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Unintentional Bias in Forensic Investigation

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Background

There are a number of unintentional reasoning errors that people systematically make, known as 'cognitive biases'. This paper summarises their effects on forensic examiners. Further information on cognitive biases and their influence on other participants in the justice system is outlined in the POSTnote, Unintentional Bias in Court.[1]

Types of cognitive bias

Contextual bias occurs when irrelevant contextual information about an event, or the way in which some information is presented, influences reasoning. People are affected by information which has nothing to do with the actual decision at hand.[2]

Confirmation bias occurs when people interpret information, or look for new evidence, in a way that conforms to their pre-existing beliefs or assumptions. People more easily see and give more weight to information which is consistent with what they already believe, and are less likely to see and give less weight to information which is not consistent with what they already believe.[3]

Expected frequency bias occurs when people get used to a particular result occurring at a certain rate, and expect it to keep on occurring at that rate. This leads to errors because people develop expectations based on past experience rather than on the actual evidence at hand, and can come to expect an outcome even before seeing the evidence.[4]

Evidence of unintentional bias in forensic investigations

A number of studies demonstrate the effects that cognitive biases can have on the results of investigations conducted by forensic examiners.

Knowledge about other forensic examiners' decisions can influence the judgements that examiners make, resulting in confirmation bias. In one study, experts were given fingerprints that they had previously identified in real cases. However, when they re-examined the same fingerprints in the study, they were led to believe that they came from another case and that they were found to be a non-match by other examiners. Even though the experts were told to ignore this background information, within this context four out of five of them did not identify the fingerprints as they did the first time they examined them.[5]

Moreover, the presence of routine, day-to-day contextual information (such as

1 Unintentional Bias in Court, POSTnote October 2015 (in press)
2 Dror, I. & Stoel, R. 2014 Cognitive forensics: human cognition, contextual information and bias, in the Encyclopedia of Criminology and Criminal Justice, pp. 353-363, Springer
3 Nickerson, R. 1998, Confirmation Bias: A Ubiquitous Phenomenon in Many Guises, Review of General Psychology, 2:2, 175-220
4 Dror, I. 2013, Practical Solutions to Cognitive and Human Factor Challenges in Forensic Science, Forensic Science Policy & Management, 4:3-4, 105-113
5 Dror, I. et al. 2006, Contextual information renders experts vulnerable to making erroneous identifications, Forensic Science International, 156:1, 74-78

the details of an eye witness's account, or whether the suspect has an alibi) can influence forensic experts' judgments, resulting in contextual bias. In another study, forensic experts were presented with fingerprints which they had already examined in real cases, but this time the prints were presented in the presence of irrelevant contextual information. The presence of this information led half the forensic experts to conclusions which differed from those they had made when they originally examined the same pair of prints in the real cases, even though they were told to ignore the contextual information.[6]

These experiments investigated actual forensic experts as they worked: the experts were presented with the fingerprint impressions by their managers in their own laboratories, and were unaware that they were participating in an experiment. Researchers were able to compare the judgments made by each expert about a particular fingerprint on an actual case with that same expert's judgment about the same fingerprint, but this time in the presence of irrelevant contextual information. The sample sizes were relatively small because they investigated actual forensic examiners, but the effect of contextual bias was such that it is likely to be present in real forensic work.[7]

In a further study, this time with DNA forensic examiners, experts were presented with a DNA sample from a real case, but without any contextual details about the case that might create bias. Only one out of 17 examiners reached the same conclusion (that the suspect could not be excluded) as the experts in the actual case who were exposed to irrelevant biasing contextual information.[8] Additional studies have replicated these findings in other forensic domains, such as hair comparisons, fire investigation, and in the identification of human remains.[9] [10] [11]

Overturned forensic identifications from real cases

Examples of cases where forensic decisions may have been influenced by irrelevant contextual information, and the cases later overturned, are detailed below.

Brandon Mayfield case, 2004 (US): In 2004, the FBI arrested the Oregon attorney Brandon Mayfield, in connection with the Madrid train bombings, after finding a match with a fingerprint from a bag of detonators. A few weeks later, the Spanish National Police informed the FBI that they had identified the print as that of Ouhnane Daoud, and Mayfield was released. An investigation by the Office of the Inspector General of the US Department of Justice revealed that whilst there were similarities between Mayfield's prints and the

6 Dror, I. & Charlton, D. 2006, Why Experts Make Errors, 56:4, Journal of Forensic Identification, 600-616

7 Dror, I. and Rosenthal, R. 2008, Meta-analytically Quantifying the Reliability and Biasability of Forensic Experts, Journal of Forensic Science, 53:4, 900-903

8 Dror, E. & Hampikian, G. 2011. Subjectivity and bias in forensic DNA mixture interpretation, Science and Justice 51: 204-208

9 Miller, L. 1987, Procedural Bias in Forensic Science Examinations of Human Hair, Law and Human Behaviour, 11:2, 157-163

10 Bieber, P. 2014, Fire Investigation and Cognitive Bias, Wiley Encyclopedia of Forensic Science, 1-8

11 Nakhaeizadeh, S. et al. 2014, The Power of Contextual Effects in Forensic Anthropology: A Study of Biasability in the Visual Interpretations of Trauma Analysis on Skeletal Remains, Journal of Forensic Sciences, 59:5, 1177-1183

impression found on the bag, there was also circular reasoning in the original identification, bias in the verification process and reliance on inadequate explanations to account for differences between Mayfield's known prints and the impression on the bag.[12]

Shirley McKie case, 1999 (Scotland): Shirley McKie, an investigating officer on a murder trial, was identified by forensic experts from a fingerprint at the crime scene, and charged with perjury for denying that the print could have been made by her. Whilst a jury unanimously found her not guilty of perjury, the fingerprint evidence remained a matter of controversy for over a decade. A public enquiry concluded that misidentifications had occurred in the McKie case. The report identified a number of cognitive bias risk factors, including that forensic practitioners might assume that 100% certainty can be attained on the basis of relatively few characteristics; that verifying examiners who know the conclusions made by initial examiners might be influenced to confirm their conclusions; and that establishing a hypothesis prematurely can lead to discounting evidence which contradicts the hypothesis.[13]

12 U.S. Department of Justice, 2011, A Review of the FBI's Progress in Responding to the Recommendations in the Office of the Inspector General Report on the Fingerprint Misidentification in the Brandon Mayfield Case

13 The Finger Print Inquiry Report, 2011

Mitigating bias in forensic investigation

The effects of cognitive biases on forensic investigations have been acknowledged by both the forensic community,[14,15] and in a recent report from the Forensic Science Regulator.[16] Further, judges in the High Court, Court of Appeal and Supreme Court have received training on cognitive bias and how it may affect forensic results. Some strategies to mitigate the influence of cognitive bias on forensic investigations are summarised below:

Removing irrelevant contextual information from samples prior to running forensic tests

Unnecessary and irrelevant information might include details such as the gender or ethnicity of the suspect, and information about their character and history, as well as details of their relationship to the suspect or victim, and their involvement in the case, when these details are irrelevant to the particular test being run (this information may be crucial and relevant to the investigative team, but not to the forensic scientific examination). Cognitive scientists have designed a process to manage the flow of information in order to minimise the effects of cognitive bias in forensic decision making, known as Linear Sequential Unmaksing (LSU). LSU differentiates information which is irrelevant to the forensic test in question, but which might be conveyed to the forensic examiner by the sample itself; the case information; the examiner's own expectations; cultural influences; and aspects of the forensic organisation's routines, and suggests when this information ought to be removed from the investigative procedure. Furthermore, the LSU bias-minimising procedure specifies the optimal sequencing and timing to manage contextual information in forensic work.[17]

Case management

Whilst contextual information may influence forensic tests, it is sometimes vital to know a range of contextual details about a sample in order to determine what sort of forensic tests are appropriate in the first place. Ideally, a 'case manager' will have oversight of all the case details, but will ensure that only relevant contextual information is provided to the forensic expert who will run the test. Following the Shirley McKie case the Scottish Police Authority Forensic Services has implemented a case management strategy where case managers limit the amount of contextual information to which the subsequent forensic

14 National Research Council, 2008, Strengthening forensic science in the Unites States: A path forward, Washington D. C.: National Academies Press

15 Stoel, R. D. et al. 2015, Minimizing contextual bias in forensic casework. In Strom, K. and Hickman, M. J. (eds.) Forensic Science and the Administration of Justice, New York: Sage

16 Forensic Science Regulator, 2015, Cognitive bias effects relevant to forensic science examinations

17 Dror, I. et al. 2015, Context Management Toolbox: A Linear Sequential Unmasking (LSU) Approach for Minimizing Cognitive Bias in Forensic Decision Making, Journal of Forensic Sciences, July

examiners have access.[18]

Minimising bias around expected outcomes

Computer programs are sometimes used to generate a list of potential fingerprint matches from a national database. In the majority of cases, if a print is positively matched by a forensic examiner, then it will have appeared at the top of the list. Overtime, this creates an expectancy bias whereby fingerprints which are near the top of the list are more likely to be matched. As a result, examiners spend less time analysing candidate fingerprints as they go down the list, which can contribute to errors.[19] Randomising the order of prints on the list could mitigate the effects of this bias.[19]

Blind verification

Where possible, forensic tests are verified by a second examiner to confirm the accuracy of the first result. This second test should be done 'blind', so that verifying examiners do not know the results of the first test, nor which of their colleagues carried it out. This minimises the influence of expectations about their colleagues' work on the results of the verification test.[19]

Summary

Forensic examiners are exposed to a great deal of irrelevant contextual information that can bias their work and conclusions. Limiting examiners to the relevant information that they need in order to do their work should help to minimise bias in forensic investigation.

18 Forensic Science Regulator, 2015, Cognitive bias effects relevant to forensic science examinations

19 Dror, I. 2013, Practical Solutions to Cognitive and Human Factor Challenges in Forensic Science, Forensic Science Policy & Management, 4:3-4, 105-113