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Schweitzer, Kimberly, A., <u>Does DNA evidence trump all other evidence? An examination of the effects of common homicide trial evidence and mock jurors' verdicts</u>, Ph.D., Psychology, May, 2016.

Every day jurors are asked to listen to numerous pieces of evidence at trial and decide the fate of another person. How exactly jurors reach their decisions, however, is still unclear. The present research sought to examine this by exploring how jurors weigh a variety of pieces of evidence and how those weights interact to lead to verdict decisions. This was done using an inductive approach across three main studies. Study 1 asked mock jurors how important 41 pieces of evidence (derived from Schweitzer, Krewson, Harrell, & Nunez, 2014) were to them when deciding a verdict and found 10 pieces of evidence that mock jurors rated as most important: DNA, fingerprints, weapon, video records, crime scene photos, gunshot residue, other bodily secretions, video confession, forensic expert testimony, and eyewitness testimony. Study 2 expanded on Study 1 using a different methodology; mock jurors were given four pieces of evidence and asked to choose the order with which they would like to view the evidence, allowing for a different measure of importance. Results indicated that mock jurors sought out DNA evidence first, then video confession, eyewitness testimony, and fingerprint evidence. Study 3 utilized and furthered the findings of the previous studies and examined how the presence and absence of highly important evidence affected mock jurors' verdicts. Results indicated that video confession and fingerprint evidence were equally as important to mock jurors no matter if present or absent at trial. Findings regarding DNA and eyewitness evidence were less clear. Implications are discussed.

DOES DNA EVIDENCE TRUMP ALL OTHER EVIDENCE? AN EXAMINATION OF THE EFFECTS OF COMMON HOMICIDE TRIAL EVDIENCE ON MOCK JURORS' VERDICTS

By

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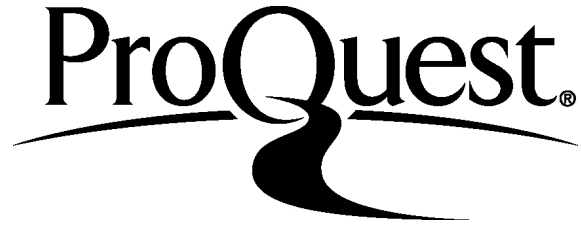
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Each year in the United States, approximately 1.5 million people sit as members of a

jury, charged with the task of determining whether or not a defendant is guilty (U.S.

Department of State, 2009). These jurors are presented with numerous pieces of evidence and

are instructed to arrive at a verdict. How jurors do this, though, remains up for debate. The

psycho-legal literature has taken, broadly, two approaches to answering this question: a

theoretically focused approach and an empirically focused approach, with most recent efforts

being empirically-focused. The empirically focused approaches to understanding juror

decision making have given mock jurors a trial scenario and varied the evidence presented,

the strength of evidence, the presentation style, etc., and shown how those variations in

specific pieces of evidence affect mock jurors' decisions. The theoretically driven approaches

postulate the different ways in which jurors decide their verdicts but do not examine the

effects of specific types of evidence. The goal of this program of research is to merge the

present theoretical and empirical literature and to determine which theory or model of juror

decision making is more appropriate. To do this, a series of studies in which the present

models and theories can be pitted against each other is needed. Before that can be done

though, how important jurors view various pieces of evidence to be in deciding their verdicts

must be determined; this was the focus of the present research.

A subset of the empirical literature in psychology and law has attempted to determine

the importance of different pieces of evidence on mock jurors' verdicts, but this research has

typically been done using a deductive approach; one that is informed by theory. The present

research sought to determine the importance of different types of evidence using an inductive

approach; one that is free from theory and a priori hypotheses. This was done largely because the goal of the next step of this program of research is to pit the existing theories against each other using the information derived from the present research. As such, using existing theories, or empirical research based off of existing theories, to inform the present work was illogical.

An inductive approach to research begins simply by observing patterns, which then lead to hypotheses and eventually theory. One approach to inductive research is Grounded Theory (Glaser & Strauss, 1967), whose proponents argue that researchers must generate theories derived strictly from the data, absent of any preconceived ideas researchers may hold. This is done by simply observing the phenomenon of interest and noticing patterns. The present research sought to utilize these tenants and conduct a series of exploratory studies to determine how mock jurors make their verdict decisions and what pieces of evidence are most influential in their decisions. Once this is done, the theories and models of juror decision making can be tested and edited to create one up-to-date model based off of empirical data derived from observations. In sum, the purpose of the present research was to lay the groundwork for testing the theories/models of juror decision making by addressing the initial question of how jurors weigh different pieces of evidence.

Jurors' Weights of Evidence

The existing theories and models of juror decision making offer insight into how jurors may integrate evidence presented during trial and reach their verdict decisions, but, by nature, they are general and do not address how specific pieces of evidence affect jurors' decisions (e.g., Story Model, Pennington & Hastie, 1992). That being said, many of the present theories of juror decision making do not assume that all evidence is equal (e.g.,

Information Integration Theory; Anderson, 1971). However, those that do attempt to account for different weighting of evidence have yet to explain the specific weighting of different specific pieces of evidence (e.g., Belief Adjustment Model; Hogarth & Einhorn, 1992). This may be in part due to the fact that whether some types of evidence are presented during a trial is case specific. For example, a murder trial would be more likely to have Deoxyribonucleic acid (DNA) evidence than a tax evasion trial. Given the vast array of evidence presented in different types of cases, the present series of studies focuses on criminal homicide trials. To explore how jurors may weigh specific pieces of evidence that may be present at criminal trials to reach their verdict decisions, the current literature on a sample of evidence that attorneys said to be most common at homicide trials (Schweitzer et al., 2014) is reviewed (i.e., eyewitness testimony, expert testimony, and visual evidence).

Eyewitness Testimony. Eyewitness testimony is arguably the most heavily weighed evidence presented at criminal trials with 75% of known wrongful convictions being, in part, due to mistaken eyewitness identification (Scheck, Neufeld, & Dwyer, 2000). Further, attorneys have indicated eyewitness identification as one of the most common types of evidence presented at homicide trials (Schweitzer et al., 2014). Research on eyewitness testimony is abundant and has been ongoing for more than 30 years. Though eyewitness testimony is arguably the most convincing evidence presented at trial, it is also one of the most unreliable pieces of evidence (e.g. Loftus & Schneider, 1987; Wells & Olson, 2003). This is a dangerous combination illustrated by the fact that jurors believe eyewitness identifications are more reliable than they actually are (Brigham & Bothwell, 1983). The most influential part of eyewitness testimony to jurors is the confidence of the witness (Cutler, Penrod, & Dexter, 1990), with increased witness confidence leading to increased perceived

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credibility of the witness (e.g. Wells & Lindsay, 1983; Whitley & Greenberg, 1986) and increased likelihood to convict (e.g. Cutler et al., 1990; Fox & Walters, 1986; Levett, Danielsen, Kovera, & Cutler, 2005; Wells, Lindsay, & Ferguson, 1979). As research has shown, there are numerous factors that can affect the reliability of eyewitness testimony (e.g. Loftus, 1979; Wells & Bradfield, 1998; Wells & Olson, 2003), such as post-identification feedback (Hasel & Kassin, 2009). Unfortunately, as Penrod and Cutler (1995) found, instructing jurors to be critical of eyewitness testimony and explaining the flaws often does nothing to decrease the weight jurors place on it and sometimes can even backfire, leading jurors to be more likely to convict.

Loftus (1974) was one of the first to examine if adding eyewitness testimony with varying degrees of reliability would do anything beyond the effects of other evidence. Undergraduates were given a vignette describing a grocery store robbery where two people were killed and a summary of the evidence presented at the trial. They were asked to determine their verdict in the case. One-third of participants were told there was no eyewitness, and one third were told the store clerk witnessed the shooting; the final third were told the store clerk witnessed the shooting but that he was discredited as an eyewitness because he was not wearing his glasses, giving him vision poorer than 20/400 and making him unable to see the robber. Only 18% of participants in the no eyewitness condition found the defendant guilty, whereas 72% of participants in the credible eyewitness condition found the defendant guilty. More interestingly, 68% of participants who were told the eyewitness could not have seen the robber's face still found the defendant guilty of murder (Loftus, 1974), indicating the addition of eyewitness testimony, no matter the reliability, has a greater impact on jurors' verdicts than other evidence presented.

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Since the Loftus (1974) study was published, other researchers have attempted to replicate her findings and the results are mixed. Cavoukian (1980) and Weinberg and Baron (1982) found a similar, but weaker effect. Hatvany and Strack (1980) used a different discrediting manipulation (the eyewitness on cross-examination said that her testimony should be disregarded) and, contrary to Loftus' results, found mock jurors rejected the discredited eyewitness testimony, supporting findings that jurors find the credibility of the eyewitness important. Saunders, Vidmar, and Hewitt (1983) added instructions to mock jurors detailing the unreliability of eyewitness testimony, and this led mock jurors to find the defendant guilty when the eyewitness had been discredited only 24% of the time. These results provide some support for Loftus' (1974) results, but illustrate when more extensive measures are used (i.e. stronger discrediting of the eyewitness and instructions regarding eyewitness unreliability), the effect of discredited eyewitness testimony is much weaker than Loftus (1974) originally found.

Finding further support for the strong effect of eyewitness testimony, Kennedy and Haygood (1992) examined mock jurors' verbal reports of what piece of evidence they weighed heaviest in determining their verdict. Using Loftus' method, they found 81% of mock jurors in the credible eyewitness condition who voted guilty said the eyewitness testimony weighed heaviest in their decisions, whereas only 50% of jurors in the discredited eyewitness condition who voted guilty said the eyewitness testimony weighed heaviest. Even though Kennedy and Haygood (1992) found mock jurors were less likely than those in the Loftus (1974) study to find the defendant guilty when the eyewitness was not credible, 50% of mock jurors who heard a discredited eyewitness testimony still gave that testimony the

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most weight in their final decisions. These studies indicate the powerful effect eyewitness testimony has on jurors' verdict decisions.

Expert Testimony. Like eyewitness testimony, expert testimony was another piece of evidence attorneys reported as commonly presented at homicide trials (Schweitzer et al., 2014). One of the first studies to examine how expert testimony affects jurors' decisions examined the impact two types of expert testimony (i.e. police and psychiatrist testimony) had on jurors. Bridgeman and Marlowe (1979) surveyed jurors who had served on one of ten felony trials that occurred in Santa Cruz County, California between 1974 and 1975. Jurors were asked to rank the order of importance that nine factors (defendant's appearance; defendant's testimony; defense lawyer; psychiatrist expert testimony; judge; jury discussion; other witnesses such as friends, parents, co-defendants; police expert testimony; and prosecutor) had in making their final decisions. Police expert testimony was ranked number one, whereas expert testimony from psychiatrists was ranked number seven of nine (Bridgeman & Marlowe, 1979). A recent meta-analysis also found support for type of experts influencing jurors' decisions. Kwartner (2007) found a psychiatrist had the largest positive effect on jurors' verdicts compared to a psychologist and other experts. The same pattern did not hold true for degree of guilt ratings, however. In general, results indicated that jurors valued different types of experts differently, but more research is necessary to determine which experts are valued most.

The various types of experts may help explain why findings on how much weight jurors give expert testimony are mixed. Some researchers have found that jurors under-weigh expert scientific testimony (Faigman & Baglioni, 1988; Kaye & Koehler, 1991; Thompson & Schumann, 1987), others have found that jurors weigh expert testimony appropriately

(Brekke, Enko, Clavet, & Seelau, 1991; Saks & Wissler, 1984), and yet other researchers have found in the same study that some jurors under-weigh expert testimony and others give expert testimony too much weight (Smith, Penrod, Otto, & Park, 1996)[1]. The broad range of the type of expert makes it difficult to draw conclusions on how much jurors weigh expert testimony in their final decisions. As Gross (1991) points out, and as the previous section alluded to, there are other pieces of evidence that may play a larger role in jurors' final decisions, for example, eyewitness testimony. More research exploring the weight jurors give expert testimony is necessary, as today there are a wide variety of experts that are allowed to testify at trial. Presently, the majority of the research regarding the weight jurors place on expert testimony deals specifically with psychological experts (e.g., Cutler & Kovera, 2011); however, some research has indicated that psychological experts are uncommon in criminal and civil trials (Bridgeman & Marlowe, 1979; Gross, 1991; Schweitzer et al., 2014).

Visual Evidence. Visual evidence has long been used to supplement the testimony of experts and eyewitnesses (Mnookin, 1998) and has become increasingly common as technology advances (Feigenson & Spiesel, 2009). As the prevalence of photographs, videos, and maps has increased, so too has the concern regarding their influence on jurors (Bornstein, Miller, Nemeth, Page, & Musil, 2005). Kassin and Garfield (1991) were among the first researchers to examine how crime scene images affect verdicts. In their study, mock jurors read one of three trial transcripts and either viewed a video of the crime scene or did not. The one-minute video showed a close-up shot of the bloody body of the victim who was lying in the street with stab wounds. Viewing a video of the crime scene had no significant effect on mock jurors' verdicts. However, results indicated that mock jurors who viewed the video of

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[1] Appropriate weighting was determined by the weight predicted by Bayes theory.

the crime scene had a lower conviction threshold, suggesting the video did have an effect on mock jurors' perceptions, however, not enough to alter their verdicts (Kassin & Garfield, 1991).

More recently, Finkelstein and Bastounis (2010) examined the effects of a crime scene photograph on mock jurors' sentencing recommendations. French undergraduates first read a trial transcript depicting an involuntary homicide and then half were shown a photograph of the bloody victim at the crime scene. Participants were then asked to sentence the defendant (who was already found guilty) to up to 15 years in prison. Participants who were shown a photograph of the crime scene gave a significantly longer sentence than those who did not see a photograph. Although these findings differ somewhat from Kassin and Garfield's (1991) findings, it is important to note that Kassin and Garfield (1991) found visual evidence lowered mock jurors' conviction thresholds, although it did not alter their verdicts, thus suggesting that visual evidence of the crime scene impacts jurors' perceptions.

In general, it is assumed that visual evidence would improve jurors' judgments because visuals have been shown to enhance jurors' attention and recall (Bell & Loftus, 1985). However, due to the small number of studies conducted on the topic of visual evidence and its effects on jurors, it is difficult to determine whether jurors actually weigh this type of evidence more heavily than others.

The Present Research

The purpose of the present research was broadly to gain insight into how jurors weigh a variety of pieces of evidence and how those weights interact to lead to a verdict. To accomplish this, three main studies were conducted using an inductive approach. Study 1 sought to determine how important mock jurors felt about different pieces of evidence when

deciding a verdict. Study 2 aimed to replicate and expand upon Study 1 using a different methodology. Broadly, Study 2 sought to determine what evidence mock jurors seek out when making their verdict decisions. More specifically, Study 2 examined what evidence mock jurors wanted to learn more about first and what order of evidence was most commonly chosen. Study 3 also sought to utilize and expand upon the findings of the previous studies and examined how the presence and absence of highly important evidence affects jurors' verdicts. Recall that the goal of this series of studies was to begin to understand what evidence is most important to jurors using an inductive approach.

<center>**Study 1**</center>

The purpose of Study 1 was to determine how important mock jurors view a variety of different pieces of evidence to be in determining their verdicts. In the present study, participants were simply asked to imagine they were a juror on a homicide trial and to rate how important each piece of evidence would be to them. Additionally, participants were asked to consider each piece of evidence independently and to imagine that the piece of evidence they were rating was the only piece of evidence present at a trial. This was done to attempt to gain ratings of each piece of evidence independent of the other pieces. A second goal of Study 1 was to narrow down the list of pieces of evidence commonly presented at homicide trials (41 pieces; Schweitzer et al., 2014) to 10 pieces of evidence mock jurors reported as being most important in making verdict decisions.

Method

Participants. Participants ($N = 317$) were recruited through Amazon's Mechanical Turk and compensated for their time. Participants who were not U.S. citizens ($n = 8$), who did not identify as living in the U.S. ($n = 5$), and who failed an attention check question (i.e.,

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"Please select four for this question."; *n* = 8) were excluded from analyses, leaving data from 296 participants. Of these participants, 175 (59.1%) were male, 234 (79.1%) were Caucasian, and they ranged in age from 18 to 67 (*M* = 34.78).

Materials and Procedure. After consenting to participate, participants were told to imagine they were serving on a jury whose duty it was to decide whether or not the defendant was guilty. Participants were then presented with 41 pieces of evidence (derived from Schweitzer et al., 2014; see Appendix A) and asked to rate how important each piece would be in reaching a verdict on a 10-point Likert scale (1 = *Not at all Important* to 10 = *Very Important*). Specifically, participants were told the following:

> There are several pieces of evidence that may be presented in a criminal trial. We are interested in how important people view different pieces of evidence to be when making a verdict decision. You will be asked to rate the level of importance of various pieces of evidence. We understand that it may be difficult to determine level of importance without any case details, but please simply judge whether each piece is important or not in making a judgment about a case. Please think of each piece of evidence INDEPENDENTLY as if it was the ONLY evidence presented at a trial. How important would that evidence be to you in determining guilt?

The 41 pieces of evidence were presented to participants in a random order. When participants finished rating the evidence, they completed a basic demographic questionnaire and received a code to obtain compensation.

Results

All 41 pieces of evidence had mean scores at or above the midpoint of the scale (i.e., 5.5) indicating each piece of evidence was on average perceived as somewhat important by mock jurors in making their decisions. Though the mean rating of importance for each piece of evidence was high, there was no indication of ceiling effects; the entire range of the scale was used for all but eight items. Results indicated that the 10 pieces of evidence mock jurors

reported would be most important when deciding a verdict were: (1) DNA, (2) fingerprints, (3) weapon, (4) video records, (5) crime scene photos, (6) gunshot residue, (7) other bodily secretions, (8) video confession, (9) forensic expert testimony, and (10) eyewitness testimony (see Table 1).

Discussion

The purpose of Study 1 was to obtain ratings of importance of a list of evidence that legal professionals said were commonly presented at homicide trials. Results indicated that, on average, mock jurors viewed all of the pieces of evidence to be at least somewhat important in order to reach a verdict. However, there were at least 10 pieces of evidence that mock jurors rated as highly important. Included in these 10 pieces of evidence are some of the types of evidence that psycho-legal researchers have been researching (e.g., expert testimony, eyewitness testimony, and photographic evidence) and others that have received less attention (e.g., video records).

DNA evidence, the piece of evidence that mock jurors in this study rated on average as most important when deciding a verdict, is one piece of evidence that has more recently received attention by researchers (e.g., Walsh, Ribaux, Buckleton, Ross, & Roux, 2004). Unfortunately, like eyewitness testimony, research has found that jurors have trouble understanding the fallibility of DNA evidence, especially when conveyed in statistical terms (Findlay & Grix, 2003; Lieberman, Carrell, Miethe, & Krauss, 2008; Villejoubert & Mandel, 2002). In fact, Koehler (1996) found that even when mock jurors were presented with the exact same DNA evidence expressed in different notations (frequency, likelihood ratio, or posterior odds ratio), they weighed the testimony differently in their verdict decisions. Other empirical research has found that compared to Bayesian statistics, jurors over- (Koehler, Chia,

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& Lindsey, 1995) and under-weigh DNA evidence (Nance & Morris, 2005; Schklar & Diamond, 1999). Recently, Lieberman and colleagues (2008) examined the persuasiveness of DNA evidence and found that DNA evidence was said to be most persuasive of the suspect's guilt, even more persuasive than eyewitness testimony. This subset of the research concerning DNA evidence illustrates the lack of agreement regarding the role DNA plays in jurors' verdict decisions and further illustrates the need for more research the topic.

There were also certain types of evidence that psycho-legal researchers have explored that were not present in the 10 pieces of evidence mock jurors reported as most important (e.g., neuroimages, psychological expert testimony). For example, a number of psycho-legal researchers have explored the effects of neuroimages on mock jurors' decisions, and like DNA evidence, the effect of neuroimages on mock jurors' decisions is contested. Some researchers have found that neuroimages bias jurors (e.g., Gurley & Marcus, 2008; McCabe, Castel, & Rhodes, 2011) and other researchers found they do not (e.g., Farah & Hook, 2013; Michael, Newman, Vuorre, Cumming, & Garry, 2013). Schweitzer and Saks (2011) offer an explanation for the discrepancy in findings by comparing verbal neuroimaging testimony to neuroimages themselves. They found neuroimages had no impact on mock jurors above and beyond the impact of verbal neuroimaging testimony itself, implying that simply adding a brain scan does not alter jurors' decisions (Schweitzer & Saks, 2011). Although these findings regarding neuroimages are interesting, according the findings from Study 1, mock jurors do not find neuroimages to be very important to reach a verdict; neuroimages were ranked 37 out of 41 pieces of evidence. That being said, in general it may be argued that psycho-legal researchers have been focusing on evidence that mock jurors find important (e.g., DNA, eyewitness testimony).

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Study 2

The list of the 10 most important pieces of evidence to mock jurors obtained from Study 1 was utilized for the second study. Study 1 sought to narrow down the list of 41 pieces of common homicide trial evidence to allow for Study 2 to further explore and tease apart the importance of the 10 pieces of evidence using a different, more behavioral, measure of importance. Study 2 sought to replicate and advance the findings from Study 1 to determine if DNA evidence and the other pieces of evidence rated as important would remain the most important evidence to mock jurors when using a different methodology. Specifically, in Study 2, mock jurors were presented with the most important pieces of evidence as indicated by Study 1 and were asked to choose the order that they would like to see the evidence. The goal of Study 2 was to determine if having only the most important pieces of evidence from Study 1 to choose from would alter mock jurors' perceptions of importance, or if results would remain the same as Study 1. Recall that the goal of this series of studies was to use an inductive approach to determine what evidence weighs heaviest in mock jurors' decisions. The methodology utilized in Study 2 allowed mock jurors to choose how they wanted to progress through the evidence at trial, and thus again allowed for the data to provide the direction for the next study.

Because the findings in Study 1 indicated that participants' ratings of importance for the ten pieces of evidence rated as most important were not reliably different from each other, it was imperative to attempt to replicate the findings in Study 1 first to determine if the order of the 10 pieces of evidence would remain the same before moving on to Study 2. To explore this, a different methodology was utilized, one which put the pieces of evidence in a trial context. In Study 2, mock jurors were allowed to choose the order that they would like to see

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the evidence. This allowed for a different measure of importance, as well as a test of the reliability of the findings in Study 1 while still using an inductive approach. However, because mock jurors were allowed to choose the order they saw the evidence and there were 10 pieces of evidence present, there were over 3 million possible different orders. To minimize the number of different orders while still trying to maintain a sense of ecological validity, a pilot test was completed first with the 10 pieces to see if a consistent order emerged, with the goal of narrowing the number of items down to four or five for Study 2.

Study 2 Pilot

 Method.

 Participants. Participants ($N = 105$) were recruited through Amazon's Mechanical Turk and compensated for their time. Participants who were not U.S. citizens ($n = 2$), who did not identify as living in the U.S. ($n = 6$), and who failed an attention check question ($n = 3$) were excluded from analyses, leaving data from 96 participants (two people who were not U.S. citizens also did not identify as living in the U.S.). Of these participants, 50 (52.1%) were male, 78 (81.3%) were Caucasian, and they ranged in age from 19 to 82 ($M = 39.98$).

 Materials and Procedure. After consenting to participate, participants were asked to assume the role of a mock juror in a homicide trial, in which they must either find the defendant guilty or not guilty of murder. Participants were first presented with brief juror instructions (see Appendix B). After reading the juror instructions, participants were directed to another page in which the following instructions appeared:

> The defendant in this case is on trial for homicide. The folders below contain information (if available) about the specific piece of evidence typed on each folder. Please select from the folders below which piece of evidence you would like to learn more about. You may only choose one folder at a time, but you are able to open as many or as few folders as you would like, and you can open the same folder more than

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once. After you are presented with the information in the folder, you will be asked if you would like to make your verdict decision or if you would like to come back to view the contents of other folders. If you choose to view other folders, you will be brought back to this page where you can select another folder. Your goal is to determine whether or not the defendant is guilty of homicide.

Below these instructions were 10 folders, and the location/order of each folder on the screen was randomized. Each folder was labeled with one of the following types of evidence: DNA, Fingerprints, Weapon Involved in the Crime, Video Records, Photographs of the Crime Scene, Gunshot Residue, Other Bodily Secretions, Video Confessions, Forensic Expert Testimony, and Witness to the Crime. After participants chose which piece of evidence they wanted to learn more about first, they were directed to another page in which they were given a brief description of the evidence (see Appendix C). For example, if participants selected to learn more about fingerprint evidence first, they were directed to a page where they were told, "The defendant's fingerprints were a match to the fingerprints found on the gun used to kill the victim." Each description of the evidence implied guilt. At the bottom of the page, participants were asked if they would like to make their verdict decisions or continue to gather more information. If participants chose to gather more information, they were redirected back to the page with the evidence folders. If participants chose to make their decisions, they were directed to a page where they were asked to decide whether or not the defendant was guilty of homicide. Participants then responded to several demographic questions and were compensated for their participation.

Results. Exactly 50% of our sample chose to view five or more pieces of evidence (of the ten available), with 14.6% viewing all 10 pieces and 15.6% viewing nine pieces. To test the order that participants chose to progress through the evidence, the data were first coded to indicate the order they chose following Peters (2013). The piece of evidence that mock jurors

chose to view first was coded as 10, the second piece was coded as 9, and so on with the last piece chosen coded as 1. Items that were not chosen to be viewed were coded as zero. An examination of the mean ranking of each piece of evidence yielded five pieces that were on average viewed within the first seven pieces of evidence chosen. Keep in mind that because 50% of the sample viewed less than five pieces of evidence, zeroes were entered for the other pieces they did not view. The five pieces of evidence that were ranked highest, and therefore chosen on average first, were DNA (M = 6.08, SE = .41), eyewitness testimony (M = 5.09, SE = .41), fingerprints (M = 4.79, SE = .41), video confession (M = 4.44, SE = .40), and forensic expert testimony (M = 4.12, SE = .38; see Table 2 for all evidence).

Discussion. The goal of the pilot study was to determine if the results from Study 1 indicating what evidence mock jurors viewed to be most important when making a verdict decision would hold using a different methodology. When mock jurors were allowed to choose the order that they progressed through the evidence, results were partially consistent with the findings in Study 1. As in Study 1, DNA was the most important piece of evidence; on average, mock jurors chose to view DNA evidence first. Also similar to Study 1, mock jurors thought fingerprint evidence was important; in Study 1, it was ranked on average second in importance and in the present study, it was on average chosen third. The other three pieces found to be highly important in the present study (as indicated by when participants chose to view them) were eyewitness testimony (ranked 2nd), video confession (ranked 4th), and forensic expert testimony (ranked 5th). In Study 1, these pieces of evidence were ranked 10th, 8th, and 9th, respectively. However, it is important to point out that the levels of importance of these three pieces of evidence in Study 1 were not reliably different from each other, thus their change in order is not entirely surprising. Additionally, the methodological

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difference from Study 1 to the current study may have also led to the different order of importance, as research has shown that people often fail to predict what leads to optimal decisions (e.g., see Hsee & Hastie, 2006). The current study attempted to correct for this possibility by using a different measure to obtain importance ratings.

A second goal of the present study was to determine the number of pieces of evidence that should be used for Study 2. The goal of Study 2 was to determine what order jurors preferred to progress through the evidence. This order would then be used for Study 3. It was important to first reduce the number of pieces of evidence to minimize the size of the design. Recall that with 10 pieces of evidence, there were over 3 million possible different order combinations. Thus, for Study 2 it was necessary to determine whether there were reliable differences amongst the top four or five pieces of evidence; four pieces allowed for 24 possible orders, whereas five pieces allowed for 120 possible orders. Similar to Study 1, the average ranking of each piece of evidence was not always reliably different from each other. However, the most important piece of evidence across both Study 1 and 2 (DNA) was significantly different than the fifth ranked piece of evidence (forensic expert testimony), $t(95) = 4.31$, $p < .001$. For this reason, and the large difference in the number of possible order combinations between using four and five pieces of evidence, Study 2 was conducted using the top four pieces of evidence from the present study.

Study 2

Method.

Participants. Participants ($N = 123$) were recruited through Amazon's Mechanical Turk and compensated for their time. Participants who were not U.S. citizens ($n = 2$), who did not identify as living in the U.S. ($n = 4$), and who failed an attention check question ($n =$

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3) were excluded from analyses, leaving data from 114 participants. Of these participants, 54 (47.4%) were male, 89 (78.1%) were Caucasian, and they ranged in age from 20 to 77 ($M =$ 35.37).

Materials and Procedure. After consenting to participate, participants were asked to assume the role of a mock juror in a homicide trial, in which they must either find the defendant guilty or not guilty of murder. Participants were first presented with brief juror instructions (see Appendix B). After reading the juror instructions, participants were directed to another page in which the following instructions appeared:

> The defendant in this case is on trial for homicide. The folders below contain information (if available) about the specific piece of evidence typed on each folder. Please select from the folders below which piece of evidence you would like to learn more about in the order of importance. For example, if you think Evidence "X" is most important to making your decision, please select that folder first, and so on, until you have viewed all of the evidence. You may only choose one folder at a time, and you can open the same folder more than once, but you are asked to look at every folder. Your goal is to determine whether or not the defendant is guilty of homicide.

Below these instructions were four folders, and the location/order of each folder on the screen was randomized. Each folder was labeled with a different type of evidence (i.e., DNA, Fingerprints, Video Confessions, and Witness to the Crime). After participants chose which piece they wanted to learn more about first, there were directed to another page in which they were given a brief description of the evidence (see Appendix C). For example, if participants selected to learn more about DNA evidence first, they were directed to a page where they were told, "The defendant's DNA was a match to the DNA found at the scene of the crime." Each description of the evidence implied guilt. If participants had not viewed all four pieces of evidence, they were redirected back to the page in which the evidence folders were. However, participants were not required to view each piece of evidence; they were asked to,

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but it was not required. When all four pieces of evidence had been viewed (or participants opted to give their verdicts), participants were asked to decide whether or not the defendant was guilty of homicide. Because the evidence was all indicative of guilt, it was expected that the majority of participants would find the defendant guilty. Participants then responded to several demographic questions and were compensated for their participation.

Results. To test the order that participants chose to progress through the evidence, the data were coded to indicate order of progression. The piece of evidence that mock jurors chose to view first was coded as four, the second piece was coded as three, the third piece as two, and the fourth piece as one. Items that were not chosen to be viewed were coded as zero. An examination of the mean ranking for each piece of evidence indicated that yet again, DNA evidence was most likely to be viewed first, then video confession evidence, eyewitness evidence, and fingerprint evidence (see Table 3 for descriptive statistics). DNA evidence was on average more likely to be chosen first compared video confession, eyewitness, and fingerprint evidence, with 46.49% of mock jurors viewing DNA evidence first. However, video confession, eyewitness, and fingerprint evidence were not reliably different from each other in terms of rank/order. Because of this, a different form of analysis was used to further explore the order that mock jurors progressed through the evidence.

Using the statistical program R, several decision trees were created to examine the relationship between the different types of evidence. Decision trees iteratively split the variables of interest into different groups until a homogenous group is found. The base of the decision tree is referred to as the root and is the variable that best separates the data based on the dependent variable (DV). If the split at the root does not lead to two homogeneous groups, that node will then be split again, with each group generated from the split referred to

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as leaves. Splitting continues until the leaves furthest from the root are homogenous or the groups are too small. Decision trees allow for paths to be generated to show what happens when variables are split certain ways. Because the goal of a decision tree is to show the path to different categories, it was necessary to define the DV. Although mock jurors were asked to give a verdict, there was little variability in responses as all of the evidence was indicative of guilt; 88.6% of participants said the defendant was guilty. Therefore, instead of using verdict as the DV, four different decision trees were created with each piece of evidence serving as the DV (see Figures 1 – 4).

Because mock jurors in this study were significantly more likely to choose DNA evidence first, the decision tree in which DNA evidence was the root was the most plausible decision model (Figure 1). The decision tree that began with DNA evidence was created when eyewitness evidence was set as the DV. When this was the case, the tree showed that when mock jurors viewed DNA evidence first, 66% of them then viewed video confession evidence, then fingerprint, and lastly eyewitness evidence. When mock jurors viewed DNA evidence third, fourth, or not at all, 34% of them viewed eyewitness evidence next. The tree also shows that there were two paths that led to eyewitness testimony being chosen approximately third: through video confession or fingerprint evidence.

Discussion. Data from Study 2 were analyzed using two different methodologies, and at first glance, it would appear that the results of the analysis of mean ranking and the decision trees are at odds. However, I argue that they are telling similar stories. The means suggest that the order through which mock jurors progressed through the evidence was: DNA, video confession, eyewitness testimony, and fingerprint evidence. The decision tree in Figure 1 suggests that mock jurors progressed through the evidence in the following order: DNA,

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video confession, fingerprint, and eyewitness testimony evidence. The two analyses yielded different results for what were the third and fourth pieces of evidence jurors chose. The decision tree was design to have eyewitness testimony be the last piece of evidence. Yet, the decision tree shows that there were two paths that led to choosing eyewitness testimony third. Because of this, it appears that on average, the order that participants were most likely to progress through the evidence was: DNA, video confession, eyewitness testimony, and fingerprint evidence.

To this point, results have shown that jurors tend to find DNA evidence, a video confession, eyewitness testimony, and fingerprint evidence important in making their verdict decisions. Although this is interesting, it is qualified by the fact that in Study 2, each piece of evidence implied the defendant was guilty. Thus, these results cannot be applied to trials in which these pieces of evidence (i.e., DNA, video confession, eyewitness testimony, and fingerprints) are not indicative of guilt. To examine how mock jurors' verdicts are altered when the evidence they think is important is not there, a third study was conducted.

Study 3

The purpose of Study 3 was to explore how mock jurors' verdicts would change when the evidence that mock jurors in the previous studies said to be important was or was not present at trial. Thus, in Study 3, each of the four pieces of evidence in Study 2 (i.e., DNA, video confession, eyewitness testimony, and fingerprints) were manipulated to be either present at trial and indicative of guilt or not present at trial. This was done in order to determine how mock jurors react when the evidence that is important to them is not available. For example, when mock jurors were told that there was no DNA evidence found at the scene, would their verdicts automatically change to not guilty? In other words, would mock jurors

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find the evidence as important when it was *not* at trial? It is possible that mock jurors need

DNA evidence to find the defendant guilty, and when there is not DNA evidence, they weigh

the lack of DNA evidence just as much in their verdicts, such that now they view the

defendant to be not guilty. It is also possible that although mock jurors need DNA evidence

to find the defendant guilty, lack of DNA evidence is not weighed as heavily in their verdicts.

Specifically, when DNA is not present, mock jurors may just brush that fact aside and look to

other pieces of evidence to inform their verdict decisions. In other words, mock jurors may

not automatically say the defendant is not guilty when DNA evidence is not present; instead

they may just search for other evidence that may or may not imply guilt. If this was the case,

the findings of Study 1 and 2 regarding the types of evidence mock jurors find important

would need to be qualified by the fact that the evidence must be present *and* indicative of guilt

in order for it to be important to them. With this in mind, the main goal of Study 3 was to

explore whether mock jurors' guilty verdict decisions are dependent on the four most

important pieces of evidence (i.e., DNA, eyewitness, fingerprint, video confession) being

present at trial, or whether guilty verdicts may still arise when some evidence is not present at

trial. Specifically, I sought to explore what combinations of evidence would lead to guilty

and not guilty verdicts.

Method

   Participants. Participants (N = 516) were recruited through Amazon's Mechanical

Turk and compensated for their time. Participants who were not U.S. citizens (n = 2), who

did not identify as living in the U.S. (n = 17), and who failed an attention check question (n =

15) were excluded from analyses, leaving data from 482 participants. Of these participants,

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239 (49.6%) were male, 372 (77.2%) were Caucasian, and they ranged in age from 18 to 74 ($M = 36.04$).

Materials and Procedure. Participants were asked to act as mock jurors in a homicide trial and told that their job was to determine whether the defendant was guilty or not guilty. They then received juror instructions (Appendix B). Afterwards, jurors were presented with a summary of the facts of the crime (Appendix D) and then given the following instructions:

> On the proceeding pages, you will see a variety of pieces of evidence that were presented at the trial of Jason Campbell. If the evidence presented makes you think, beyond a reasonable doubt, that Jason Campbell murdered James Reese, then you may make your decision by selecting the choice "make my decision." If not, please continue to view more evidence by selecting the choice "gather more information."

Next, participants were given a brief description of each piece of evidence in the following fixed order: DNA, Video Confession, Eyewitness Testimony, and Fingerprint. Each piece of evidence was presented on its own page, and participants were presented with one of two descriptions, creating a 2 (DNA: not present or implies guilt) x 2 (Video Confession: not present or implies guilt) x 2 (Eyewitness Testimony: not present or implies guilt) x 2 (Fingerprint: not present or implies guilt) design. In the "not present" description, participants were informed that the evidence was not present (e.g., "There were no fingerprints found on the gun used to kill the victim."). In the "implies guilt" description, participants were told the evidence was present, and it implied the defendant was guilty (e.g., "The defendant's fingerprints were a match to the fingerprints found on the gun used to kill the victim."). After participants chose to make their verdict decisions, they were redirected to a page where they were asked to decide their verdicts and then continued to another page where they provided basic demographic information.

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Results

The results of Study 3 were analyzed using market basket analyses (MBA) in R (Hahsler, Hornik, Grun, & Buchta, 2014). MBA is common in marketing research and allows for the creation of rules; rules show the associations between items. In this study, the pieces of evidence are referred to as items, and the combinations of evidence and verdicts are referred to as transactions. The rules created using MBA allow for "if X and Y, then Z" statements. For example, MBA might say, if DNA, eyewitness testimony, fingerprint evidence, and a video confession are all present, then the verdict will be guilty. For each rule, there is an associated support, confidence, and lift. The support of a rule refers to the fraction of transactions in the data that have that specific combination of items. The higher the number, the more instances of that combination of evidence and verdict in the data. The confidence of a rule refers to the probability that a specific combination of items (i.e., the pieces of evidence) will predict a specific outcome (i.e., verdict). The higher the confidence, the more likely the combination of evidence is to predict mock jurors' verdicts. The lift of a rule refers to the ratio of support and confidence. A lift greater than one indicates that the combination of items (i.e., pieces of evidence) *increased* the likelihood of the response (i.e., guilty/not guilty verdicts); a lift less than one indicates that the combination of items *decreased* the likelihood of the response; a lift equal to one indicates that the items are independent of the response. MBA was used to explore the different combinations of evidence and verdicts to determine how the presence and absence of different types of evidence alter mock jurors' verdicts.

The first MBA conducted examined the different rules that led to mock jurors saying the defendant was guilty. In order for a combination of evidence to be a rule, the support was

required to be greater than or equal to 1% and the confidence to be greater than or equal to 50%. These restrictions led to 53 rules that predicted guilty verdicts. Of those 53 rules, 36 had a lift greater than one (recall that a lift greater than one indicates that the presence of the items increases the likelihood of the verdict response) and 24 had a confidence greater than 75% (see Table 4). The one rule that led to guilty verdicts 100% of the time was when all four pieces of evidence were present and indicative of guilt. The next two rules of the top 10 rules (based on confidence and lift) did not have DNA present and still predicted guilty verdicts more than 96% of the time. Additionally, one rule in the top 10 rules was made up of only two pieces of evidence: fingerprints and video confession. When both fingerprints and video confession evidence were present, mock jurors said the defendant was guilty 94% of the time.

The second MBA was similar to the first, with the only exception being that rules were required to contain all four pieces of evidence (as opposed to any number of pieces; i.e., 1-4 pieces). Results indicated only eight rules that had a confidence above 50% and lift above one (see Table 5). Of these eight rules, four had a confidence greater than 75%. As before, the number one rule (based on confidence and lift) predicting guilty verdicts was one in which all four pieces of evidence were present and indicative of guilt. The second rule included all evidence present except DNA, which was absent; the third rule included all evidence present except eyewitness testimony, which was absent; the fourth rule included fingerprint and video confession evidence present, and DNA and eyewitness testimony absent (see Table 5 for details).

The third MBA was similar to the first, except this time the items were set to predict not guilty verdicts, instead of guilty verdicts. This yielded 29 rules with confidence great than

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or equal to 50%, lift greater than one, and support greater than 1%. Of these, seven rules had confidence greater than 75% (see Table 6). When DNA, fingerprints, eyewitness testimony, and a video confession were absent, mock jurors decided the defendant was not guilty 96.15% of the time. When DNA was present but the other three pieces of evidence were absent, not guilty was chosen 95.83% of the time. Similarly, when eyewitness testimony was present but the other three pieces of evidence were absent, mock jurors said not guilty 93.33% of the time. Also, no fingerprint or video confession evidence alone lead to not guilty verdicts 83.19% of the time.

Lastly, the fourth MBA was similar to the second in that in order for a rule to be created, it had to use all four pieces of evidence and similar to the third MBA in that the response being analyzed was when mock jurors said the defendant was not guilty. This analysis led to six rules (see Table 7). Of these six rules, the same three rules discussed in the previous paragraph led to not guilty verdicts over 75% of the time. The other three rules which led to not guilty verdicts over 50% of the time were: (4) fingerprint and video confession absent and eyewitness testimony and DNA present; (5) DNA, eyewitness, and video confession absent and fingerprint present; and (6) DNA, fingerprint, and eyewitness absent and video confession present.

Discussion

Study 3 aimed to examine what would happen to mock jurors' verdicts when the evidence they indicated was important was not present at trial. Results from a series of MBAs indicated that not all four pieces of evidence needed to be present for mock jurors to find a defendant guilty of homicide. Specifically, although DNA consistently was indicated to be the most important piece of evidence to jurors, MBA indicated that the presence of DNA was

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not necessary to find a defendant guilty. Video confession and eyewitness testimony were also not required to be present every time in order for jurors to reach a guilty verdict. Video confession evidence was not present at trial in three of the top eight rules; this also occurred for eyewitness testimony and DNA evidence. Fingerprint evidence that was not present at trial appeared in only one of the top eight rules. These findings imply that when predicting whether a mock juror would find the defendant guilty of homicide, the presence of fingerprint evidence is of upmost importance compared to DNA, eyewitness testimony, and video confession evidence. This sentiment is reiterated when considering the MBA in which rules were allowed to be created with any number of pieces of evidence. Fingerprint evidence was present and part of each of the top 14 rules that predicted guilty verdicts, and in 17 total rules of the top 24 rules. Video confession also played a strong role in the rules; video confession was present and part of the top nine rules that predicted guilty verdicts, and in 16 total rules of the top 24 rules. Also, fingerprint and video confession evidence alone led to a rule that predicted guilty verdicts 94% of the time. Thus, it seems that fingerprint and video confession evidence may be even more important to mock jurors' verdict decisions (and DNA less important) than the previous studies indicated.

General Discussion

The present series of studies sought to gain a more comprehensive understanding of how jurors reach their verdict decisions using an inductive approach to research. The results of Study 1 showed that mock jurors thought DNA, fingerprints, weapon, video records, crime scene photographs, gunshot residue, other bodily secretions, video confession, forensic expert testimony, and eyewitness evidence were the 10 most important pieces of evidence (out of 41) required to make their verdict decisions. Study 2 further delved into what evidence mock

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jurors found most important to reach their verdicts by pitting the pieces of evidence deemed as most important (from Study 1) against each other and making mock jurors choose the order in which they wanted to learn more about each piece of evidence. Because mock jurors were allowed to choose the order they progressed through the evidence, Study 2 was able to illustrate what evidence mock jurors found crucial to make their decisions using a different methodology. An examination of means and decision trees from Study 2 indicated that of the most important pieces of evidence from Study 1, mock jurors wanted to learn more about DNA evidence first, then a video confession, eyewitness testimony, and fingerprint evidence. Study 3 built on Study 2 and aimed to determine what mock jurors do when the evidence they said was most important to make their verdict decisions in Study 2 was not available in Study 3 (e.g., there was no DNA evidence found at the scene). Specifically, Study 3 sought to answer questions such as: was lack of DNA evidence as important to a mock juror's final decision as the presence of DNA evidence?

Using MBA, sets of evidence (i.e., rules) that led to guilty and not guilty verdicts were examined. These rules indicated that the piece of evidence that was reliably found to be most important to mock jurors across the previous studies, DNA, was not actually necessary to find the defendant guilty of homicide. In fact, Study 3 indicated that the presence of video confession and fingerprint evidence was more consistently required to predict guilty verdicts. When DNA and eyewitness testimony were part of a rule that predicted guilty verdicts, the two pieces were not required to be present at trial. In other words, DNA and/or eyewitness testimony were not present at trial in three of the four rules that predicted guilty verdicts 75% of the time (e.g., there was no eyewitness to the crime and participants still found the defendant guilty). These findings were reiterated in the rules for not guilty verdicts. DNA or

eyewitness testimony was included and indicative of guilt in two of the top three rules that predicted not guilty verdicts over 90% of the time. Fingerprints and video confession, however, were always not present at trial when not guilty verdicts were highly likely.

These findings imply that not all evidence is weighed equally, and that for some pieces of evidence the presence or absence of it will affect how much weight is assigned to it, whereas for others the weight is more constant. For example, results support the claim that when fingerprint evidence is present and indicative of guilt, a juror will say the defendant is guilty over 75% of the time. When fingerprint evidence is absent, results support the claim that more than 75% of the time the defendant will be found not guilty. This consistency in verdict with the varying presence and absence of evidence indicates that fingerprint evidence is weighed the same whether it is present or absent. Similar conclusions can be drawn for video confession evidence. DNA and eyewitness testimony, however, offer much less straightforward conclusions. The presence of DNA and eyewitness testimony leads to both guilty and not guilty verdicts, as does the absence of these two pieces. What this may then indicate is that the weight of these two pieces of evidence is dependent on the presence or absence of other evidence. For example, if there is fingerprint evidence and a video confession that indicates the defendant is guilty, it does not matter whether or not there is DNA evidence or testimony from an eyewitness, mock jurors will still find the defendant guilty. However, if either fingerprint evidence or a video confession was not available, mock jurors needed the other piece to be indicative of guilt in order to find the defendant guilty (i.e., there were no rules that predicted guilty verdicts that had both fingerprint evidence and video confession evidence absent). Specifically, if fingerprint evidence was not available at trial, then a video confession had to be present and imply guilt in order for mock jurors to find the

defendant guilty; if a video confession was not available at trial, then there had to be fingerprint evidence present that implied guilt for a guilty verdict to be given.

Limitations

Although the present research is the first of its kind and offers insight into how mock jurors make their decisions, it is not without limitations. First, the present series of studies is limited by the fact that the scenarios were specific to, and the evidence came from, a homicide trial. However, this was done purposefully because it cannot be assumed that all types of evidence will be perceived similarly by jurors across case types (e.g., homicide trial versus drug trafficking). Additionally, a homicide trial was chosen because of the frequency with which homicides occur; the most severe offense for 60% of defendants arrested for more than one felony in 2009 was homicide, second only to rape (65%; Reaves, 2013). The present research was also in part limited by the small subset of evidence that was used in the second and third studies. Unfortunately, this was a requirement of the designs to be able to obtain the required sample size. As mentioned earlier, the difference in number of possible orders in Study 2 when going from five to four pieces of evidence was 96 (120 vs. 24), and the difference in cells in Study 3 when going from five to four pieces of evidence as 16 (32 vs. 16). These drastic differences encouraged the use of fewer pieces of evidence. Nevertheless, the variation of the four pieces of evidence was still more than what is typical in the psycho-legal research. If larger sample sizes can be obtained, future research should explore what happens when jurors are presented with more than four pieces of evidence. The more evidence presented, the more ecologically valid the study would be.

An additional concern of the present research was not illuminated until examination of the results of Study 3. The results of Study 1 and Study 2 indicated which pieces of evidence

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were perceived as most important for mock jurors' verdicts. However, in both studies, the evidence was said to be present at trial, and in Study 2, the evidence was indicative of guilt. From these studies, the four most important pieces of evidence to mock jurors were obtained and utilized for Study 3. The results of Study 3, though, indicated that the findings of the earlier studies may be specific to the evidence being present at trial and damning. Study 3 indicated that the evidence mock jurors' rated as important in the earlier studies was not necessarily the evidence they required to find the defendant guilty. Specifically, in both Study 1 and Study 2, results indicated that DNA evidence was the most important piece of evidence to mock jurors. The results from Study 3 do not support this conclusion, and instead argue that fingerprint and video confession evidence are the most important pieces. Thus, the four pieces of evidence chosen for Study 3 may not actually be the most important pieces of evidence for mock jurors to reach their verdicts, and future research should further explore what evidence is important both when it is and is not indicative of guilt.

Another limitation of the present research was that the models of juror decision making were not explicitly tested. Although the major goal was to begin to understand how important mock jurors viewed a variety of pieces of evidence, a second goal was that the knowledge obtained from these studies would allow for the different theories and models of juror decision making to be tested.

Future Directions

Some of the major models that have been applied to juror decision making are Story Model (Pennington & Hastie, 1992), Information Integration Theory (Anderson, 1967, 1971; Ostrom, Werner, & Saks, 1978), and Belief Adjustment Model (Hogarth & Einhorn, 1992).

They are briefly reviewed to provide background of how each can be tested utilizing the information gleaned in the present series of studies.

Information Integration Theory (IIT; Anderson, 1971) takes into account the possibility that jurors may weigh different types of evidence differently. IIT argues that each piece of information is represented by two parameters: a scale value and a weight. The scale value is the location of the piece of information along a judgment dimension (e.g., pro-prosecution or pro-defense), and the weight is the importance of that information. The model states that the scale values combine linearly (assuming the weights are constant), indicating that the scale value of each piece of information is independent and should not interact with other evidence (Anderson, 1971). However, the findings from Study 3 indicated that each piece of evidence may not have the same weights. Specifically, results indicated that video confession and fingerprint evidence may be weighed more than DNA evidence and eyewitness testimony. However, a more thorough test of IIT is necessary to determine whether or not this is true.

To test IIT, the information regarding the importance of the evidence collected in the present studies is necessary. The scale value can be easily manipulated; the evidence would be varied based on a continuum of whether it is indicative of the defendant's guilt or innocence. To examine if scale values combine linearly as the model states, the weights of each piece of evidence must be held constant. This could be done using the most important pieces of evidence that should not vary in weight (e.g., DNA, fingerprint, video confession, and eyewitness testimony), and examining whether varying the scale value leads mock jurors to different verdict decisions. Additionally, IIT postulates that the scale values should be

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independent of each other, and thus verdicts should not vary based on the order of presentation of the evidence.

Another theory used to explain juror decision making that can be tested using the results of the present research is the Belief Adjustment Model (BAM; Hogarth & Einhorn, 1992), which assumes jurors start with an initial opinion (on a continuum of not guilty to guilty) based on their background information. When a new piece of evidence is presented, it is encoded as increasing or decreasing the initial judgment, weighted according to its judged strength, and additively combined with the juror's prior beliefs. This three-step process repeats until all of the evidence has been presented, and the juror is left with a final rating of guilt or innocence. BAM is an online model, meaning the pieces of evidence are sequentially, as opposed to globally, processed. Because of this, order effects of the presentation of evidence are seen. Specifically, when pieces of evidence both support and contradict guilt, the model predicts recency effects, and the last piece of evidence is often overweighed (Hogarth & Einhorn, 1992).

Similar to IIT, BAM can be tested using the information obtained from the present research. To test if the initial guilt judgment alters verdicts, the evidence should be equally important and presented in a fixed order. If jurors who begin the trial presuming there is a 75% chance the defendant is guilty (i.e., if they are prosecution biased) are more likely to find the defendant guilty than those who begin the trial thinking the defendant is not guilty, then the notion of initial judgments altering verdicts is supported. To test whether evidence is sequentially processed, the same set of evidence (controlling for weight) can be presented in different orders. If this tenant of BAM holds, the different orders should lead to different verdict judgments. Additionally, to test whether recency effects occur when the evidence is

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equally split between supporting guilty and not guilty verdicts, the last piece of evidence should be altered. If the last piece of evidence is indicative of guilt and otherwise the evidence has been split (i.e., equal amounts of evidence that imply guilty as not guilty), BAM would suggest that mock jurors would find the defendant guilty. If the last piece of evidence supports not guilty verdicts, mock jurors should find the defendant not guilty in order to support BAM.

A third model, and arguably one of the most well-known and supported models of juror decision making in the psycho-legal literature (Carlson & Russo, 2001), is Story Model (Pennington & Hastie, 1992). Story Model argues jurors construct stories to make sense of the evidence that is presented to them during trial (Pennington & Hastie, 1986, 1992, 2003). Jurors' stories are typically constructed from three types of knowledge: case-specific information from the trial, personal knowledge about events similar in content to events from the trial, and a generic expectation about what makes a complete story. Story Model postulates that as pieces of evidence are presented to jurors during trial, jurors are integrating those pieces into their story of what occurred using the three types of knowledge outlined above. According to the model, how each juror's story unfolds then determines his/her verdict. Story Model assumes jurors are sensitive to the interdependence among pieces of evidence, and their story is constructed to explain this interdependence. Story Model does not, however, postulate how different pieces of evidence may be given different weights in the juror's story; it simply argues that the evidence needs to tell a story.

To test Story Model, the evidence could be arranged in such a way that it tells a coherent story or not. Instead of presenting the evidence in order of importance like in Study 3, the evidence would be presented so that it tells a narrative. Specifically, mock jurors could

be given opening arguments that set-up the story of how the crime happened and then the evidence would be presented in that order. For example, mock jurors could be told that the defendant purchased ammunition from a sporting goods store, drove to the defendant's house, went inside and shot the defendant, left, and threw his bloody shirt and the gun in a garbage one block away. The evidence would then be presented in that order. Specifically, the prosecution would present a receipt of the ammunition that matched (or did not) the bullet found in the victim purchased the day of the defendant's death; then an eyewitness would testify that he/she saw (or did not) the defendant's car parked outside the victim's house around the time the victim died; then a forensic expert would testify that the weapon found was used to kill the victim, registered to the defendant, and had the defendant's fingerprints on it (or did not); then a police officer would show the video of the defendant confessing (or not) to the crime. According to Story Model, this style of presentation should lead jurors to be most likely to find the defendant guilty.

Future research should examine these three models/theories of juror decision making (i.e., Story Model, IIT, BAM) and pit them against each other to explore which best predicts jurors' decisions.

Conclusion

The results from the present research expand the existing knowledge of how jurors make decisions during trial by starting from the beginning and using an inductive approach. The greater knowledge possessed of this process, the more psycho-legal researchers will be able to conduct research that will be applicable and informative to legal actors and policy makers. This research was the first to examine what jurors find most important of a large pool of evidence of commonly presented homicide trial evidence and was the first to explore

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what jurors do when they are allowed to progress through the evidence in the order they desired. Additionally, this research was the beginning in a line of research that will test and update the existing theories and models of juror decision making. Science is constantly advancing and as more forensic evidence is allowed in the courtroom, the need for research and theories capable of explaining how it will effect jurors' decisions grows. Though empirical research has begun to delve into the effects, the existing models of juror decision making pre-date many of the recent scientific advances, further illustrating the need to update, modify, and merge them. Every day jurors decide the fate of other citizens; it is imperative that more is known regarding how exactly jurors come to their decisions.

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Table 1.

Study 1: 10 Most Important Pieces of Evidence to Mock Jurors

Importance	Evidence Type	Mean (SE)
1	DNA	9.17 (0.08)
2	Fingerprints	8.52 (0.09)
3	Weapon	8.34 (0.10)
4	Video Records	8.11 (0.10)
5	Crime Scene Photos	8.03 (0.11)
6	Gunshot Residue	8.02 (0.10)
7	Other Bodily Secretions	8.02 (0.11)
8	Video Confession	7.99 (0.13)
9	Forensic Expert Testimony	7.76 (0.10)
10	Eyewitness	7.73 (0.11)

Table 2.

Study 2 Pilot: Average Order of Progression through the Evidence

Order Chosen	Evidence Type	Mean (SE)
1	DNA	6.16 (0.39)
2	Eyewitness	5.19 (0.40)
3	Fingerprint	4.65 (0.41)
4	Video Confession	4.48 (0.39)
5	Forensic Expert Testimony	4.25 (0.38)
6	Crime Scene Photos	3.50 (0.38)
7	Gunshot Reside	3.43 (0.36)
8	Weapon	3.36 (0.38)
9	Video Records	2.97 (0.36)
10	Other Bodily Secretions	1.93 (0.28)

Table 3.

Study 2: Average Order of Progression through the Evidence

Order Chosen	Evidence Type	Mean (SE)
1	DNA	2.95 (0.11)
2	Video Confession	2.46 (0.11)
3	Eyewitness	2.33 (0.10)
4	Fingerprint	2.18 (0.10)

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Table 4.

Study 3: Rules for Guilty Verdicts with Confidence Greater Than 75%

Rule	DNA	Video Confession	Eyewitness	Fingerprint	Confidence (%)	Lift	Support (%)
1	1	1	1	1	100.00	1.65	3.73
2		1	1	1	97.83	1.61	9.34
3	0	1	1	1	96.43	1.59	5.60
4	1	1		1	96.00	1.58	9.96
5		1		1	94.17	1.58	20.12
6	1	1	0	1	93.75	1.54	6.22
7	0	1		1	92.45	1.52	10.17
8		1	0	1	91.23	1.50	10.79
9	0	1	0	1	88.00	1.45	4.56
10	1		0	1	84.91	1.40	9.34
11	1			1	84.54	1.39	17.01
12	1		1	1	87.09	1.38	7.68
13			1	1	83.51	1.37	16.80
14	0		1	1	83.02	1.37	9.13
15	1	1			81.15	1.33	20.54
16				1	80.83	1.33	32.37
17	1	1	1		80.43	1.32	7.68
18		1			78.78	1.30	40.04
19			0	1	78.13	1.29	15.56
20		1	1		77.88	1.28	16.80
21	0			1	77.08	1.27	15.35
22	0	1			76.42	1.26	19.50
23	1	1	0		76.27	1.25	9.34
24	0	1	1		75.86	1.25	9.13

Note. 1 = evidence was present and indicative of guilt; 0 = evidence was not present; blank cell = evidence was not part of the rule created

Table 5.

Study 3: Rules for Guilty Verdicts Requiring Four Pieces of Evidence with Confidence

Greater Than 50%

Rule	DNA	Video Confession	Eyewitness	Fingerprint	Confidence (%)	Lift	Support (%)
1	1	1	1	1	100.00	1.65	3.73
2	0	1	1	1	96.43	1.59	5.60
3	1	1	0	1	93.75	1.54	6.22
4	0	1	0	1	88.00	1.45	4.56
5	1	0	1	1	73.08	1.20	3.94
6	1	0	0	1	71.43	1.18	3.11
7	0	0	1	1	68.00	1.12	3.53
8	1	1	1	0	62.50	1.03	3.11

Note. 1 = evidence was present and indicative of guilt; 0 = evidence was not present; blank cell = evidence was not part of the rule created

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Table 6.

Study 3: Rules for Not Guilty Verdicts with Confidence Greater Than 75%

Rule	DNA	Video Confession	Eyewitness	Fingerprint	Confidence (%)	Lift	Support (%)
1	0	0	0	0	96.15	2.45	5.19
2		0	0	0	96.00	2.45	4.77
3	1	0	0	0	95.83	2.44	4.77
4	0	0		0	94.64	2.41	11.00
5	0	0	1	0	93.33	2.38	5.81
6		0		0	83.19	2.12	20.53
7	0	0	0		79.54	2.03	7.26

Note. 1 = evidence was present and indicative of guilt; 0 = evidence was not present; blank cell = evidence was not part of the rule created

Table 7.

Study 3: Rules for Not Guilty Verdicts Requiring Four Pieces of Evidence with Confidence

Greater Than 50%

Rule	DNA	Video Confession	Eyewitness	Fingerprint	Confidence (%)	Lift	Support (%)
1	0	0	0	0	96.15	2.45	5.19
2	1	0	0	0	95.83	2.44	4.77
3	0	0	1	0	93.33	2.38	5.81
4	1	0	1	0	58.97	1.50	4.77
5	0	0	0	1	55.56	1.42	2.07
6	0	1	0	0	50.00	1.28	2.49

Note. 1 = evidence was present and indicative of guilt; 0 = evidence was not present; blank cell = evidence was not part of the rule created
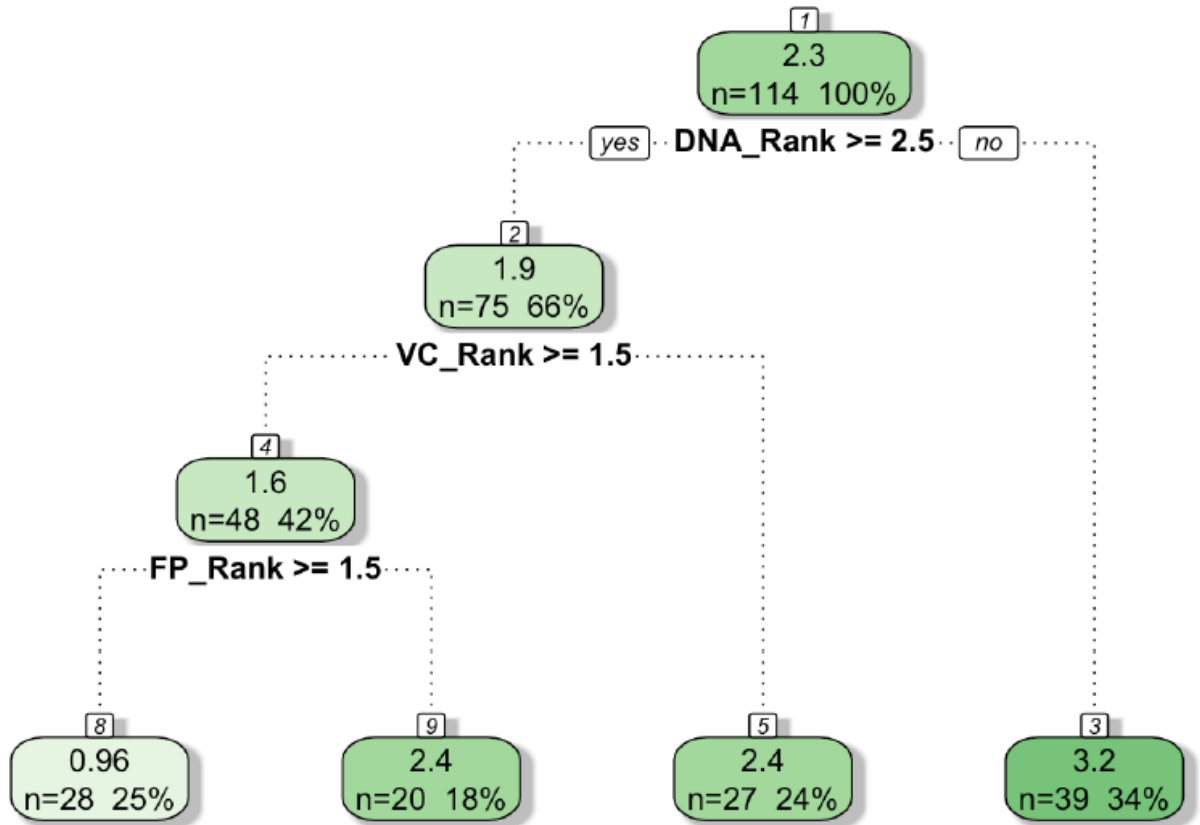
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Figure 1. Study 2 decision tree analysis with eyewitness evidence as the dependent variable.
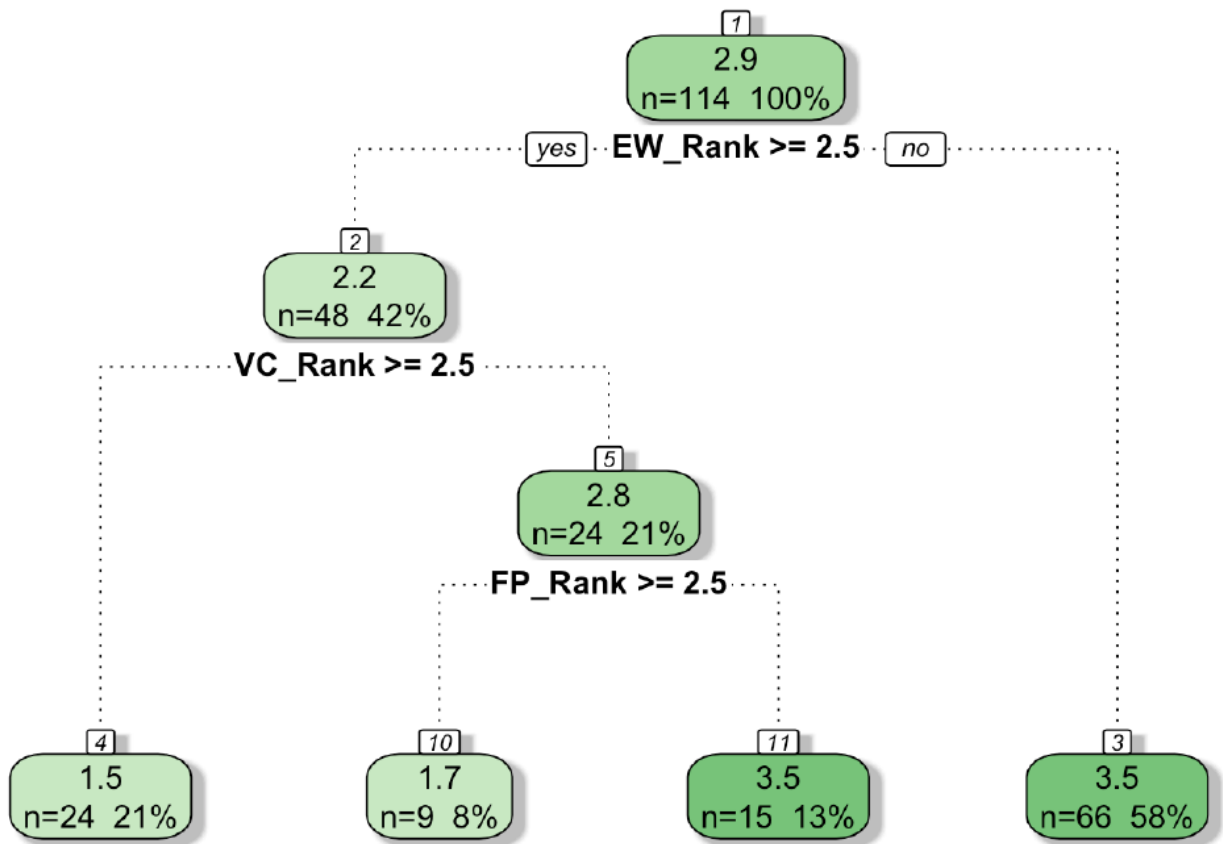
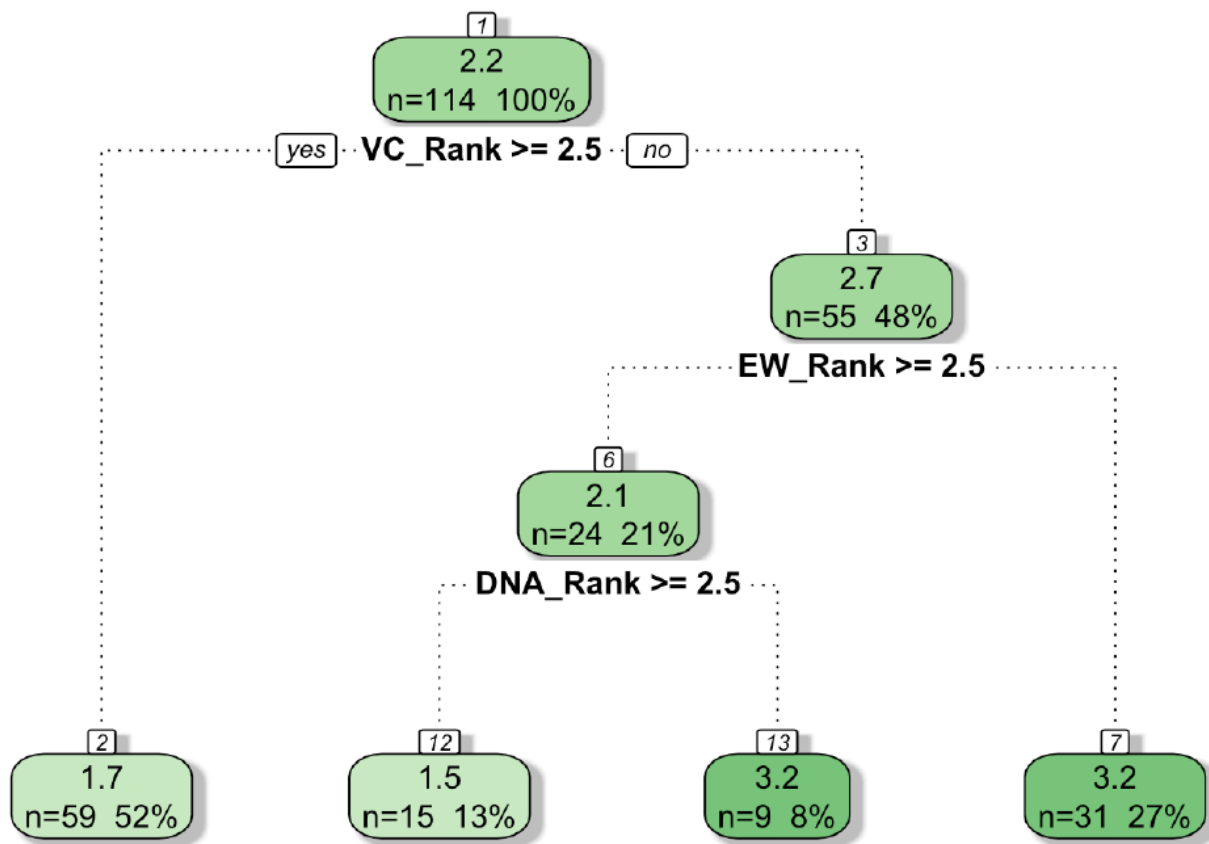*Figure 2.* Study 2 decision tree analysis with DNA evidence as the dependent variable.

Figure 3. Study 2 decision tree analysis with fingerprint evidence as the dependent variable.
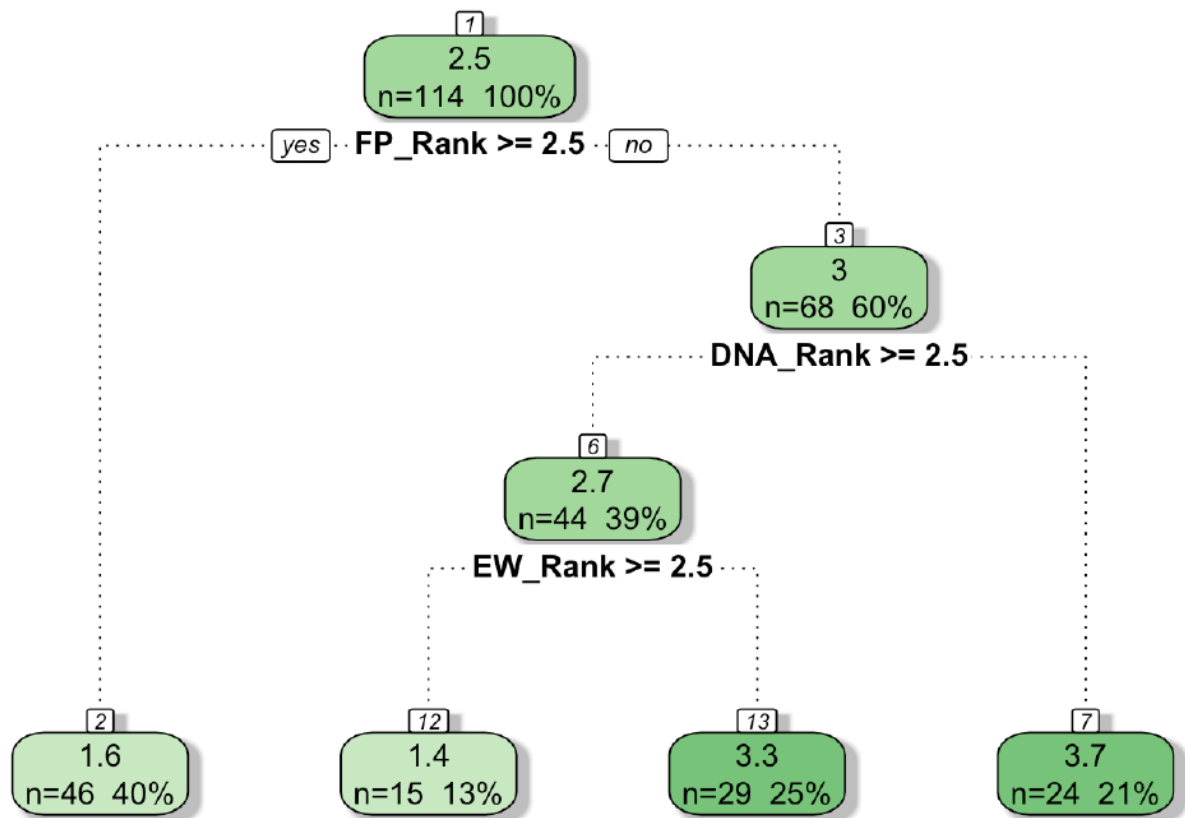
Figure 4. Study 2 decision tree analysis with video confession evidence as the dependent variable.

List of Evidence (Study 1)

1. Fingerprints
2. Footprints
3. DNA
4. Blood Typing
5. Other Bodily Secretions
6. Hair
7. Tire Marks/Skid Marks
8. Property of a victim found on or near the defendant or his/her property
9. Property of the defendant found at the scene
10. Gunshot residue
11. Fibers
12. Weapon involved in the crime
13. Bank account information
14. Receipts
15. Video records
16. Audio records
17. Chain of evidence documents
18. Cell phone text messages
19. Cell phone photos
20. Facebook posts
21. Emails
22. Internet search histories
23. Files on computer hard drive
24. Video confessions
25. Audio confessions
26. Written confessions
27. Diagrams of injuries
28. Photos of the crime scene
29. Timeline of the crime
30. Neuroimages (i.e., PET, fMRI, CAT) of the brain
31. Maps
32. Mental health professional's testimony
33. Physician's testimony
34. Forensic expert's testimony
35. Police officer's testimony
36. Information technology (IT) expert's testimony
37. Psychologist's testimony
38. Medical expert's testimony
39. Witness to the crime
40. Character witness
41. Alibi witness

Appendix B

Juror Instructions

The defendant is charged by indictment with the murder of James Reese. In order for you to find the defendant guilty of murder, the State is required to prove each of the following elements beyond a reasonable doubt:

1. that the defendant caused James Reese's death or serious bodily injury that then resulted in his death, and

2. that the defendant did so purposely or knowingly.

If after a consideration of the evidence you are convinced beyond a reasonable doubt that the defendant either purposely or knowingly caused James Reese's death or serious bodily injury resulting in death, then your verdict must be guilty. If, however, after a consideration of the evidence you find that the State has failed to prove any element of the offense beyond a reasonable doubt, your verdict must be not guilty.

Appendix C

Evidence Descriptions for Study 2 and Study 3

DNA: The defendant's DNA was a match to the DNA found at the scene of the crime (Study 2 and 3). There was no DNA found at the scene of the crime (Study 3).

Video Confession: At the station, the defendant admitted to killing the victim and agreed to record his confession. The video depicts the defendant in an interrogation room at the police department recounting how he killed the victim (Study 2 and 3). A video confession from the defendant was not obtained (Study 3).

Eyewitness Testimony: The victim's neighbor testified that he saw the defendant's car parked in front of the victim's house around the time he was shot and killed (Study 2 and 3). There were no eyewitnesses to the crime (Study 3).

Fingerprints: The defendant's fingerprints were a match to the fingerprints found on the gun used to kill the victim (Study 2 and 3). There were no fingerprints found on the gun used to kill the victim (Study 3).

Forensic Expert Testimony: A forensic expert provided testimony regarding the characteristics of the bullet's trajectory. The expert testified that based on the way the bullet entered the victim's body, the shooter was approximately 6' tall. The expert also testified that the defendant is 6'1" tall (Study 2).

Crime Scene Photographs: Photographs of the crime scene showed two bloody footprints which match shoes found in the defendant's home (Study 2).

Gunshot Residue: When the defendant was brought into the police station for questioning, his right hand and shirt sleeve tested positive for gunshot residue (Study 2).

Weapon: The gun used to kill the victim was registered to the defendant and was missing

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from his gun safe (Study 2).

Video Records: Video surveillance footage from the victim's home security system shows the defendant entering the victim's home just before the alleged time of death (Study 2).

Other Bodily Secretions: When the defendant was brought in for questioning, an officer noticed that there was blood on his shirt. Testing revealed that the blood type on the defendant's shirt was a match to the victim's blood type (Study 2).

Appendix D

Summary of the Facts of the Crime

According to the prosecution, Jason Campbell killed James Reese, 44, in his home. Campbell used to be friends with one of Reese's relatives and had been to Reese's house once before. Campbell broke into Reese's house while he slept and asked him for money. When Reese refused to give Campbell money, Campbell attacked Reese in his bedroom and shot him. Campbell then stole $20, went out, got drunk and returned to sleep at Reese's house. According to the defense, Jason Campbell did not kill Reese. The defense does not deny that Campbell asked for $20 from Reese; however, the defense argues that Campbell did not kill Reese. Instead, after Reese denied Campbell the money, Campbell left and went to the bar to get drunk.