

The Importance of Forensic Evidence on Decisions of Criminal Guilt

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Abstract

Recent studies have found that the general public perceives forensic evidence to be relatively inaccurate and to involve high levels of human judgement. This study examines how important the general public finds forensic evidence by comparing decisions on guilt and punishment in criminal cases that involve forensic versus eyewitness testimony evidence and examining whether a *CSI* effect exists. Specifically, this experimental survey study utilized a 2 (crime type: murder or rape) x 4 (evidence type: DNA, fingerprint, victim eyewitness testimony, or bystander eyewitness testimony) - 1 (no victim testimony for murder scenario) design, yielding seven vignettes scenarios to which participants were randomly assigned. Results indicate that forensic evidence was associated with more guilty verdicts and higher confidence in a guilty verdict. Forensic evidence did not change the expected sentence length and did not generally affect the ideal sentence length. However, for rape, respondents believed that the offender should receive a longer sentence when forensic evidence was presented but forensic evidence did not alter likely sentence that respondents expected the offender to receive. The results of this study did not support a *CSI* effect. Overall, this study suggests that forensic evidence – particularly DNA – has a stronger influence during the verdict stage than the sentencing stage.

Keywords: forensic science, forensic evidence, CSI effect, eyewitness testimony

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Highlights

- Forensic evidence is associated with more guilty verdicts.
- Forensic evidence is associated with higher confidence in guilty verdict.
- Forensic evidence does not affect expected or ideal sentence length for murder.
- Forensic evidence affects ideal sentence but not expected sentence length for rape.
- Belief in the accuracy of forensic TV shows does not moderate the relationship between forensic science and decisions of guilt.

Novelty Statement

Forensic science and eyewitness testimony have been considered convincing types of evidence. This experimental study examines how forensic evidence, compared to eyewitness testimony, influences decisions of guilt and punishment. Results suggest that forensic evidence affects decisions of guilt, as forensic evidence is associated with more guilty verdicts and higher confidence in guilty verdicts. The impact of forensic evidence on sentencing is more varied, with no notable difference in expected or ideal sentences for murder or expected sentence for rape, but an increase in the ideal sentence for rape. In general, forensic evidence – and DNA in particular – seems to have a stronger impact during the verdict stage than the sentencing stage for the violent crimes of murder and rape. There is no moderation effect of belief in the accuracy of forensic TV shows on the relationship between forensic science and decisions of guilt. Implications of these findings are discussed.

1 Introduction

Forensic evidence has been thought to be some of the strongest evidence admitted and judged in the courtroom (Freeman and Punzo, 2001; O’Neill Shermer et al., 2011; Maeder et al., 2017; Pearson et al., 2018; Schweitzer and Nuñez, 2018). DNA evidence in particular has been considered the gold standard for forensic techniques for jurors (Clancy and Bull, 2015; Hans et al., 2011; Lieberman et al., 2008). In fact, DNA has been found to have a greater effect on guilty verdicts than other types of non-DNA forensic evidence, demonstrating people’s confidence in DNA and their preconceived expectations that DNA evidence is more precise and discerning than non-DNA forensic evidence, and thus, less likely to risk a coincidental match (Thompson and Newman, 2015). Research has indicated that jurors believe that DNA evidence is more reliable than it may be and do not understand its potential fallibility (Findlay and Grix, 2003; Lieberman et al., 2008). However, there have also been recent studies that have found that the lay public perceives forensic evidence in general to be relatively inaccurate and to involve high levels of human judgement (Ribeiro et al., 2019; Kaplan et al., 2020). Overall, inaccurate perceptions or beliefs of forensic evidence can have devastating effects, especially when faulty forensic analyses result in miscarriages of justice (Project, 2019). As such, there has been increasing interest in understanding how various actors of the criminal justice system – such as potential jury members, judges, defense attorneys and prosecutors – view forensic evidence and whether they recognize the limits of such evidence.

One concern that arises out of the use of forensic evidence in jury trials is what has been dubbed the “*CSI* effect.” In essence, the *CSI* effect suggests that television shows that show forensic evidence may affect the general public’s perceptions, beliefs, attitudes, or expectations of forensic science evidence such that forensic evidence may be incorrectly perceived as being as accurate or as quick to be analyzed as shown on TV (Cole and Dioso-Villa, 2006; Podlas, 2006; Smith and Bull, 2012; Kaplan et al., 2020; Ribeiro et al., 2019). This in turn could result in jurors placing an inordinate amount of importance on forensic evidence and lead them to incorrectly penalizing defendants when any form of forensic evidence is presented or incorrectly penalizing prosecutors when there is no forensic evidence (Eatley et al., 2016; Podlas, 2006). Examining whether criminal justice actors understand the limits of forensic evidence may be particularly important when there are other forms of evidence present that could contradict the available

forensic evidence or when forensic evidence is unavailable or unfeasible to obtain.

1.1 Forensic Evidence vs. Eyewitness Testimony

Prior work has indicated that certain types of forensic evidence are perceived as more accurate and objective than others (Ribeiro et al., 2019; Kaplan et al., 2020). Empirical studies evaluating the *CSI* effect commonly examine DNA and fingerprint evidence. Interestingly, a study by Kaplan et al. (2020) noted that DNA and fingerprinting was perceived as the two most accurate forensic techniques out of the 10 techniques evaluated, and these two types of evidence were also deemed foundationally valid in the President’s Council of Advisors on Science and Technology (PCAST) report (The President’s Council of Advisors on Science and Technology, 2016). However, in addition to forensic evidence, there are other types of evidence that could be presented during a case. Of particular interest is how forensic evidence is perceived compared to eyewitness testimony. Numerous studies have demonstrated that jurors perceive both eyewitness testimony and forensic analysis to be strong forms of evidence for trial decision-making (Berman et al., 1995; Brewer and Burke, 2002; Lieberman et al., 2008; Lindsay et al., 1981). Eyewitness testimony is considered one of the most convincing evidence presented to jurors and has historically been considered the gold standard (Beil, 2011; Brewer and Wells, 2011). Moreover, eyewitnesses who were more proximate, and therefore more familiar, with the defendant during the commission of the offense, such as the victim of an offense, may be perceived as more accurate in their descriptions of a defendant than bystander eyewitnesses; indeed, this type of witness familiarity with the defendant has been shown to significantly increase the likelihood for and confidence in guilty verdicts, as compared to when a stranger was a bystander eyewitness (Sheahan et al., 2018). However, jurors often believe eyewitness identifications to be more reliable than they actually are in reality (Brigham and Bothwell, 1983; Loftus and Schneider, 1987; Wells and Olson, 2003). In fact, eyewitness error is one of the leading causes of wrongful convictions, with an estimated one in three eyewitnesses making an erroneous identification (Wells et al., 1998; Wise et al., 2014)

Studies have examined the relative strength of forensic evidence compared to other types of evidence. Eyewitness testimony in particular has been a comparison of interest because eyewitness testimony has been considered one of the most convincing types of evidence (Brewer and Wells, 2011). Eyewitness testimony and forensic evidence both have significant effects on the level of

confidence in guilt, with forensic evidence eliciting higher levels of confidence (Pearson et al., 2018). Moreover, these effects were even larger for more serious crimes, suggesting that the presence of DNA evidence may lead to higher juror certainty in guilty verdicts if presented in trials involving more severe or harmful offenses (Pearson et al., 2018). Thus, forensic evidence (especially DNA evidence) tends to be perceived as more accurate and given more weight than eyewitness testimony for mock jurors when determining their verdicts and in the confidence in their verdicts (Freeman and Punzo, 2001; Lieberman et al., 2008; Pozzulo and Dempsey, 2009; Schweitzer and Nuñez, 2018; Skolnick and Shaw, 2001).

1.2 Current Study

In order for existing literature to better contemplate the needs of those who wish to apply it in the courtroom, Schweitzer and Nuñez (2018) have argued that researchers should focus on examining the importance of different types of evidence, commonly presented in criminal trials, to jurors and their verdicts. Specifically, testing how different characteristics of such evidence may lead to varying outcomes and confidence in juror verdicts may not only help to better understand juror behavior, but can also aid legal actors, such as judges and lawyers, make more informed decisions if they know what types of evidence, and for what particular cases, affect jurors' verdicts (Schweitzer and Nuñez, 2018). This is not only true for verdicts involving guilt determination, but also for juror sentencing. Indeed, juror sentencing is still a practice for felony offenses for over 4,000 cases each year, and therefore, their sentencing verdicts dictate the punishment outcomes for thousands of defendants every year (King and Noble, 2005).

Further, as evidence presented at any given trial is case-type specific, it is also important to examine the effects of evidence in cases involving offenses that already vary in the likelihood or probability of conviction. For example, tracking felonies in the 75 largest counties in the U.S. in 2009, the Bureau of Justice Statistics found that the basic probability a defendant would eventually be convicted of a felony charge at trial was highest for those charged with murder (60 percent) and drunk driving, while the lowest probability was for those charged with rape (35 percent) and assault (Reaves, 2013). As such, Schweitzer and Nuñez (2018) argue that it is especially important to examine the importance, weight, and effect of different types of evidence in trials that already vary in their probability of conviction. Such work will have both empirical

and practical applications for researchers and practitioners.

The current study, to offer guidance on these issues, seeks to extend current literature, regarding the importance of different types of evidence to mock jurors and the effects of such evidence on their verdict confidence, by comparing two forensic techniques (DNA and fingerprint) with two types of eyewitness testimonies (bystander and victim) for two different case-types (murder and rape). Based on prior work, these forms of evidence have been argued to be most important to jurors. There are five hypotheses tested in the current study.

1. Participants will be more likely to say that a defendant is guilty if there is forensic evidence rather than eyewitness testimony.
2. Participants will be more confident that a defendant is guilty if there is forensic evidence rather than eyewitness testimony.
3. Participants will expect a harsher sentence if there is forensic evidence rather than eyewitness testimony.
4. Participants will want a harsher sentence if there is forensic evidence rather than eyewitness testimony.
5. Participants who believe fictional TV shows depicting forensic evidence are accurate are more likely to say a defendant is guilty in cases with forensic evidence.

2 Method

To evaluate how different forms of forensic evidence affect decisions on criminal guilt, participants were randomly assigned to read one of seven vignettes depicting a crime and were then asked to answer the same set of questions regardless of the vignette. We used vignettes for two crimes where forensic evidence is frequently collected during an investigation - murder and rape ([McEwen, 2011](#)) - and varied which form of evidence was used during the hypothetical trial. We utilized two forms of forensic evidence - DNA and fingerprints - and compare them against two non-forensic types of evidence - testimony from an eyewitness and testimony from the victim (for the rape vignette only).

We chose DNA and fingerprint evidence because they are among the most common types of evidence collected in cases of rape or murder and thus are likely to be used in criminal cases

where jurors’ perceptions of their importance will affect whether the defendant is convicted or not (McEwen, 2011). Past studies of how accurate the general public perceives forensic evidence to be has found that DNA and fingerprints are considered the most accurate (Kaplan et al., 2020) or among the most accurate (Ribeiro et al., 2019) forensic techniques.

Each vignette is a short story explaining the facts of the case. Following these facts is the text “During the trial, the prosecution’s only evidence in the case was ...” with the type of forensic evidence used replacing the ellipses. While real-world criminal trials may have a number of forms of evidence tying the defendant to the crime, we used only a single form of evidence to isolate the impact of that evidence on our participants’ decisions of guilt and sentencing.

The murder vignette used in the current study was a modified version of Porter et al. (2010)’s vignette. In this modified vignette, a man enters a convenience store which has a single store employee and a single customer inside, murders the employee, and flees the store. The possible types of evidence in this vignette are “the customer’s eyewitness identification and testimony,” “DNA found on the murder weapon that was matched to the defendant,” and “a fingerprint found on the murder weapon that was matched to the defendant.” The complete text of the vignette is in Appendix A.

The rape vignette used in the current study was adopted from Krahé et al. (2007) and depicts a stranger rape in a parking lot that is interrupted by a person driving into the lot and illuminating the scene with their vehicle headlights. The language was slightly modified to better fit the vignette scenario such that the DNA evidence came from a rape kit of the victim; fingerprints were taken from a car in the parking lot near where the rape occurred; and the eyewitness was the driver of the vehicle that interrupted the rape. Similar to the murder vignettes, the possible evidence types for the scenario included DNA evidence, fingerprint evidence, and bystander witness evidence. In addition, the victim’s “eyewitness identification and testimony” was a fourth possible form of evidence for the rape vignette. The complete text of the vignette used in this study is in Appendix B.

2.1 Decisions on Guilt

To measure how different types of evidence affect decisions on guilt, we used two questions from Krahé et al. (2007). First, we asked the participants “If you were a member of the jury, would you

vote to find the defendant guilty (that they committed the crime) or not guilty?”. Their choices were “Guilty” or “Not Guilty.”¹ We use logistic regression to estimate how the odds of a guilty decision are affected by the type of evidence provided. To more precisely measure opinions on defendant guilt, respondents were then asked how certain they were that the defendant was guilty on a numeric scale from 0% certain to 100% certain.^{2,3} To estimate how each form of forensic evidence affects the respondent certainty, we use ordinary least squares (OLS) regression.

2.2 Decisions on Punishment

In addition to questions on whether the defendant was guilty, we evaluated decisions on punishment. As participants may factor in the cost of a mistake - that is, sentencing an innocent person to prison - they are expected to request a harsher sentence toward those whom they are more certain is guilty. As with the questions regarding decisions on guilt, we utilized questions from [Krahé et al. \(2007\)](#) to evaluate these decisions on punishment. Participants were asked “If the defendant is convicted, he will be sent to prison. What sentence do you think he is likely to receive in this case? (in years)” and “If the defendant is convicted, he will be sent to prison. What sentence do you think he should receive in this case? (in years)”. We use OLS regression to estimate the effect of forensic evidence on recommended prison sentence.

2.3 CSI Effect

While most studies examine correlations between how many hours respondents watch forensic science TV shows and their opinions on the accuracy of forensic evidence ([Cole and Dioso-Villa, 2006](#); [Ribeiro et al., 2019](#)), we utilized [Kaplan et al. \(2020\)](#)’s method of directly asking participants how accurate they believe these shows to be. To address whether this *CSI* effect is real, we asked participants how accurate they “think the [most accurate/average] fictional TV show is in depicting forensic science?” with a 4-point Likert scale from *Not accurate at all (1)* to *Very accurate (4)* with

¹These answers are displayed in a random order to avoid anchoring due to one answer always being shown first.

²To avoid the possibility of participants answer being biased by the default start value, that default value for the starting position of the anchor was randomly assigned to be 0, 50, or 100. A one-way ANOVA was conducted to determine whether the starting position of the anchor influenced respondents’ self-reported confidence level in their verdict decision. There were no differences between the three anchor groups [$F(2,380) = .327$, $p = .721$].

³[Krahé et al. \(2007\)](#) used a 7-point Likert scale to answer this question. We preferred a 100-point numeric scale to more precisely measure the degree of certainty.

the option of *Not sure*. In addition, we asked participants to write the name of the show which they believe to be “the most accurate fictional forensic science TV show.” We use a moderation analysis to examine if belief in the accuracy of forensic science TV shows affects the relationship between forensic evidence and judging the defendant to be guilty.

2.4 Participants

We used Amazon’s Mechanic Turk platform to find participants for the survey.⁴ Mechanic Turk is a website that allows members of the general public to perform simple tasks, such as complete a survey, for small amounts of money. Participants view a description of the task on the Mechanical Turk website and then decide whether to proceed with the task or not. When a participant decided to participate in the current study, a link in the description of the task directed them to the Qualtrics survey website where they completed the survey. Participants were limited to adults residing in the United States and they received up to \$1 in compensation for completing the survey. The study procedures were approved by the University of Pennsylvania’s institutional review board and Rutgers University’s institutional review board.

Three hundred ninety people completed the survey and submitted responses.⁵ All respondents answered the survey on April 9th, 2020. We used two attention check questions to ensure that participants were reading the questions before answering. The first question of the survey after the introductory page that explained the purpose of the survey asked what that purpose was. Any selection other than “Decisions on guilt” was considered to have failed the attention check.⁶ Participants were then randomly assigned to one of the seven vignette conditions. The second attention check question asks which crime the defendant was charged with; any answer other than the crime described in the participant’s vignette was deemed an attention check failure.⁷ Four participants failed the first attention check and an additional three participants failed the second attention check. After removing these seven participants, there were 383 participants whose responses were used in this study.

⁴<https://www.mturk.com/>

⁵Participants were required to answer every question, resulting in no missing responses.

⁶The other choices were: “Mass incarceration”, “Mental health”, “Drunk driving”, and “Juvenile crime”.

⁷In case participants were unfamiliar with the legal definition of rape or murder, each vignette explicitly stated which crime the defendant in the vignette was charged with.

The sample consisted of slightly more people identifying as male (54%) than as female (46%). Respondents were generally in their late 30s ($M = 37$ years old, $SD = 12$) with the oldest respondent aged 79 and the youngest aged 20. They were, on average, well-educated; every respondent had at least a high school diploma and 59% having a four-year degree or higher. Nearly three-quarters (72%) of respondents identified as non-Hispanic White, 7% identified as non-Hispanic Black, 10% identified as non-Hispanic Asian or Pacific Islander, and about half of one percent identified as non-Hispanic American Indian or Alaska Native. Seven percent of respondents identified as Hispanic, and the remaining 3.5% identified as mixed-race. Nearly all (92.4%) of the sample were registered to vote in the United States and 17% had served on a jury in the past.⁸

3 Results

Respondents were randomly assigned to 1 of 7 vignette scenarios: murder with DNA evidence ($n = 53$), murder with fingerprint evidence ($n = 52$), murder with a bystander eyewitness testimony ($n = 56$), rape with DNA evidence ($n = 53$), rape with fingerprint evidence ($n = 59$), rape with a bystander eyewitness testimony ($n = 57$), or rape with a victim eyewitness testimony ($n = 53$). There was a significant association between crime type and verdict ($2(1) = 5.425$, $p = .02$). A one-way ANOVA was conducted to compare demographics between vignette groups. There were no differences in age [$F(6, 376) = .302$, $p = .936$], sex [$F(6, 376) = .606$, $p = .726$], education level [$F(6, 376) = .236$, $p = .965$], income level [$F(6, 376) = .994$, $p = .429$], voter status [$F(6, 376) = 1.224$, $p = .293$], or jury service [$F(6, 376) = 1.519$, $p = .170$] between respondents in any vignette group.

3.1 Decisions on Guilt

There was a significant relationship between verdict and the presentation of forensic evidence ($\chi^2(1) = 11.473$, $p = .01$). There were more verdicts of guilty when forensic evidence was presented than would be expected if the null hypothesis were true. Table 1 shows the results of a logistic regression that evaluates how each form of evidence affects the odds of a conviction relative to

⁸In the United States, people are often selected for jury duty based on voter-registration lists so this is a proxy for jury-eligibility.

eyewitness testimony. Columns 1 and 2 show the odds ratio (OR) and 95% confidence interval for the effect in a murder case while columns 3 and 4 do the same for a rape case. For murder, the odds of a guilty verdict are 3.2 times greater when DNA evidence is presented relative to when bystander eyewitness testimony is provided, and this result was statistically significant (OR = 3.20, 95% CI [1.063, 9.632], $p = .039$). While the odds of a guilty verdict are 2.1 times greater when fingerprint evidence is presented compared to when bystander eyewitness testimony is provided, this was not statistically significant (OR = 2.14, 95% CI [.788, 5.825], $p = .135$).

For rape, DNA evidence increases the odds of a guilty verdict by a factor of 20 compared to bystander eyewitness testimony (OR = 19.92, 95% CI [4.416, 89.872], $p < .001$). While the odds of a guilty verdict are 1.5 times greater when fingerprint evidence is presented compared to when bystander eyewitness testimony is provided, this was not statistically significant (OR = 1.5, 95% CI [.719, 3.229], $p = .272$). Victim eyewitness increases the odds of a guilty verdict by a factor of 3 relative to when bystander eyewitness testimony is provided, and this was statistically significant (OR = 2.98, 95% CI [1.281, 6.946], $p = .011$).

3.1.1 Confidence of Verdict

Respondents were instructed to rate the confidence of a guilty verdict decision on a sliding scale from 0% - 100%. The overall mean confidence level for the entire sample was 70.83 (SD = 27.61). A t-test was conducted to examine whether participants who received a vignette with forensic evidence (DNA or fingerprint) reported higher confidence in a guilty verdict decision than those who received a vignette with eyewitness testimony evidence (bystander or victim). The results showed that respondents had significantly higher levels of confidence ($p < 0.001$) in a guilty verdict decision when they received forensic evidence ($M = 76.71$, $SD = 25.50$) than eyewitness testimony evidence ($M = 63.13$, $SD = 28.50$).

Table 2 shows the results of an OLS regression that examines whether there were differences in confidence level and the presence of forensic evidence based on the type of crime committed. We analyze the effect of each piece of evidence relative to bystander eyewitness testimony separately for murder and rape. These analyses revealed that for murder, both the presence of DNA ($\hat{\beta} = 12.99$, $p = .005$) or fingerprint evidence ($\hat{\beta} = 13.51$, $p = .004$) was significantly more likely to result in a guilty verdict compared to bystander eyewitness testimony. For rape, DNA ($\hat{\beta} = 35.08$,

$p < .001$) and victim eyewitness testimony ($\hat{\beta} = 13.96$, $p = .006$) were significantly more likely to result in a verdict compared to bystander eyewitness testimony, but the result for fingerprint evidence was not significant ($\hat{\beta} = 5.39$, $p = .276$).

3.2 Decisions on Punishment

3.2.1 Likely Sentence

Table 3 shows the results of an OLS regression that examines whether the presentation of forensic evidence would be associated with a longer likely sentence compared to the presentation of eyewitness testimony. Results indicated no significant difference between the presentation of forensic evidence and witness evidence on the likely sentence length for either murder or rape cases. These findings suggest that respondents do not believe that the sentence defendants are likely to receive are dependent on the form of evidence in the case.

3.2.2 Ideal Sentence

An OLS regression was also run to examine whether the presentation of forensic evidence (DNA or fingerprints) would be associated with a longer ideal sentence compared to the presentation of eyewitness testimony (victim and bystander eyewitness testimony). Respondents recommended an ideal sentence of nearly nine years longer when presented with forensic evidence relative to those presented with non-forensic evidence ($\hat{\beta} = 8.60$, $p = .002$).

Table 4 shows an OLS analysis examining the effect of each form of evidence relative to bystander eyewitness testimony for murder and rape separately. Results show that for murder, there were no significant differences in the ideal sentence respondents believed the defendant should receive when DNA or fingerprint evidence was presented. For rape, there were no significant differences in the ideal sentence respondents believed the defendant should receive when fingerprint or victim eyewitness testimony evidence was provided. However, when DNA evidence was present, there was an increase of 12.76 years for the ideal sentence that respondents reported a defendant should receive compared to bystander eyewitness testimony evidence ($\hat{\beta} = 12.76$, $p < .001$, CI [5.668, 19.844]).

3.3 *CSI* Effect

A moderation analysis was conducted to determine whether participants who believe fictional TV shows depicting forensic evidence is accurate are more likely to say a defendant is guilty in cases with forensic evidence. For murder, belief in the accuracy of forensic TV shows does not moderate the relationship between the presence of forensic evidence and verdict.⁹ Similarly, there was no interaction effect between belief in the accuracy of forensic TV shows and presence of forensic evidence for rape. These results provide evidence against the presence of a "CSI effect" in people's opinions on the accuracy and importance of forensic evidence.

4 Discussion

The findings of the current study reveal that forensic evidence increases the likelihood that a defendant receives a guilty verdict (Hypothesis 1) and increases the level of confidence in a guilty verdict (Hypothesis 2). Additionally, the presentation of forensic evidence did not change the likely sentence that participants expected defendants to receive (Hypothesis 3) but did increase the length of sentence that respondents thought defendants should receive (Hypothesis 4). Lastly, there was no evidence of a *CSI* effect, as there were no differences in verdict decision between respondents who believed fictional forensic science TV shows were accurate and those who did not (Hypothesis 5).

The results on decisions of guilt are consistent with those reported in previous studies ([Freeman and Punzo, 2001](#); [Lieberman et al., 2008](#); [Pozzulo and Dempsey, 2009](#); [Schweitzer and Nuñez, 2018](#); [Skolnick and Shaw, 2001](#)). The results of this study indicate that the presence of forensic evidence, particularly DNA evidence, is viewed as a strong form of evidence. When DNA evidence is available, there are increased odds that the defendant will be found guilty compared to bystander eyewitness testimony. Moreover, individuals are more confident in their verdict decision when DNA is available. While DNA does increase the odds of a guilty verdict ($OR = 3.2$) for murder, this effect is over six times stronger for rape ($OR = 19.92$).

Additionally, victim eyewitness testimony for our rape case increased the odds of a guilty verdict and the confidence in a guilty verdict compared to bystander eyewitness testimony. Given that the

⁹Null results were found for both the "average" and "most accurate" forensic TV show variables.

rape scenario occurred at night, this could indicate that respondents believed the eyewitness (a person driving their car into the parking lot where the rape occurred) could not see the offender as well as the victim could. However, as there was no significant effect of fingerprints in the rape case, this does indicate that respondents believe that victim eyewitness testimony is a superior form of evidence than fingerprints, lending support that the finding is not due to the scenario being at night. Future research should examine other scenarios to see if and how these findings hold.

In general, results suggest that forensic evidence does not seem to affect respondents' sentencing decisions. However, for rape, respondents believed that the offender should have received a longer sentence when forensic evidence was presented but this did not match the likely sentence that respondents expected the offender to receive. Given that there were no differences in the likely sentence that respondents believed the defendant would receive even when forensic evidence was presented, forensic evidence may play a more crucial role during the verdict stage for rape cases. It is unclear why respondents' preference for a longer sentence did not translate into a longer likely sentence when forensic evidence was provided. This finding may reflect respondents' view that sentencing outcomes for rape cases tend to be relatively lenient – indeed, recent high-profile rape cases may have contributed to the development or exacerbation such perceptions ([Reyes, 2001](#); [Tierney, 2018](#)). Nevertheless, these findings may provide some insight into what stage of the trial process forensic evidence would be most impactful and for what types of crimes.

Results from the current study do not support the *CSI* effect, as there were no differences in the strength of the relationship between the presence of forensic evidence and the verdict decision based on how accurately people thought forensic TV shows were. This finding is in line with prior work utilizing this method of examining the *CSI* effect ([Kaplan et al., 2020](#)). However, the current results do indicate that forensic evidence does seem to influence decisions on guilt and punishment, indicating that respondents do place importance on forensic evidence. It could therefore be useful to provide a general overview about the accuracy and drawbacks of forensic evidence that is presented during a trial to minimize the risk of having jurors incorrectly penalize defendants when forensic evidence is presented or incorrectly penalize prosecutors when no forensic evidence is available ([Eatley et al., 2016](#); [Podlas, 2006](#)).

This work has practical implications for those wanting to apply it to the courtroom, and also helps to augment researchers' knowledge on the importance of different types of evidence to jurors

and their verdicts, involving both guilt determination and sentencing ([Schweitzer and Nuñez, 2018](#)). Such results provide guidance to practitioners that forensic evidence helps to increase the probability of and certainty in juror guilty verdicts across different types of offenses. Yet, as the basic probability a defendant will be eventually be convicted of rape at trial has been found to be one of the lowest of any felonies ([Reaves, 2013](#)), this work may help to suggest ways in which different types of evidence can be used to strengthen the likelihood of conviction in rape cases.

For example, DNA evidence was found to increase the odds of a jurors' guilty verdict by a factor of 20, as compared to when bystander evidence was presented. This immensely persuasive effect of DNA evidence in rape cases, even compared to murder cases, may be especially important to consider given the backlog of rape kits in the United States ([Fucci, 2015](#)). Indeed, this study suggests that introducing DNA evidence may significantly strengthen a prosecutor's argument and likelihood for conviction in rape cases, which may encourage prosecutors to spend more time and energy to ensure that rape kits are processed in a timely manner so that DNA evidence is available at trial if it has been collected. This study also has implications for law enforcement practices at the scene of the crime. As DNA evidence significantly increases the likelihood of a guilty verdict relative to eyewitness testimony for rape, but that fingerprints had no significant difference, law enforcement should prioritize collecting DNA evidence over fingerprints whenever possible - and particularly when limited by resource constraints that prevent collecting both - during rape cases.

Similarly, victim eyewitness testimony in the rape case increased the odds of a guilty verdict and jurors' confidence in their verdicts, as compared to bystander evidence. Findings such as these may lead prosecutors to encourage rape victims to provide victim testimony evidence during rape trials, as such testimony may increase the likelihood of conviction. However, it is also crucial for prosecutors to weigh the benefits of presenting victim testimony against the potential negative consequences, such as increased psychological damage for the victim from reliving a potentially traumatic event, as well as potential victim-blaming behavior by others, particularly when there are demographic differences (e.g., socioeconomic status) between the accused and the accuser ([Ferguson et al., 1987](#); [Ford et al., 1998](#); [Jones and Aronson, 1973](#); [Yamawaki et al., 2007](#)).

Ultimately, as this study has its limitations, this research suggests that future work should examine the current issues in several different areas. The current study focused on two specific crimes (murder and rape), as these crimes are more likely to involve forensic evidence. However,

it may be useful to compare forensic and eyewitness testimony evidence for other types of violent crimes. Given the increasing use of forensic evidence - in particular, DNA - used in property crime cases, future research should also examine perceptions of types of evidence for property crimes ([Roman et al., 2009](#); [Murphy, 2019](#)). As the current study suggests, forensic evidence may impact various crimes in dissimilar ways in different stages of the criminal justice process. Thus, it could be valuable for future studies to investigate what types of evidence would be instrumental in a trial for various crimes so that resources could be allocated more effectively.

The current study also involved a limited number of evidence types. These were chosen because they have been considered the "gold standard" either historically or by contemporary standards. However, there are many other forms of evidence that could be presented during a trial that were not evaluated in this study but should be considered in future work. This study used only a single form of evidence per vignette - to isolate the effect of that particular form of evidence on respondent opinions - however, actual cases may have multiple forms of evidence presented. Future studies should include combinations of evidence to examine how the interaction between multiple forms of evidence affect people's opinions. Finally, given recent large-scale protests against police brutality specifically, and a perceived unjust criminal justice system generally, similar studies should be conducted periodically to examine if and how opinions on forms of evidence change over time ([Buchanan et al., 2020](#)). Opinions on forensic evidence, especially relative to civilian or police eyewitness testimony, may serve as a barometer of the public's belief in the legitimacy of the criminal justice system.

References

- Beil, L. (2011). The certainty of memory has its day in court.
- Berman, G. L., Narby, D. J., and Cutler, B. L. (1995). Effects of inconsistent eyewitness statements on mock-jurors' evaluations of the eyewitness, perceptions of defendant culpability and verdicts. *Law and Human Behavior*, 19(1):79–88.
- Brewer, N. and Burke, A. (2002). Effects of testimonial inconsistencies and eyewitness confidence on mock-juror judgments. *Law and Human Behavior*, 26(3):353–364.
- Brewer, N. and Wells, G. L. (2011). Eyewitness identification. *Current Directions in Psychological Science*, 20(1):24–27.
- Brigham, J. C. and Bothwell, R. K. (1983). The ability of prospective jurors to estimate the accuracy of eyewitness identifications. *Law and Human Behavior*, 7(1):19.
- Buchanan, L., Bui, Q., and Patel, J. (2020). Black lives matter may be the largest movement in U.S. history.
- Clancy, D. and Bull, R. (2015). The effect on mock-juror decision-making of power-of-speech within eyewitness testimony and types of scientific evidence. *Psychiatry, Psychology and Law*, 22(3):425–435.
- Cole, S. A. and Dioso-Villa, R. (2006). CSI and its effects: Media, juries, and the burden of proof. *New England Law Review*, 41:435.
- Eatley, G., Hueston, H. H., and Price, K. (2016). A meta-analysis of the CSI effect: The impact of popular media on jurors' perception of forensic evidence. *Politics, Bureaucracy & Justice*, 5(2).
- Ferguson, P. A., Duthie, D. A., and Graf, R. G. (1987). Attribution of responsibility to rapist and victim: The influence of victim's attractiveness and rape-related information. *Journal of Interpersonal Violence*, 2(3):243–250.
- Findlay, M. and Grix, J. (2003). Challenging forensic evidence? observations on the use of DNA in certain criminal trials. *Current Issues in Criminal Justice*, 14(3):269–282.
- Ford, T. M., Liwag-McLamb, M. G., and Foley, L. A. (1998). Perceptions of rape based on sex and sexual orientation of victim. *Journal of Social Behavior and Personality*, 13(2):253.
- Freeman, N. and Punzo, D. (2001). Effects of dna and eyewitness evidence on juror decisions. *Psi Chi Journal of Undergraduate Research*, 6:109–117.
- Fucci, G. E. (2015). No law and no order: Local, state and federal government responses to the United States rape kit backlog crisis. *Cardozo Public Law, Policy, and Ethics Journal*, 14:193.
- Hans, V. P., Kaye, D. H., Dann, B. M., Farley, E. J., and Albertson, S. (2011). Science in the jury box: Jurors' comprehension of mitochondrial dna evidence. *Law and human behavior*, 35(1):60–71.

- Jones, C. and Aronson, E. (1973). Attribution of fault to a rape victim as a function of respectability of the victim. *Journal of personality and social psychology*, 26(3):415.
- Kaplan, J., Ling, S., and Cuellar, M. (2020). Public beliefs about the accuracy and importance of forensic evidence in the united states. *Science & Justice*.
- King, N. J. and Noble, R. L. (2005). Jury sentencing in noncapital cases: Comparing severity and variance with judicial sentences in two states. *Journal of Empirical Legal Studies*, 2(2):331–367.
- Krahé, B., Temkin, J., and Bieneck, S. (2007). Schema-driven information processing in judgements about rape. *Applied Cognitive Psychology: The Official Journal of the Society for Applied Research in Memory and Cognition*, 21(5):601–619.
- Lieberman, J. D., Carrell, C. A., Miethe, T. D., and Krauss, D. A. (2008). Gold versus platinum: Do jurors recognize the superiority and limitations of DNA evidence compared to other types of forensic evidence? *Psychology, Public Policy, and Law*, 14(1):27.
- Lindsay, R., Wells, G. L., and Rumpel, C. M. (1981). Can people detect eyewitness-identification accuracy within and across situations? *Journal of Applied Psychology*, 66(1):79.
- Loftus, E. F. and Schneider, N. G. (1987). Behold with strange surprise: Judicial reactions to expert testimony concerning eyewitness reliability. *UMKC Law Review*, 56:1.
- Maeder, E. M., Ewanation, L. A., and Monnink, J. (2017). Jurors’ perceptions of evidence: The relative influence of DNA and eyewitness testimony when presented by opposing parties. *Journal of Police and Criminal Psychology*, 32(1):33–42.
- McEwen, T. (2011). The role and impact of forensic evidence in the criminal justice system, final report.
- Murphy, H. (2019). Coming soon to a police station near you: The DNA ‘magic box’.
- O’Neill Shermer, L., Rose, K. C., and Hoffman, A. (2011). Perceptions and credibility: Understanding the nuances of eyewitness testimony. *Journal of Contemporary Criminal Justice*, 27(2):183–203.
- Pearson, J. M., Law, J. R., Skene, J. A., Beskind, D. H., Vidmar, N., Ball, D. A., Malekpour, A., Carter, R. M., and Skene, J. P. (2018). Modelling the effects of crime type and evidence on judgments about guilt. *Nature human behaviour*, 2(11):856–866.
- Podlas, K. (2006). The CSI effect and other forensic fictions. *Loyola of Los Angeles Entertainment Law Review*, 27:87.
- Porter, S., ten Brinke, L., and Gustaw, C. (2010). Dangerous decisions: The impact of first impressions of trustworthiness on the evaluation of legal evidence and defendant culpability. *Psychology, Crime & Law*, 16(6):477–491.
- Pozzulo, J. D. and Dempsey, J. L. (2009). Witness factors and their influence on jurors’ perceptions and verdicts. *Criminal Justice and Behavior*, 36(9):923–934.

- Project, I. (2019). Overturning wrongful convictions involving misapplied forensics. <https://www.innocenceproject.org/overturning-wrongful-convictions-involving-flawed-forensics/>, Last accessed July 24, 2019.
- Reaves, B. A. (2013). Felony defendants in large urban counties, 2009-statistical tables. *Washington, DC: US Department of Justice*.
- Reyes, I. B. (2001). The epidemic of injustice in rape law: Mandatory sentencing as a partial remedy. *UCLA Women's Law Journal*, 12:355.
- Ribeiro, G., Tangen, J. M., and McKimmie, B. M. (2019). Beliefs about error rates and human judgment in forensic science. *Forensic Science International*, 297:138–147.
- Roman, J. K., Reid, S. E., Chalfin, A. J., and Knight, C. R. (2009). The DNA field experiment: A randomized trial of the cost-effectiveness of using DNA to solve property crimes. *Journal of Experimental Criminology*, 5(4):345.
- Schweitzer, K. and Nuñez, N. (2018). What evidence matters to jurors? the prevalence and importance of different homicide trial evidence to mock jurors. *Psychiatry, Psychology and Law*, 25(3):437–451.
- Sheahan, C. L., Pozzulo, J. D., Reed, J. E., and Pica, E. (2018). The role of familiarity with the defendant, type of descriptor discrepancy, and eyewitness age on mock jurors' perceptions of eyewitness testimony. *Journal of Police and Criminal Psychology*, 33(1):35–44.
- Skolnick, P. and Shaw, J. I. (2001). A comparison of eyewitness and physical evidence on mock-juror decision making. *Criminal Justice and Behavior*, 28(5):614–630.
- Smith, L. L. and Bull, R. (2012). Identifying and measuring juror pre-trial bias for forensic evidence: development and validation of the forensic evidence evaluation bias scale. *Psychology, Crime & Law*, 18(9):797–815.
- The President's Council of Advisors on Science and Technology (2016). *Report to the President, Forensic Science in Criminal Courts: Ensuring Scientific Validity of Feature-comparison Methods*. Executive Office of the President of the United States, President's Council
- Thompson, W. C. and Newman, E. J. (2015). Lay understanding of forensic statistics: Evaluation of random match probabilities, likelihood ratios, and verbal equivalents. *Law and human behavior*, 39(4):332.
- Tierney, K. (2018). The leniency epidemic: A study of leniency granted to convicted rapists in America and Australia. *Penn State Journal of Law and International Affairs*, 6:342.
- Wells, G. L. and Olson, E. A. (2003). Eyewitness testimony. *Annual Review of Psychology*, 54(1):277–295.
- Wells, G. L., Small, M., Penrod, S., Malpass, R. S., Fulero, S. M., and Brimacombe, C. E. (1998). Eyewitness identification procedures: Recommendations for lineups and photospreads. *Law and Human behavior*, 22(6):603.

- Wise, R. A., Sartori, G., Magnussen, S., and Safer, M. A. (2014). An examination of the causes and solutions to eyewitness error. *Frontiers in psychiatry*, 5:102.
- Yamawaki, N., Darby, R., and Queiroz, A. (2007). The moderating role of ambivalent sexism: The influence of power status on perception of rape victim and rapist. *The Journal of Social Psychology*, 147(1):41–56.

Table 1: Logistic regression results for whether they would vote to find the defendant guilty based on evidence type, with bystander eyewitness testimony evidence as reference group

Evidence Type	Murder		Rape	
	Exp($\hat{\beta}$)	95% CI	Exp($\hat{\beta}$)	95% CI
DNA	3.20	[1.063, 9.632]	19.92	[4.416, 89.872]
Fingerprint	2.14	[0.788, 5.825]	1.52	[0.719, 3.229]
Victim Eyewitness	—	—	2.98	[1.281, 6.946]

Note: Statistically significant results are bolded.

Table 2: OLS Regression results for how certain they are that the defendant is guilty based on evidence type, with bystander eyewitness testimony evidence as reference group

Evidence Type	Murder		Rape	
	$\hat{\beta}$ (Se($\hat{\beta}$))	95% CI	$\hat{\beta}$ (Se($\hat{\beta}$))	95% CI
DNA	12.99 (4.55)	[4.009, 21.978]	35.08 (5.07)	[25.090, 45.061]
Fingerprint	13.51 (4.57)	[4.482, 22.540]	5.39 (4.93)	[-4.329, 15.109]
Victim Eyewitness	—	—	13.96 (5.07)	[3.977, 23.948]

Note: Statistically significant results are bolded.

Table 3: OLS regression results for the likely sentence that the defendant would receive based on evidence type, with bystander eyewitness testimony evidence as reference group

Evidence Type	Murder		Rape	
	$\hat{\beta}$ (Se($\hat{\beta}$))	95% CI	$\hat{\beta}$ (Se($\hat{\beta}$))	95% CI
DNA	-3.83 (4.47)	[-12.658, 5.007]	2.60 (2.09)	[-1.524, 6.716]
Fingerprint	3.33 (4.49)	[-5.542, 12.210]	-0.05 (2.04)	[-4.057, 3.963]
Victim Eyewitness	—	—	-1.46 (2.09)	[-5.581, 2.659]

Note: Statistically significant results are bolded.

Table 4: OLS regression results for ideal sentence that the defendant would receive based on evidence type, with bystander eyewitness testimony evidence as reference group

Evidence Type	Murder		Rape	
	$\hat{\beta}$ (Se($\hat{\beta}$))	95% CI	$\hat{\beta}$ (Se($\hat{\beta}$))	95% CI
DNA	-5.90 (5.80)	[-17.358, 5.549]	12.76 (3.60)	[5.668, 19.844]
Fingerprint	4.16 (5.83)	[-7.348, 15.672]	6.44 (3.50)	[-0.458, 13.339]
Victim Eyewitness	—	—	-1.00 (3.60)	[-8.086, 6.089]

Note: Statistically significant results are bolded.

Appendix A - Murder Vignette

In August 2018, a convenience store was robbed in a Philadelphia suburb. At the time, the only people in the store were the clerk behind the counter, and one customer who was shopping in the back of the store, who hid when the suspect entered the store. The store had video surveillance, but the footage was extremely grainy, and it was unable to provide investigators with any identifying information. The suspect approached the store clerk and threatened him with what appeared to be a large kitchen knife. After the store clerk handed over \$140 from the cash register along with several cartons of cigarettes, the suspect demanded more money. When the clerk failed to provide the additional money, the suspect stabbed the clerk once in the chest, and then ran out of the store. Unfortunately, emergency medical teams were unable to save the store clerk. The police later recovered the murder weapon from a nearby dumpster. The accused was arrested that same night, and was charged with murder.

Appendix B - Rape Vignette

Alice was on her way home on a cold night in January. She had attended a meeting with colleagues and afterwards they had all gone out for a meal to a small Italian restaurant. Because she had to drive home, she didn't drink any alcohol. The road where she lives was closed because of road works, so she left her car in the parking lot around the corner. One of her colleagues offered to walk her back to her house but she told him this was not necessary. It was a frosty night, and she felt cold. As she started crossing the unlit parking lot to her house, she stopped to admire the beautiful night sky. Suddenly, a man stepped out from behind a parked car and blocked her way. At first, Alice thought the man was drunk and attempted to walk past him quickly. However, he grabbed her with a firm grip and pushed her against the car. When she tried to scream, he held his hand over her mouth. He told her to be quiet because otherwise he would have to harm her. She tried to escape from his grip, but he was stronger than her and hit her in the face. Suddenly, he pushed her to the ground, kneeled over her so that she could not resist, and had sexual intercourse with her. A man drove into the parking lot at this time with his headlights on, clearly illuminating Alice and her attacker. The attacker then fled the scene and Alice made an emergency call to the police. The police arrived within minutes and searched the area. Not far from the scene, they arrested a suspect, Rob, who had acted suspiciously by trying to dump his coat in a trash can. Rob was charged with the rape of Alice.