

STUDY OF JURIES AND EXPERT EVIDENCE

- Survey and interview jurors in 60 Supreme and District Court criminal trials about perceptions and comprehension of expert evidence
- Invite judge, counsel and experts to be interviewed
- First in-depth analysis of expert evidence in jury trials in Australia
- Approval from Attorneys-General, Chief Justices of Supreme Courts, Chief Judges of District Courts
- Funded by ARC, results to be published by AIJA

MURDER, MANSLAUGHTER SEXUAL ASSAULT, FRAUD

Sydney, Brisbane, Melbourne Mar-Nov

Jury trials in which expert testimony will be presented

- Psychologists, psychiatrists, therapists
- Medical practitioners, e.g., physicians
- Natural and physical scientists: earth scientists, biologists, chemists, physicists
- DNA and other forensic experts
- Pathologists
- Child development experts
- Accountants, actuaries, financial experts

How to participate?

Contact:

Dr Jacqueline Horan (for the project team)

Senior Lecturer and Member of the Victorian Bar (Academic)

Melbourne Law School

The University of Melbourne

P: (03) 83441022

Email: j.horan@unimelb.edu.au

Chief Investigators:

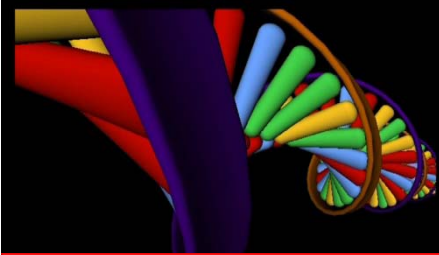
Dr Ian Freckelton

Dr Jane Goodman-Delahunty

Dr Jacqueline Horan

Dr Mark Israel

Dr Blake McKimmie



DNA, JURY TRIALS AND THE WHITE COAT EFFECT



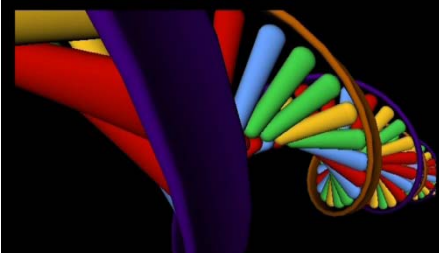
Professor Jane Goodman-Delahunty

Australian Graduate School of Policing

& School of Psychology

Charles Sturt University

Email: jdelahunty@csu.edu.au



OVERVIEW

- TV portrayals of forensic science
- Mechanisms of CSI effects
- Jury expectations in criminal trials
- Trends in recent Australian cases
- Juror difficulties with DNA evidence
- What Australians know about DNA evidence
- Can experts enhance jurors' DNA knowledge?
- Can visual aids increase juror learning from experts?
- Effects of CSI and an expert tutorial on the “white coat syndrome” and jury verdicts
- Implications for practice and legal reform



FORENSIC SCIENCE IN TV SHOWS

- 84 million viewers in 2007
- Forensic science prominence:
 - one forensic test per episode
- Unrealistic speed and accuracy
 - “too sexy, too fast and too clean” (Stephens 2007)
- Jurors “overawed by the scientific garb in which the evidence is presented and attach greater weight to it than it is capable of bearing” (R v Duke 1979)
- If perceived as irrefutable, can result in wrongful convictions, miscarriages of justice



MECHANISMS OF CSI EFFECTS

- Juries more knowledgeable about forensic scientific evidence such as DNA
- More motivated and attentive jurors
- Identify with investigators, victim-focused
- Presence of forensic scientific evidence predicts verdicts:
 - FSE absent → jury acquits
= anti-prosecution bias
 - FSE present → jury convicts
= pro-prosecution bias

Goodman-Delahunty & Tait 2006



PAST STUDIES OF CSI EFFECTS

“Tech” effect

Expect more scientific evidence in criminal cases (Shelton Kim & Barak 2007)

Educative effect

Better-informed about concepts of proof than non-viewers (Podlas 2006)

More sceptical of forensic evidence (Schweitzer & Saks 2007)

No verdict effect

CSI viewing had no significant impact on conviction rates (Cole & Dioso-Villa 2009; Tyler 2006)



TRENDS IN AUSTRALIAN CASES

- Science of DNA evidence no longer controversial
- More pressure on Crown to introduce DNA evidence
- Overload DNA lab scientists, back-logged sample testing
- Rare that DNA is the only circumstantial evidence linking defendant to a crime, but increasingly use in high volume crimes
- Convictions 23 times higher with DNA evidence Briody 2001
- Concern about jury views of DNA evidence
- Uncertainty how to address jury perceptions of DNA evidence



ADMISSIBLE DNA EVIDENCE

Link to crime scene

- Evidence of the finding of a crime scene stain or trace
- Evidence DNA was extracted from it

DNA profiling

- Evidence that DNA was tested
- Comparison of the DNA profile from the crime scene stain with DNA profile from the accused
- Expert opinion that profiles match and the extent of the match.

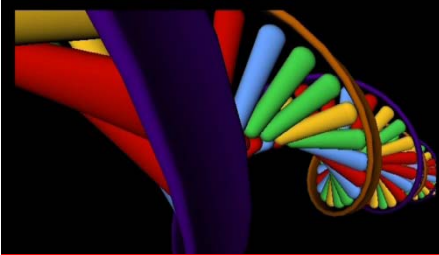
Random match probability

- Expert opinion based on statistics and population genetics as to the likelihood that some person other than the accused has the same profile as that in the crime scene stain.



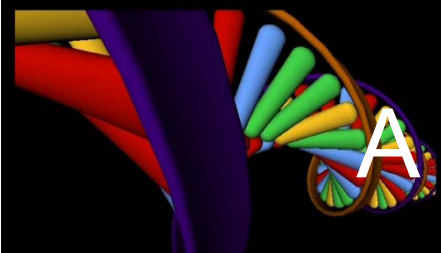
PROBABILISTIC LANGUAGE

- Experience with mathematical concepts:
 - Some jurors believe chance always means 50-50?
- Framing of statistics as percentages vs frequencies:
 - 0.001% chance vs one in a thousand
 - 0.01% chance in small population such as Australia
- Percentages more persuasive than frequencies:
 - Easier to imagine percentages, seem more probable
 - more compelling as they approach zero
 - Frequencies allow for other alternatives
- Describe relative rarity of DNA profile match as “weak”
“strong” “very strong” or “extremely strong”



THE DANGERS

- **Conflate match statistics with proof of guilt:**
 - Transpose statistics on match probability as the probability the accused left the crime scene stain
 - statistics expressed in percentages close to 100%
- **Overestimate power of DNA match:**
 - DNA from the accused vs match by chance?
 - Match probability expressed as 1 to one billion+
 - Some experts avoid figures above 1 in 10 billion (estimated population of earth)
 - Murdoch (NT): “150 quadrilliion time more likely”
- “Prosecution” and “defence” fallacies



A “WHITE COAT” EFFECT?

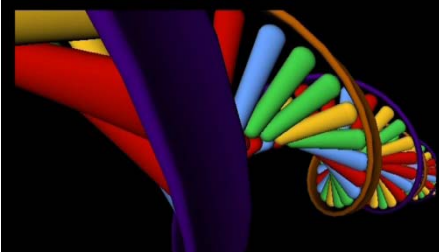


Toshikazu Sugaya, 62, after release from a life sentence based on 1991 DNA tests

“Having lay judges participate in the criminal trial to weigh the evidence and reach a verdict should lead to **fewer miscarriages of justice**”

“I can't say firmly that lay judges could have prevented Sugaya's conviction, because forensic evidence and a confession were submitted, and there is **no proof the lay judges would not have been swayed into believing them**”

Makoto Miyazaki, President
Japan Federation of Bar Associations



AUSTRALIAN CASES

Farah Jama (VIC) sentenced to 6 years in prison. Served 16 months, sentence overturned because of DNA contamination. DNA evidence was the only circumstantial evidence linking the accused to the crime scene. Statewide review of DNA evidence conducted in 2010.

Frank Button (QLD) sentenced to 7 years in prison. Released in 2002 after 10 months when independent DNA testing exonerated him and pointed to someone else in the community as the perpetrator.

Marc Renton (QLD) sentenced to 14 years in prison. Evidence controverted by re-analysis of original sample 18 months after conviction. Case not reopened.

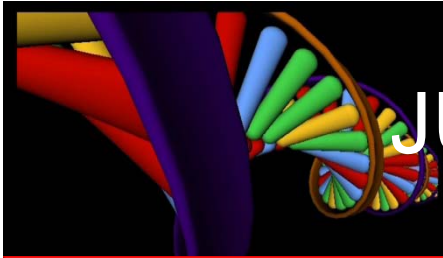
Benjamin Forbes (ACT) sentenced to 12 years in prison. Convicted on the basis of a DNA match with no other corroborating evidence. Appeal denied by High Court in 2010 on grounds that the jury found him guilty beyond a reasonable doubt.



PROPER USE OF STATISTICAL EVIDENCE

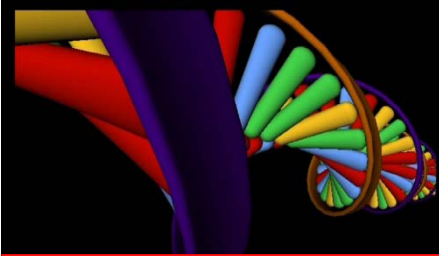
- Statistical evidence on the significance of the DNA match is **not evidence** of the probability **that the accused is the source** of the incriminating DNA.
- Statistical evidence interpreting the DNA match is expert evidence that the **jury may use** in deciding whether it is satisfied beyond reasonable doubt that the accused is the source of the incriminating DNA.
- Statistical evidence is undeniably strong evidence pointing to a conclusion that the accused was the source of the incriminating DNA, but is **not direct evidence** of that fact. It must be considered in the light of other evidence in the case.

Doyle CJ in *R v Karger* (2001) 83 SASR 135



JUROR DIFFICULTY IN DNA CASES

- **Overconfidence in science – a “white coat effect”:**
 - Beliefs influence assessment (Schklar & Diamond 1999)
 - Overestimate importance (Wheate 2007)
 - Jurors who admit difficulty convict (Findlay 2008)
- **Interventions to reduce juror error:**
 - Explain probability application (Faigman & Baglioni 1988)
 - Judicial directions (Dartnall & Goodman-Delahunty 2006)
 - Note-taking, question experts, checklist, glossary, deliberation (Dann Hans & Kaye 2007)
 - Consensus of parties facilitated understanding (Findlay & Grix 2003)

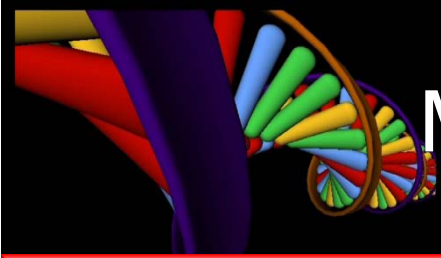


TRIAL INNOVATIONS

A jury tutorial on DNA profiling?

- Pre-trial tutorial to familiarise jury with technical language and probabilities (Myers Reinstein & Griller 1999)
- A prepared tutorial on DNA profiling (Young 2000)
- High pre-trial familiarity with DNA reduced juror doubt about the strength of the prosecution case (Findlay 2008).
- Tutorials at the start of a complex trial may extend benefits of formal education, math and science familiarity enjoyed by some jurors (Hans et al., 2011)

But, the courtroom is primarily an oral environment ...



MULTIMEDIA AND LEARNING

Few people learn best from oral material (Felder & Soloman 1993)

Cognitive overload (Sweller & Chandler 1994)

Multimedia (words + pictures) exploit dual coding channels

Mixed research outcomes, in and out of court:

Multimedia enhance learning (Mayer 2001)

No facilitative effect of illustrations (Sweller 1990)

Facilitative and persuasive effects (Kassin & Dunn 1990)

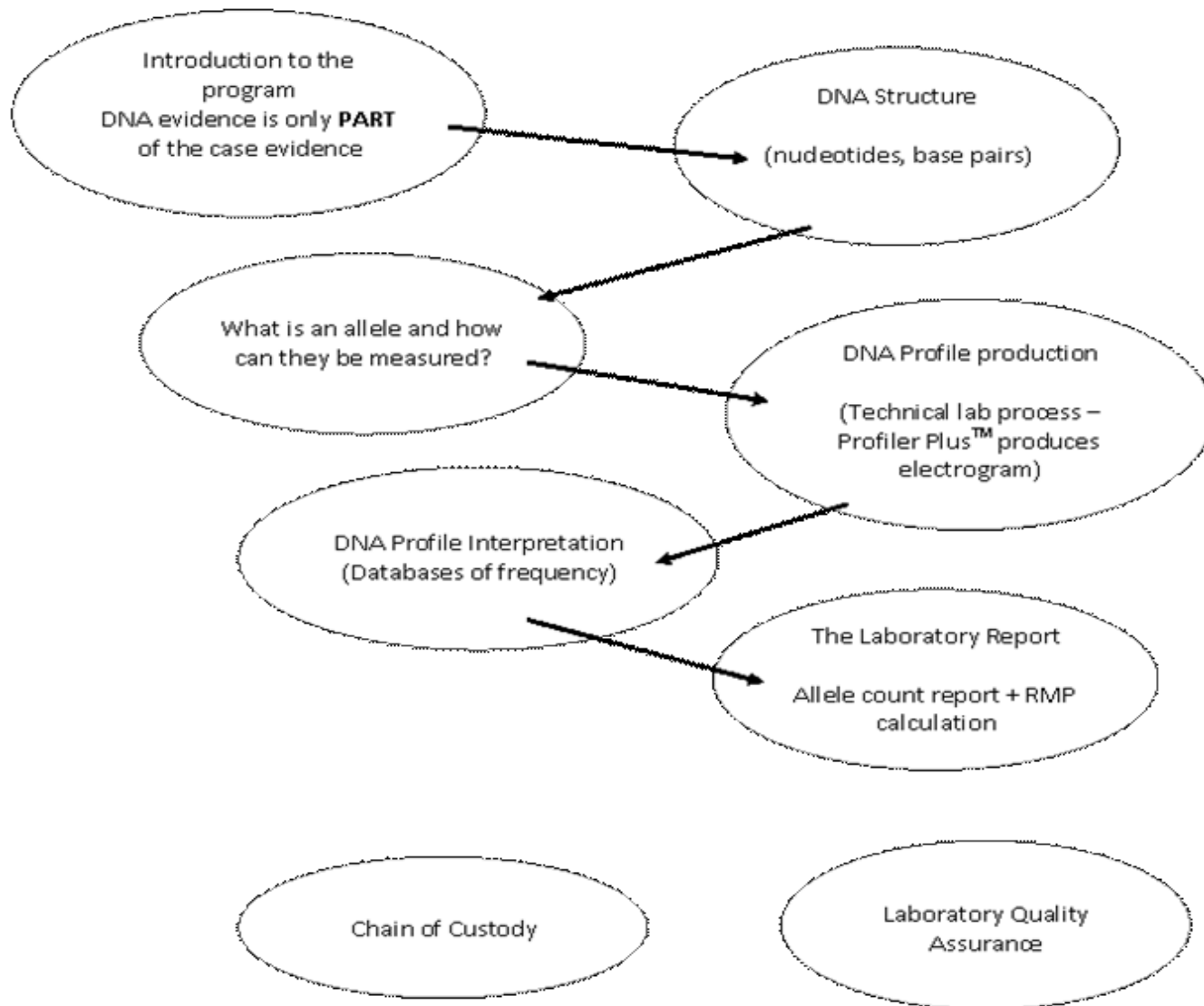


DNA PROFILING TUTORIAL

- Synchronised images, animation and audio
- Cognitively sequenced structure
- Structure of Observed Learning Outcomes (SOLO) 4 levels of understanding [\(Biggs & Collis 1982\)](#)
- Three-dimensional modelling of DNA structure
clear labels, a narrative explanation of mathematical concepts and calculations
- Consulted forensic scientists and legal counsel for realism and accuracy



CONTENT OF DNA TUTORIAL





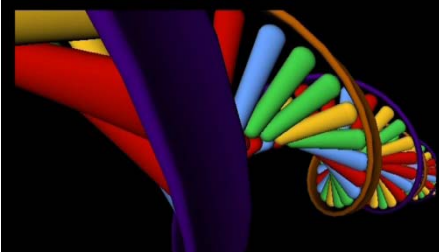
CONTENT OF RMP TUTORIAL

The laboratory
report

Allele count
tables + RMP
calculation

What is
probability?

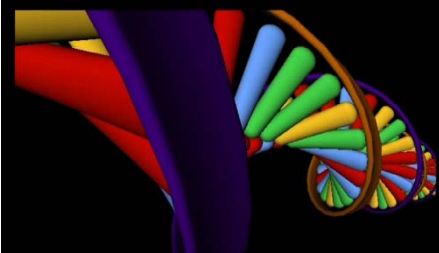
Concrete
examples from
everyday life



HYPOTHESES - 1

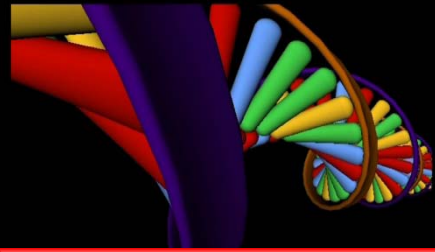
More frequent CSI exposure:

- positively correlated with high expectations of forensic scientific evidence, higher pre-trial DNA knowledge, not verdicts
- presence of forensic scientific evidence is positively correlated with pro-prosecution biases:
 - more learning from FSE for prosecution
 - victim sympathy
 - perception of FSE as stronger



HYPOTHESES - 2

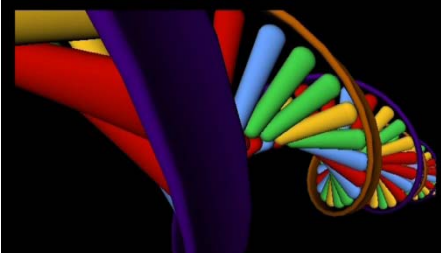
- DNA evidence increases convictions
- As DNA knowledge increases, trust in DNA evidence will decline
- As DNA knowledge increases, convictions will decrease
- Mock-jurors will learn more from a multimedia than an oral expert tutorial



STUDY DESIGN

Between-subjects factorial design

	Oral		Partial-oral	Multimedia
EXPERT EVIDENCE	No expert, DNA tests inconclusive	Profiling and RMP tutorials	Multimedia profiling Oral RMP tutorials	Profiling and RMP tutorials

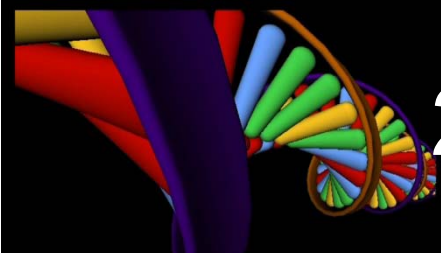


SIMULATED TRIAL

- **Audiotaped circumstantial homicide** (4900 words)

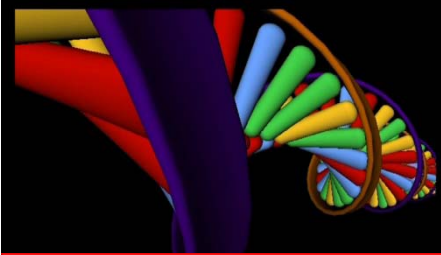


- 35 mins: Opening statements, summary testimony of 8 witnesses, direct and cross-exam of DNA expert, closing arguments, jury directions on the law
- Prosecutor leads forensic DNA expert
- 18-min DNA tutorial (oral/multimedia) (3019 words)
- Control group = inconclusive DNA tests, no expert



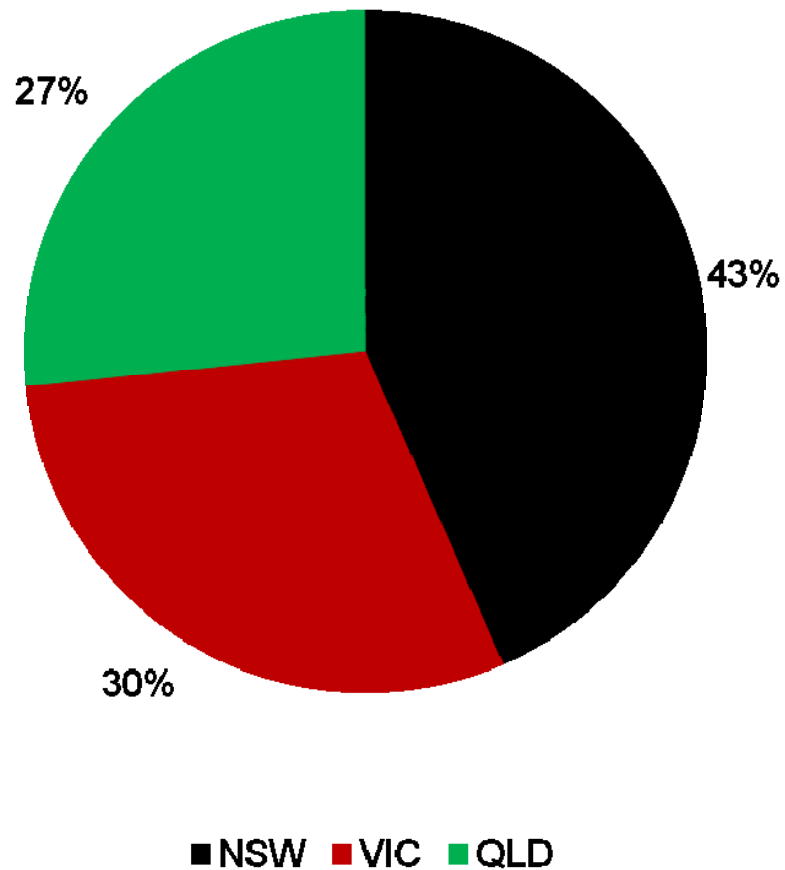
2-STAGE PROCEDURE

- Emailed 23,157 individuals within 60 km of metropolitan courts in Sydney, Melbourne and Brisbane; jury eligibility age 18+, citizenship
- 25% (6637) opened mail; 74% accessed link
- 70% completed pre-trial questions (N=3611)
- 7-10 days later invited to serve as virtual jurors in a 1-hour criminal trial online simulation
- Jury pools based on learning style (visual vs verbal), state, age (under/over 45 years), gender, randomly allocated to jury groups

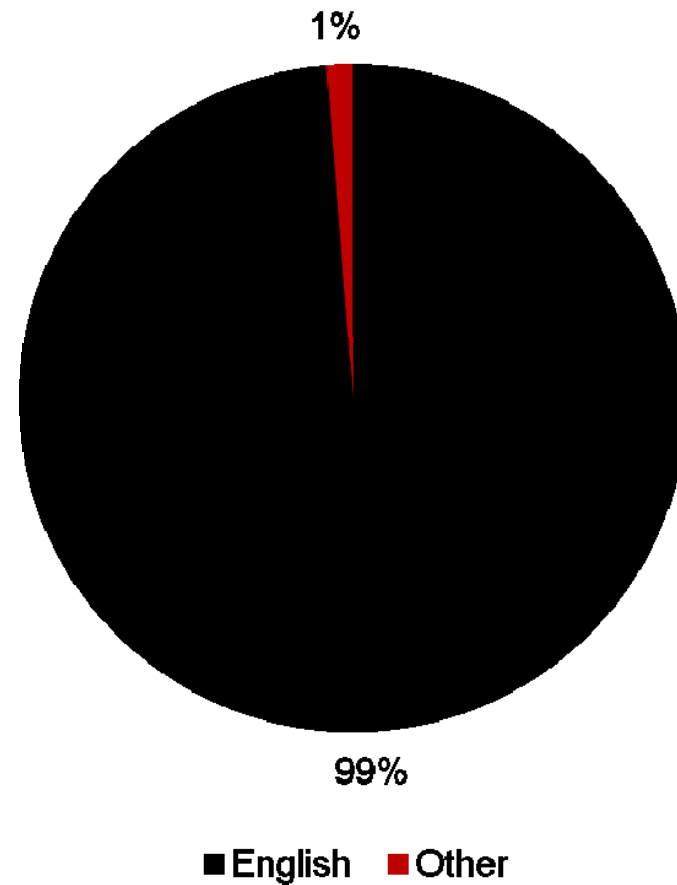


VIRTUAL JURORS

Participants by state



Native English speakers





DNA KNOWLEDGE QUESTIONS

Sample True/False questions:

A crime scene sample of DNA can contain traces of more than one individual: True/False

To determine whether two DNA samples match, forensic scientists analyse the entire DNA strand of all chromosomes: True/False

DNA samples that come from different individuals may match by chance: True/False

It is better to have too much DNA than too little since testing can then be repeated with less: True/False



DNA KNOWLEDGE QUESTIONS

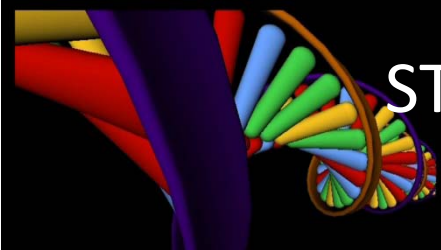
Sample multiple choice items:

In NSW the law requires the measurement and recording of _____ Short Tandem Repeat markers (including gender) for DNA comparisons.

- a. 9 b. **10** c. 11 d. 12

If the RMP of a DNA profile in a criminal case is 1 in 100,000 this means the probability that:

- a. the defendant is guilty is 1 in 100,000.
b. the defendant is innocent is 1 in 100,000.
c. the defendant is not the source is 1 in 100,000.
d. **any person chosen at random would match this profile is 1 in 100,000.**



STRUCTURE OF OBSERVED LEARNING OUTCOMES (SOLO) TAXONOMY

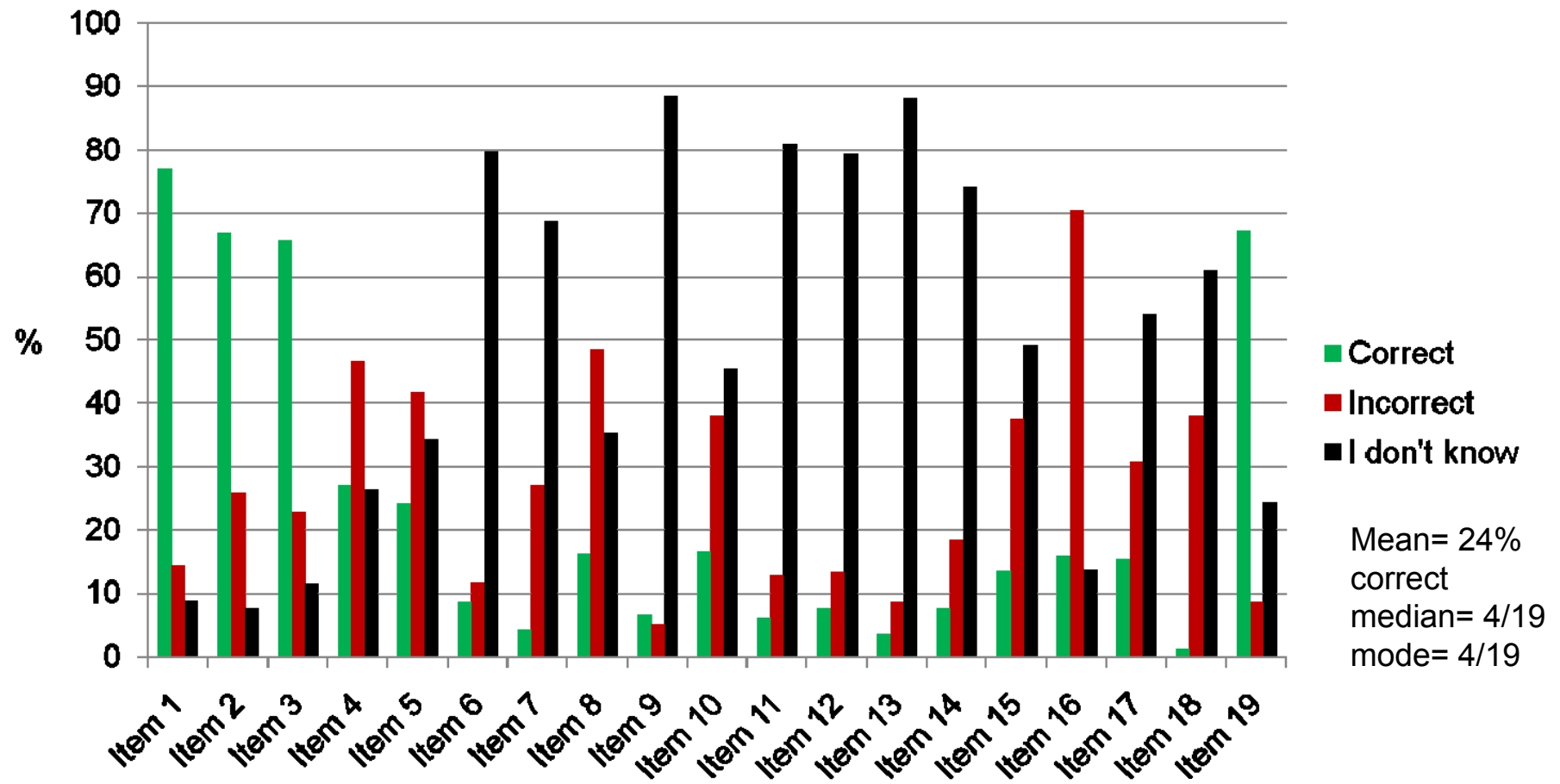
LEVEL OF UNDERSTANDING	DESCRIPTION
Prestructural	Unfamiliarity
Unistructural	Identify and perform simple procedures
Multistructural	Enumerate, describe, list, combine
Relational	Compare, contrast, analyse, relate, apply
Extended Abstract	Theorise, generalise, reflect

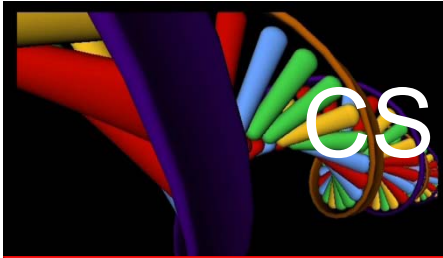
DNA knowledge test items by taxonomy					
LEVEL	LABEL	PRE-TRIAL	POST-TRIAL	DNA	RMP
1	Unistructural	5	10	9	1
2	Multistructural	7	9	9	0
3	Relational	5	8	4	4
4	Extended abstract	2	2	1	1



PRE-TRIAL DNA KNOWLEDGE

Responses to 19 DNA questions before trial





CSI EXPOSURE QUESTIONS

How often do you watch the following programs?

CSI; CSI: New York; CSI Miami

Law & Order; Law & Order: Criminal Intent

Law & Order: SVU

Criminal Minds; Bones; NCIS

Crime & Investigation Network

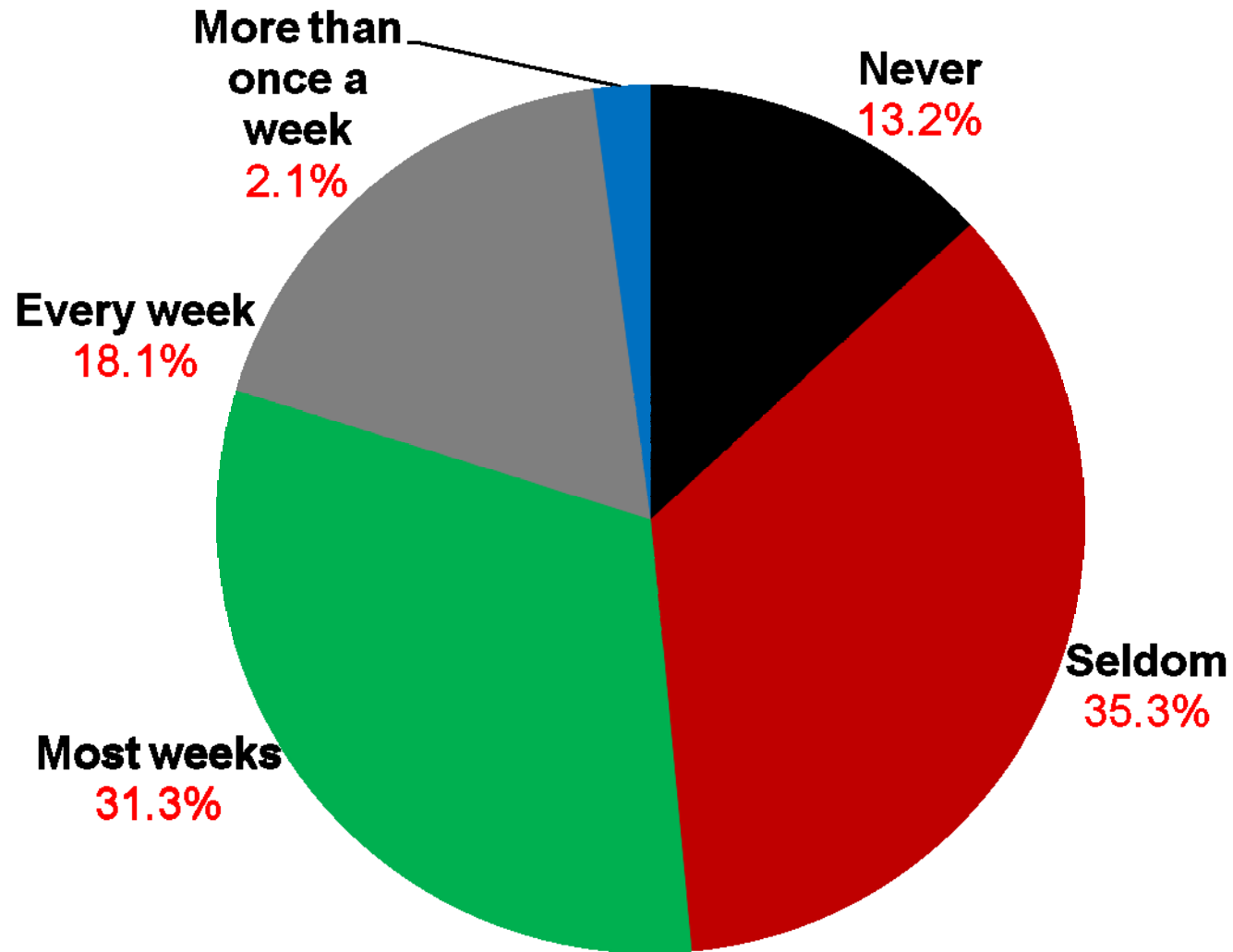
4 = more than once a week; 3 = every week;

2 = most weeks; 1 = not often; 0 = never (zero to 36)

How realistic are CSI programs?

7-point Likert scale: endpoints: not at all/extremely

CSI VIEWING HABITS OF MOCK-JURORS





EXPECTATIONS OF FORENSIC SCIENCE

Out of 10 criminal cases, in how many do you expect the following evidence?

Eyewitness

CCTV (closed circuit TV)

Forensic scientist

Psychologist

Fingerprints

DNA

Post-mortem report

How trustworthy is that evidence?

1=not at all trustworthy; 7=extremely trustworthy



CSI EXPOSURE AND PERCEPTIONS

- Overall, **strong expectations** in criminal trials for forensic experts 72%, fingerprint evidence 72%, DNA evidence 72%
- **Frequent CSI viewers anticipated significantly more forensic evidence than infrequent viewers**
- Overall, perceived CSI realism was moderate ($M = 4.4$; $SD = 1.3$)
- Pre-trial DNA knowledge poor (24% correct)
- **Jurors who perceived CSI as more realistic had less DNA knowledge**

Linear regression Std Beta = -0.18, $t = -3.10$, $p < .01$

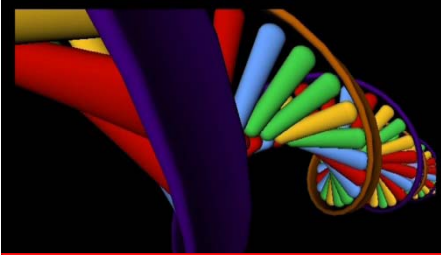


CSI VIEWING AND EXPECTATIONS

Correlations of frequency of CSI viewing and expectations of types of evidence

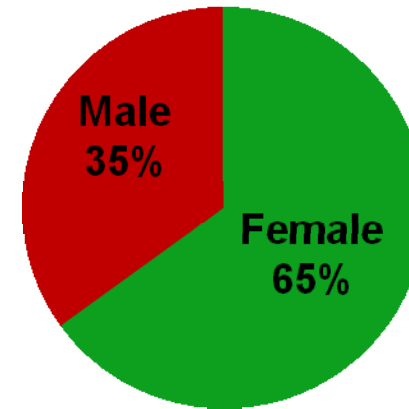
(Kendall's tau b, N=399, $p < 0.01$)**

	Eyewitness	Expert	CCTV	Psychologist	Fingerprint	Forensic scientist	Autopsy	DNA
EXPOSURE TO CSI SHOWS	0.02	0.09**	0.11**	0.15**	0.16**	0.17**	0.2**	0.2**

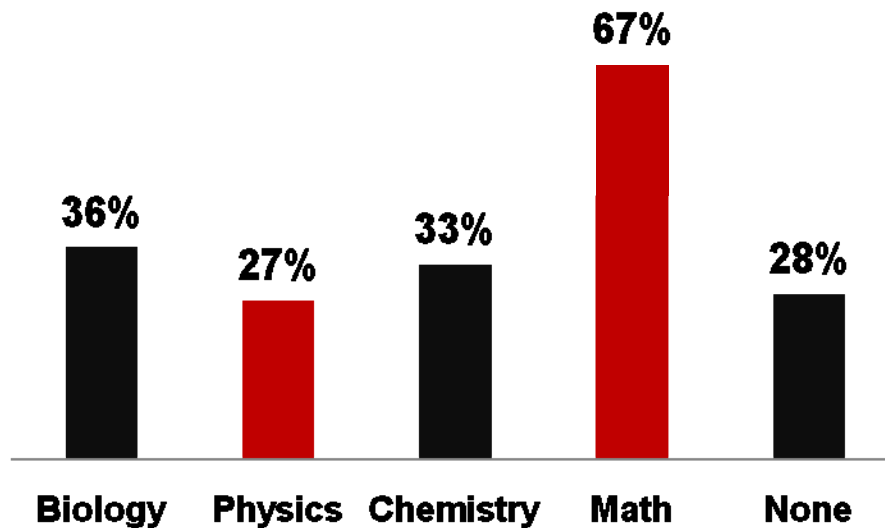


STAGE 2: VIRTUAL JURORS

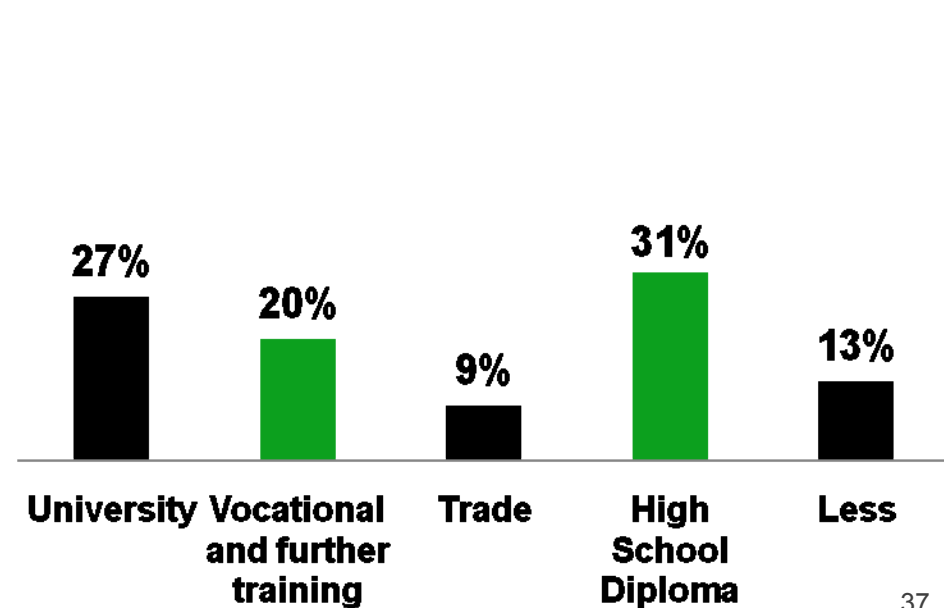
- 470 jury eligible citizens
- Mean age 47 years (18-78)



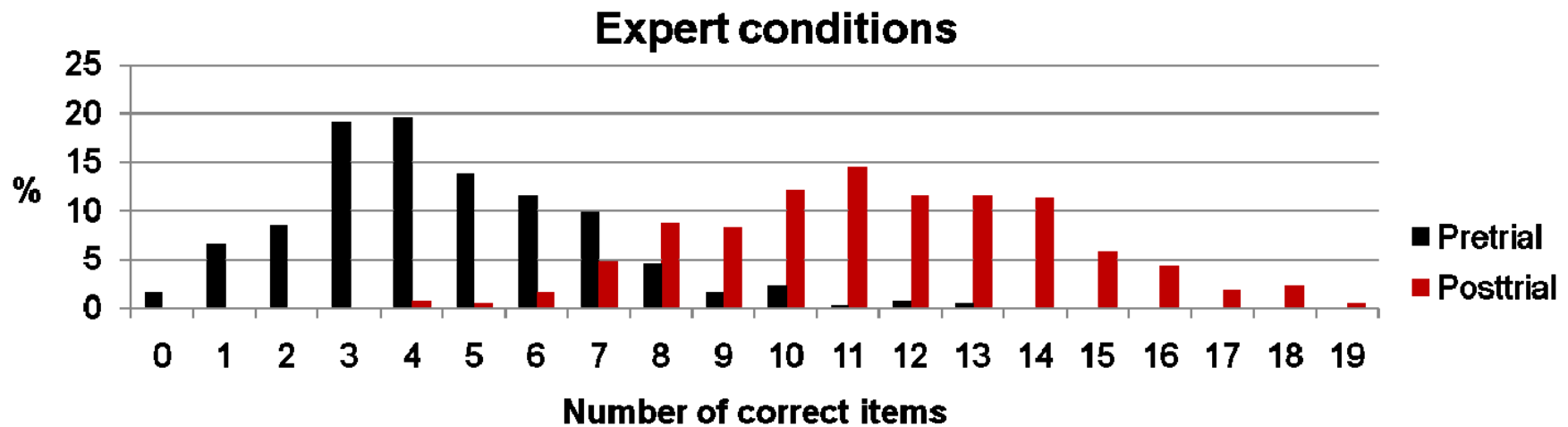
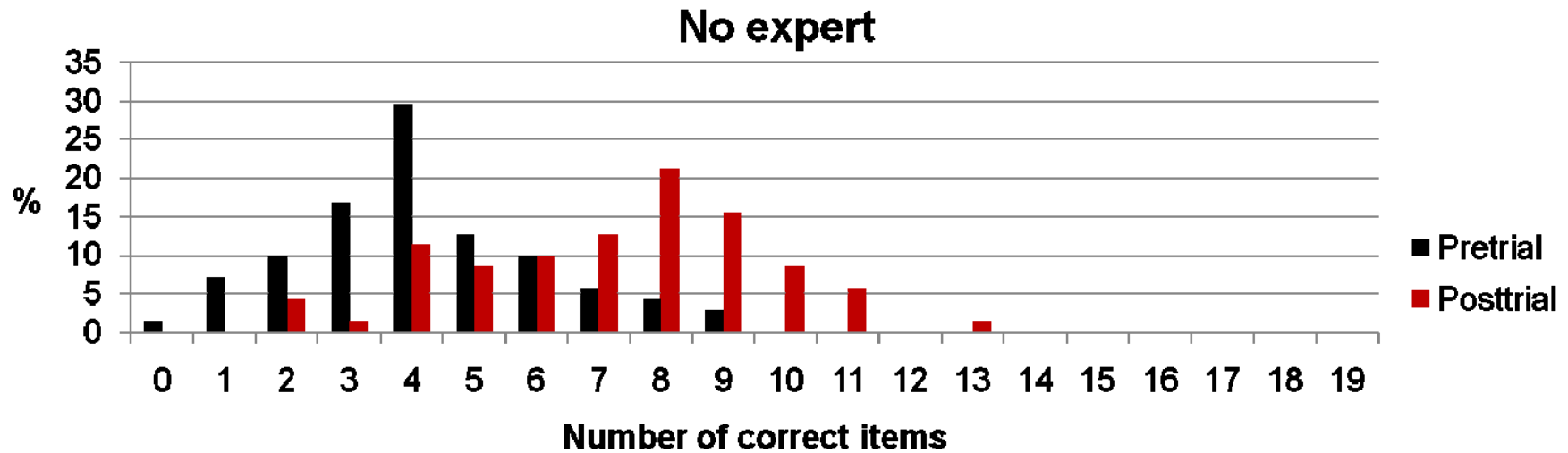
High school subjects

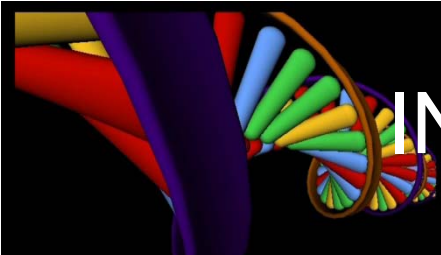


Highest level of education



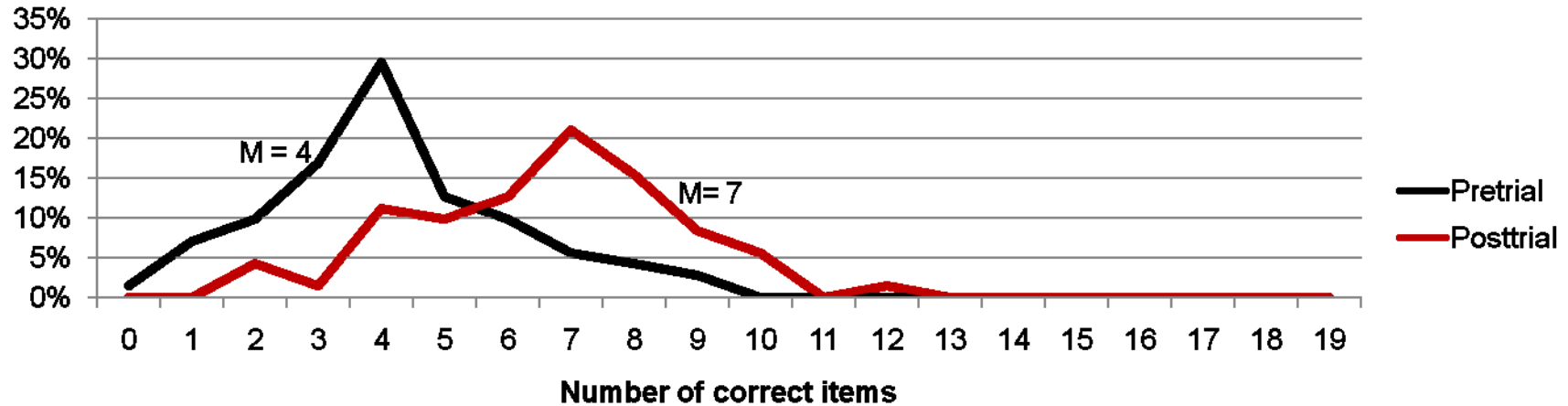
INFLUENCE OF EXPERT TUTORIAL



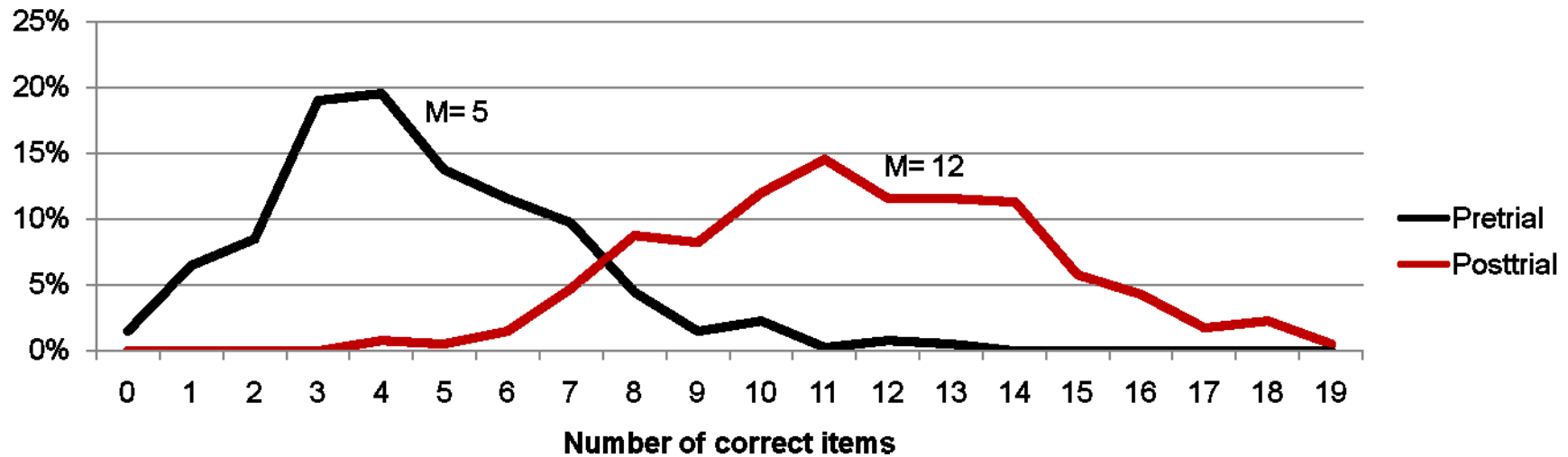


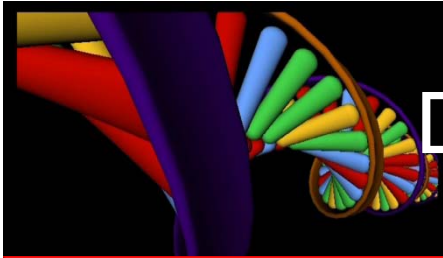
INFLUENCE OF EXPERT TUTORIAL

No expert



Expert conditions





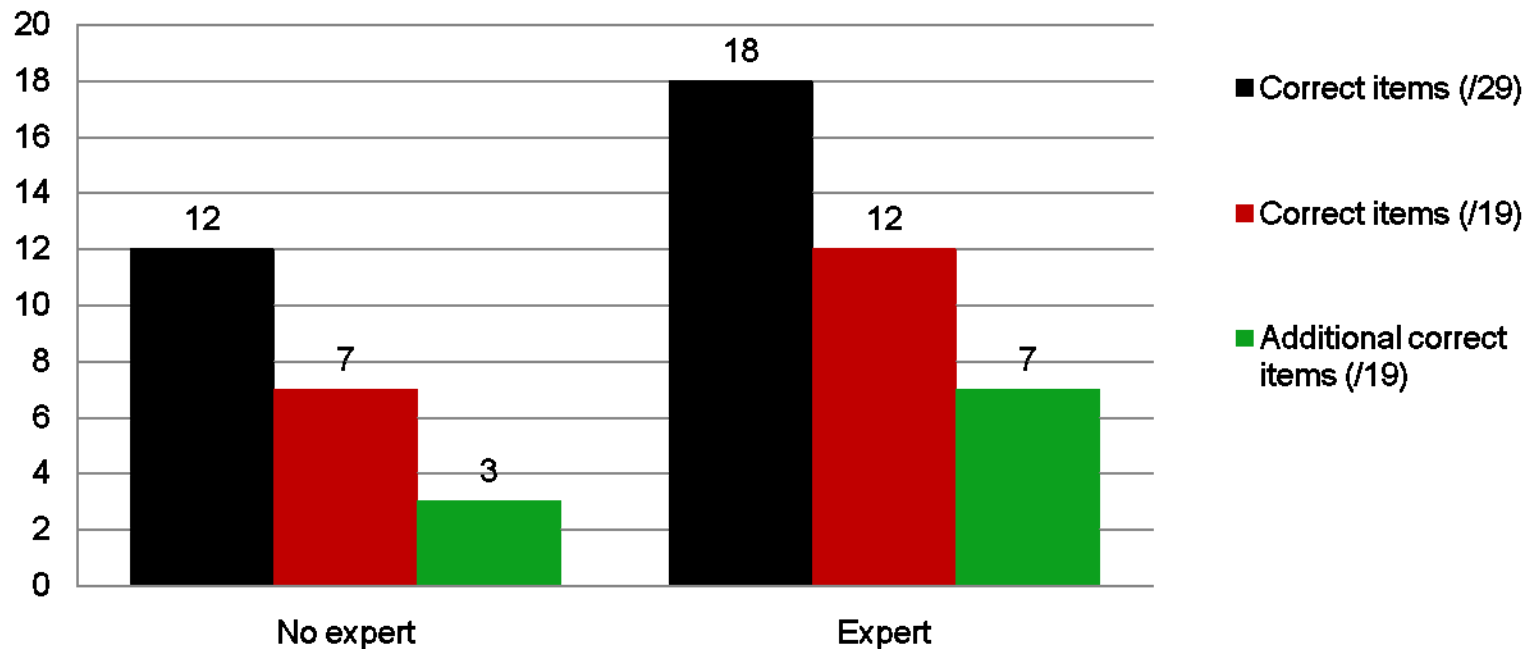
DNA KNOWLEDGE INCREASE

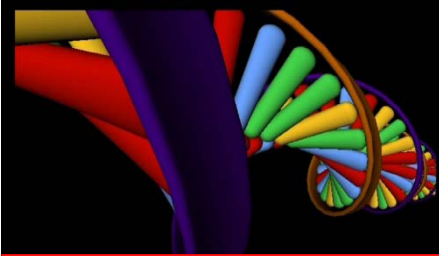
Posttrial 29 (19 + 10 new) multiple choice questions:

Mean= 59% correct (17/29)

→ average learning gain of 32% (6 more items correct)

Average posttrial knowledge and knowledge gain





EFFECT OF DNA EXPERT

Perceived culpability and verdict

Across all seven conditions:

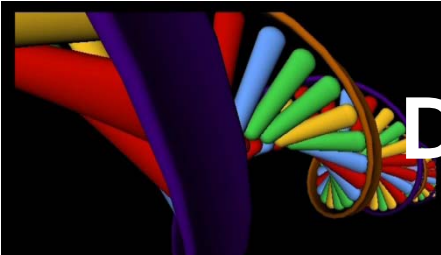
Average perceived culpability	80%
Average conviction rate	53%

Significant effect of DNA expert on convictions:

Conviction rate following DNA expert evidence:

No expert	23%
Expert	59%

DNA evidence powerful, appropriately presented,
nonetheless increased convictions in a very circumstantial
case with no direct evidence



DNA KNOWLEDGE AND VERDICT

Posttrial DNA Knowledge and Perceived Culpability (percent)

	Posttrial DNA Knowledge (number correct out of 29 items)			
	0-16	17-20	21-29	Total
Percent who:				
Found evidence convincing	52	49	44	48
Very/extremely confident of guilt	54	48	43	48
Guilt more than 90% likely	56	57	52	55
Voted to convict defendant	65	56	54	59
<i>Persons</i>	136	143	120	399



CSI EXPOSURE AND LEARNING

No differences in pre-trial DNA knowledge

More frequent CSI viewers had less formal education

(Nonpar Kendall's $\tau = -0.145$; $N=399$, $p<.01$);

few studied high school mathematics

(Kendall's $\tau = -0.102$; $N=399$, $p<.01$).

With education held constant, frequency of exposure to CSI predicted DNA learning, a negative relationship

(Linear regression: std Beta = -0.11 , $t = -2.26$, $N=399$; $p<.05$).

Frequent CSI viewers benefited less from the DNA expert tutorial and testimony



CSI AND TRUST IN SCIENCE

- Greater trust in scientific expert evidence:
forensic scientist, psychologist, fingerprints, DNA and
autopsy by frequent than infrequent CSI viewers
(Kendall's tau, $N=399$; $p < .05$)
- Viewers who **perceived CSI as more realistic achieved less learning**
(Std Beta = -0.16, $t = -2.67$, $p < .01$)
- Results held when education held constant.

**No evidence CSI exposure increased knowledge or
scepticism about forensic scientific evidence**



PROSECUTORIAL BIAS AND CSI

More frequent CSI viewers:

- More sympathetic to the crime victim ($\chi^2=4.04$, $df=1$, $p<.05$).
- More susceptible to inferential errors:
 - interpreted RMP as a 99.99% chance the defendant committed the crime

1 in 1 billion “from a random sample of 1 billion people, defendant is most likely to be the DNA source”

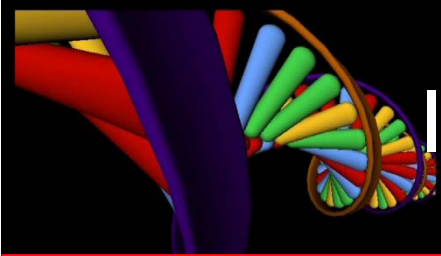
Some indications CSI viewing was associated with a pro-prosecution bias and the prosecution fallacy



CSI VIEWING AND VERDICT

Overall, mean conviction rate 59% in groups exposed to expert
CSI viewing was unrelated to verdict:

- Frequent viewers no more or less prone to convict than infrequent viewers
- Conviction rate highest in mock-jurors with the least post-trial DNA knowledge
($\chi^2=4.23$, $df=1$, $p<.05$) (65% vs 56%);
- Frequent CSI viewers **more confident in verdicts** (Kendall's $\tau=0.084$; $N=399$, $p<.05$);
- More **motivated to serve as jurors** in future ($\chi^2=18.50$, $df=1$, $p<.05$)



INFLUENCE OF EXPERT TUTORIAL

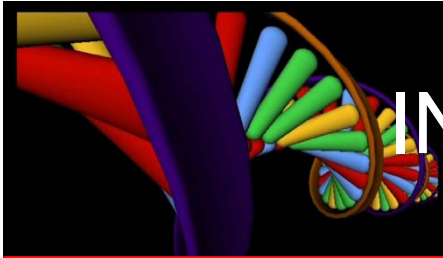
- Education predicted knowledge and learning
- Increased knowledge reduced the inculpatory force of DNA evidence
- Conviction rate highest in mock-jurors with the least post-trial DNA knowledge
- Trust in DNA declined after expert evidence
 - more critical of evidence
 - less blinded by science



ORAL VS MULTIMEDIA TUTORIALS

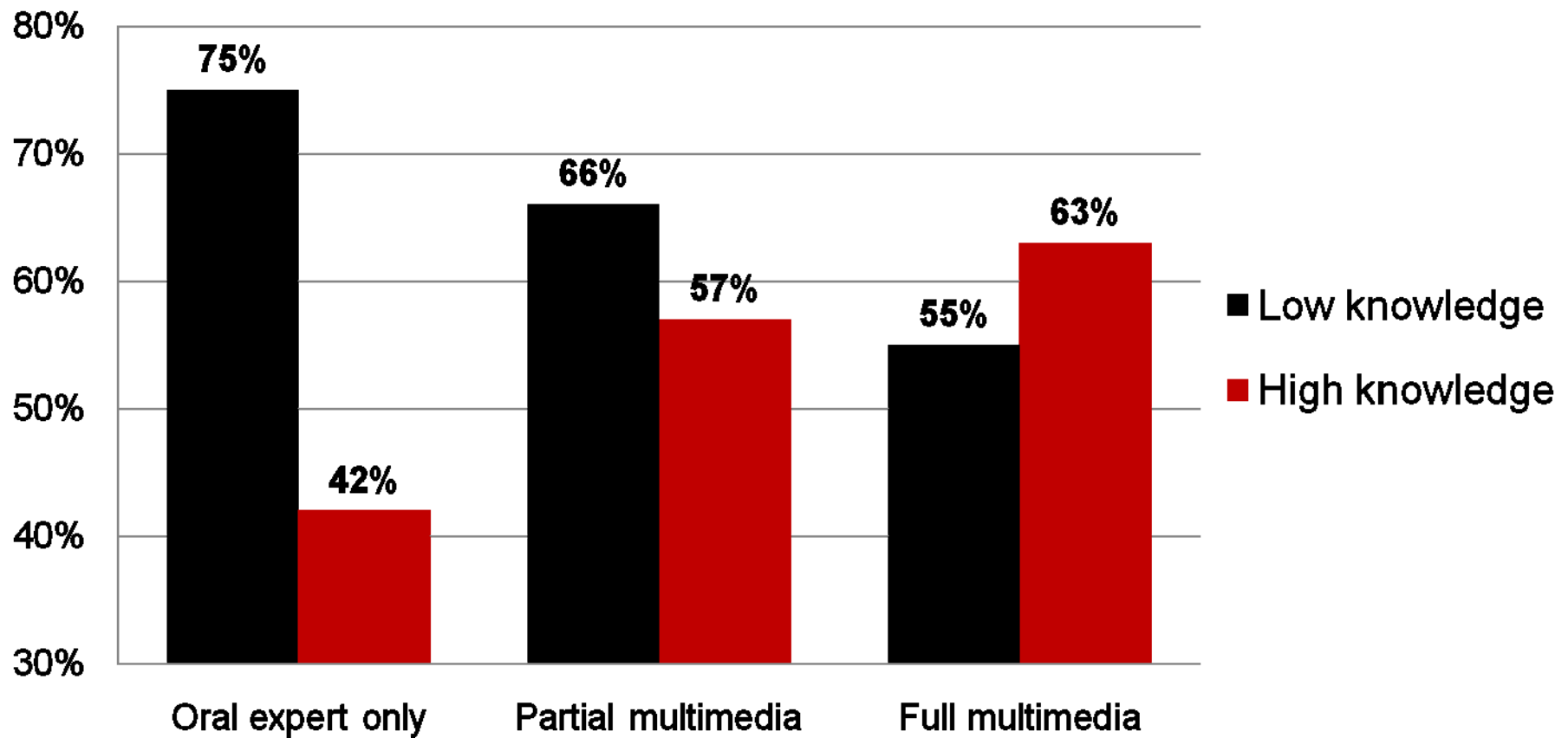
Exposure to multimedia vs oral expert evidence:

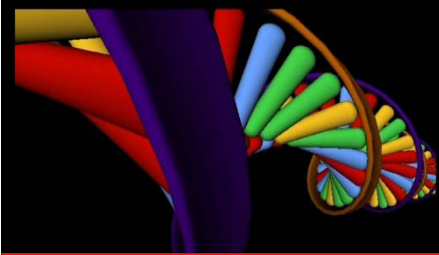
- Rated defendant less culpable: 79 vs 86%
- Fewer convictions: 57 vs 65%
- no undue persuasion effect of multimedia
- Increased skepticism about DNA evidence
- Reduced susceptibility to “white coat effect”
- Saw defense case as stronger (46 vs 41%)
- Reduced propensity to convict in less knowledgeable jurors (those with lower number of correct answers on DNA knowledge test)



INFLUENCE OF MEDIA ON VERDICT

Convictions by mode of expert evidence and posttrial DNA knowledge





JUROR SELF-INSIGHT

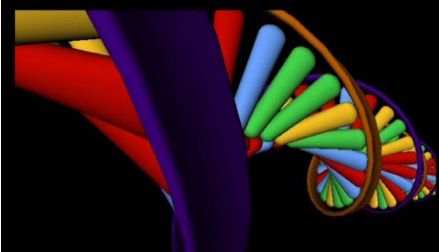
Was tutorial “useful” and “easy to understand”?

Ratings associated with verdicts:

- “Guilty” rated DNA evidence more useful and easier to follow than “not guilty”

Self-reports did not match performance:

- Higher ‘ease of understanding’ accompanied less learning



STUDY LIMITATIONS

- Test of single circumstantial fact-pattern
- Over-representation of women in sample?
- Jury-eligible vs actual jury sample
- Individual verdicts, no deliberation
- Motivation in simulated vs actual trials?
- Correlational nature of findings does not permit causal conclusions about CSI

Mock-jurors exposed to multimedia were more keen to serve as jurors in the future than those who heard oral evidence



CONCLUSIONS ON CSI EFFECTS

CSU expectation effect replicated:

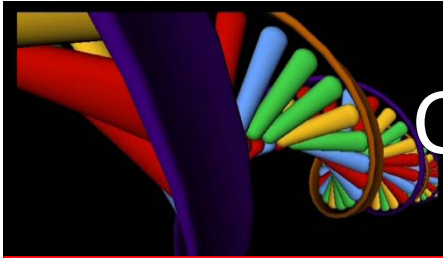
Expect more scientific evidence
perceived as more trustworthy, useful

Some evidence of CSI and pro-prosecution bias:

Less receptive to content of expert evidence
Victim sympathy, prosecution fallacy rate

Absence of CSI verdict effect replicated:

CSI viewing did not predict convictions in presence of DNA
expert evidence



CONCLUSIONS AND IMPLICATIONS

- Brief narrative tutorial on scientific concepts assisted jurors
- Multimedia facilitated jury understanding of complex information
- Avoid reliance on juror self-reports of understanding and usefulness of evidence
- Greater understanding increased juror objectivity

Evidence misunderstood compromises justice



QUESTIONS?

Acknowledgments:

Co-researcher:

Dr Lindsay Hewson

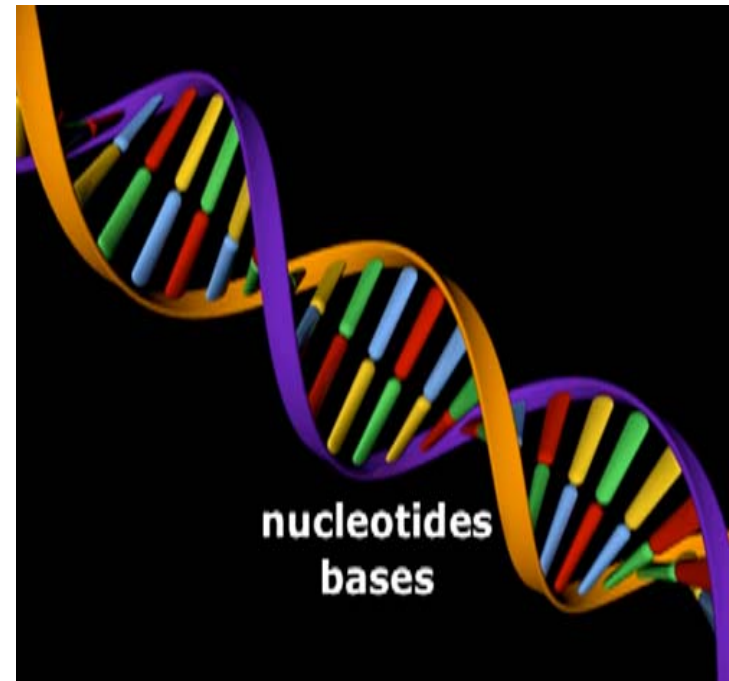
Research assistants:

Yat Sang Cheung

Kate O'Brien

Hielkje Verbrugge

Berenike Waubert de Puiseau



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