



Penn Statim

Online Companion to Penn State Law Review

**Motivated Cognition and Juror Interpretation of Scientific Evidence: Applying
Cultural Cognition to Interpretation of Forensic Testimony**

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Abstract

This paper reports the results of a study investigating how jurors interpret and digest scientific evidence when it is presented to them in a trial setting and how differences in juror attitudes and education influence interpretation of scientific evidence. The study involved a sample of mock jurors recruited from Amazon Mechanical Turk (n=91). Study subjects each viewed a transcript of a mock legal case involving DNA evidence. Results suggest that when presented with conflicting expert testimony, jurors will interpret evidence in a way that is consistent with pre-existing attitudes or beliefs (such as political predispositions). Importantly, results suggest that a juror's ability to do this and therefore the polarization between jurors of different political pre-dispositions increases as level of education increases. For jurors classified as Conservative, as education levels increased, the prosecution expert was rated as more credible and the defendant was found guilty more often. For jurors classified as Liberal, as education levels increased, the prosecution expert was rated as less credible and the defendant was found guilty less often. Theoretical and practical implications of these findings are discussed.

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I. Introduction

Research has shown that improper use of forensic evidence and invalid forensic science testimony can result in (and has resulted in) wrongful convictions.¹ Jurors are usually not trained to critically interpret and evaluate scientific evidence and are often asked to evaluate exceedingly technical information that is beyond the scope of their knowledge.² In addition, partisan experts often present conflicting interpretations of scientific evidence at trial.³ Because of this, it is not surprising that jurors have trouble interpreting the scientific evidence presented to them, and are not always able to evaluate evidence effectively.⁴ When faced with information that is difficult to understand, jurors have leeway to interpret evidence in a way that is consistent with their existing viewpoint, rather than in a way that is most justifiable based on the science itself.

This paper combines psychological research on motivated cognition, with legal research on juror evaluation of forensic evidence, to suggest that when presented with conflicting interpretations of scientific evidence, jurors will rely on the evidence supporting their pre-existing attitudes or convictions. This is likely to happen more as

¹ NATIONAL ACADEMY OF SCIENCE REPORT, STRENGTHENING FORENSIC SCIENCE IN THE UNITED STATES: A PATH FORWARD (2009) at <https://www.ncjrs.gov/pdffiles1/nij/grants/228091.pdf>; see also Paul C. Giannelli, Wrongful Convictions and Forensic Science: The Need To Regulate Crime Labs, 86 N.C. L. Rev. 163 (2007) (documenting failures of crime labs and forensic techniques and arguing for increased regulation of forensic evidence)

² See Joel Cooper, Elizabeth Bennett, & Hollu Sukel, *Complex Scientific Testimony: How do jurors make decisions?*, 20(4), Law and Human Behavior, 379 (1996).

³ Jennifer Mnookin, *Expert Evidence, Partisanship, and Epistemic Competence*, 73 Brook. L. Rev. 1009 (2007-2008)

⁴ See Cooper, Bennet, & Sukel, *supra* note 2.

a juror's level of education increases, due to an increased ability to take information and use it to support existing beliefs.

A. DNA Evidence in Criminal Trials

This paper focuses on one specific type of scientific evidence that is often used in criminal adjudication – deoxyribonucleic acid (DNA) evidence. The method for developing a DNA “profile” of a person that could be used for forensic identification was first described by geneticist Alex Jeffreys in 1985.⁵ Shortly following this, commercial laboratories began using “fingerprinting” and the United States Federal Bureau of Investigation began using forensic DNA techniques.⁶ The type of DNA testing typically used in criminal investigations analyzes nuclear DNA (nDNA), although mitochondrial DNA (mtDNA) (which is less conclusive) has also been used in forensic identification.⁷ DNA is now used extensively in the criminal justice system and the overwhelming value of DNA evidence is well recognized and widely accepted.⁸ Importantly, the introduction of DNA evidence in criminal appeals has, as of March 7, 2016, led to 337 post-conviction exonerations in the United States.⁹

Despite this success, research identifies areas of vulnerability in juror understanding of scientific evidence, including DNA. Firstly, Jurors themselves recognize that

⁵ Alec J. Jeffreys et al., *Hypervariable “Minisatellite” Regions in Human DNA*, 314 *Nature* 67 (1985)

⁶ Jonathan Kahn, *Race, Genes, and Justice: A Call to Reform the Presentation of Forensic DNA Evidence in Criminal Trials*, 74(2) *Brook. L. Rev.* 325 (2008).

⁷ Julian Adams, *Nuclear and Mitochondrial DNA in the Courtroom*, 13 *JL&Pol’y*, 69 (2005).

⁸ *Id.*

⁹ See Innocence Project analysis at <http://www.innocenceproject.org/free-innocent/improve-the-law/fact-sheets/dna-exonerations-nationwide>.

scientific evidence is challenging.¹⁰ Secondly, mock jury research has shown that lay citizens can fall prey to fallacious reasoning about statistical arguments and forensic evidence.¹¹ Although DNA evidence is one of the more established forms of scientific evidence, there are still issues that can be debated by experts, for example how much weight should be given to evidence based on mitochondrial, rather than nuclear, DNA.¹² This means that issues surrounding the reliability of DNA evidence and the conclusions that can be drawn from DNA evidence are still presented to jurors in criminal trials.

Research has examined cases of innocent people convicted of serious crimes based on scientific evidence (including DNA), to understand problems with this scientific evidence. This research has shown that a significant amount of wrongful convictions based on scientific evidence involved invalid testimony by forensic analysts at trial – testimony with conclusions misstating empirical data or wholly unsupported by empirical data.¹³ This invalid testimony included testimony from 72 forensic analysts, from 25 states.¹⁴ This highlights the importance of ensuring that jurors are able to effectively analyze scientific evidence and form appropriate conclusions, and

¹⁰ Joe Cecil, Valerie Hans, & Elizabeth Wiggins, *Citizen Comprehension of Difficult Issues: Lessons from Civil Jury Trials*, 40 Am. U.L.Rev. 727 (1991).

¹¹ Suzanne Kaasa, Tiamoyo Peterson, Erin Morris, & William Thompson, *Statistical Inference and Forensic Evidence: Evaluating a Bullet Lead Match*, 31(5) Law and Human Behavior, 433 (2007).

¹² David Kaye, Valerie Hans, Michael Dann, Erin Farley, & Stephanie Albertson, *Statistics in the Jury Box: How Jurors Respond to Mitochondrial DNA Match Probabilities*, 4(4) J. Empirical Legal Stud. 797 (2007).

¹³ Brandon Garrett & Peter Neufeld, *Invalid Forensic Science Testimony and Wrongful Convictions*, 95 Va. L. R. 1 (2009).

¹⁴ *Id.*

suggests that jurors are not effectively distinguishing between experts presenting conflicting interpretations of scientific evidence.

One technique to improve juror analysis of DNA and other scientific evidence is to give jurors organizational tools such as jury notebooks and checklists. However, despite theoretical promise, research has shown that these tools have only a “modest” effect on jury comprehension of scientific evidence.¹⁵ It is therefore important to understand how jurors analyze and digest scientific evidence, and to develop tools and policy to ensure that jurors analyze this evidence effectively and reach appropriate conclusions. It is particularly important to understand how jurors evaluate expert testimony and how they assimilate evidence on scientific issues in order to identify possible sources of bias in juror evaluation of scientific evidence. We can gain insight into this issue by looking at the scientific literature on motivated cognition.

B. Motivated Cognition

Psychological research has shown that when decision makers have a preference regarding the outcome of an evaluative task, they are more likely to arrive at that desired conclusion by engaging in inadvertently biased processes for accessing, constructing, and evaluating beliefs.¹⁶ This is likely to be exacerbated when decision makers are not in a position to investigate an issue for themselves fully, and need to rely on conflicting evidence given by experts. Research suggests that when laypeople

¹⁵ See Kaye, Hans, Dann, Farley, & Albertson, *supra* note 12.

¹⁶ Ziva Kunda, *The Case for Motivated Reasoning*, 108(3) *Psychological Bulletin*, 480 (1990); Avanti Sood, *Motivated Cognition in Legal Judgments – An Analytic Review*, 9 *Annu. Rev. Law Soc. Sci.* 307 (2013).

are evaluating evidence presented by experts, they will more readily recall instances of experts taking the position that is consistent with their cultural predisposition.¹⁷ In the case of jury decision-making, this means that jurors are more likely to rely on evidence given by an expert whose evidence and opinions accord with their pre-existing views or their pre-existing impression of whether a defendant is innocent or guilty. In a system where partisan experts are employed, it is easy for a juror to agree with the expert who provides an interpretation that supports their existing viewpoint.

Conventional wisdom may suggest that the best way to counter motivated cognition in interpretation of scientific evidence would be to select jurors with a high degree of science and technical reasoning capacity. However, psychological research suggests the opposite. Research has shown that laypeople with the highest degrees of science literacy and technical reasoning capacity are the most polarized when reaching conclusions based on scientific evidence.¹⁸ So, in the area of global warming, when asked “how much risk do you believe climate change poses to human health, safety, or prosperity?” as individuals with hierarchical individualist ideas got more science numerate, their perception of the risk decreased, but as individuals with egalitarian communitarian ideas got more science literate, their perception of the risk increased.¹⁹ This is likely to be because individuals seek out and credit information supportive of

¹⁷ Dan Kahan, Hank Jenkins-Smith, & Donald Braman, *Cultural Cognition of Scientific Consensus*, *Journal of Risk Research*, 1 (2010).

¹⁸ Dan Kahan, Ellen Peters, Maggie Wittlin, Paul Slovic, Lisa Larrimore Ouellette, Donald Braman, & Gregory Mandel, *The Polarizing Impact of Scientific Literacy and Numeracy on Perceived Climate Change Risks*, 2(10) *Nature Climate Change*, 732 (2012).

¹⁹ *Id.*

their values, and individuals who are more science literate are more likely to be able to do this effectively, and confirm their pre-existing viewpoint.²⁰

Applying this to juror analysis of scientific evidence, we would expect jurors who are more science literate to be more polarized in their interpretation of evidence based on their pre-existing views in a case. One way this may be important in legal cases is when looking at jurors' pre-existing political beliefs. Individuals with conservative views are traditionally more punitive and more likely to convict a defendant.²¹ Therefore, we would expect that as jurors with conservative views became more science literate they would interpret scientific evidence to point more towards defendant guilt, and as jurors with more liberal views became more science literate they would interpret scientific evidence to point more towards defendant innocence.

II. Study Design and Hypotheses

A. Design

This study examined the relationship between juror political predispositions and juror education (measured by number of years in school), and perceptions of scientific evidence and final verdicts in a legal case. The Cornell University Institutional Review Board approved all materials.

²⁰ *Id.*

²¹ Anna King & Shadd Maruna, *Is a Conservative Just a Liberal Who Has Been Mugged? Exploring the Origins of Punitive Views*, 11(2) *Punishment & Society* 147 (2009).

Participants were 91 subjects recruited from Amazon Mechanical Turk (44% female) with an average age of 32.38 ($SD=10.40$). The majority of our sample (56%) was of non-Hispanic White descent. The largest religious affiliation was non-religious (29.7%).

All participants received a case summary based on one used by Kaye et al. (2007).²² All case summaries involved the same evidence, focusing on mitochondrial DNA evidence potentially linking a defendant to the crime. We recorded participants' verdict in the case, and also asked questions about their perceptions of the scientific evidence in the case, particularly their perceptions of the credibility of the prosecution expert (these ratings were given on a scale from 1 (low credibility) to 10 (high credibility)), and the strength of the prosecution case (which was based on DNA analysis) (these ratings were given on a scale from 1 (very weak) to 10 (very strong)).

Participants were also asked standard demographics questions including how much education they had completed (from high school to post-graduate work) and their political affiliation (Conservative, Moderate or Liberal).

B. Hypothesis

The rationale for the design of the study was to apply findings on motivated cognition in the psychological literature to juror interpretation of scientific evidence in a legal case. Specifically, the goal was to test two hypotheses:

²² *Supra* note 12.

1. As participants classified as Conservative become more educated, they will be more likely to find the defendant guilty and will be more convinced by the prosecution case and expert testimony. This is because literature shows that individuals with conservative viewpoints have a predisposition towards conviction. Conservatives with a greater level of education will be able to seek out and use evidence in accordance with this predisposition more effectively and will therefore find the defendant guilty more often.
2. As participants classified as Liberal become more educated, they will be less likely to find the defendant guilty and will be less convinced by the prosecution case and expert testimony. This is because literature shows that individuals with liberal viewpoints have a predisposition towards acquittal. Liberals with a greater level of education will be able to seek out and use evidence in accordance with this predisposition more effectively and will therefore find the defendant guilty less often.

III. Results

We split our sample into Liberals, Conservatives and Moderates. Participants were classified as Liberal if they identified as very liberal or somewhat liberal; Conservative if they identified as very conservative or somewhat conservative; and Moderate if they identified as moderate, moderate leaning towards liberal or moderate leaning towards conservative. This resulted in 42 of our participants being classified as Liberal, 26 of our participants being classified as Conservative, and 24 of our

participants being classified as Moderate. We then ran correlations within each of these groups to examine the relationship between level of education, perceptions of the prosecution scientific evidence, and final verdict.

A. The Relationship Between Political Predisposition, Level of Education, and Final Verdict

In the Liberal participants, there was a significant correlation between final verdict and education level, such that participants who had completed more education were more likely to find the defendant not guilty ($r = -0.369$, $p = 0.016$). For Conservative participants, there was no significant correlation between final verdict and years of school completed, but there was a trend suggesting that those with more education were more likely to find the defendant guilty ($r = 0.330$, $p = 0.108$). The correlations between final verdict and education level for Liberals and Conservatives can be seen in Figure 1. For Moderate participants, there was no relationship between years of school completed and likelihood of finding the defendant guilty ($r = 0.107$, $p = 0.620$).

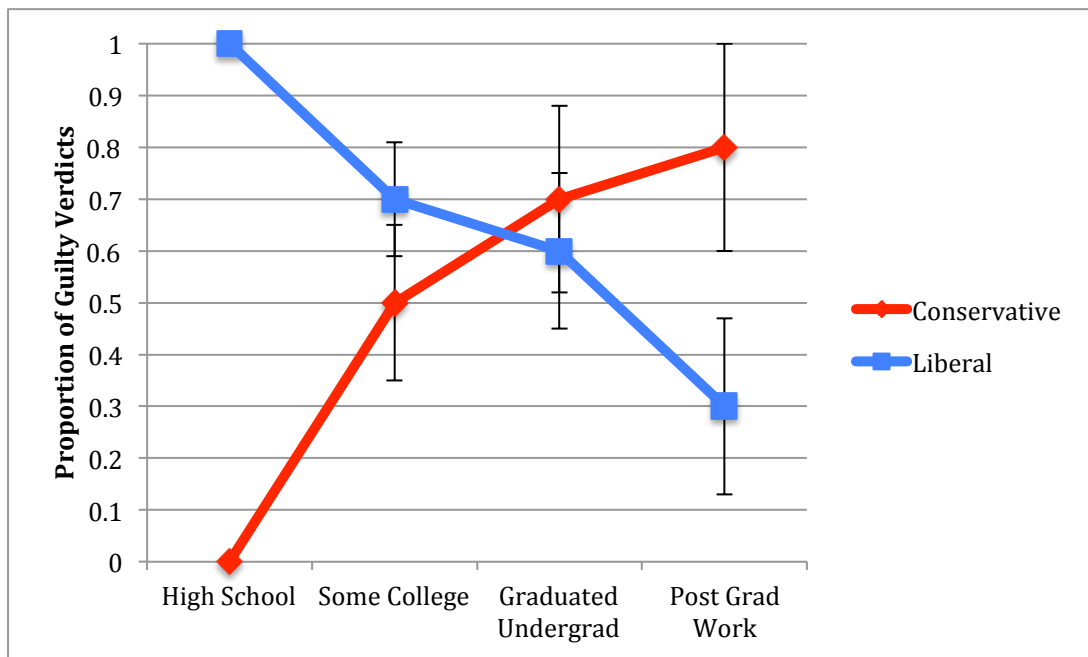


Figure 1: Correlations between proportion of guilty verdicts and level of education in Liberals and Conservatives. Error bars represent +/- 1 standard error.

B. The Relationship Between Political Predisposition, Level of Education, and Evaluation of Scientific Evidence

For the Liberal participants, there were significant correlations between education level and perception of the prosecution case. Those who had completed more education viewed the prosecution expert as less credible ($r=-0.346$, $p=0.025$) and the prosecutions case as weaker ($r=-0.525$, $p<0.001$). For Conservative participants, there was a significant correlation between education level and perception of the prosecution expert. Participants who had completed more education viewed the prosecution expert as more credible ($r=0.452$, $p=0.023$). The correlations between perception of prosecution expert credibility and education level can be seen in Figure 2. In Conservative participants there was also a correlation between education level and perception of prosecution case strength, which was marginally significant.

Participants who had completed more education viewed the prosecution case as stronger ($r=0.378$, $p=0.062$). For the moderate participants there was no relationship between education level and perception of the prosecution case.

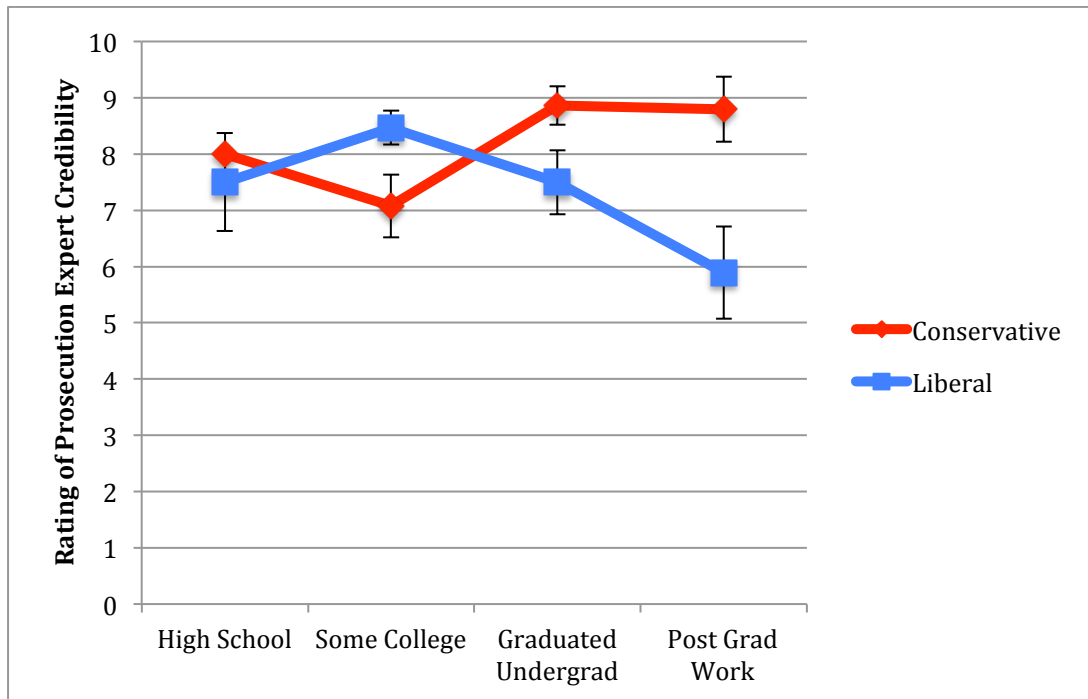


Figure 2: Correlations between perception of credibility of the prosecution expert and level of education in Liberals and Conservatives. Error bars represent +/- 1 standard error.

IV. Discussion

The aim of this study was to test how jurors analyze and digest scientific evidence, such as DNA. In accordance with our predictions, our results show that jurors with a higher level of scientific literacy (measured by years of education) appear to be more influenced by pre-existing viewpoints than jurors with a lower level of scientific literacy. Specifically, as Conservative jurors become more educated they are more

likely to find the prosecution expert to be credible, and more likely to find the defendant guilty. As Liberal jurors become more educated they are less likely to find the prosecution expert to be credible, less likely to find the prosecutions case to be strong, and less likely to convict the defendant. For Moderate jurors (with less strong existing viewpoints), there appears to be no relationship between education level and either perceived credibility of experts or verdict.

These findings are in accordance with our predictions and findings in the broader psychological literature on the effect of scientific literacy on opinions about politically polarizing issues, where individuals with higher levels of scientific literacy have been found to be more polarized on political issues.²³ This is likely to be because more educated individuals are better at taking given information and using it to support their pre-existing beliefs or convictions.

These findings can inform innovations in jury trials involving scientific evidence in several ways. Firstly, attorneys should be aware of potential biases in jurors, and particularly in jurors who have strong preexisting attitudes and are highly educated or science literate. Attorneys can use this information during voir dire where peremptory challenges and challenges for cause can both be used to prevent biased jurors from sitting on a jury.²⁴ Secondly, understanding that jurors interpreting scientific evidence, especially those who are science literate, are likely to interpret

²³ Dan Kahan, Ellen Peters, Maggie Wittlin, Paul Slovic, Lisa Larrimore Ouellette, Donald Braman, & Gregory Mandel, *The Polarizing Impact of Scientific Literacy and Numeracy on Perceived Climate Change Risks*, 2(10) *Nature Climate Change*, 732 (2012).

²⁴ Valerie Hans & Alayna Jehle, *Avoid Bald Men and People with Green Socks – Other Ways to Improve the Voir Dire Process in Jury Selection*, 78 *Chi.-Kent. L.Rev.* 1179 (2003).

scientific evidence to support pre-existing attitudes, can help inform innovations to reduce the role of motivated cognition in the legal system. In the current system, trials are increasingly complex and multiple expert witnesses often appear presenting conflicting information.²⁵ These experts are usually partisan and compensated by one of the parties, creating a system where jurors must often pick which expert to believe. This creates a system where it is easy for jurors to rely on the expert that most supports the view that they are predisposed to agree with and fosters motivated cognition and poor juror decision making. One solution may be to select only moderate jurors who do not appear to be influenced by pre-existing political attitudes regardless of education level, however this is unlikely to be realistic.

One more realistic solution may be to use court appointed experts in complex cases. Here jurors would only be presented with evidence from one expert, leaving less scope to interpret scientific evidence in different ways. This would also solve problems currently caused by inadequate funding for investigative and expert services for indigent defendants.²⁶

V. Conclusion

Ultimately, scientific evidence is often difficult for jurors to understand, and this is exacerbated by the current system where partisan experts present conflicting

²⁵ Jennifer Mnookin, *Expert Evidence, Partisanship, and Epistemic Competence*, 73 Brook. L. Rev. 1009 (2007-2008)

²⁶ See John Blume and Sheri Johnson, *Gideon Exceptionalism?*, 122 Yale L.J. 2126 (2013).

interpretations of the evidence. The results presented in this paper suggest that this uncertainty can lead jurors, especially those with high levels of education, to agree with evidence and interpretations that fit with their preexisting attitudes and beliefs, rather than the weight of scientific evidence. This may be why jurors are finding defendants guilty based on invalid testimony by forensic analysts.²⁷ Future work should investigate ways to combat this motivated cognition in jurors, with court appointed experts being one possible solution.

²⁷ See Brandon Garrett & Peter Neufeld, *Invalid Forensic Science Testimony and Wrongful Convictions*, 95 Va. L. R. 1 (2009).