meyers-Levy’s Selectivity Hypothesis that suggests males “seem to rely on heuristics in place of detailed message elaboration” and will be motivated to “base their judgment on a select subset of available information” (Putrevu, 2001, p. 6). Conversely, the theory suggests women are “comprehensive processors who attempt to assimilate all available information before rendering judgment” giving equal weight to various factors before making a decision (Putrevu, 2001, p. 6). Within the scope of this research, it can be interpreted that males, when compared to females, are more influenced by heuristics rather than the content of the testimony to make a verdict decision.

Participants were asked to describe their television programming preferences and reading habits to test the assumptions of the “CSI effect.” It has been proposed that the show *CSI: Crime Scene Investigation* creates unrealistic expectations of forensic
evidence and subsequently makes its presence the strongest indicator of guilt. Overall, participants watched *Law & Order* the most when they had time during the week, followed by *CSI* and *Cops*, respectively. Similarly, participants responded to reading about crime online once or twice a week, followed by the newspaper and crime novels respectively. However, participants’ television preferences and reading habits did not have a significant effect on verdict decisions under either testimony complexity condition. This was originally hypothesized to occur for only the condition of low complexity, however similar results were found under the condition of high complexity. This finding is consistent with previous research that demonstrates individuals who watch *CSI* or general crime programs do not differ in their verdicts compared to individuals who claim to not watch these shows (Goodman-Delahunty & Tait, 2008; Holmgren & Fordham, 2011; Podlas, 2005; Schweitzer & Saks, 2006; Shelton, Kim & Barak, 2007) and indicates that even under conditions of high complexity, when heuristics should be most powerful, the “*CSI* effect” does not operate.

Participants were asked to complete a questionnaire designed to assess their prior legal attitudes before reading case materials. Within the questionnaire were six specific questions designed to measure their existing beliefs regarding forensic evidence and crime labs. Total scores for both measures were significantly correlated with later verdict decisions under both conditions of testimony complexity. Thus, it appears that individuals will use some degree of existing knowledge and have pre-existing expectations for forensic evidence and criminal investigation in their legal decision-making. The results of this study demonstrated that these beliefs are not likely to come from watching television shows such as *CSI*, however the source could be changes
regarding technology. It is reasonable to believe that the ever-changing enhancement and advancement of technology could account for the increased pre-existing expectations of scientific evidence (Shelton, Kim & Barak, 2007).

**Implications of the Current Study**

The results of the study identify specific factors and characteristics within forensic evidence presentations and testimony that influence jurors in their decision-making. Varying levels of testimony complexity were found to influence jurors in their verdict decisions, particularly by motivating some to rely on extra-legal factors, such as crime lab type, to make decisions. Research has generally found that when jurors are presented with statistical and scientific testimony, they are likely to make inferences and rely on heuristic cues (Daftary-Kapur, Dumas & Penrod, 2010; Dartnall & Goodman, 2006; Lieberman, Carrell, Miethe, & Krauss, 2008). The present research findings are consistent with these previous results, as well as research on dual modes of mental processing, which have implications for forensic evidence testimony and presentations in the courtroom.

Forensic evidence, by its very nature, is scientific and complex. Although it is often unavoidable to completely take the science out of an explanation of forensic evidence, the findings show the benefits of making witness presentations and testimony, easier for jurors to understand, and ultimately comprehend. Using lay terms and simplistic language when describing the process of analyzing evidence or other explanations conveyed in testimony, will help jurors in multiple ways. Jurors will be able understand the testimony better, and will also likely form their beliefs about the case and eventual verdict decisions based on the content of the testimony rather than outside cues.
such as crime lab type or expert characteristics. Simultaneously, lawyers, judges and other courtroom actors can be more confident knowing that juror biases are reduced and facts of the case are being weighed more appropriately.

Ultimately the findings can inform public policy by adding to the material that will develop best practice guidelines for forensic evidence presentations in court. For example, the results and scope of the project can support the activities in the newly created Forensic and Crime Scene Investigation Consortium (FCSIC). The purpose of FCSIC is to develop a national training program for best practices in crime scene investigation and analysis, as well as the courtroom presentation of that evidence. The results will add to the empirically based education and training materials designed to enhance courtroom testimony skills of expert witnesses.

The findings also have implications for crime labs across the United States as the results demonstrate some individuals hold beliefs about evidence that comes from different types of crime labs. Labs associated with a police agency or those that are private businesses have an advantage over corporate crime labs in terms of individual impressions of quality and credibility of evidence, and consequently verdict decisions. Public or private labs may appear to jurors as a formal source for analyzed evidence compared to corporate labs such as the Target crime lab. However, interestingly enough, police labs often send overflow work to labs such as the Target crime lab. The tendency to devalue corporate labs, may be due to the lack of awareness of corporate crime laboratories by most individuals across the nation. Lawyers and experts in the field will likely want to emphasize the experience and credentials of the expert, and crime lab itself, to ensure individuals recognize the credibility of the lab. However, it is important
that these factors are not overemphasized to the extent that jurors believe the expert is a “hired gun” (Cooper & Neuhaus, 2000).

In addition, the findings are useful for lawyers during *voir dire* as the results demonstrate lawyers should carefully consider the composition of the jury, particularly the gender of potential jurors. Having a male dominated jury could result in a verdict decision that has been made based on subjective judgments and the application of pre-existing knowledge and beliefs. Selecting a jury that is evenly matched across gender would allow for a verdict decision that likely utilized a comprehensive review of the presented evidence and appropriately weighed all facts of the case. Lawyers will want to use thorough consideration when selecting a jury, as the selected individuals may be influenced by complex testimony and engage in methods of mental processing that rely extra-legal factors and instincts.

**Limitations**

There are various limitations involved with the current study, particularly due to the scope and nature of the study falling under the umbrella of experimental research using mock jurors. There are threats to both ecological and external validity due to participants being presented with a written transcript of the case summary, expert and cross testimony and instructions from the judge. Participants also delivered individual verdict decisions rather than deliberating with other jurors to arrive at an appropriate verdict. Therefore, the actual procedure and experience of being in a courtroom setting is lacking which poses a threat to the ecological validity of the results. However, consistent with most jury decision-making research that uses mock jurors, results are generalizable “from simulation studies to the behavior of real jurors”, increasing both ecological and
external validity (Bornstein, 1999, p. 88). In addition, a recent study sampling authors of jury-decision making research, as well as editors and board members of three major research journals, found that a vast majority of respondents felt that omitting a jury deliberation in an experimental study did not make the research too artificial to merit publication (Lieberman, Sakiyama, Heen, & Krauss, 2014).

Using Mechanical Turk to conduct the study also limits the results as it difficult to control for outside factors such as distractions, participant confusion on questions, technological difficulties and so forth. Participants completed the study online on their own rather than being in a controlled research lab. Despite these limitations, most participants answered questions on manipulations and on different aspects of the correctly, which demonstrates a reasonable degree of attention paid to the presented materials by participants.

**Future Directions**

It may be useful for future research to investigate the testimony complexity and crime lab component across different types of forensic evidence such as DNA or hair fibers. Examining the differences between verdict decisions for fingerprints and DNA would provide interesting results, particularly due to the research that has found DNA to exert a powerful influence on jurors’ verdict decisions (Lieberman et al., 2008). Multiple researchers have examined how jurors tend to struggle with testimony comprehension, specifically presented on DNA because of its complex and statistical format (Devine, 2012; Goodman, 1992; Koehler, 2001; Schklar & Diamond, 1999). Because of the nature of fingerprint evidence, which is relatively simplistic, more powerful effects would be expected with DNA. Strengthening the complexity manipulation would offer a stronger
argument for dual modes of processing having a significant effect on verdict decisions. Although significant differences were found between participants in the low complexity and high complexity conditions in this study, there is still potential to strengthen the testimony complexity manipulation to achieve a greater difference between groups.

Including visual evidence embedded within testimony, versus only written testimony is also a route for future investigation. The materials used in this study contained an image of two sets of fingerprints with matching points of comparison, in all conditions. Research has shown that individuals process information better when presented in both verbal and visual information (Binder, 2006; Hewson & Goodman-Delahunty, 2008; Morell, 1998; Park & Feigenson, 2012). However, more recent research has shown that visual aids often function as a peripheral cue and cause jurors to have visual hindsight bias (Dahir, 2005; Park & Feigenson, 2012).

When an individual is presented with a visual interpretation of an event or series of events, shown the outcome, and questioned on it later, they have a tendency to say they “knew it all along” or believe that the outcome was predictable (Harley, Carlsen, & Loftus, 2004; Feigenson & Spiesel, 2009; Roese & Vohs, 2012). Individuals view the testimony and the party using images, as more reliable and credible (Dahir, 2005; Park & Feigenson, 2012) due to becoming overly confident with the visual information which subsequently can affect their legal decisions. Thus, it would be useful to conduct a study that used the same components of this research, and manipulate the presentation of visual images.
Conclusion

Overall, the results demonstrate how various factors within expert testimony motivate jurors to engage in different types of mental processing. Characteristics of expert testimony or of the expert witness specifically, influence jurors to either focus on the content of the testimony or rely on heuristic cues to make a verdict decision. The findings can assist researchers, legal experts, and other professionals in the field to respond to the nationwide need for mandatory training requirements for forensic and crime scene professionals. Ultimately, this will aid in the development of a national curriculum that can develop the most effective methods and techniques for an expert witness to utilize when presenting forensic evidence in court.
Table 1

Descriptive Statistics for Full Sample Demographics

<table>
<thead>
<tr>
<th>Variable</th>
<th>Descriptive Statistics</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Age Range</strong></td>
<td>n = 172, M = 34.4</td>
</tr>
<tr>
<td>18-24</td>
<td>33 (19.2%)</td>
</tr>
<tr>
<td>25-34</td>
<td>58 (33.7%)</td>
</tr>
<tr>
<td>35-49</td>
<td>46 (26.7%)</td>
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<tr>
<td>50-64</td>
<td>27 (15.7%)</td>
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<tr>
<td>65 and over</td>
<td>8 (4.7%)</td>
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<tr>
<td><strong>Gender</strong></td>
<td>n = 172</td>
</tr>
<tr>
<td>Male</td>
<td>70 (40.7%)</td>
</tr>
<tr>
<td>Female</td>
<td>102 (59.3%)</td>
</tr>
<tr>
<td><strong>Race</strong></td>
<td>n = 172</td>
</tr>
<tr>
<td>Hispanic or Latino</td>
<td>7 (4.1%)</td>
</tr>
<tr>
<td>Black or African American</td>
<td>13 (7.6%)</td>
</tr>
<tr>
<td>Caucasian</td>
<td>146 (84.9%)</td>
</tr>
<tr>
<td>Asian</td>
<td>3 (1.7%)</td>
</tr>
<tr>
<td>American Indian or Alaskan Native</td>
<td>2 (1.2%)</td>
</tr>
<tr>
<td>Other</td>
<td>1 (0.6%)</td>
</tr>
<tr>
<td><strong>Political Affiliation</strong></td>
<td>n = 172</td>
</tr>
<tr>
<td>Liberal</td>
<td>84 (48.8%)</td>
</tr>
<tr>
<td>Conservative</td>
<td>31 (18.0%)</td>
</tr>
<tr>
<td>Independent</td>
<td>57 (33.1%)</td>
</tr>
<tr>
<td><strong>Employment Status</strong></td>
<td>n = 170</td>
</tr>
<tr>
<td>Currently not employed</td>
<td>24 (14.1%)</td>
</tr>
<tr>
<td>Part-Time</td>
<td>28 (16.5%)</td>
</tr>
<tr>
<td>Full-Time</td>
<td>87 (51.2%)</td>
</tr>
<tr>
<td>Student</td>
<td>14 (8.2%)</td>
</tr>
<tr>
<td>Disabled</td>
<td>6 (3.5%)</td>
</tr>
<tr>
<td>Education</td>
<td>n = 172</td>
</tr>
<tr>
<td>--------------------</td>
<td>----------</td>
</tr>
<tr>
<td>Did not complete high school</td>
<td>2 (1.2%)</td>
</tr>
<tr>
<td>High School/GED</td>
<td>11 (6.4%)</td>
</tr>
<tr>
<td>Some College</td>
<td>75 (43.6%)</td>
</tr>
<tr>
<td>Bachelor's Degree</td>
<td>65 (37.8%)</td>
</tr>
<tr>
<td>Master's Degree</td>
<td>14 (8.1%)</td>
</tr>
<tr>
<td>Advanced Graduate Work or Ph.D.</td>
<td>5 (2.9%)</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>U.S. Citizen</th>
<th>n = 171</th>
</tr>
</thead>
<tbody>
<tr>
<td>Yes</td>
<td>168 (98.2%)</td>
</tr>
<tr>
<td>No</td>
<td>3 (1.8%)</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Felony Status</th>
<th>n = 172</th>
</tr>
</thead>
<tbody>
<tr>
<td>Yes</td>
<td>11 (6.4%)</td>
</tr>
<tr>
<td>No</td>
<td>161 (93.6%)</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Called for Jury Duty</th>
<th>n = 167</th>
</tr>
</thead>
<tbody>
<tr>
<td>Yes</td>
<td>96 (57.5%)</td>
</tr>
<tr>
<td>No</td>
<td>71 (42.5%)</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Selected for Jury Duty</th>
<th>n = 171</th>
</tr>
</thead>
<tbody>
<tr>
<td>Yes</td>
<td>39 (22.8%)</td>
</tr>
<tr>
<td>No</td>
<td>132 (77.2%)</td>
</tr>
</tbody>
</table>

Note: Only valid total number of cases for each variable (n) are reported, which vary among variables due to missing data.
Table 2
Assessments of Guilt Across Conditions

<table>
<thead>
<tr>
<th>Condition</th>
<th>Assessment 1</th>
<th>Assessment 2</th>
</tr>
</thead>
<tbody>
<tr>
<td>Public Lab</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Low Complexity</td>
<td>55.24% (22.12)</td>
<td>81.36% (20.89)</td>
</tr>
<tr>
<td>High Complexity</td>
<td>56.59% (24.23)</td>
<td>84.93% (13.50)</td>
</tr>
<tr>
<td>Private Lab</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Low Complexity</td>
<td>46.92% (21.05)</td>
<td>77.24% (22.67)</td>
</tr>
<tr>
<td>High Complexity</td>
<td>50.12% (19.71)</td>
<td>79.31% (19.55)</td>
</tr>
<tr>
<td>Corporate Lab</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Low Complexity</td>
<td>51.30% (20.50)</td>
<td>80.85% (19.98)</td>
</tr>
<tr>
<td>High Complexity</td>
<td>52.68% (25.80)</td>
<td>79.46% (21.13)</td>
</tr>
</tbody>
</table>

Note. Percentages indicate assessment of guilt. Higher percentages signify greater perceptions of guilt. Standard deviations are presented in parentheses.
Table 3

<table>
<thead>
<tr>
<th>Crime Lab Type</th>
<th>Testimony Complexity</th>
<th>Testimony Complexity</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Low Complexity</td>
<td>High Complexity</td>
</tr>
<tr>
<td>Public Lab</td>
<td>5.05a (6.50)</td>
<td>4.39a (6.09)</td>
</tr>
<tr>
<td></td>
<td>n = 25</td>
<td>n = 26</td>
</tr>
<tr>
<td>Private Lab</td>
<td>3.56a (7.09)</td>
<td>6.88b (5.30)</td>
</tr>
<tr>
<td></td>
<td>n = 24</td>
<td>n = 25</td>
</tr>
<tr>
<td>Corporate Lab</td>
<td>3.20a (6.87)</td>
<td>0.82c (7.41)</td>
</tr>
<tr>
<td></td>
<td>n = 26</td>
<td>n = 28</td>
</tr>
</tbody>
</table>

Note. Means indicate the initial verdict decision multiplied by the level of confidence. Higher means signify greater confidence in a participant’s guilt decision. Standard deviations are presented in parentheses.
Table 4

<table>
<thead>
<tr>
<th></th>
<th>Crime Lab Type</th>
<th>Crime Lab Type</th>
<th>Crime Lab Type</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Public Lab</td>
<td>Private Lab</td>
<td>Corporate Lab</td>
</tr>
<tr>
<td>Male</td>
<td>4.29&lt;sub&gt;a&lt;/sub&gt; (6.93)</td>
<td>6.15&lt;sub&gt;c&lt;/sub&gt; (6.21)</td>
<td>-0.35&lt;sub&gt;b&lt;/sub&gt; (8.45)</td>
</tr>
<tr>
<td></td>
<td>n = 22</td>
<td>n = 19</td>
<td>n = 17</td>
</tr>
<tr>
<td>Female</td>
<td>5.15&lt;sub&gt;a&lt;/sub&gt; (5.74)</td>
<td>4.29&lt;sub&gt;a&lt;/sub&gt; (6.42)</td>
<td>4.37&lt;sub&gt;a&lt;/sub&gt; (6.20)</td>
</tr>
<tr>
<td></td>
<td>n = 29</td>
<td>n = 30</td>
<td>n = 37</td>
</tr>
</tbody>
</table>

Note: Means indicate the initial verdict decision multiplied by the level of confidence. Higher means signify greater confidence in a participant’s guilt decision. Standard deviations are presented in parentheses.
Appendix B

Pre-Trial Questionnaires

Prior to receiving any case materials, participants first completed a demographic questionnaire, legal attitudes questionnaire designed to assess prior beliefs regarding forensic evidence, and a television and reading habits questionnaire to measure the extent to which participants’ television programming preferences and reading habits influence their expectations of forensic evidence and criminal investigation.

B1

Demographic Questionnaire

Age: ________

Gender: M F

Race/Ethnicity:

_____ Hispanic or Latino
_____ Black or African American
_____ Caucasian
_____ Asian
_____ American Indian or Alaskan Native
_____ Native Hawaiian or Other Pacific Islander
_____ Other (Please specify: ____________________________)

Political Affiliation:

_____ Democrat
_____ Republican
_____ Independent
_____ Libertarian
_____ Green Party
_____ Other (Please specify: ____________________________)

What is your employment status?
_____ Currently not employed
Part-Time
Full-Time
Student
Disabled
Retired

What is the highest level of education you completed?
Did Not Complete High School
High School/GED
Some College
Bachelor’s Degree
Master’s Degree
Advanced Graduate work or Ph.D.

Are you a U.S. citizen?
Yes No

Have you ever been convicted of a felony?
Yes No

Have you ever been called for jury duty?
Yes No

Have you ever been selected for jury duty?
Yes No
Legal Attitudes Questionnaire

Please read the following statements and respond according to how much you agree or disagree with the position presented.
Use the following scale to answer each question:
1 = I very strongly disagree with the statement
10 = I very strongly agree with the statement

1. A suspect who runs from the police most probably committed the crime.
   1 2 3 4 5 6 7 8 9 10

2. DNA is the most reliable type of physical evidence we have today.
   1 2 3 4 5 6 7 8 9 10

3. The death penalty is cruel and inhumane.
   1 2 3 4 5 6 7 8 9 10

   1 2 3 4 5 6 7 8 9 10

5. For serious crimes like murder, a defendant should be found guilty if there is a 90% chance that he or she committed the crime.
   1 2 3 4 5 6 7 8 9 10

6. I would convict a defendant if the only evidence against him were fingerprints.
   1 2 3 4 5 6 7 8 9 10

7. I would convict a defendant if the only evidence against him were an eyewitness.
   1 2 3 4 5 6 7 8 9 10

8. I would convict a defendant if the only evidence against him were DNA.
   1 2 3 4 5 6 7 8 9 10

9. I would convict a defendant if the only evidence against him was circumstantial.
   1 2 3 4 5 6 7 8 9 10
10. Crime laboratories run by a police agency are always reliable.

11. If detectives obtain a blood sample from a crime scene, they can easily compare that DNA to a suspect’s DNA.

12. If detectives lift fingerprints from a crime scene, they can easily compare them to a suspect’s prints.

13. Extenuating circumstances should not be considered – if a person commits a crime, then that person should be punished.

14. If a defendant’s fingerprints are identical to fingerprints left at the crime scene, then the defendant is guilty.

15. Juries make accurate decisions most of the time.
Television & Reading Habits Questionnaire

Please use the scale below to report how often you watch the following television programs:
0 = I have never watched that show
1 = I have seen that show once or twice
2 = I try to watch that show when I have time during the week
3 = I watch that show regularly every week

Please circle your responses.

<table>
<thead>
<tr>
<th>The Voice</th>
<th>SportsCenter</th>
<th>The Amazing Race</th>
<th>Dancing with the Stars</th>
<th>The First 48</th>
<th>Mad Men</th>
<th>Law &amp; Order</th>
</tr>
</thead>
<tbody>
<tr>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>1</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>1</td>
</tr>
<tr>
<td>2</td>
<td>2</td>
<td>2</td>
<td>2</td>
<td>2</td>
<td>2</td>
<td>2</td>
</tr>
<tr>
<td>3</td>
<td>3</td>
<td>3</td>
<td>3</td>
<td>3</td>
<td>3</td>
<td>3</td>
</tr>
</tbody>
</table>
Television & Reading Habits Questionnaire

Please use the scale below to report how often you do any of the following:
0 = Never
1 = Once or twice a week
2 = When I have time during the week
3 = Almost every day

How often do you read about local politics online?
0 1 2 3

How often do you read about community events online?
0 1 2 3

How often do you read about crime activity online?
0 1 2 3

How often do you read about sports online?
0 1 2 3

How often do you read fiction novels?
0 1 2 3

How often do you read non-fiction novels?
0 1 2 3

How often do you read romance novels?
0 1 2 3

How often do you read crime novels?
0 1 2 3

How often do you read the newspaper?
0 1 2 3

How often do you read about community events in the newspaper?
0 1 2 3

How often do you read about local politics in the newspaper?
0 1 2 3

How often do you read about crime activity in the newspaper?
0 1 2 3
How often do you read about sports in the newspaper?
0  1  2  3
Appendix C

Case Materials

Participants received the same case description of a second-degree murder that occurred in a local park. Participants were then presented with expert testimony detailing fingerprint evidence taken from the crime scene and recovered knife, and fingerprints taken from the suspect at the time of jail booking. Participants then read a cross-examination of the expert witness.

Case Description

Case No. CR98R03168-00

In Case No. CR98R03168-00, Steven Murphy is accused of second-degree murder. On the night of September 8, 2013, the victim (Paul Thompson) was assaulted while running in Memorial Park near downtown.

The prosecution alleges that Steven Murphy sat on a bench in a darker section of the park holding a newspaper in front of his face. According to the State’s story, when Murphy saw Paul Thompson running alone, he stood up and followed him. As Thompson bent down to tie his shoe, the state claims Murphy grabbed him from behind, covering his mouth. When Thompson started putting up a fight, his attacker pulled out a large knife and held it to his throat. It is believed that Murphy was interested in money, but Thompson had not carried his wallet with him on his run. After several minutes of fighting, the attacker finally cut deeply into Thompson’s stomach. When Thompson fell to the ground, the assailant removed his watch, running shoes, and iPOD before fleeing the scene.

An early morning jogger found Thompson’s body in the park and called police. Detectives who arrived at the scene recovered a bloody knife that appeared to have dropped 15 feet away from the crime scene. They took the knife and other collected fingerprints to the lab for processing.

Approximately 2:00 a.m. on September 9, police officer Mark Riley noticed a suspicious young, white male anxiously pacing outside of a convenience store near the park. The man appeared to have a bloodstain on his t-shirt. Officer Riley questioned the individual, asking if he needed help. The man fidgeted, stared at the ground and said he worked as a cook. His coworker had cut himself earlier in the night. The man said everything was fine now, and he was just waiting for the bus to take him home. Several hours later, when
Officer Riley heard of the murder, he thought of the man’s somewhat odd behavior and encouraged the detectives to look for him.

Police officers found Steven Murphy in the park the next day and brought him in for questioning. Officers asked Murphy where he had been the night before, and he said he was at work. Prior to that, he had been at the park, but he claimed he left the park shortly after dark and walked around downtown before starting his shift. Police investigated Murphy’s place of employment and found he had been there the night of the attack, but no one could recall precisely what time he had arrived or left.

The defense contends that the police charged Steven Murphy with the crime because they were incapable of conducting a more thorough investigation. The defense alleges that the District Attorney’s office arrested the first suspect they found as a way to appease angry citizens who were concerned that such a violent act could take place in their safe, neighborhood park.

**Question:** At this point, what would you estimate to be the probability that Steven Murphy is guilty of murder? Please choose a number between 0% and 100%, where 0% means, “absolutely sure he is not guilty” and 100% means, “absolutely sure he is guilty”:

_________________%
Expert Testimony for all Low Complexity Conditions

Officer Daniels who was the jail-booking officer at the time of Steven Murphy’s arrest took the suspect’s fingerprints and placed them on a standard fingerprint card. The prints were taken and submitted to CRIME LAB VARIABLE\(^2\) for identification. The physical evidence of the recovered knife and lifted prints from the crime scene and from Paul Thompson were also submitted to CRIME LAB VARIABLE\(^2\) At the trial, lab technician Frank Miller presented the evidence for the prosecution.

PA: Will you please state your name and occupation for the court?

Expert: My name is Frank Miller, and I am a forensic lab technician at CRIME LAB VARIABLE in Minneapolis, Minnesota.

Condition 1:

PA: Is the crime laboratory directly affiliated with and managed by the Minneapolis Police Department?

Expert: Yes. The crime lab is directly managed by the Minneapolis Police Department. The lab was established in 2009 by the police department.\(^3\)

Condition 3:

PA: Does any type of police agency manage the crime lab?

Expert: No. The crime lab was established in 2007 as an independent business to analyze forensic evidence. It is not affiliated with any police or government agency.\(^4\)

Condition 5:

PA: So is the crime laboratory directly affiliated with the major retail store Target?

Expert: Yes. The crime lab is affiliated with the major retail store Target and has been in service since 2006.\(^5\)

PA: Mr. Miller, how long have you been working at CRIME LAB VARIABLE or in the same line of work?

Expert: I have been working at CRIME LAB VARIABLE for the last 5 years, and have

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\(^2\) Crime lab variable: Public – Minneapolis Police Department, Crime Laboratory; Private – Integrated Forensic Laboratory, Inc.; Corporation – Target Corporation Forensic Services Laboratory

\(^3\) Condition 1: Public Lab/Low Complexity

\(^4\) Condition 3: Private Lab/Low Complexity

\(^5\) Condition 5: Corporate Lab/Low Complexity
been in crime scene investigations and fingerprint identifications for 10 years.

PA: To perform the type of work that you do is there any type of qualifications or certifications required?

Expert: Yes. All investigators and analysts must be certified through the Internal Association for Identification. I am currently certified as a Senior Crime Analyst. This means I have a minimum of 5 years in crime scene related activities and have completed a minimum of 144 hours of Crime Scene Certification Board approved instruction in crime scene related courses within the last 5 years. I have also presented on different areas of crime scene investigation to professional organizations and have provided testimony before in court.

PA: What is your current area of work and specific job function at CRIME LAB VARIABLE?

Expert: I manage all latent fingerprint identifications made at CRIME LAB VARIABLE, so that means I supervise all of the locating, developing, photographic, and lifting of prints at the crime scene and in the lab. I also make sure that our lab is clean and free of any contaminants. I am the coordinator of our unit for the proficiency tests run by the American Society of Crime Laboratory Directors. These tests help our lab get accreditation through the Society to certify that we use appropriate industry standards in our latent fingerprint procedures.

PA: How many labs are accredited through the Society?

Expert: Out of 500 labs in the country, only 384 labs are currently accredited through the Society. It is quite an honor for CRIME LAB VARIABLE to be among that group as it shows we are doing our job well.

PA: In your years at CRIME LAB VARIABLE, how many fingerprint identifications have you made?

Expert: Oh gosh, far too many to count. Probably more than 500 identifications is reasonable to say, although I haven’t been doing as many personally since I took over more of a supervisor role.

PA: Did you look at Mr. Murphy’s fingerprints and the prints off the evidence left at the crime scene?

Expert: Yes, sir. One of my unit members was really backed up one day and I was available to start working on the case file since we had the latent prints and the inked impressions in the lab and ready to be looked at. I was also interested in looking at the prints as I helped one of our lab technicians with getting the prints off the evidence that was recovered from the crime scene.
PA: What is a latent fingerprint?

Expert: The word latent means hidden from view or invisible. Fingerprints that cannot be seen with the naked eye are latent prints. But as a result of the police and media, a latent print has come to mean any fingerprint that is left at the crime scene. Really, any fingerprint imprint that has accidentally been left on a somewhat smooth surface.

PA: What is an inked impression or inked fingerprint?

Expert: An imprint of the friction ridges on a finger or thumb as a result of putting ink on a finger or thumb and then pressing that finger onto a piece of nonabsorbent paper which is preprinted on a fingerprint card.

PA: Can you tell the court how you treat fingerprints taken from evidence from a crime scene?

Expert: The method of treating an item for prints depends on several things such as the type of surface being looked at, location of the surface, and the physical conditions of the crime scene. Surfaces like glass must be treated differently from surfaces like paper or wood because the prints absorb differently into materials like paper or wood. I use a chemical solution that enhances and develops hidden prints stained with blood on a surface. It is best applied by dipping the object into the solution or by spraying the item if it cannot be dipped. Development usually appears within 30 seconds.

PA: How do you see the prints?

Expert: The prints usually appear within 30 seconds when using this chemical solution.

PA: Now could you tell the court how you see if there is a match between the fingerprints left at the crime scene and the defendant?

Expert: Certainly. I look at the prints by placing each under a magnifying glass that has two side-by-side lenses; by changing the focus I can look at both prints at the same time. It is obvious if the patterns are of the same type. If they are, a closer look at ridges that make up the pattern will display a match in length, space, forking, and separation. The identifiable parts of a fingerprint are called ridge characteristics. By grouping these features in one print, I should be able to tell if that group of features is present in the other. It is not necessary that an entire pattern be recognized in order to compare to prints. Parts of a hidden pattern have features that can be grouped and compared to an inked fingerprint. Two features within a pattern will allow me to count the ridges between those features and further help in identifying the hidden print.

PA: Were you given the defendant’s inked fingerprints?
Expert: Yes

PA: By whom?

Expert: Officer Daniels provided them to our lab. He was the jail-booking officer at the time of arrest for Mr. Murphy and obtained his prints.

PA: How many points of comparison are required in order to confidently identify a hidden imprint?

Expert: The exact number depends on how clear, complete, and unusual the features are but in my opinion no less than eight. Most of my coworkers would agree that in no case are more than 12 necessary to confidently determine identity.

PA: In your study of the science of fingerprints at CRIME LAB VARIABLE and in your years of experience have you ever encountered, read, or heard about two people who had the same fingerprints?

Expert: No, sir. No two fingers have yet been found that share the same characteristics. Fingerprint individuality is not dependent on age, size, gender, or race.

PA: Based upon your experience, education, training, and the comparisons of the hidden prints taken off of the evidence and the defendant’s inked fingerprints, do you have an opinion, based on a reasonable scientific certainty, as to whether or not the same person made the hidden prints and the inked prints?

Expert: Yes, I do.

PA: What is that opinion?

Expert: It is my opinion that the impression lifted off of the knife left at the crime scene is identical with finger numbers 6, 7, 8, 9, and 10 from the inked fingerprint card taken from the defendant and that they therefore were made by the same person. If you look at my picture here of finger number 10, you can see 9 points of comparison from the prints taken at the crime scene and the inked prints from jail booking.
PA: Would it be right to say that according to your analysis, you found a positive identification between the defendant and the fingerprints left on the weapon left at the crime scene?

Expert: Yes that is correct. I believe I was able to get a positive identification between the two prints. There were enough points of uniqueness between the two sets of prints to find a positive ID.

PA: Thank you Mr. Miller. No further questions.
Expert Testimony for all High Complexity Conditions

Officer Daniels who was the jail-booking officer at the time of Steven Murphy’s arrest took the suspect’s fingerprints and placed them on a standard fingerprint card. The prints were taken and submitted to CRIME LAB VARIABLE for identification. The physical evidence of the recovered knife and lifted prints from the crime scene and from Paul Thompson were also submitted to CRIME LAB VARIABLE. At the trial, lab technician Frank Miller presented the evidence for the prosecution.

PA: Will you please state your name and occupation for the court?

Expert: My name is Frank Miller, and I am a forensic lab technician at CRIME LAB VARIABLE in Minneapolis, Minnesota.

Condition 2:

PA: Is the crime laboratory directly affiliated with and managed by the Minneapolis Police Department?

Expert: Yes. The crime lab is directly managed by the Minneapolis Police Department. The lab was established in 2009 by the police department.

Condition 4:

PA: Does any type of police agency manage the crime lab?

Expert: No. The crime lab was established in 2007 as an independent business to analyze forensic evidence. It is not affiliated with any police or government agency.

Condition 6:

PA: So is the crime laboratory directly affiliated with the major retail store Target?

Expert: Yes. The crime lab is affiliated with the major retail store Target and has been in service since 2006.

PA: Mr. Miller, how long have you been working at CRIME LAB VARIABLE Inc. or in the same line of work?

Expert: I have been working at CRIME LAB VARIABLE for the last 5 years, and have

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6 Crime lab variable: Public – Minneapolis Police Department, Crime Laboratory; Private – Integrated Forensic Laboratory, Inc.; Corporation – Target Corporation Forensic Services Laboratory
7 Condition 2: Public Lab/High Complexity
8 Condition 4: Private Lab/High Complexity
9 Condition 6: Corporate Lab/High Complexity
been in crime scene investigations and fingerprint identifications for 10 years.

PA: To perform the type of work that you do is there any type of qualifications or certifications required?

Expert: Yes. All investigators and analysts must be certified through the Internal Association for Identification. I am currently certified as a Senior Crime Analyst. This means I have a minimum of 5 years in crime scene related activities and have completed a minimum of 144 hours of Crime Scene Certification Board approved instruction in crime scene related courses within the last 5 years. I have also presented on different areas of crime scene investigation to professional organizations and have provided testimony before in court.

PA: What is your current area of work and specific job function at CRIME LAB VARIABLE?

Expert: I oversee all latent fingerprint identifications made at CRIME LAB VARIABLE so that means I supervise all of the locating, developing, photographic, and lifting of prints at the crime scene and in the lab. I also ensure that our lab facilities are clean and free of any contaminants. I am the coordinator of our unit for the proficiency tests run by the American Society of Crime Laboratory Directors. These tests help our lab acquire accreditation through the Society to certify that we use appropriate industry standards in our latent fingerprint procedures.

PA: How many labs are accredited through the Society?

Expert: Out of approximately 500 labs in the country, only 384 labs are currently accredited through the Society. It is quite an honor for CRIME LAB VARIABLE to be among that group as it shows we are doing our job well.

PA: In your years at CRIME LAB VARIABLE, how many fingerprint identifications have you made using your current technique?

Expert: Oh gosh, far too many to count. Probably more than 500 identifications is reasonable to say, although I haven’t been doing as many personally since I took over more of a supervisor role.

PA: Did you examine Mr. Murphy’s fingerprints and the prints off the evidence left at the crime scene?

Expert: Yes, sir. One of my unit members was really backed up one day and I was available to start working on the case file since we had the latent prints and the inked impressions in the lab and ready to be analyzed. I was also interested in examining the prints as I assisted one of our lab technicians with lifting the latent prints off the evidence that was recovered from the crime scene.
PA: What is a latent fingerprint?

Expert: The word latent means hidden from view or invisible. In the science of fingerprints only those fingerprints that cannot be seen with the unaided eye are latent prints. But as a result of police and media usage, a latent print has come to mean any fingerprint that is left at the crime scene. Essentially, any fingerprint impression that has inadvertently been left on a relatively smooth surface.

PA: What is an inked impression or inked fingerprint?

Expert: An impression of the friction ridges on a finger or thumb as a result of applying ink to the finger or thumb and then pressing that digit onto a piece of nonabsorbent paper which is preprinted on a fingerprint card.

PA: Can you describe to the court the procedures you use to process fingerprints taken from evidence from a crime scene?

Expert: The method of processing an item for prints depends on several variables such as the type of surface being examined, location of the surface, and the physical conditions of the crime scene. Nonporous surfaces must be processed differently from porous surfaces because the absorption of various components of the fingerprint residue by porous materials. I use a chemical called Aqueous Leuco Crystal Violet that enhances and develops latent prints stained with blood porous or non-porous surfaces. It is best applied by submerging the object into the Aqueous Leuco Crystal Violet solution or by spraying the item if it cannot be dipped. Development usually appears within 30 seconds.

PA: How do the prints become visible to you?

Expert: Development usually appears within 30 seconds when using Aqueous Leuco Crystal Violet as a chemical solution.

PA: Now could you describe to the court a little bit about the procedures you used to determine whether or not there is a match between the fingerprints left at the crime scene and the defendant?

Expert: Certainly. I examine the prints by placing each under a dual lensed magnifying glass; by adjusting the focus I can examine both prints simultaneously. It is readily apparent if the patterns are of the same type. If they are, a closer examination of the ridges that make up the pattern will display a similarity in length, space, forking, and divergence. The identifiable parts of a fingerprint are called minutiae. The shape, location, and number of minutiae individualize a fingerprint. By grouping these minutiae in one print, I should be able to readily identify if that group of characteristics is present in the other. It is not necessary that an entire pattern be recognized in order to compare to prints. Parts of a latent pattern have minutiae that can be grouped and used to compare to an inked
impression. Two characteristics within a pattern will allow me to count the ridges between those characteristics and further assist in identifying the latent print. Any number of minutiae may be present in a single latent print, depending on the quality and size of the print.

PA: Were you provided the defendant’s inked impressions?

Expert: Yes

PA: By whom?

Expert: Officer Daniels provided them to our lab. He was the jail-booking officer at the time of arrest for Mr. Murphy and obtained his prints.

PA: How many points of comparison are required in order to positively identify a latent impression?

Expert: The precise number is dependent upon how clear, complete, and unusual the minutiae are but in my opinion no less than eight. Most of my colleagues would agree that in no case are more than 12 necessary to positively establish identity.

PA: In your study of the science of fingerprints at CRIME LAB VARIABLE and in your years of experience have you ever encountered, read, or heard about two people who had identical fingerprints?

Expert: No, sir. No two fingers have yet been found that share identical minutiae. Fingerprint individuality is not dependent on age, size, gender, or race.

PA: Based upon your experience, education, training, and the comparisons of the latent prints taken off of the evidence and the defendant's inked impressions, do you have an opinion, based on a reasonable scientific certainty, as to whether or not the same person made the latent impression and the inked impression?

Expert: Yes, I do.

PA: What is that opinion?

Expert: It is my opinion that the impression lifted off of the knife left at the crime scene is identical with finger numbers 6, 7, 8, 9, and 10 from the inked fingerprint card taken from the defendant and that they therefore were made by the same person. If you look at my picture here of finger number 10, you can see 9 points of comparison from the prints taken at the crime scene and the inked prints from jail booking.
PA: Would it be accurate to say that according to your analysis, you established a positive identification between the defendant and the fingerprints left on the weapon left at the crime scene?

Expert: Yes that is correct. I believe I was able to obtain a positive identification between the two prints. There were enough points of uniqueness between the two sets of prints to establish a positive ID.

PA: Thank you Mr. Miller. No further questions.
Cross-Examination for Public Laboratory Conditions 1 & 2

**Next, the defense attorney began to question the expert, Mr. Miller.**

DA: Mr. Miller, when you say you work at the Minneapolis Police Department Crime Lab, you are referring to the local police department in Minneapolis?

Expert: Yes.

DA: With all this advanced technology at the Minneapolis Police Department Crime Lab, there is no possible way that two people can have the same fingerprints or fingerprint profile, right?

Expert: No, sir. It is possible that two fingerprints from two individuals can initially look similar but the finger friction ridges on skin form identifiable patterns of loops, whorls, and arches.

DA: Do these ridge characteristics differ from person to person?

Expert: No, the lines that make the ridges and patterns are common stuff; however, the location and their relationship to one another differ. We may have any combination of patterns, only loops or loops and arches, loops arches and whorls, arches and whorls, loops and whorls. Sometimes there may be more than one pattern in a print.

DA: So the ridges and patterns are common and do not differ greatly from person to person?

Expert: Well, yes, the lines and ridges are common, but it is the combination of patterns that make each print unique.

DA: Now, isn’t it true that some people are wrongly convicted because of fingerprint evidence?

Expert: Well, that’s very rare, especially at the Minneapolis Police Department Crime Lab. Many people are released from prison based on our fingerprint identifications that proved other types of evidence to be wrong. Fingerprints are a very reliable means of identification.

DA: But it is true. Some people have been wrongly convicted because of faulty fingerprint identification and evidence.

Expert: Yes, I suppose that is true, but I have never been involved with any such case.

DA: Isn’t it true that fingerprint samples can be easily contaminated because of lab
technicians, or their inexperience with fingerprint powders and developing prints, or the mislabeling of samples?

Expert: Yes, that’s true, and contamination can be a problem, but at the Minneapolis Police Department Crime Lab we are very careful to maintain clean facilities and have high standards for our lab technicians. Our technicians are all extremely experienced and qualified and have been certified. We have an excellent record in our proficiency tests and review of analyzed prints, and contamination problems are very rare.

DA: What about the police handling of the fingerprints? You can’t monitor the crime scene until you get there or witness the jail-booking officer obtaining prints. And, you can’t monitor the prints until they arrive at your lab. Couldn’t the police have contaminated the evidence accidentally or intentionally?

Expert: Well, yes, police contamination is possible, but in this case, the detectives who arrived at the crime scene were unaware of any suspect in the case, and it would have been difficult to tamper with the prints. The evidence is sealed from the crime scene until it is delivered to our lab.

DA: Did you know how the police found the suspect?

Expert: I heard from the detectives they saw him near the crime scene and picked him up for questioning.

DA: Couldn’t your knowledge of the police’s strong suspicion of this suspect have affected your ability to run an unbiased experiment on these samples?

Expert: Listen, sir, every case that comes through our lab is handled with the same caution and meticulous care. We want the police to find the suspect as much as everyone else in the city. I am concerned about the violence that goes on in our city, but that concern would never affect my work. This is science, after all. It is entirely factual.

DA: Entirely factual? So you’re telling me there is no possible way for your own opinion to affect your judgment of the results?

Expert: No, sir.

DA: In this case, you are a hundred percent certain that Mr. Murphy left the prints?

Expert: Yes, sir.

DA: There’s no possibility you could have made a mistake?

Expert: No, sir.

DA: In every case in which you’ve identified a latent print to an ink print, have you been
a hundred percent certain?

Expert: Yes, sir.

DA: But that doesn’t mean mistakes aren’t made using the method that you use?

Expert: I suppose there are mistakes made. I have heard of mistakes being made.

DA: You have heard of mistakes, you’re aware of latent print identification mistakes?

Expert: Yes, sir.

DA: Did any of the other lab technicians review the prints to check your work and establish a positive identification between the two prints?

Expert: No, sir.

DA: No further questions.
Next, the defense attorney began to question the expert, Mr. Miller.

DA: Mr. Miller, when you say you work at the Integrated Forensic Laboratory Inc., you are referring to a private business that analyzes forensic evidence?

Expert: Yes.

DA: With all this advanced technology at Integrated Forensic Laboratory, Inc., there is no possible way that two people can have the same fingerprints or fingerprint profile, right?

Expert: No, sir. It is possible that two fingerprints from two individuals can initially look similar but the finger friction ridges on skin form identifiable patterns of loops, whorls, and arches.

DA: Do these ridge characteristics differ from person to person?

Expert: No, the lines that make the ridges and patterns are common stuff; however, the location and their relationship to one another differ. We may have any combination of patterns, only loops or loops and arches, loops arches and whorls, arches and whorls, loops and whorls. Sometimes there may be more than one pattern in a print.

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DA: But it is true. Some people have been wrongly convicted because of faulty fingerprint identification and evidence.

Expert: Yes, I suppose that is true, but I have never been involved with any such case.

DA: Isn’t it true that fingerprint samples can be easily contaminated because of lab technicians, or their inexperience with fingerprint powders and developing prints, or the mislabeling of samples?
Expert: Yes, that’s true, and contamination can be a problem, but at Integrated Forensic Laboratory, Inc. we are very careful to maintain clean facilities and have high standards for our lab technicians. Our technicians are all extremely experienced and qualified and have been certified. We have an excellent record in our proficiency tests and review of analyzed prints, and contamination problems are very rare.

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Expert: I heard from the detectives they saw him near the crime scene and picked him up for questioning.

DA: Couldn’t your knowledge of the police’s strong suspicion of this suspect have affected your ability to run an unbiased experiment on these samples?

Expert: Listen, sir, every case that comes through our lab is handled with the same caution and meticulous care. We want the police to find the suspect as much as everyone else in the city. I am concerned about the violence that goes on in our city, but that concern would never affect my work. This is science, after all. It is entirely factual.

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Expert: No, sir.

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Expert: Yes, sir.

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Expert: Yes, sir.

DA: Did any of the other lab technicians review the prints to check your work and establish a positive identification between the two prints?

Expert: No, sir.

DA: No further questions.
Next, the defense attorney began to question the expert, Mr. Miller.

DA: Mr. Miller, when you say you work at Target Corporation Forensic Services, are you referring to the major retail store Target?

Expert: Yes.

DA: So I would be correct in saying you work at the Target Crime Lab?

Expert: Yes.

DA: So the same place I can buy clothes or movies from is also analyzing forensic evidence that is used in criminal cases?

Expert: Yes that would be correct. However, the laboratory is not accessible to the public or people shopping at Target. There are only two doors that have access to the lab and both are secure and require credentials to open.

DA: So to be clear, the lab is not affiliated with a police department.

Expert: No.

DA: With all this advanced technology at Target Corporation Forensic Services, there is no possible way that two people can have the same fingerprints or fingerprint profile, right?

Expert: No, sir. It is possible that two fingerprints from two individuals can initially look similar but the finger friction ridges on skin form identifiable patterns of loops, whorls, and arches.

DA: Do these ridge characteristics differ from person to person?

Expert: No, the lines that make the ridges and patterns are common stuff; however, the location and their relationship to one another differ. We may have any combination of patterns, only loops or loops and arches, loops arches and whorls, arches and whorls, loops and whorls. Sometimes there may be more than one pattern in a print.

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Expert: Well, that’s very rare, especially at Target Corporation Forensic Services. Many people are released from prison based on our fingerprint identifications that proved other types of evidence to be wrong. Fingerprints are a very reliable means of identification.

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Expert: Yes, I suppose that is true, but I have never been involved with any such case.

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Expert: No, sir.

DA: No further questions.
Appendix D
Judge’s Instruction and Jury Verdict Form

D1

Judge’s Instruction

The following are the instructions from the judge that explain the relevant laws in this case.

Ladies and Gentlemen of the Jury:

It is my duty to instruct you in the law that applies to this case, and you must follow the law as I state it to you. As jurors, it is your exclusive duty to decide all questions of fact submitted to you and for that purpose to determine the effect and value of the evidence. You must not be influenced by sympathy, prejudice or passion. The information in this case is only an accusation against the defendant that informs the defendant of the charge. You are not to consider the filing of the information or its contents as proof of the matter charged.

The evidence you are to consider consists of the testimony of the witness and the exhibits admitted into evidence. The Court has admitted physical evidence of a weapon recovered from the crime scene, fingerprints taken from the crime scene and off of the recovered weapon, fingerprints obtained at the time of the defendant’s arrest, and expert’s opinions concerning the analysis of this physical evidence. You are the sole judges of whether any such evidence has a tendency and reason to prove any fact at issue in this case. You should carefully review and consider all the circumstances surrounding each item of evidence, including, but not limited to, its discovery, collection, storage, and analysis. If you find any item of evidence does not have a tendency and reason to prove any element of the crime’s charge or the identity of perpetrator of such of the crime’s charge, you must disregard such evidence.

Now I want to define the elements of the charge against the defendant. The State has charged the defendant with second-degree murder. Murder is the unlawful killing of a human being, or a fetus, with malice aforethought. Such malice may be express or implied. It is express when there is manifested a deliberate intention unlawfully or take away the life of a fellow creature. It is implied, when no considerable provocation appears, or when the circumstances attending the killing show an abandoned and malignant heart. This murder does not fulfill the requirements necessary for first degree, so you will only consider second-degree murder when making your decision. Second-degree murder is considered an intentional killing that was not premeditated.

A defendant is presumed innocent. This presumption continues throughout the entire trial unless you find it has been overcome by the evidence, beyond a reasonable doubt. The State has the burden of proving each element of the crime beyond a reasonable doubt.
A reasonable doubt is one for which a reason exists. A reasonable doubt is such a doubt as would exist in the mind of a reasonable person after fully, fairly and carefully considering all of the evidence or lack of evidence. Doubt, to be reasonable, must be actual and substantial, not mere possibility or speculation.

If the State has failed to prove the elements of the charged offenses beyond a reasonable doubt, it is your duty to find the defendant not guilty.
Jury Verdict Form

Question: At this point, what would you estimate to be the probability that Steven Murphy is guilty of murder? Please choose a number between 0% and 100%, where 0% means, “absolutely sure he is not guilty” and 100% means, “absolutely sure he is guilty”:

_________________%

As a juror, you are instructed to consider all of the evidence presented in this case carefully. You are to find against Steven Murphy only if the evidence convinces you “beyond a reasonable doubt” that Steven Murphy is guilty of this crime.

What verdict would you return? (Please check beside your response below):

_________________ Not Guilty ___________________ Guilty

Using the scale below, how confident are you in your verdict choice?

not at all confident extremely confident

1 2 3 4 5 6 7 8 9 10

In a sentence or two, please describe the main reason why you chose the verdict that you did:

What was the crime Steven Murphy was being accused of?

Was DNA evidence presented in this case?

Yes  No

Was fingerprint evidence presented in this case?

Yes  No

Did an eyewitness see Mr. Murphy commit a crime?

Yes  No
How would you rate the complexity of the fingerprint testimony?

not at all complex
extremely complex

1  2  3  4  5  6  7  8  9  10

The crime lab that analyzed the case evidence:

A. A police department crime laboratory
B. An independent business established to analyze evidence
C. Lab affiliated with a major retail store

What was the name of the laboratory that analyzed the evidence?

Was the laboratory accredited by the American Society of Crime Laboratory Directors?

Yes  No

Was the laboratory directly affiliated with a major corporation?

Yes  No

How would you rate the evidence produced by the laboratory?

extremely low quality
extremely high quality

1  2  3  4  5  6  7  8  9  10

How would you rate the evidence produced by the laboratory?

not at all reliable
extremely reliable

1  2  3  4  5  6  7  8  9  10

not at all credible
extremely credible

1  2  3  4  5  6  7  8  9  10
Was the laboratory affiliated with a private organization?

Yes  No

How would you rate the complexity of the fingerprint testimony?

<table>
<thead>
<tr>
<th>not at all complex</th>
<th>extremely complex</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>2 3 4 5 6 7 8 9 10</td>
</tr>
</tbody>
</table>

Did the expert lab technician say that the fingerprints taken from the defendant at booking matched the fingerprints taken from the crime scene and evidence?

Yes  No

Was the lab technician well-trained for his position?

Yes  No

How would you rate the expert witness?

<table>
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<td>1</td>
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<th>extremely low expertise</th>
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<tbody>
<tr>
<td>1</td>
<td>2 3 4 5 6 7 8 9 10</td>
</tr>
</tbody>
</table>
Was the fingerprint evidence contaminated?
   Yes   No

Are you aware of any crime lab misconduct?
   Yes   No

Are you aware of the Innocence Project?
   Yes   No
References


N.Y. EXEC. LAW § 995b

OKLA. STAT. ANN. tit. 74, § 150.37


TEX. CODE CRIM. PROC. ANN. art. 38.35


VITA

University of Nevada, Las Vegas

Miliaikeala S.J. Heen

Degrees:
Bachelor of Arts, Criminal Justice, 2012
University of Nevada, Las Vegas

Thesis Title: Putting the Microscope on Crime Labs: The Effects of Evidence Complexity and Laboratory Type on Jurors’ Perceptions of Forensic Evidence

Thesis Examination Committee:

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Committee Member, Tamara Madensen, Ph.D.
Committee Member, Terance D. Miethe, Ph.D.
Graduate Faculty Representative, Anna Lukemeyer, Ph.D.