Chapter 8: The Importance of Ethics and Impartiality in Forensic Science

Why Is Being Aware of Bias Important to a Canadian Forensic Science Expert?

Cognitive bias can be defined as an error in thinking when processing information and can come in a number of forms. In forensic science, cognitive bias must be understood by the stakeholders (practitioners, lawyers, judges, and society), as it can impact final conclusions in a case.

Some commonly found forms of cognitive bias in forensic science are:

- confirmation bias - where the person only uses the information that confirms their belief in something
- contextual bias - where the expert's decision is influenced by extraneous information or factors
- selection bias - which is introduced when selecting specific individuals in or for an investigation

There are two core reasons to understand and mitigate the risk of bias:

1. The first is to do good science - Our biases infiltrate everything we do - our everyday decision making, our crime scene analysis, our case benchwork, and our research. Therefore, as practitioners, bias can influence the outcome of our analysis and testimony in court.
2. The second reason is that the Supreme Court of Canada has provided direction to the courts on the duty of an expert witness that includes "absence of bias" - This ruling, the White Burgess ruling, indicates that a judge should also assess the independence and impartiality of an expert witness.

The Supreme Court's Decision

The White Burgess ruling on expert-opinion evidence in Canada came from the Supreme Court and stated three duties of an expert witness: impartiality, independence, and absence of bias.

Description from Judge J. Cromwell (White Burgess Inman v. Abbott and Haliburton Co., 2015):
"Expert witnesses have a duty to the court to give fair; objective and non-partisan opinion evidence. They must be aware of this duty and able and willing to carry it out. The expert's opinion must be impartial in the sense that it reflects an objective assessment of the questions at hand. It must be independent in the sense that it is the product of the expert's independent judgment, uninfluenced by who has retained him or her or the outcome of the litigation. It must be unbiased in the sense that it does not unfairly favour one party's position over another. The acid test is whether the expert's opinion would not change regardless of which party retained him or her. These concepts, of course, must be applied to the realities of adversary litigation."

This ruling referenced the Kaufman and Goudge reports and how flawed forensic science opinions in these cases played a prominent role in miscarriages of justice. Justice Cromwell also references David Paciocco's (2009) assessment of the topic, Taking a "Goudge" out of Bluster and Blarney: An "Evidence-Based Approach" to Expert Testimony. Professor Paciocco skilfully summarizes an evidence-based approach, how that may work within the Mohan test, and the lessons learned from the Goudge report.
This article supports the need for all forensic experts (not just pathologists) to confine opinion to their expertise, to use an evidence based approach, and to understand that science is a dynamic process and that the court needs to be the gatekeeper of testimony.

R. v. Millard (2018)

This was a highaprofile murder trial in the Ontario courts, where the accused was being tried for the murder of his father, Wayne Millard. Although this is an Ontario Superior Court decision, it has not been appealed and therefore not challenged in a higher court such as the Ontario Court of Appeal.

The original 2012 investigation into the death concluded that Wayne Millard had committed suicide by a single gunshot to the face. After the accused had been charged with two other murders, the suicide case was reopened and sufficient evidence gathered to lay a first degree murder charge on April 10, 2014. The trial commenced on May 31, 2018, and part of this new evidence was the expert opinion of a police officer who had a background in shooting scene reconstruction. The officers opinion on the orientation, position, and location of the gun when discharged and the likelihood that Wayne Millard discharged the shot was ruled inadmissible by the judge, Maureen Dorothy Forestell.

As part of the proceedings, Justice Forestell provided the following: "that [the officer] understood the concept of bias and that he understood the duty of an expert witness which he described as an obligation to deliver impartial, honest, full, frank and fair evidence. He testified that he understood that his evidence was to be as unbiased as possible. He testified that to the best of his ability he removed any bias from his experimentation, report and testimony" Due to the White Burgess ruling, this type of questioning will become commonplace in expert witness examination in the Canadian court system.

The witness provided evidence that in his examination he had used scene and post-mortem photographs and the autopsy report. He had also experimentally reconstructed the event by test firing the gun into Styrofoam human heads.

The defence questioned the witness regarding the evidence, and the witness indicated that relied on the assumption that the scene had not been contaminated. The defence produced testimonial evidence that a blanket with blood on it had been moved prior to the taking of the scene photographs

In this ruling, the challenge by the defence was that the evidence was not relevant to the proceedings and that the expert was biased.

Regarding this assertion, the judge concluded that the expert "was aware of the photograph showing a blanket that must have been moved from the area of the head of the deceased." The expert had indicated that there was no intermediary surface at the scene that could have altered the deposit of gunshot residue at the scene. However, this blanket could have been an intermediary surface and the expert “failed entirely to disclose the evidence of the blanket or his reasoning process in relation to it, in his notes, report or testimony-in-chief. The photograph was a significant piece of evidence that could impact adversely on the conclusion he reached.”

Justice Forestell wrote:

“The failure of a proposed expert to disclose information that would undermine his opinion goes beyond confirmation bias. A similar situation was considered in the Report of The Commission on Proceedings Involving Guy Paul Morin (the Kaufman Commission). Commissioner Kaufman, commenting on a Crown expert's failure to disclose that a search for particular fibres had been conducted, said that the expert witness's “failure to disclose demonstrates a misapprehension of his role as an independent, neutral scientist. A scientist is not entitled to discount a potential defence position (or indeed a Crown position) and then fail to disclose evidence which might bear upon that position.” ”

The expert was not allowed to testify because the judge ruled that he "was unable or unwilling to comply with the duty of an expert to provide independent, impartial and unbiased evidence with respect to the re-creation, observation and interpretation of GSR (gunshot residue) deposition at the scene of Wayne Millard's death and the position, location and orientation of the firearm at the time that it was discharged and killed Wayne Millard. The Crown has failed to rebut this concern on a balance of probabilities."

The witness's opinion was ruled inadmissible based on confirmation bias.

Beyond the issue of bias, Judge Forestell pointed out her concerns that two five-day courses on shooting reconstruction may be inadequate for providing an opinion on the interpretation of GSR deposits. She also indicated that the re-creation of the scene was not a proper scientific experiment, citing the lack of replication, quantitative data, and hypotheses development. The witness also failed to falsify hypotheses and control variables, and rejected evidence that did not support his opinion.

There was also concern about whether the methodology could be attributed to inadequate training or failure to apply the training; however, the inadequacy of training was not resolved in the ruling.

R. v. France (2017)

We reviewed this court case within chapter 5, as it linked to the requirement of conducting a complete literature review as an expert witness before the courts. This court ruling also provides an example of expert witness bias and the offering of an opinion outside the expert's area of expertise.

First type of bias displayed in this case:
In this case, the pathologist provided an opinion on abdominal trauma that was outside of his expertise. He failed to consult all the research literature on assaults and falls causing abdominal trauma in children but provided categoric evidence that the injury was from an assault and not a fall. In this approach he was predisposed to seeing the case as an assault and failed to consider other explanations. This was a biased approach.

Second type of bias displayed in this case:
The defence approached the witness with research literature evidence on child falls that caused abdominal trauma and asked the pathologist to consider other explanations.
According to Justice Molloy, the pathologist failed to be objective, indicating, "now grudgingly prepared to say that an accidental fall cannot be ruled out completely as the cause of the injury, he stands by his characterization of it as "an unprecedented accident" while adding that it is 'improbable.' I find this to be an illustration of professional credibility bias."

R. v. Livingston (2017)

The third court case provides an example of an individual developing contextual bias by being too close to the investigative team. Although this is an Ontario Superior Court decision, it has not been appealed and therefore has not been challenged in a higher court such as Ontario's Court of Appeal.

In 2012, a retired police officer was hired back by his police service to complete computer forensic analysis on Project Hampden, the police service's name for the criminal investigation that led to the charges within the court proceedings. The witness was hired to examine 24 computer hard drives seized from the Ontario provincial government's cyber-security branch. His role expanded quickly, and he began to participate in team activities such as conference calls and team meetings. At one point in the investigation, the witness was noted to be recommending specific additional Criminal Code charges and was involved in the execution of search warrants.

The defence submitted that the witness should not be allowed to testify because he "has impermissibly conflated his role as an investigator with that of his role as an expert."

The Crown relied on the White Burgess ruling, indicating that the threshold requirement for an expert witness is not onerous.

The judge ruled that the expert witness did not maintain "his distance and independence from the day-to-day activities of the Project Hampden team… He participated in numerous project meetings by either conference call or in person... The most concerning example of partisanship occurred on February 22, 2015"

The witness sent an email to the lead investigators recommending that the defendants in this case be charged with mischief to data, contrary to section 430 (1.1) of the Criminal Code.

"And he went even further, providing a summary of the investigation to show that 'the facts' of the case would meet the test for the charge."

The judge commented that this behaviour "made two months before he offered his final forensic report," demonstrated a lack of independence and impartiality effectively nullifying the witness's opinion and evidence."

Sources of Bias

“I think there's responsibility both at the federal and provincial levels for education in a grander sense—and that is to provide recognition financially to people who are educators, to help provide access to on-the-spot learning, so kids are not biased against science. Especially when people are younger, their curiosity needs never to be beaten down. It has to go someplace. And you can only do that if you have people who love the subject they're teaching, and who provide the student with the ability to do it in the field.”

- Roberta Bondar (Buck, 2015)

Dr. Itiel E. Dror is a research psychologist at University College, London, UK, who studies human cognition and can be credited as one of the first scientists to study cognitive bias in forensic science. In 2017, Dr. Dror published a paper entitled "Human Expert Performance in Forensic Decision Making: Seven Different Sources of Bias."

In this article, he advises that forensic practitioners must understand the different stages/sources, of bias before they can recognize bias and find ways to mitigate it.

The table below shows Dr. Dror's list of different sources of bias that may influence observations and forensic conclusions. The original sources come from Francis Bacon's doctrine of idols but have been expanded for forensic science work.

The table lists the dependent factor, in which the stage of bias can be influenced; for example, just being part of the human species can influence cognitive architecture and the brain, or organizational factors can be influenced by the social groups with which we are connected.

Stage of Bias	Dependency
Cognitive architecture and the brain	Human nature
Training and motivation	Human nature
Organizational factors	Environment, culture, and experience
Base rate expectations	Environment, culture, and experience
Irrelevant case information	Case-specific
Reference materials	Case-specific
Case evidence	Case-specific

Research on Bias in Forensic Science

Many forensic practitioners work in unpredictable environments that are rich in contextual case information, and they use subjective methodologies. If humans are involved in forensic case analysis, the elimination of bias is impossible; however, it can be mitigated.

Relevant factors when discussing bias within forensic science include: (Edmond et al., 2017).

- human perception
- memory of events or a person's knowledge
- contextual information from an investigation that may not be required in forensic analysis
- expertise or experience in certain areas
- decision making on what should or should not be included in a forensic analysis
- communication
- verification or peer review of conclusions confidence
- organizational/workplace culture
- feedback from others

Therefore, a forensic research culture that embraces the aid of cognition-focused scientists will improve the value and utility of forensic science.

The following sections summarize current research studies in forensic science for your consideration when thinking about bias. First, we will review articles that support the need for forensic practitioners to recognize bias and examine current studies that have explored bias in different forensic disciplines. Second, we will investigate the research on suggested solutions to mitigate bias in casework.

Recognizing That Bias Does Exist

The first step in recognizing bias is to acknowledge that it exists.

Articles:

Dror and colleagues (2006):

- The article "Contextual Information Renders Experts Vulnerable to Making Erroneous Identifications" was on fingerprint comparisons and the introduction of contextual information.
- The researchers took earlier fingerprint cases in which the fingerprint expert individualized a crime scene fingerprint to a suspect and had the experts re-examine the prints.
- However, in the second examination the researchers introduced information that the fingerprints were not a match.
- When the experts completed a second analysis (five years after the first analysis), it was found that the examiners came up with different conclusions that contradicted their previous individualization.
- In 4 out of the 5 cases the experts had changed their conclusion.
- This was an influential study that caused forensic examiners to think about bias in their work.

Dr. Bryan Found (2014):

- Dr. Bryan Found (2014) provided an opinion article in the Australian Journal of Forensic Sciences on the progress of cognitive research in forensic science.
- He specifically discussed the change in basic assumptions within the identification disciplines and how the examination of cognition has increased in these disciplines.
- Found listed the most common types of bias that require research in the sciences, including the following:

contextual bias: when contextual information from a case or scene has influenced an analysis or opinion
confirmation bias: when a person uses information that only confirms their opinion or belief
motivational bias: a conscious inconsistency that is influenced by a person's situation
expectation bias: usually relates to researchers who only present what they believe is expected

Nakhaeizadeh and colleagues (2006):

- Cognitive bias in non-metric anthropological assessments was studied by Nakhaeizadeh and colleagues (2014).
- The researchers divided experts into three groups and provided skeletal remains for them to conduct non-metric analyses for age, sex, and ancestry.
- Two of the groups were given "extraneous contextual information" about the skeletal remains that included DNA results indicating gender, the origin of the skeleton, and age at death estimation.
- A third group was provided no information other than the skeletal remains.
- The researchers found that there was a significant bias effect when the extraneous contextual information was present, suggesting that research is required to develop an evidence-based approach for skeletal assessments that could help control bias.

Smalarz and colleagues (2016):

- A study conducted by Smalarz and colleagues (2016) looked at how criminal stereotypes can bias forensic evidence analysis.
- In this study, the researchers provided university students with two different mock police incident reports, one of a stereotypical crime and one of a non-stereotypical crime.
- The students were asked to judge whether the suspect's fingerprint matched the fingerprint recovered at the crime scene.
- The participants were given personal information about the suspect type such as race and sex.
- The researchers found that the students most often believed the fingerprints to match when the suspect fit the stereotype, even when the prints did not match.
- Therefore, knowing the suspect's information when conducting examinations has been shown to be a source of bias in forensic science.

Kukucka and colleagues (2017):

- Kukucka and colleagues (2017) studied how exposure to case contextual information can lead to confirmation bias in forensic science.
- The researchers surveyed 403 forensic practitioners from 21 countries.
- They found that these practitioners had a limited appreciation of the concept of cognitive bias.
- In fact, many believed that they were immune to bias and could reduce it by willpower.
- The practitioners also exhibited bias blind spots, indicating that they thought there may be bias in other disciplines and for other scientists but not for them.
- This research supported the idea that forensic practitioners may be unaware of bias and that procedural reform is required.

Charman and colleagues (2017):

- Contextual information can bias how individuals, whether experts in law enforcement or civilian university students, evaluate physical evidence.
- In 2017, Charman and colleagues (2017) conducted a study where police officers and undergraduate students were provided a fictitious criminal case and received incriminating, exonerating, and neutral evidence.
- The participants were asked to provide their belief of the suspect's guilt within the case.
- They were then given more pieces of ambiguous evidence and had their belief in the suspect's guilt re-evaluated.
- It was found that the initial belief in guilt significantly biased the evaluation of the ambiguous evidence.
- This indicated that there was a snowball effect on the belief of guilt with the addition of new evidence.
- This study helps us understand that bias is part of human nature, and as forensic science students and practitioners we need to know that it can creep into any situation.
- In this study it was shown that the sequence (and control) of information release is important in combating a biased approach.

Mitigating Bias

Numerous articles have suggested ways to mitigate bias in forensic analysis and reporting, covering disciplines including friction ridge analysis, DNA, and bloodstain pattern analysis, plus some generalizations for forensic science.

The table which follows summarizes these suggested remedies and explains the application as intended by the researchers.

As you reviewed the previous list of remedies, you may have noticed a pattern forming—the articles suggest the same methods of control. Many of these solutions are derived from science and methods of scientific research, such as controlling variables and peer review. Therefore, the understanding and use of the scientific method, hypothetico-deductive reasoning, and an evidence-based approach can help control bias in your forensic science work and research.

Research Article	Solution Type	Application
Fillers Can Help Control for Contextual Bias in Forensic Comparison Tasks (Ouigley-McBride & Wells, 2018)	- Filler-control procedure	The researchers suggest that the use of alternative hypotheses testing, knowing the evaluators' abilities, the methodologies used, and standardized training with certification of experts can help mitigate bias
Understanding and Mitigating Bias in Forensic Evaluation: Lessons from Forensic Science (Zapf & Dror, 2017)	- Scientific method/testing - hypotheses - Evaluator characteristics - Methods used - Training	The researchers suggest that the use of alternative hypotheses testing, knowing the evaluators' abilities, the methodologies used, and standardized training with certification of experts can help mitigate bias.
A Biased Opinion: Demonstration of Cognitive Bias on Fingerprint Matching through Knowledge of DNA Test Results (Stevenage & Bennett, 2017)	- Blind analysis and verification - Sequential unmasking - Evidence pack (filler-control) - Case management	This research is related to bias in fingerprint analysis; however, the solutions could be applicable to multiple disciplines. The researchers suggest keeping contextual information blind to the examiner, controlling information and unmasking as needed, using filler control, and having managerial oversight.
Diagnosing Crime and Diagnosing Disease: Bias Reduction Strategies in the Forensic and Clinical Sciences (Lockhart & Satya-Murti, 2017)	- Error rates - Knowing sources of bias in a discipline	This study suggests going beyond blinding and masking by developing statistical data that can show error rates and specific biases.
Strengthening Forensic DNA Decision Making through a Better Understanding of the Influence of Cognitive Bias (Jeanguenat, Budowle, & Dror, 2017)	- Training and education - Quality control - Review process - Analysis and interpretation process - Controlling information	The listed solution types have been suggested for DNA analysis but could be used in any laboratory environment.
Implementing Context Information Management in Forensic Casework: Minimizing Contextual Bias in Firearms Examination (Mattijssen et al., 2016)	- Context information management (CIM)	CIM is used to control the information flow to the forensic examiner. A case manager would decrease task-irrelevant case information and increase task-relevant information.
Contextual Bias: What Bloodstain Pattern Analysts Need to Know (Zajac et al., 2015)	- Awareness - Training - Objective methods - Information control - Multiple hypothesis testing - Technical and peer review - Research	This list of solutions is suggested for bloodstain pattern analysis; however, these strategies are common among the other articles that have been reviewed.
Practical Solutions to Cognitive and Human Factor Challenges in Forensic Science (Dror,)2013	- Blind verification - Dummy cases - Randomized lists - e.g. Automated Fingerprint Identification System (AFIS) - Training - Remove irrelevant information - Triage approach - Context management - Domain-specific cognitive profiles for recruitment	Blind verification and dummy case submission can help with controlling base rate irregularities. The other solutions have been suggested and discussed above.

Ethics in Forensic Science

Cognitive bias is not an ethical issue; however, ethics play a complex role in forensic science.

Ethics can be defined as the "moral principles that govern a person's behaviour or the conducting of an activity" (Oxford English Dictionary, 2018). This description integrates scientific concepts with the application of law.

It is important to note that ethical issues can be controlled in forensic science by following codes of ethics

Therefore, in this section we will review two areas of ethics. The first pertains to the ethical considerations for forensic practitioners as provided by the Canadian Society of Forensic Science (CSFS); the second relates to conducting research.
Although the different forensic and research disciplines have specific codes of ethics, we present these two leading Canadian examples for your consideration.

The CSFS provides ethical guidelines for their membership. Gold (2003) has suggested that there are 11 different things that an expert witness can do to improve their legitimacy in the Canadian court system, and one of the listed items is to be part of a professional society or association.

Members of the Canadian Society of Forensic Science,

With respect to their responsibilities to the CSFS, shall:

1. comply with the By-laws of the Society
2 report to the Board any violation of these "Rules of Professional Conduct" by another member of the Society
3. accept that their membership in the Society demonstrates an active interest in forensic science; however, this membership does not by itself mean that they have the necessary qualifications to practice in their forensic science discipline nor does it mean that they are competent in their forensic science discipline

With respect to their responsibilities to their client, employer, or to the court, shall:

4. treat all information from an agency or client with the appropriate confidentiality
5. make all reasonable efforts to treat items of potential evidential value with the care and control necessary to ensure their integrity
6. take reasonable steps to ensure that all items in a case receive appropriate technical analysis
7.
    a. utilize methods, techniques, standards and controls, provided that they exist, that they are generally accepted and that they current; and
    b. utilize methods and techniques with standards and controls to conduct examinations and analysis such that they could be reproduced by another qualified and competent person
8. make full and complete disclosure as required by law of the findings to the submitting agency or client
9. make and keep work notes on all items received, the examinations done, the results obtained and the findings and conclusions made in a timely fashion
10. render opinions and conclusions strictly in accordance with the results and findings in the case and only to the extent justified by those results and findings
11. make all efforts to testify in a clear, straightforward manner and refuse to extend themselves beyond their field of expertise or level of competence
12. not exaggerate, embellish or otherwise misrepresent qualifications when testifying
13. be impartial and independent in their analysis, reporting and testimony

With respect to their responsibilities to the profession of forensic science, shall:

14. carry out their duties in a professional manner and strive to be worthy of the confidence of the public
15. regard and respect their peers with the same standards that they hold for themselves
16.
    a. set a reasonable fee for services if it is appropriate to do so, taking care not to set unreasonably high fees for services, not to charge fees for services not done or services that are unnecessary, while being able to reduce or waive fees
    b. not, under any circumstances, render services on a contingency basis
17. strive to maintain and improve their skills and knowledge and to keep current with advances and standards in their discipline.

Researcher Ethics

- Most tertiary research institutions will have a research ethics board (REB).
- A university REB is a group of appointed academics who review ethics applications from researchers and students when ethical considerations are required in a research project, in order to maintain a high ethical standard and ensure that research participants are protected.
- REB submissions and approvals deal with three major areas: the use of human subjects, the use of animals, and the use of biohazardous materials.
- This is a risk management benefit for those who are part of a university or college environment; however, research conducted outside of these institutions may not be as monitored.

Key Terms:

Bias blind spots: to recognize biases in others while denying the existence of those same biases in themselves

Cognitive bias: an error in thinking when processing information, it can take various forms

Contextual bias: occurs when contextual information from a case or scene has influenced an analysis or opinion

Expectation bias: bias usually relating to researchers who only present what they believe is expected

Gunshot residue (GSR): the traces produced from the discharge of a firearm. A GSR kit is used in the field at firearm scenes to collect samples of gunshot residue

Motivational bias: a conscious inconsistency that is influenced by a person's situation

Selection bias: introduced when selecting specific individuals in an investigation