Crime and mental illness: A neurobiological perspective

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The Brain on the Stand

By JEFFREY ROSEN
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I. Mr. Weinstein's Cyst When historians of the future try to identify the moment that neuroscience began to transform the American legal system, they may point to a little-noticed case from the early 1990s. The case involved Herbert Weinstein, a 65-year-old ad executive who was charged with strangling his wife, Barbara, to death and then, in an effort to make the murder look like a suicide,
Inside A Psychopath's Brain: The Sentencing Debate
by BARBARA BRADLEY HAGERTY

Second in a three-part series

June 30, 2010

Kent Kiehl has studied hundreds of psychopaths. Kiehl is one of the world's leading investigators of psychopathy and a professor at the University of New Mexico. He says he can often see it in their eyes: There's an intensity in their stare, as if they're trying to pick up signals on how to respond. But the eyes are not an element of psychopathy, just a clue.

Officially, Kiehl scores their pathology on the Hare Psychopathy Checklist, which measures traits...
A REPORTER AT LARGE

SUFFERING SOULS

The search for the roots of psychopathy.

BY JOHN SEABROOK

NOVEMBER 10, 2008

The Western New Mexico Correctional Facility sits in high-desert country about seventy miles west of Albuquerque. Grants, a former uranium boomtown that depends heavily on prison work, is a few miles down the road. There’s a glassed-in room at the top of the prison tower, with louvred windows and, on the ceiling, a big crank that operates a searchlight. In a box on the floor are some tear-gas shells that can be fired down into the yard should there be a riot. Below is the prison complex—a series of low six-sided buildings, divided by high hurricane fences.

Dr. Kent Kiehl uses MRI technology to scan prison inmates for signs of psychopathy in the hope of discovering a treatment.
The Making of a Psychopath

Why They Don’t Care: They Can’t

Brainpower Boost
How Action Fuels Learning
**HEAD CASE**

Last year, functional magnetic resonance imaging made its debut in court.

**Virginia Hughes** asks whether the technique is ready to weigh in on the fate of murderers.

Brian Dugan, 32, has been sentenced to death in a case that is not yet complete. Dugan was convicted of murdering Nicole Johnson, 28, in a pool at their home in 2016.

Johnson was a student at the University of New Mexico in Albuquerque. Dugan, a student at the University of Chicago, had been arrested for the murder.

Dugan's case has been appealed multiple times, and a retrial is scheduled for later this year.

**Militating circumstances**

The purpose of the work, Kuhl says, is to eliminate the stigma against people who have been convicted of capital crimes. Dugan's case is no exception.

Dugan's case is not the only case where fMRI has been used. In 2019, a judge in Illinois ruled that fMRI evidence could be used in Dugan's case.

Dugan's lawyers have argued that fMRI evidence is not reliable and that it should not be used to sentence Dugan to death.

**Taking the stand**

On 29 October, a jury in Illinois ruled that fMRI evidence could be used in Dugan's case. Dugan was convicted of first-degree murder in 2016.

Dugan's case is still pending, and a retrial is scheduled for later this year.

**Brian Dugan, 32, received a death sentence in 2016 for the murder of Nicole Johnson, 28.**

**Fumi Hara, MD, PhD, a neuroscientist at the University of Chicago, says that fMRI evidence could be used to make a more informed decision.**

**Fumi Hara, MD, PhD, a neuroscientist at the University of Chicago, says that fMRI evidence could be used to make a more informed decision.**
The Research Network on Law and Neuroscience, supported by the John D. and Catherine T. MacArthur Foundation, addresses a focused set of closely-related problems at the intersection of neuroscience and criminal justice: 1) determining the law-relevant mental states of defendants and witnesses; 2) assessing a defendant’s capacity for self-regulating his behavior; and 3) assessing whether, and if so how, neuroscientific evidence should be admitted and evaluated in individual cases.

http://www.lawneuro.org/
Crime and mental illness:

“Serious mental illness” within the last year

General U.S. population: 4%

U.S. jail and prison population: 20%

James, DJ, Glaze, LE. *Mental Health Problems of Prison and Jail Inmates*, Bureau of Justice Statistics 2006
Impulse control disorders linked to crime

Substance abuse disorder

• Recurrent use despite problems
• Progression from occasional pleasurable effects to compulsive habitual use
• Failure of cognitive/behavioral control mechanisms
Impulse control disorders linked to crime

Substance abuse disorder

General U.S. population

- 9%

U.S. jail and prison population

- 50%
Impulse control disorders linked to crime

Psychopathy

- Severely antisocial behavior
- Glib, manipulative interpersonal style reflecting shallow affect, callousness, lack of remorse
- Reckless, irresponsible, impulsive behavior reflecting failure of cognitive/behavioral control mechanisms
Impulse control disorders linked to crime
Psychopathy

General U.S. population: 1%
U.S. jail and prison population: 20%
What, if anything, can (or should) brain science contribute to the legal management of these individuals?
Prefrontal Cortex

Control of behavior “in the moment”
Neurological patient with PFC damage

BEFORE TUMOR
- Chief accountant, supervisor
- Married, good father
- Respected
- Superior intelligence
Neurological patient with PFC damage

AFTER TUMOR
- Bankrupt
- Divorced, remarried a prostitute, redivorced
- Estranged from family, friends
- No guilt or empathy
- Poorly modulated anger
- Superior intelligence

“Pseudopsychopathy”
PFC and criminal behavior

• 40 year old teacher, married, normal social habits
• Began viewing child pornography and soliciting prostitution
• Sexual advances toward his step-daughter, convicted of child molestation
• Removed from home, assigned to rehab center, where sexual advances continued
• On eve of sentencing, admitted to ER with severe headache and balance problems...
PFC and criminal behavior

Massive PFC tumor
PFC and criminal behavior

• Tumor surgically removed, behavior returned to normal, allowed back home
• Approximately a year later, headaches and pornography again; tumor had regrown
• Tumor removed again, behavior returned to normal
Right Orbitofrontal Tumor With Pedophilia Symptom and Constructional Apraxia Sign

Jeffrey M. Burns, MD; Russell H. Swerdlow, MD

Background: Orbitofrontal abnormalities are associated with poor impulse control, altered sexual behavior, and sociopathy.

Objective: To describe a patient with acquired pedophilia and a right orbitofrontal tumor who was unable to inhibit sexual urges despite preserved moral knowledge.

Design: Case report.

Results: The patient displayed impulsive sexual behavior with pedophilia, marked constructional apraxia, and agraphia. The behavioral symptoms and constructional deficits, including agraphia, resolved following tumor resection.

Conclusions: For patients with acquired sociopathy and paraphilia, an orbitofrontal localization requires consideration. This case further illustrates that constructional apraxia can arise from right prefrontal lobe dysfunction. Agraphia may represent a manifestation of constructional apraxia in the absence of aphasia and ideomotor apraxia.

Arch Neurol. 2003;60:437-440

The orbitofrontal cortex contributes to moral knowledge acquisition and social integration. Adult-acquired orbitofrontal damage may diminish impulse control and can be associated with sociopathic behavior. We describe a 40-year-old man who was treated with medroxyprogesterone acetate to purveyors of child pornography. He also solicited prostitution at “massage parlors,” which he had not previously done. The patient went to great lengths to conceal his activities because he felt that they were unacceptable. However, he continued to act on his sexual impulses, stating that “the pleasure principle overrides” his urge restraint. He began making
MRI and PET data presented in case of Herbert Weinstein
PFC dysfunction in impulse control disorders
PFC dysfunction in impulse control disorders
PFC dysfunction in impulse control disorders

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Department of Psychology
PFC dysfunction in psychopathy

- Adult male inmates
- Psychopathic (n=20) vs Non-psychopathic (n=20)
- Compare connections between the PFC and amygdala
  - Amygdala: brain structure for fear/anxiety
  - Fear/anxiety critical input to normal decision-making
  - Psychopaths operate in fearless/low-anxious manner

Motzkin et al., *Journal of Neuroscience*, 2011
PFC dysfunction in psychopathy

Motzkin et al., *Journal of Neuroscience*, 2011
PFC dysfunction in addiction

• Adult male inmates
• Psychopathic (n=18) vs Non-psychopathic (n=22)
• Compare connections between the PFC and nucleus accumbens
  – Nucleus accumbens: reward center in brain
  – Addicts operate as if no control over intake of rewarding substances

Motzkin et al., in prep
PFC dysfunction in addiction

Motzkin et al., *in prep*
Summary: Brain imaging studies

- Disorders of impulse control are associated with criminality and incarceration
- PFC—the critical brain area for impulse control—is dysfunctional in psychopathy and addiction
Implications

• Neurobiological data may soon play an increasing role in the legal system
  – Determining likelihood of future offense
  – Prospects for rehabilitation
  – Questions of culpability
PET data presented in trial of Peter Braunstein
fMRI data presented in trial of Brian Dugan