Forensic Psychological Science in Capital Litigation: Emerging Topics

Cognitive Bias, Behavior Genetics, and Neurobehavioral Imaging

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Cognitive bias is a mistake in reasoning, evaluating, remembering, or other cognitive process, often occurring as a result of holding onto one's preferences and beliefs regardless of contrary information.

Psychologists study cognitive biases as they relate to memory, reasoning, and decision-making.
Forensic Examples of Cognitive Bias

Allegiance effects

Formation of opinions in favor of the retaining party rather than on an objective assessment of available evidence.

-Dan Murrie’s Psychopathy Checklist studies
Forensic Examples of Cognitive Bias

**Anchoring or primacy bias**

Information received at the outset of a case may lead to initial ideas and formulations that are difficult to abandon.

**Confirmatory bias**

Focusing on evidence that supports rather than disconfirms a hypothesis.
**Forensic Examples of Cognitive Bias**

**Fundamental attribution error**

Attributing more weight to dispositional qualities rather than situational circumstances when considering the reasons for someone's behavior.

**Diagnosis momentum**

Assigning a particular diagnosis without adequate evidence, which gathers momentum over time to the point that it may appear accurate.
Overconfidence

Overconfidence may lead to insufficient data collection and synthesizing of information prematurely.
Studied 1099 forensic mental health professionals:

Most evaluators expressed concern over cognitive bias, but held an incorrect view that mere willpower can reduce bias.

Evidence was also found for a bias blind spot (Pronin, Lin, & Ross, 2002), with more evaluators acknowledging bias in their peers’ judgments than in their own.

Bias Training

The Zapf study evaluators with training in bias held beliefs suggesting an increased awareness and understanding of the potential impact of bias.

However, while encouraging, it remains to be seen whether mere knowledge translates into improved performance.
Minimize Allegiance Effects

Clearly state at the outset of a professional relationship your expectation that the expert’s conclusions be objective and based on the data available, even if it may not support your position.
Minimize Anchoring or Primacy Bias

- Don’t “poison the well.”

- Provide not only facts that support your position, but also the facts that the opposing side will likely argue.

- Avoid lengthy pre-evaluation interviews with experts.

- Encourage your expert to engage in rigorous consideration of alternative hypotheses.
Nature vs Nurture Debate => Nature AND Nurture

According to a meta-analysis on data from 24 genetically informative studies, up to 50% of the total variance in aggressive behavior is explained by genetic influences.

Understanding how genes and environment interact to produce violent and criminal behavior is key.

Having a genetic predisposition for criminal behavior alone generally does not determine the actions of an individual.

However, the combination of a genetic predisposition and environmental risk factors does increase their chances for engaging in criminal or anti-social behavior.
Forensic psychologists are particularly well equipped to:

1. Recognize factors in an individual’s history that may raise or refute the need for genetic testing, and

2. Evaluate the presence or absence of environmental risk factors that can interact with genetic predispositions.
Two genes associated with violent repeat offenders are the MAOA gene; and a variant of cadherin 13 (CDH13).

CDH13 has previously been associated with substance abuse and ADHD; and more recently with extremely violent behavior.

Figure 3.
Manhattan plot in chromosome 16 (generated by Haploview) for the GWAS of extremely violent offenders. The inset shows a detailed view (generated by SNAP) of the CDH13 region in association with extremely violent offending.
Monoamine Oxidase - A (MAOA): The “Warrior Gene”

“The Warrior Gene:” The MAOA gene is important for controlling the amount of dopamine and serotonin in the brain.

- Serotonin and dopamine are important in regulating aggression, emotion and cognition.

- The low-activity genotype may increase the risk for aggressive and antisocial behavior.
5–10% of all severe violent crime in Finland has been attributed to MAOA and CDH13 genotypes.

Inbreeding => ↑ risk for cognitive, behavioral, and intellectual impairments.

Genetic diseases with forensic behavioral implications (e.g., Kleinfelter's Syndrome increases criminality risk).
Behavior Genetics Examples

- Genetic predispositions to SSRI medication metabolism.
  - Increased risk of side effects involving irritability, agitation, and anger.

- Hereditary transmission of risk for mental disorder, substance abuse, and violent behavior.
Forensic Behavioral Neuroscience

- Lesion Studies of Violent Criminal Brains
- The Psychopath’s Brain and Brain Regions Associated with Morality
Lesion network localization of criminal behavior

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Fig. 1. Lesions temporally associated with criminal behavior. Lesions from 17 patients with acquired criminal behavior, manually traced onto a common brain atlas (MNI).
Fig. 4. Lesions temporally associated with criminality are functionally connected to morality regions. (A) Regions functionally connected to lesion locations temporally associated with criminal behavior (red) are similar to regions activated by moral decision-making tasks (green; overlap in yellow). (B and C) Lesion locations temporally associated with criminal behavior (gray) are functionally connected to regions activated by moral decision-making tasks identified in meta-analyses using Neurosynth (B) or ALE (C), unlike lesions causing other neurologic syndromes (control syndromes; black). **P < 0.0001.
The Psychopathic Brain
Psychopathy as a disorder of the moral brain: Fronto-temporo-limbic grey matter reductions demonstrated by voxel-based morphometry

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Fig. 1. Brain regions showing grey matter reductions in patients with high psychopathy scores compared to normal healthy volunteers. Results are displayed at $p < 0.005$ (uncorrected) for the whole-brain, with a cluster threshold of 5 voxels. *A priori* regions of interest that additionally survived Small Volume Correction for multiple comparisons are highlighted, and included the anterior temporal cortex (aTC), medial orbitofrontal cortex (mOFC), lateral orbitofrontal cortex (latOFC), frontopolar cortex (FPC) and the superior temporal sulcus region (STS).
Fig. 2. Three-dimensional renderings showing regions of grey matter reduction correlated with PCL: SV Factor 1 (interpersonal/affective dimension) in patients with high psychopathy scores. The lateral view on the left panel shows the effects in the STS region, while the right panel shows the effects in the medial orbitofrontal/subgenual cortex (effects surviving correction for multiple comparisons). Effects in the FPC are not visible in this projection.
Forensic Neuropsychologists specialize in the study of relationships between brain damage and human behavior.

They are uniquely situated to assess whether abnormalities seen in brain imaging studies have discernable cognitive, emotional, and/or behavioral manifestations that are relevant to the issues before the Court.
Moral Enhancement Using Non-invasive Brain Stimulation

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Biomedical enhancement refers to the use of biomedical interventions to improve capacities beyond normal, rather than to treat deficiencies due to diseases. Enhancement can target physical or cognitive capacities, but also complex human behaviors such as morality. However, the complexity of normal moral behavior makes it unlikely that morality is a single capacity that can be deficient or enhanced. Instead, our central hypothesis will be that moral behavior results from multiple, interacting cognitive-affective networks in the brain. First, we will test this hypothesis by reviewing evidence for modulation of moral behavior using non-invasive brain stimulation. Next, we will discuss how this evidence affects ethical issues related to the use of moral enhancement. We end with the conclusion that while brain stimulation has the potential to alter moral behavior, such alteration is unlikely to improve moral behavior in all situations, and may even lead to less morally desirable behavior in some instances.
Thank You!

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