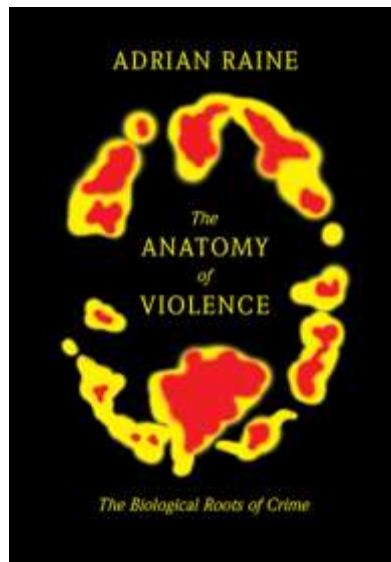


The Anatomy of Violence: Dissecting The Biological Roots of Crime

Adrian Raine

*Departments of Criminology, Psychiatry, and Psychology,
University Of Pennsylvania.*



5th International Bergen Conference on Forensic Psychology, 23rd October, 2018

OUTLINE

1. Early Biological Risk Factors
2. Brain Mechanisms
3. Legal and Societal Implications
 - prediction
 - prevention
 - punishment

Prenatal Nutrition and Adult Antisocial Personality



Prenatal Exposure to Wartime Famine and Development of Antisocial Personality Disorder in Early Adulthood

Richard Neugebauer, PhD, MPH

Hans Wijbrand Hoek, MD, PhD

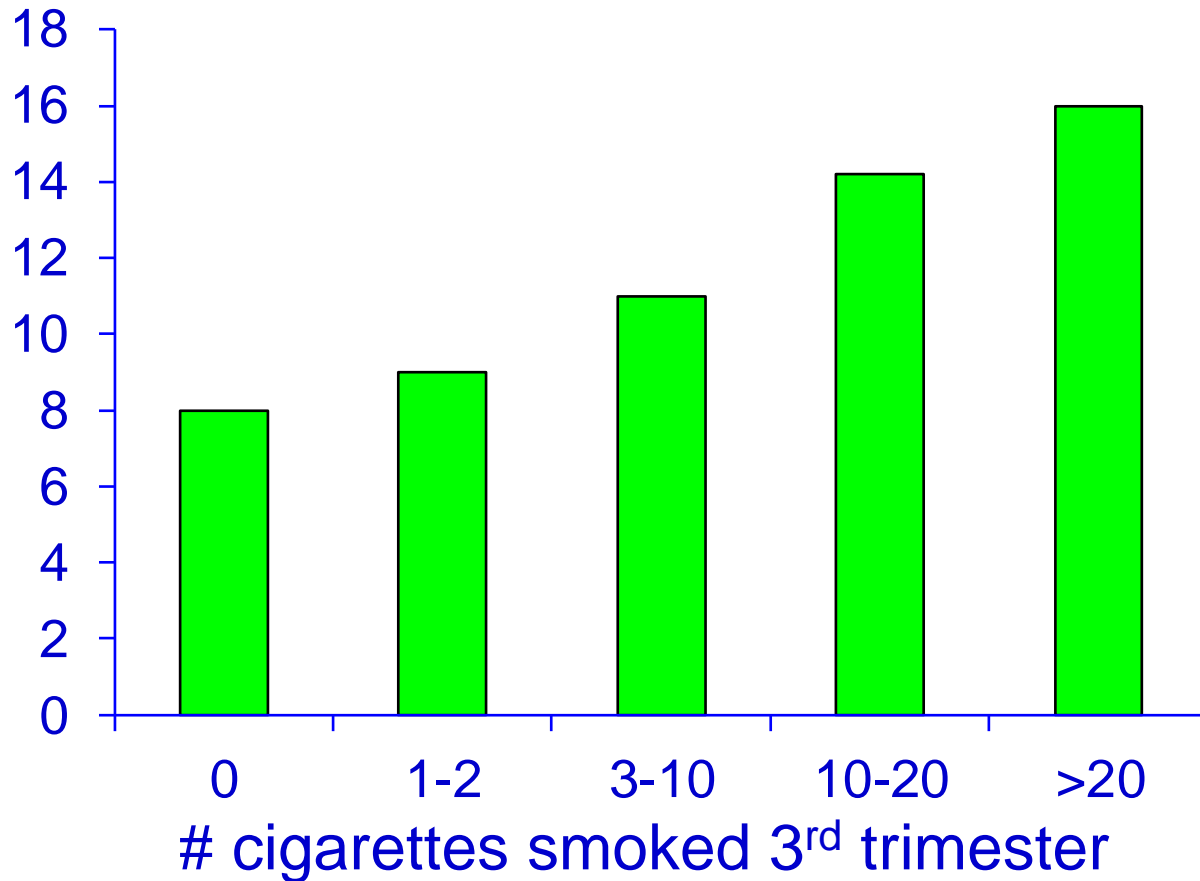
Esra Susser, MD, DrPH

Context Several observational epidemiological studies report an association of pregnancy and obstetric complications with development of antisocial personality disorder (ASPD) in offspring. However, the precise nature and timing of the hypothesized biological insults are not known.

Brennan et al. (1999)

- 4,169 males born 1959-1960 in Copenhagen

% violent
age 34



controlled for :

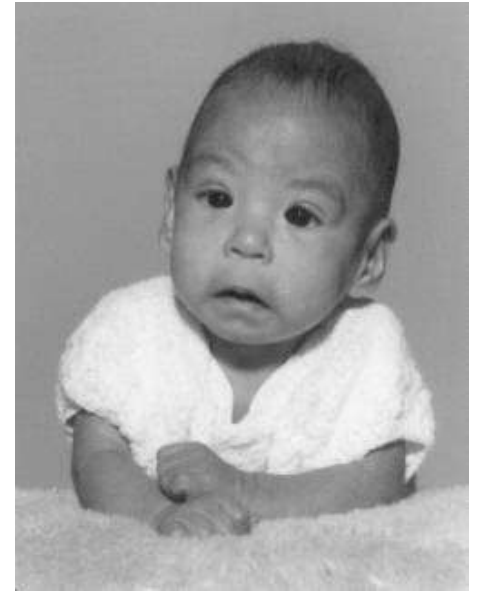
- SES,
- mum's age
- mum' education
- unwanted pregnancy
- obstetric factors

- > 20 other studies find same relationship

FETAL ALCOHOL SYNDROME (FAS)

Streissguth et al. (1996): 473 with FAS or FAE

- 61% rate of delinquency
- 58% police contacts in adulthood
- 54% males (33% females) arrested / convicted after age 12







Jamillah Falls, Memphis, TN

Baby girl born July 5, 2014
Baby tested positive for heroin & marijuana
Convicted of **assault** - 6 months in prison

**PARENTAL RESPONSIBILITY
OR ...
HELP, NOT HANDCUFFS**

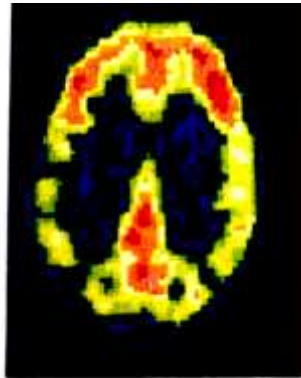
OUTLINE

1. Early Biological Risk Factors
2. Brain Mechanisms
3. Legal and Societal Implications

Prefrontal Dysfunction in Murderers

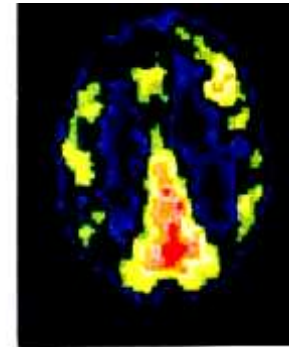
Raine et al., 1994, *Biological Psychiatry*, 42, 495-508

41 controls

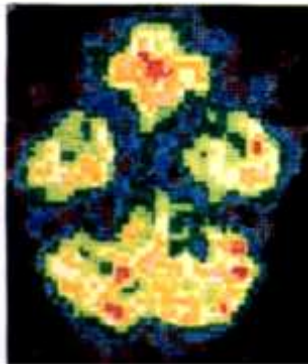


NORMAL

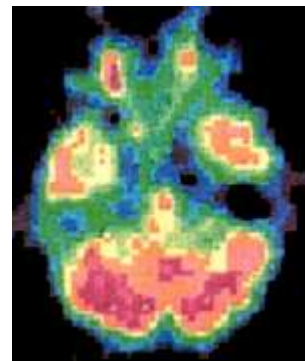
41 murderers



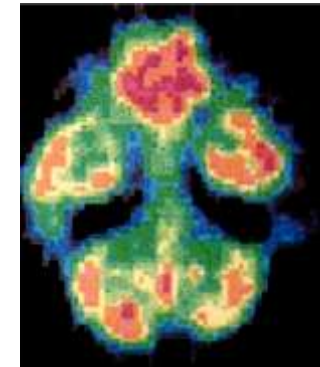
MURDERER



NORMAL
CONTROL



REACTIVE
MURDERER

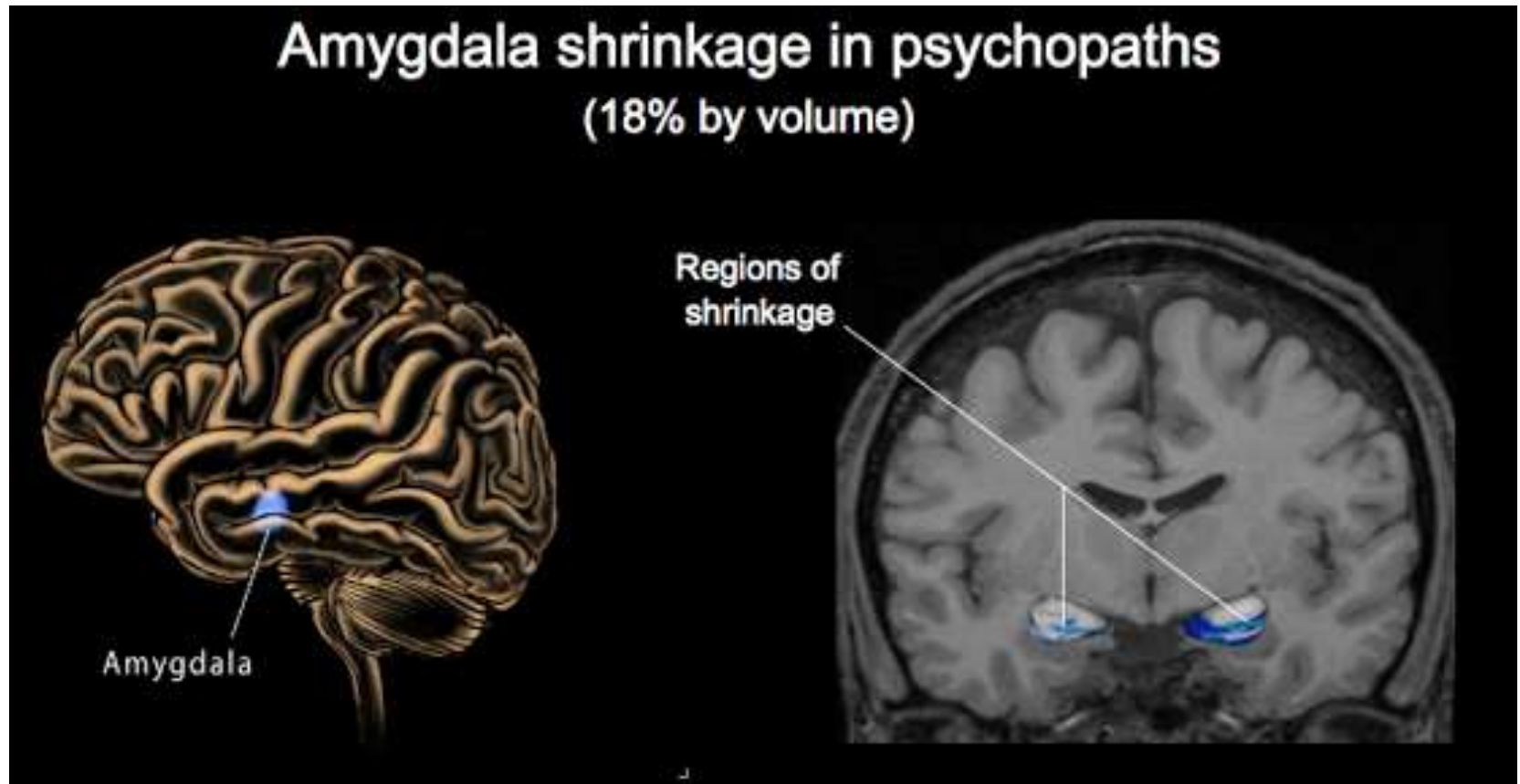


PROACTIVE
MURDERER

Amygdala and Psychopathy

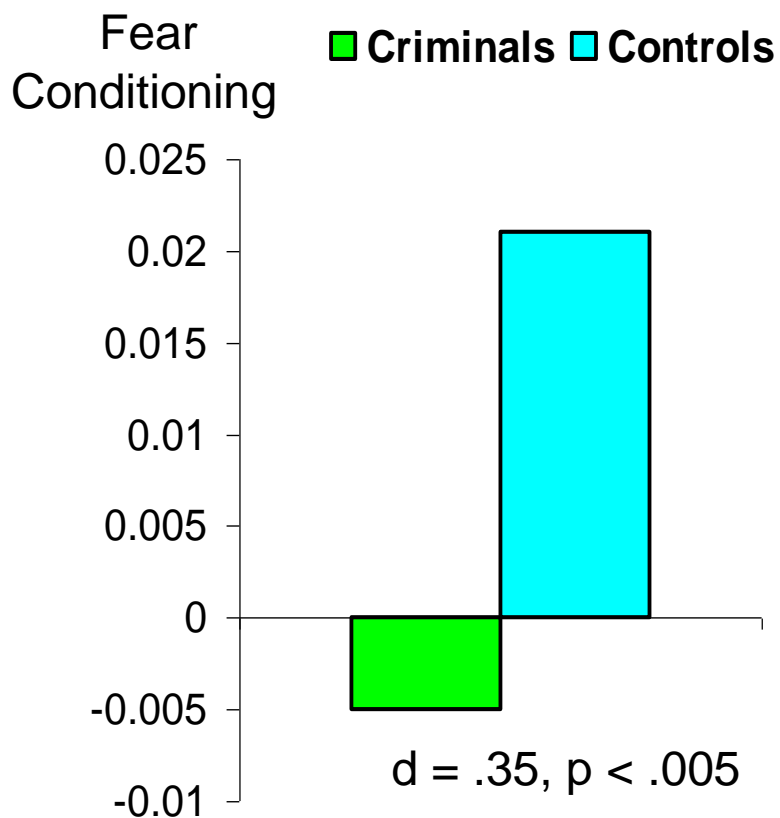
Yang et al., (2009).
Archives of General Psychiatry

27 psychopaths vs. 32 non-psychopaths



Fear Conditioning at Age 3 and Crime at age 23

Gao et al. (2010) *Am. J. Psychiat.*, 167, 156-160.



N = 1,795 3-year-olds

- fear conditioning at age 3
- criminal convictions at age 23

Criminal offenders N = 137

Matched controls N = 274

Match on:

sex, ethnicity, social adversity

Editorial

Born to Be Criminal? What to Make of Early Biological Risk Factors for Criminal Behavior

While the important role of psychosocial factors in the development of criminal behavior has long been acknowledged, there has been an increasing interest in the neurobiological basis of aggression and crime over the past decade, boosted by method-

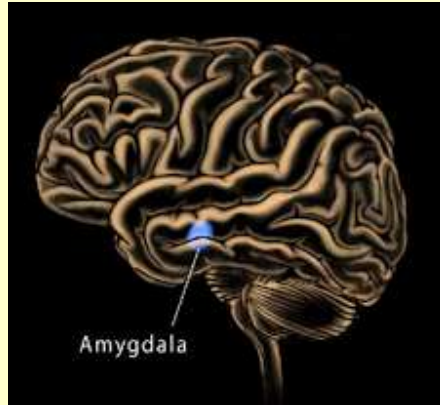
“If not handled with great caution, neurobiological markers can easily be misused to stigmatize individuals who are perceived as a potential threat to society.”

“Neurobiological research offers a great chance to further our understanding of antisocial and criminal behavior.

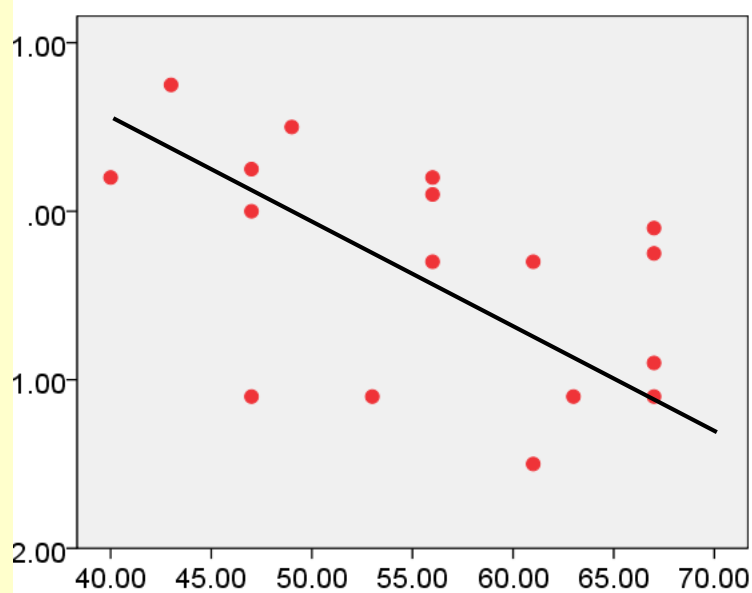
This understanding should be used to benefit those children who are at greatest risk for a criminal career and to design interventions that are tailored to their needs”.

Amygdala, Moral Decision-Making & Psychopaths

Glenn et al. 2009, *Molecular Psychiatry*, 14, 5–9

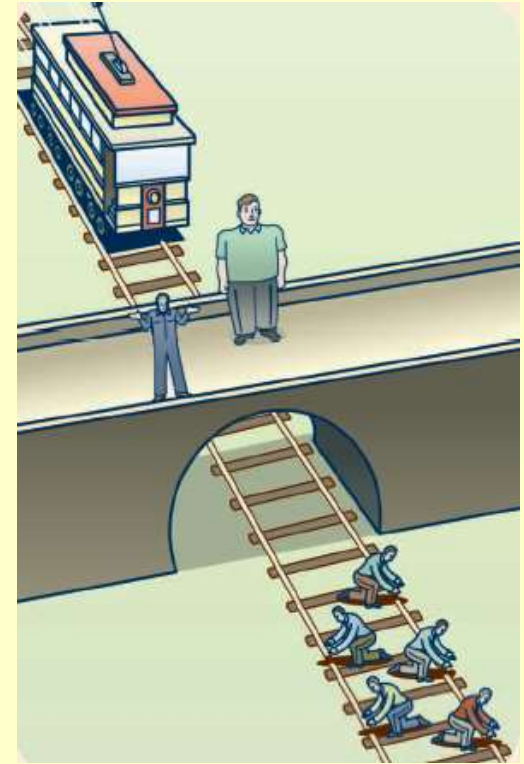


Amygdala
Activation



Psychopathy Score

$r = -.49$
 $p < .05$





Psychopaths may *know* right from wrong, but ...

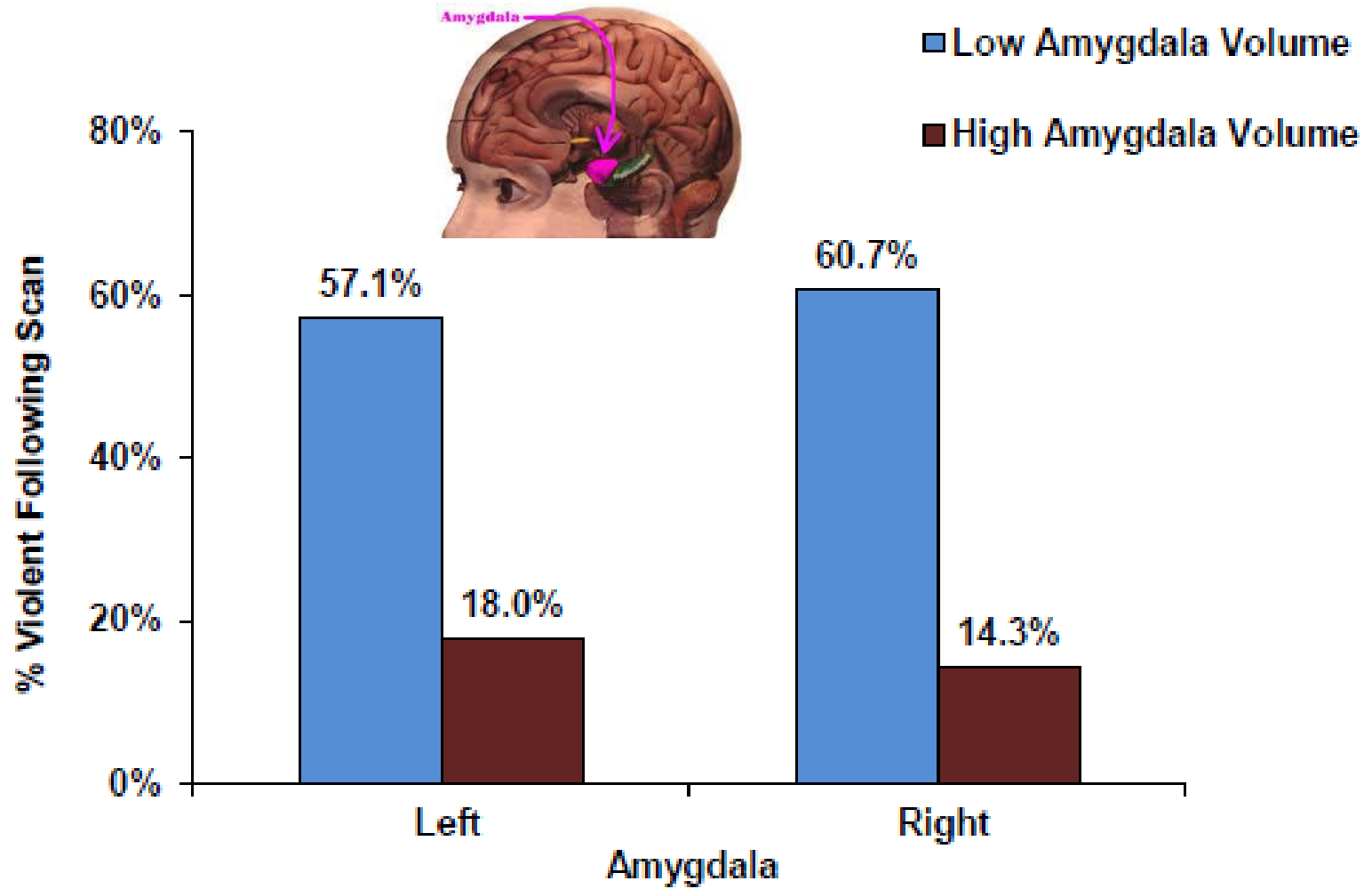
Do they having the *feeling* of what's right and wrong?

OUTLINE

1. Early Biological Risk Factors
2. Brain Mechanisms
3. Legal and Societal Implications
 - prediction
 - prevention
 - punishment

Amygdala Volume Predicts Later Violence

Pardini et al. (2013) *Biological Psychiatry*



Controlling for prior aggression, violence, and psychopathy

OUTLINE

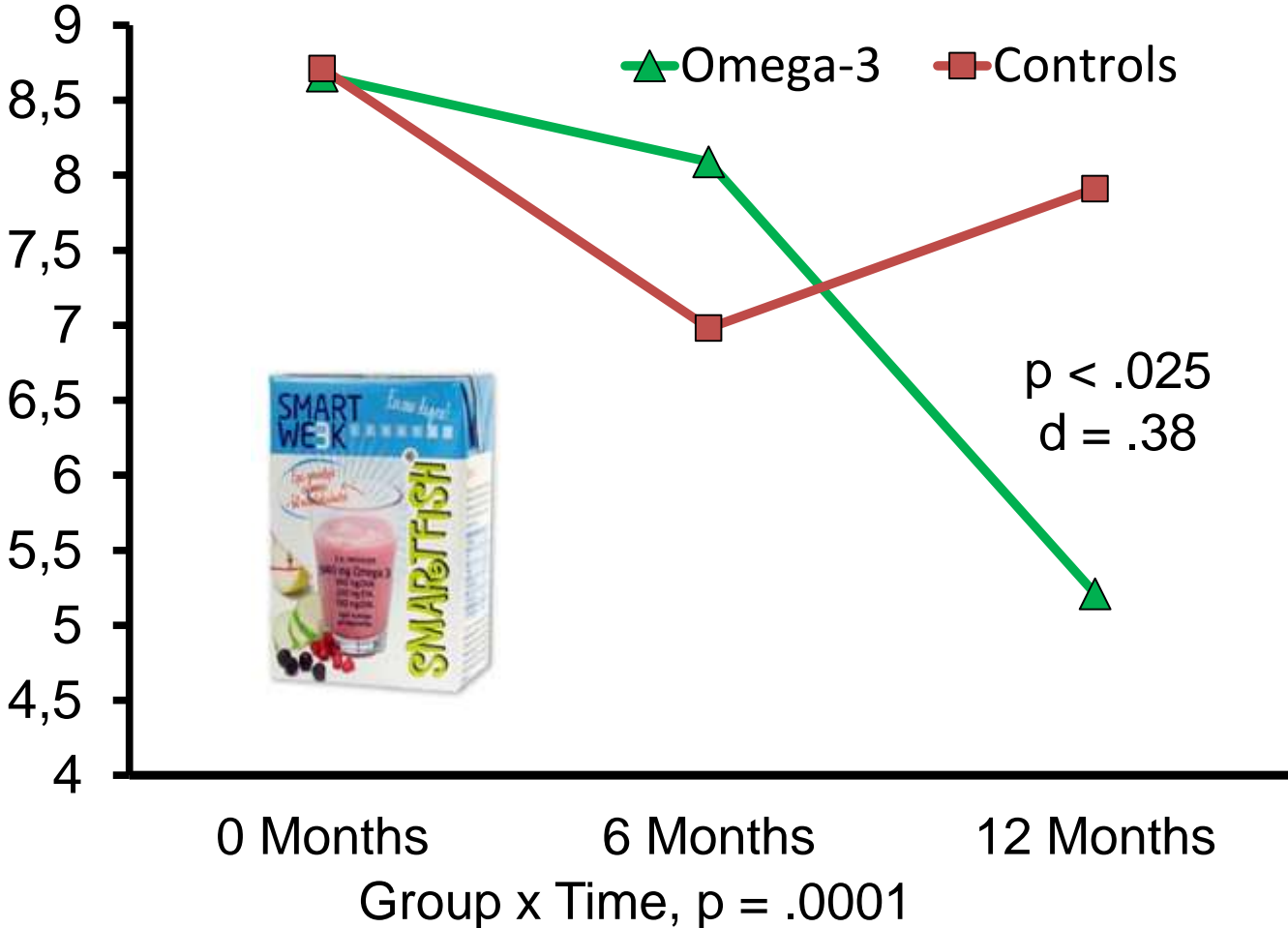
1. Early Biological Risk Factors
2. Brain Mechanisms
3. Legal and Societal Implications
 - prediction
 - prevention

Omega-3 and Child Antisocial Behavior

Raine et al. (2015). *J. Child. Psychol. Psychiat.* 56 509-520



Child
Antisocial
Behavior



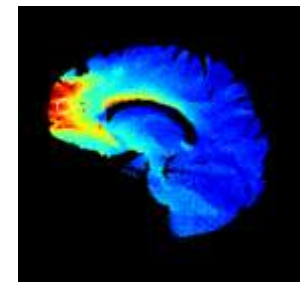
Transcranial Direct Current Stimulation (tDCS) and Criminal Intent

Choy et al. (2018), *Journal of Neuroscience*

Double-blind, stratified, randomized controlled trial

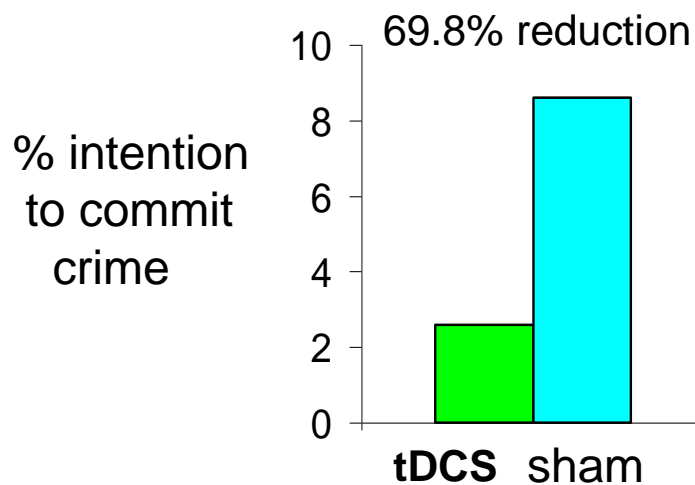
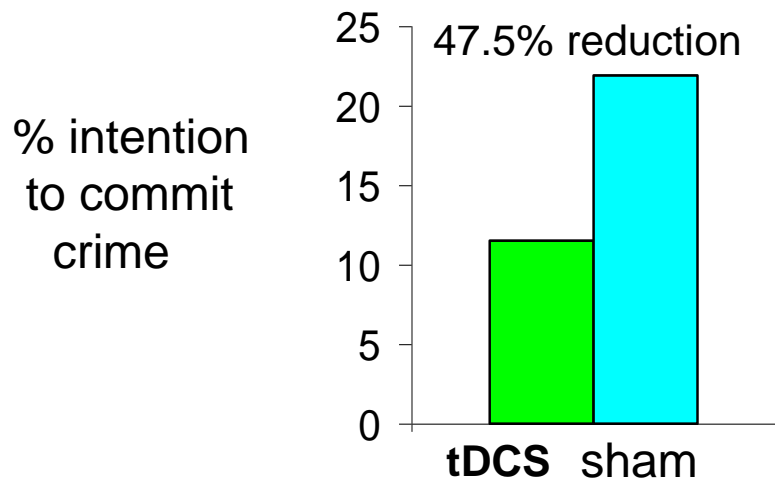
39 tDCS stimulation

42 sham stimulation



■ tDCS ■ Controls

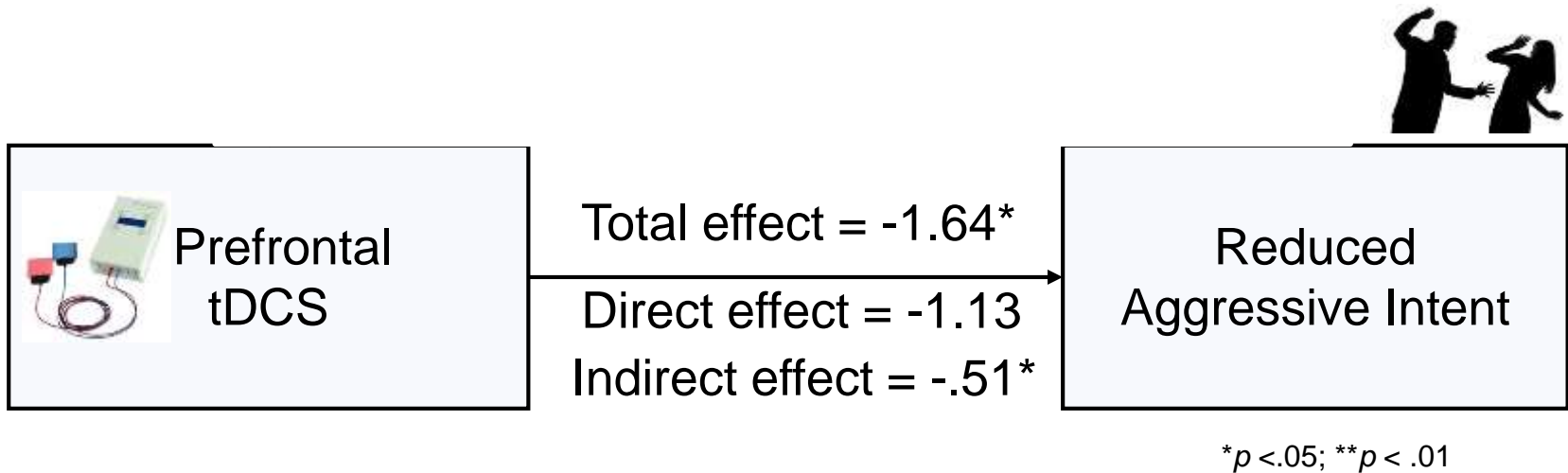
■ tDCS ■ Controls



Physical assault

Sexual assault

Mediation: Perceptions of Moral Wrongfulness



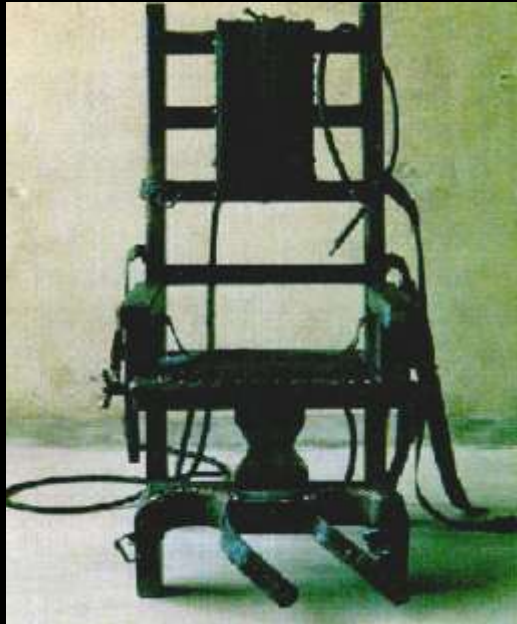
Enhanced perception of moral wrongfulness accounts for 31% of the total tDCS treatment group effect in reducing aggressive intent

OUTLINE

1. Early Biological Risk Factors
2. Brain Mechanisms
3. Legal and Societal Implications
 - prediction
 - prevention
 - punishment

Neuroethics, Neurolaw, and Neurocriminology Interface

If neurobiological impairments predisposes to antisocial behavior, are criminals responsible?



THE CASE OF MICHAEL: ACQUIRED PEDOPHILIA

Burns & Swerdlow (2003) *Arch. Neurol.* 60:437-440



- 40 years old, 2nd marriage (stable), schoolteacher
- no psychiatric history or sexually deviant behavior

Michael

Is Michael Responsible?

Michael *is* responsible: he has rational capacity:

1. he knew what he was doing
2. he knew act was illegal / immoral

“The fact is, I did what I did do. I am responsible for it, I am the one to blame.”

- Is it *just* to blame Michael?

“Now, whether I should be held as accountable for it as someone without a tumor? No, I don’t think so”.

- Should we consider **emotion** alongside cognition in responsibility criteria?
- What about others with equivalent brain dysfunction which is not treatable, but present?

SUMMARY

1. Early Biological Risk Factors

- Early constraints on free will

2. Brain Mechanisms

- Prefrontal cortex, amygdala

3. Legal and Societal Implications

- Can omega-3 and prefrontal upregulation reduce crime?
- Better prediction from neurobiology?
- Should mercy season justice?

Antisocial Personality as a Neurodevelopmental Disorder

Adrian Raine

Departments of Criminology, Psychiatry, and Psychology, University of Pennsylvania, Philadelphia, Pennsylvania 19104, USA; email: araine@sas.upenn.edu

Abstract

Although antisocial personality disorder (APD) is one of the most researched personality disorders, it is still surprisingly resistant to treatment. This lack of clinical progress may be partly due to the failure to view APD as a neurodevelopmental disorder and to consider early interventions. After first defining what constitutes a neurodevelopmental disorder, this review evaluates the extent to which APD meets neurodevelopmental criteria, covering structural and functional brain imaging, neurocognition, genetics and epigenetics, neurochemistry, and early health risk factors. Prevention and intervention strategies for APD are then outlined, focusing on addressing early biological and health systems, followed by forensic and clinical implications. It is argued both that APD meets criteria for consideration as a neurodevelopmental disorder and that consideration should be given both to the possibility that early onset conduct disorder is neurodevelopmental in nature, and also to the inclusion of psychopathy as a specifier in future *Diagnostic and Statistical Manual* revisions of APD.