A Neurodevelopmental Perspective on Male Violence

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Early Origins of Male Violence, Santa Fe, May 1, 2019

A NEURODEVELOPMENTAL PERSPECTIVE ON VIOLENCE

1. The neurodevelopmental perspective
2. Early influences on development
3. Neural mechanisms
4. Neuromoral perspective
5. Prevention strategies
6. Why males?

Antisocial Personality as a Neurodevelopmental Disorder

Raine (2018), *Annual Review of Clinical Psychology*

1. Originates often before grade school
2. Abnormalities in brain structure / function
3. Accompanied by neurocognitive impairments
4. Significant genetic basis
5. Runs relatively stable developmental course without remission / relapse
6. Continues into adulthood resulting in social, academic, and occupational functioning.

+ + + + +

a. invariably, but not exclusively, a male condition

b. low base rate

c. comorbidity with other neurodevelopmental disorders

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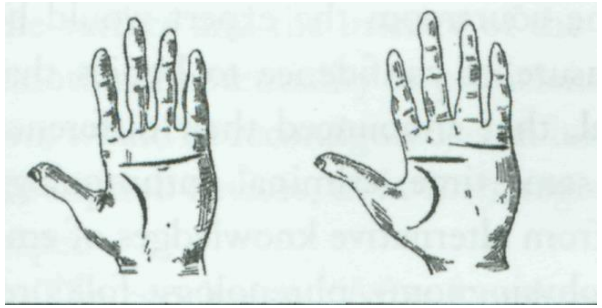
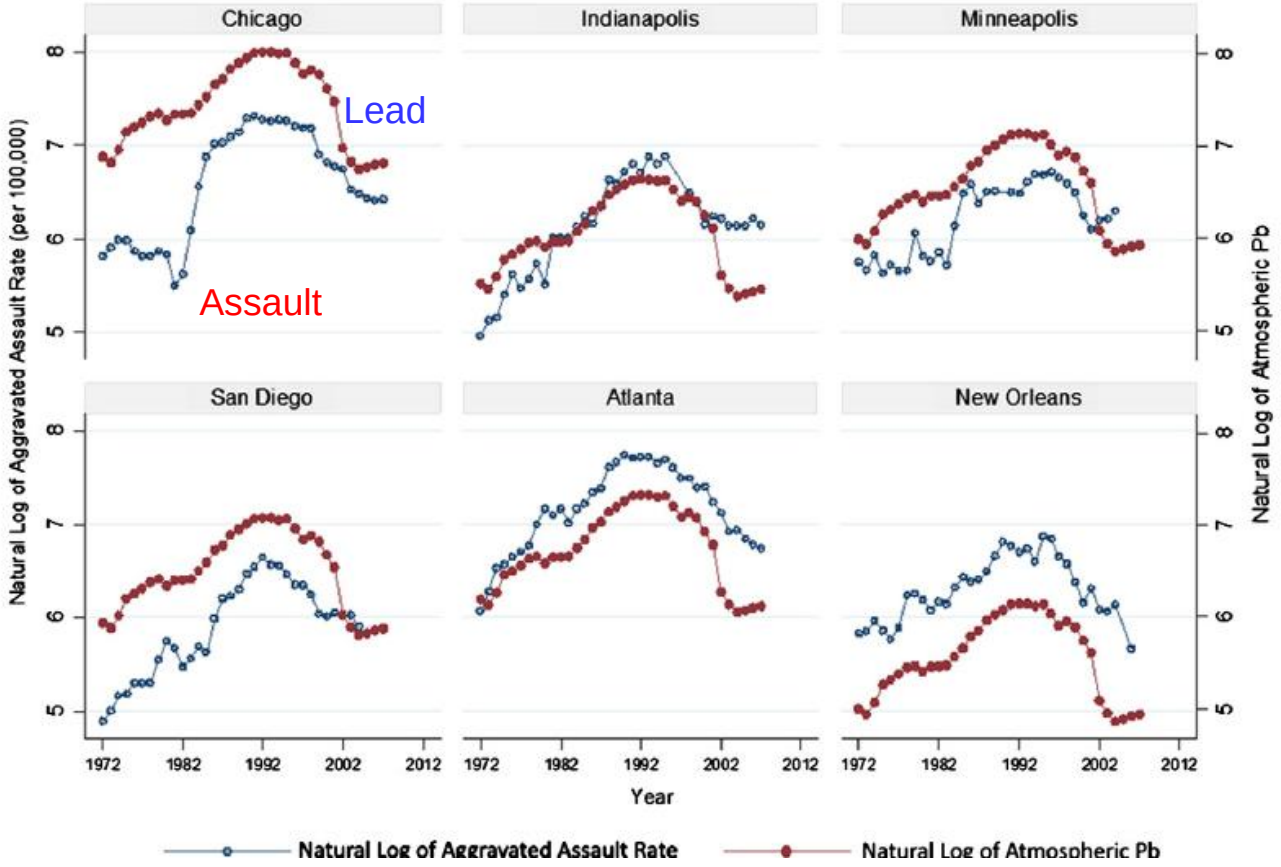
Minor Physical Anomalies

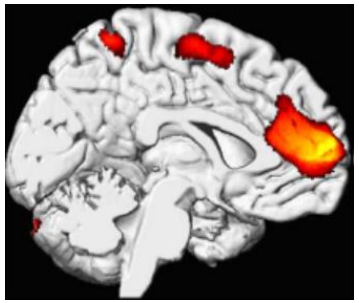
- Low Seated Ears
- Furrowed Tongue
- Single Palmar Crease
- Curved 5th Finger
- Third Toe Longer than Second
- Fine Hair
- Abnormal Head Size
- Big gap between 1st and 2nd toe

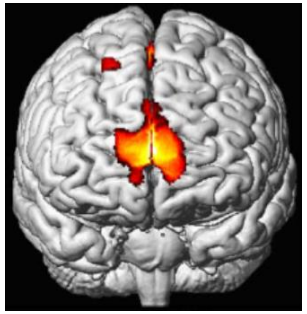


Waldrop et al. (1978); Halverson & Victor, (1976);
Paulus & Martin, (1986); Mednick & Kandell (1988);
Brennan et al. (1993); Pine et al. (1997);
Arseneault et al. (2000); Ryan et al. (2012)
Teny et al. (2015); Dyshniku et al., (2015)

Lead – Assault Correlations at City Levels

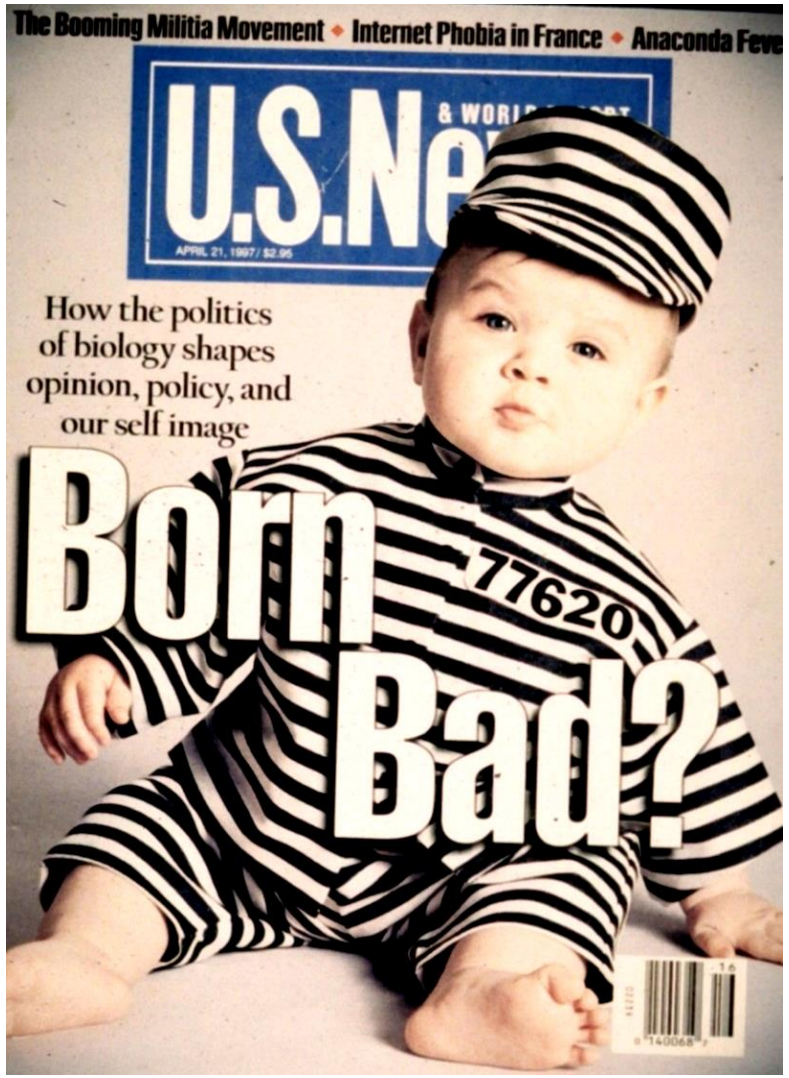


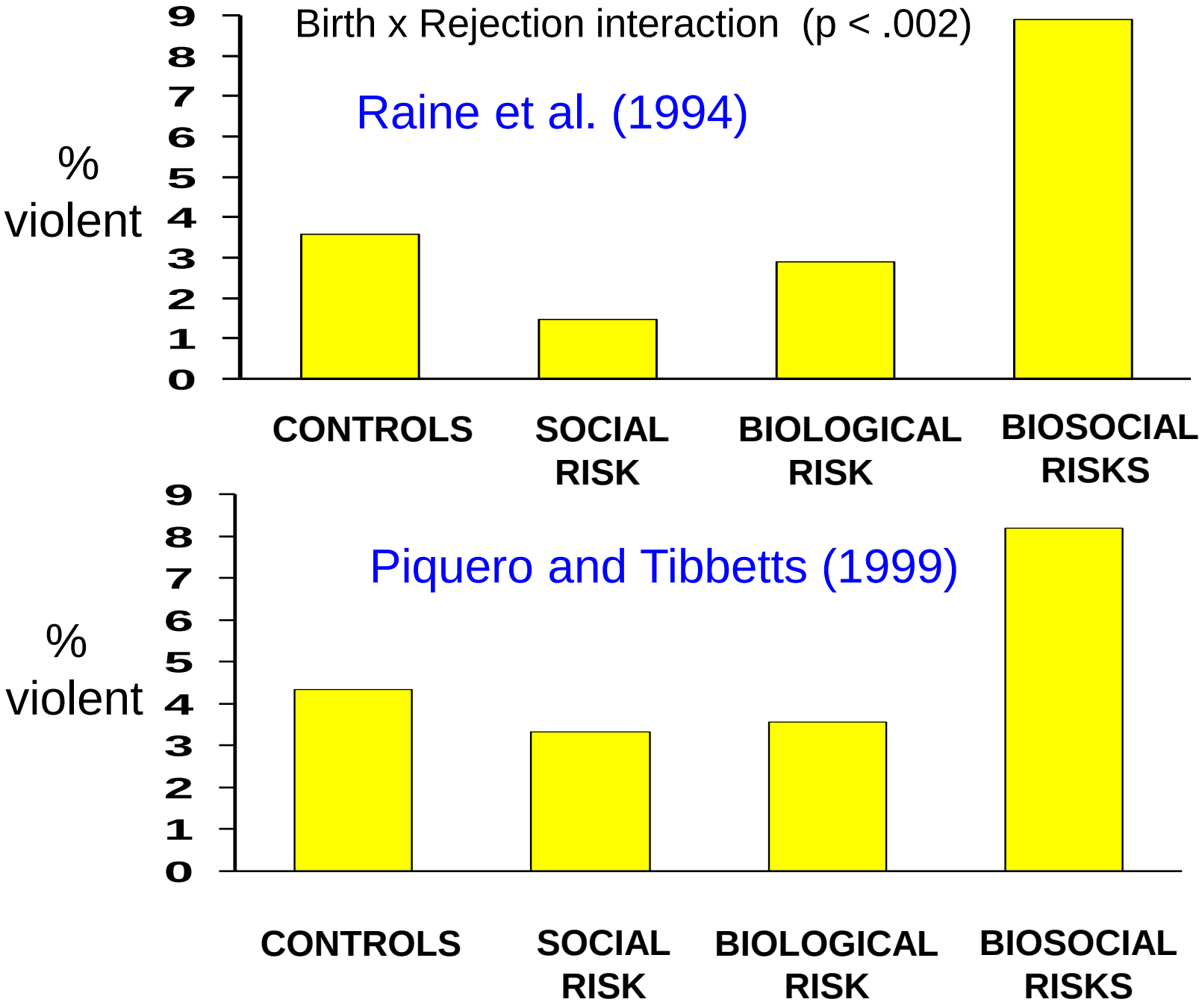




Cecil (2008)

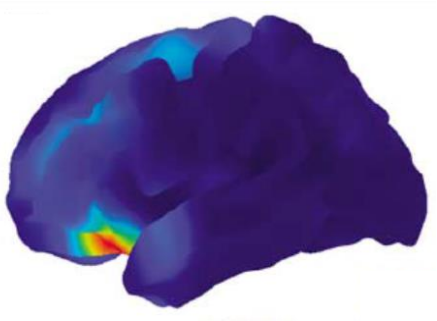
Lead levels at 2-3 years and brain volume


The Booming Militia Movement • Internet Phobia in France • Anaconda Feve
U.S.Ne
& WORL
APRIL 21, 1997 / $2.95
How the politics of biology shapes opinion, policy, and our self image
Born 77620 Bad?


Birth x Rejection interaction (p < .002)
Raine et al. (1994)
% violent
0
1
2
3
4
5
6
7
8
9
CONTROLS
SOCIAL RISK
BIOLOGICAL RISK
BIOSOCIAL RISKS
Piquero and Tibbetts (1999)
% violent
CONTROLS
SOCIAL RISK
BIOLOGICAL RISK
BIOSOCIAL RISKS

Brennan, Mednick et al. (1999)

- 4,169 males born 1959-1960 in Copenhagen



Toro et al. 2008

> 20 other studies find same relationship

Prenatal Nutrition and Adult Antisocial Personality

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

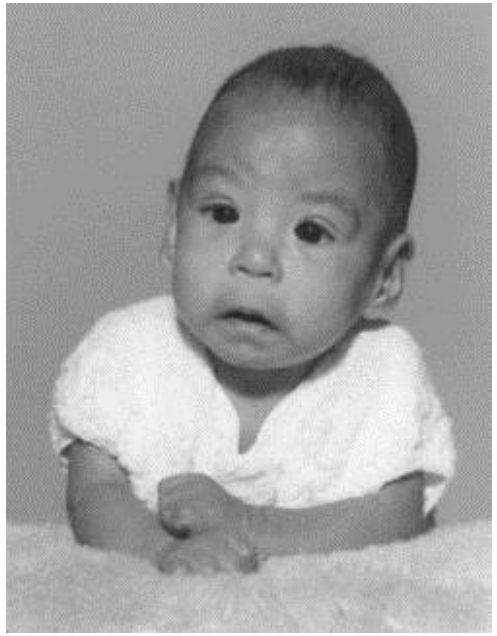
Richard Neugebauer, PhD, MPH
Hans Wijbrand Hoek, MD, PhD
Ezra Susser, MD, DrPH

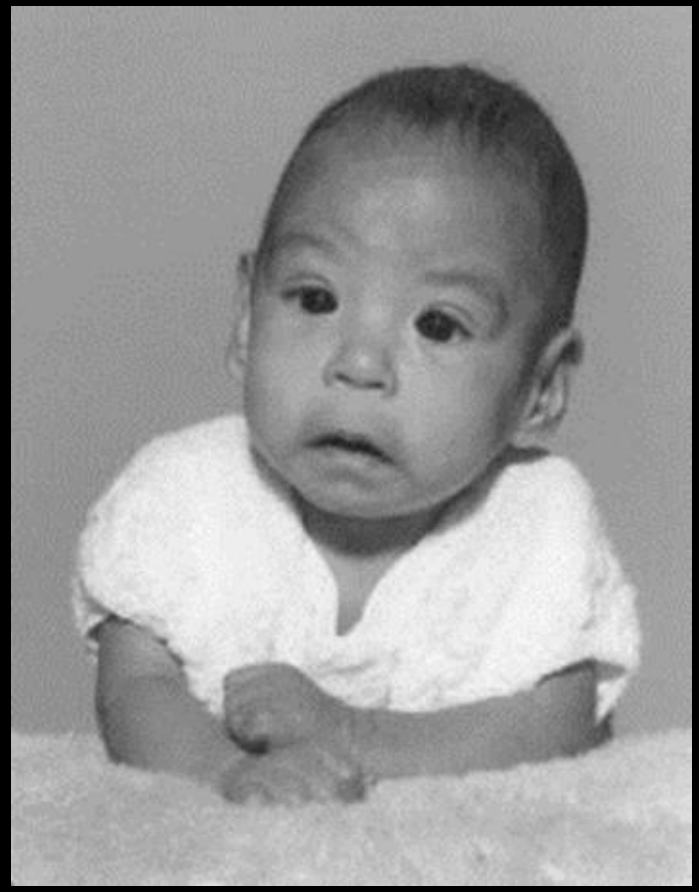
Context Several observational epidemiological studies report an association of pregnancy and obstetric complications with development of antisocial personality disorder (ASPD) in offspring. However, the precise nature and timing of the hypothesized biological insults are not known.

FETAL ALCOHOL SYNDROME (FAS)

Streissguth et al. (1996): N = 473

- 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 RESPONSIBILTY
OR …
HELP, NOT HANDCUFFS

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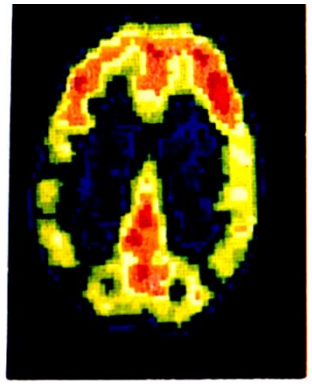
Prefrontal Dysfunction in Murderers

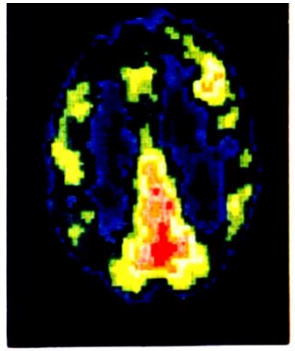
Raine et al., 1994, *Biological Psychiatry, 42*, 495-508

41 controls

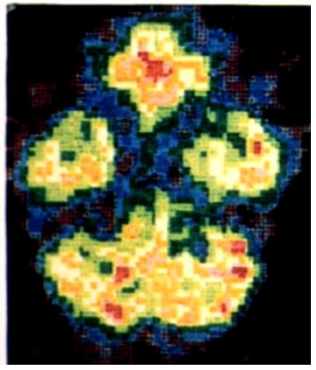


NORMAL

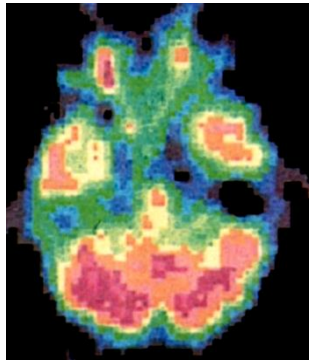
41 murderers



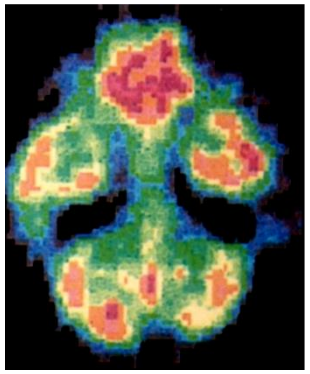
MURDERER



NORMAL CONTROL



REACTIVE MURDERER

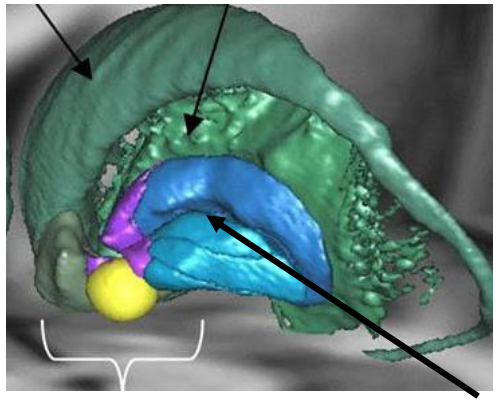


PROACTIVE MURDERER

Psychopathy: Striatum and Rewards

Striatum

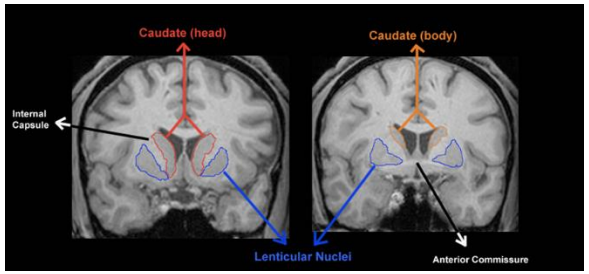
Caudate Putamen



Nucleus accumbens **Globus pallidus**

Structure

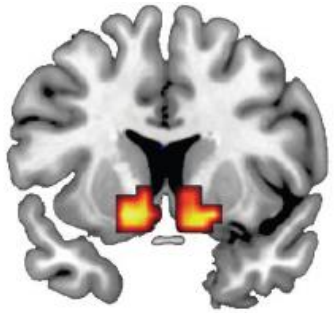
Glenn et al. (2010)
Biol. Psychiatry, *67*, 52-58



9.6% volume *increase* in psychopaths

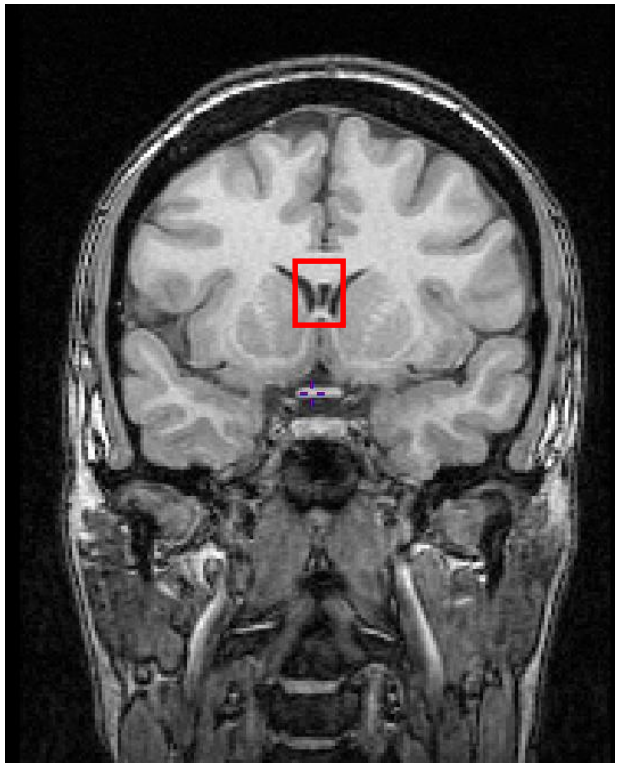
Function

Buckholtz et al. (2010)
Nat. Neuro. 13, 419-421



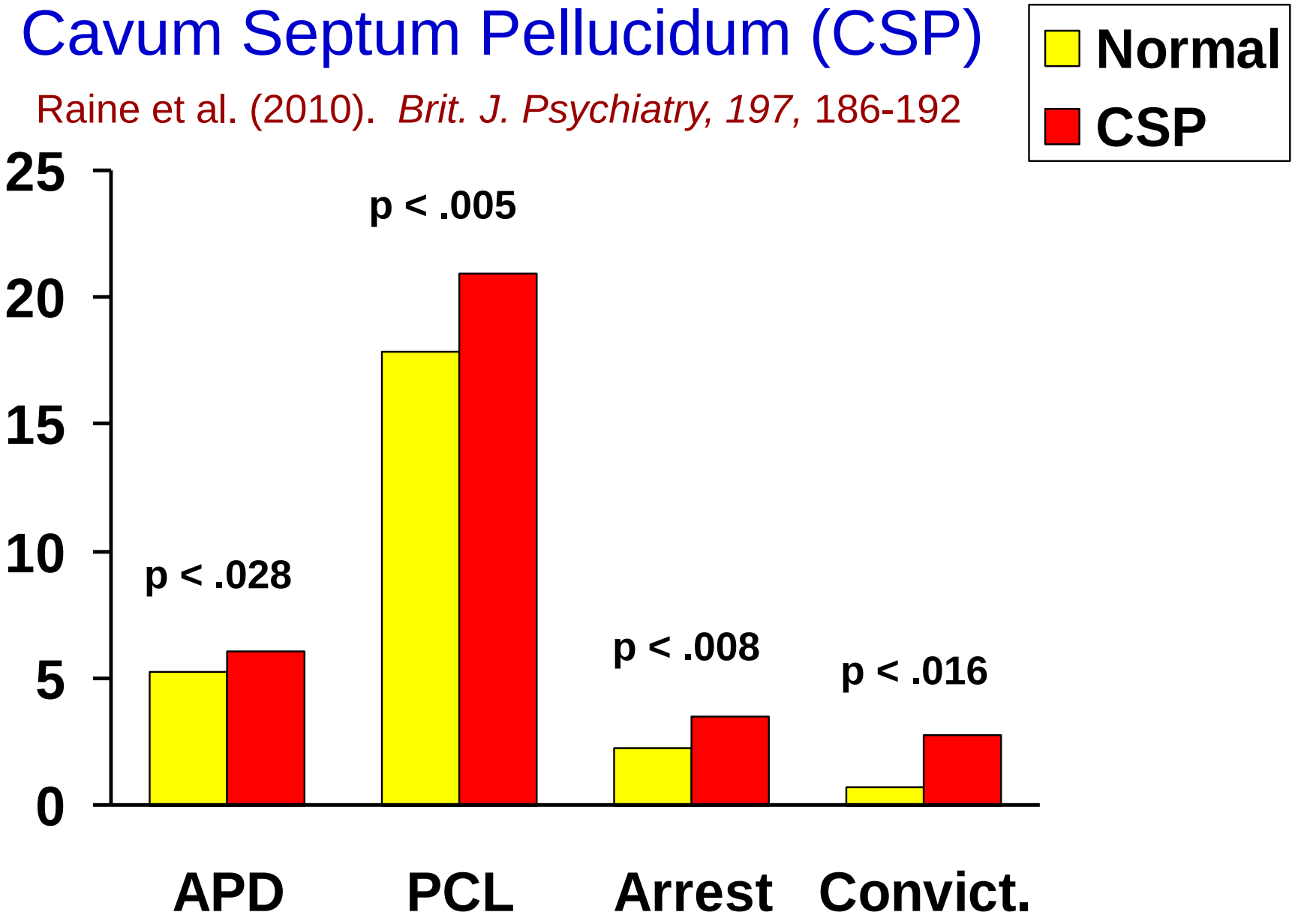
Psychopathy and reward hypersensitivity

Cavum Septum Pellucidum



Cavum Septum Pellucidum (CSP)

Raine et al. (2010). *Brit. J. Psychiatry, 197,* 186-192



THE JOURNAL OF CHILD PSYCHOLOGY AND PSYCHIATRY
Journal of Child Psychology and Psychiatry 54:5 (2013), pp 575–581 doi:10.1111/j.1469-7610.2012.02603.x

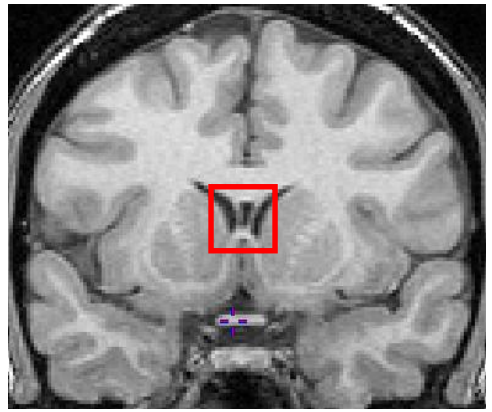
The relationship between large cavum septum pellucidum and antisocial behavior, callous-unemotional traits and psychopathy in adolescents

Stuart F. White, Sarah Brislin, Stephen Sinclair, Katherine A. Fowler, Kayla Pope, and R. James R. Blair

Unit on Affective Cognitive Neuroscience, National Institute of Mental Health, NIH, Bethesda, MD, USA

Cavum Septum Pellucidum is associated with:

- higher psychopathy scores
- increased proactive aggression
- diagnosis of disruptive behavior disorder



1,432 male prisoners: CSP and ↑ psychopathy (Crooks et al., 2018)

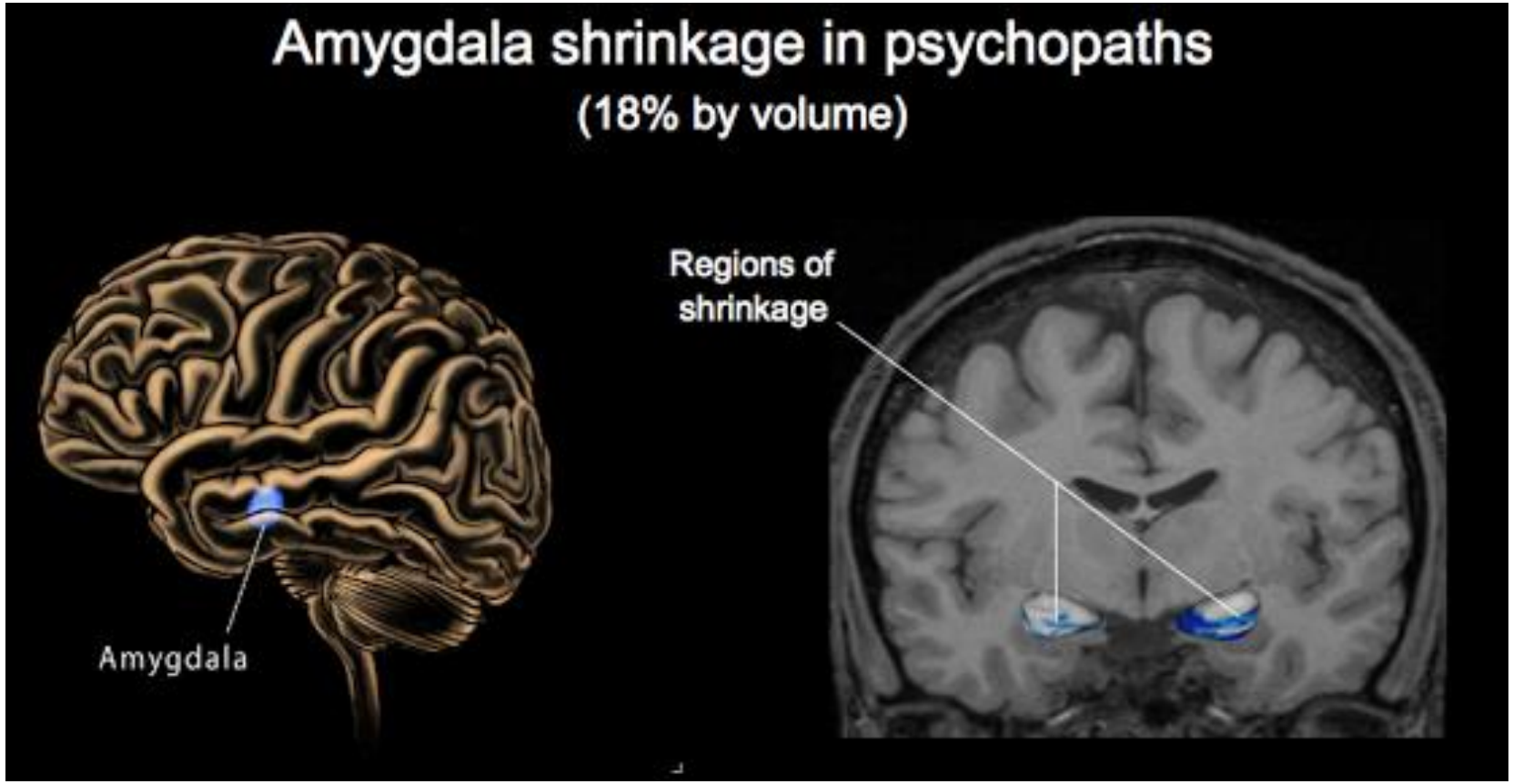
355 female prisoners: CSP and ↑ psychopathy (Crooks et al., 2019)

Amygdala and Psychopathy

Yang et al., (2009).

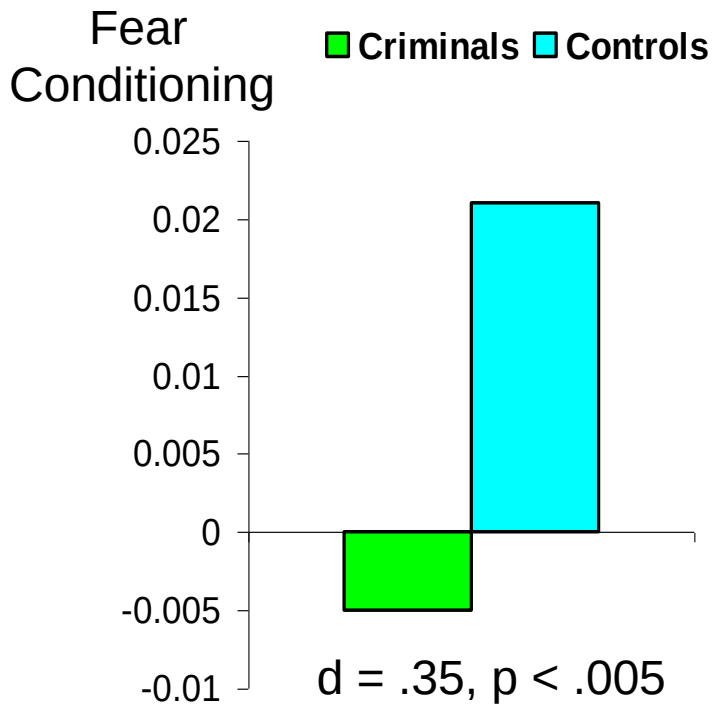
Archives of General Psychiatry, 66, 986-994.

27 psychopaths vs. 32 non-psychopaths



Lack of Fear at Age 3 Predisposes to Adult Crime

Gao et al. (2010) *American Journal of Psychiatry, 167,* 156-160.



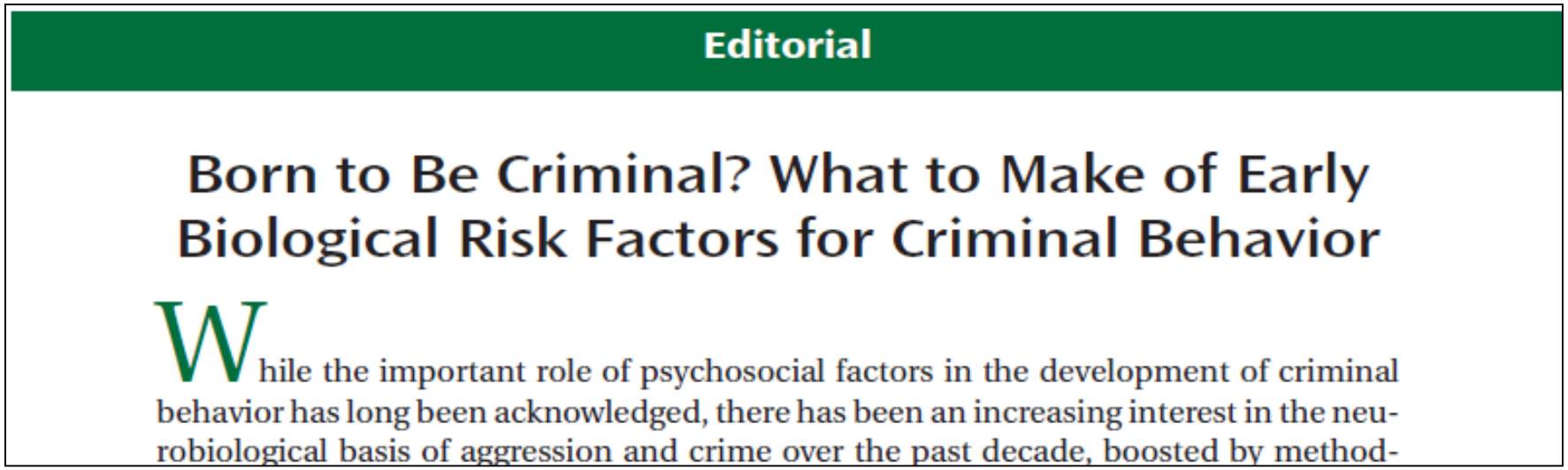
N = 1,795 3-year-olds

Criminal offenders N = 137

Matched controls N = 274

Match on:
sex, ethnicity, social adversity

Editorial: Philipp Sterzer (2010), *American Journal of Psychiatry*, 167, 1-3.



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."

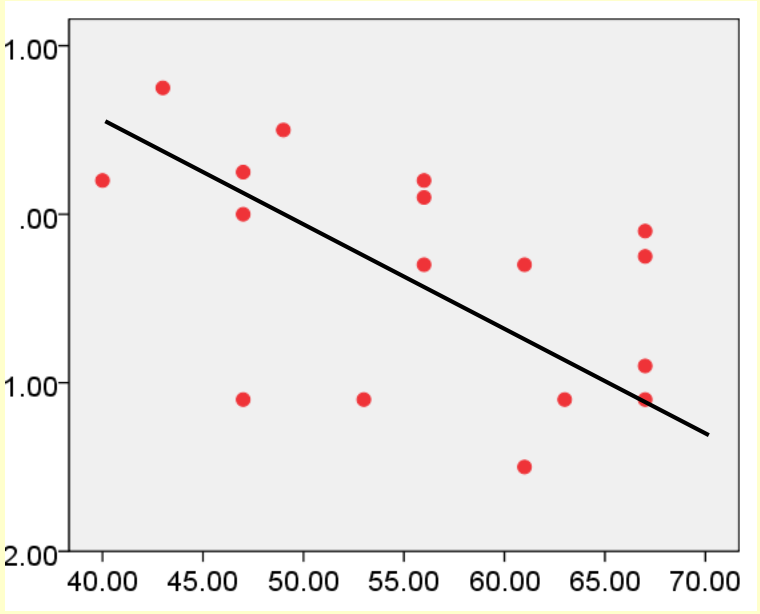
"Neurobiological research offers a great chance to further our understanding of antisocial and criminal behavior.

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

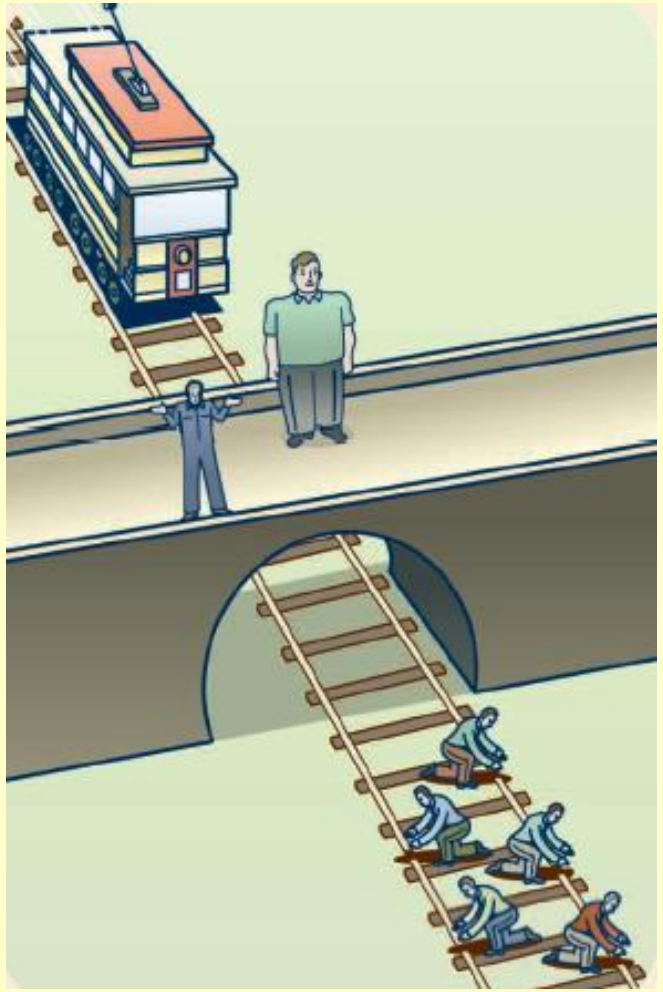
Amygdala Activation



Psychopathy Score

r = -.49

p < .05



Psychopaths may *know* right from wrong, but …

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

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Neuromoral Theory of Antisocial Behavior

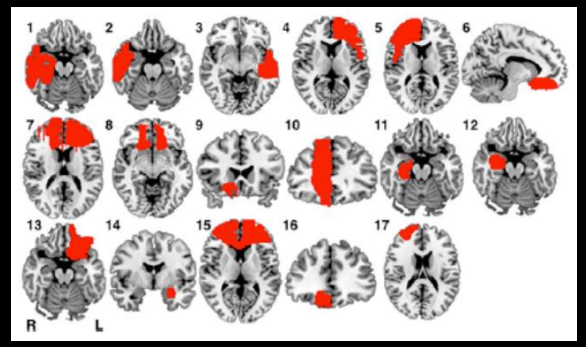
Raine & Yang (2006) *Social, Cog, & Affective Neuro.*
Raine (2019) *Psychiatry Research*

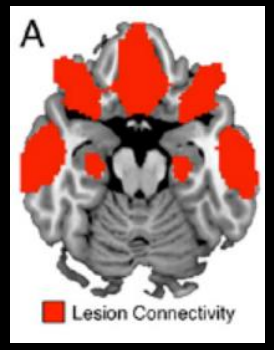
Moral + Antisocial

Moral only

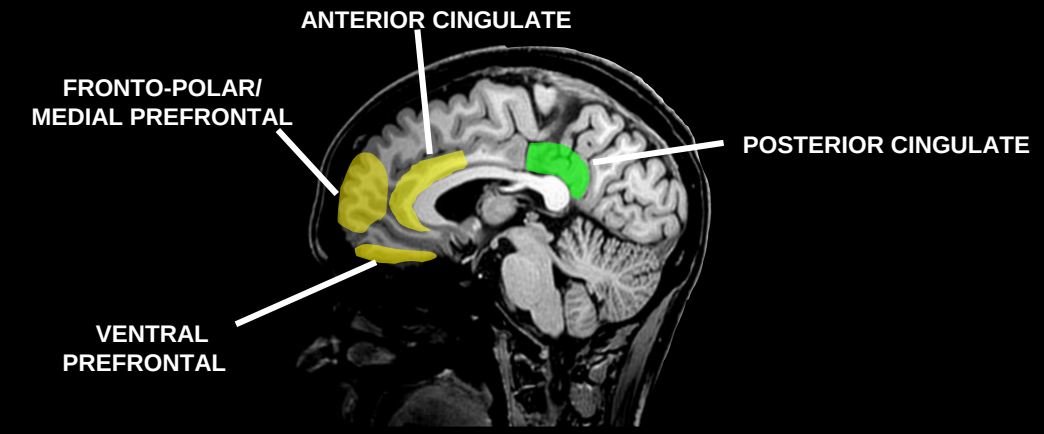
Antisocial only

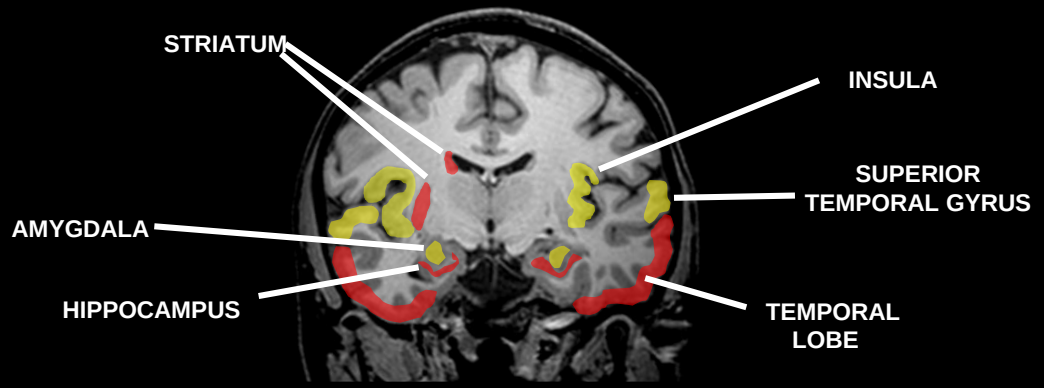
Darby et al. (2018). *PNAS, 115, 601-606*

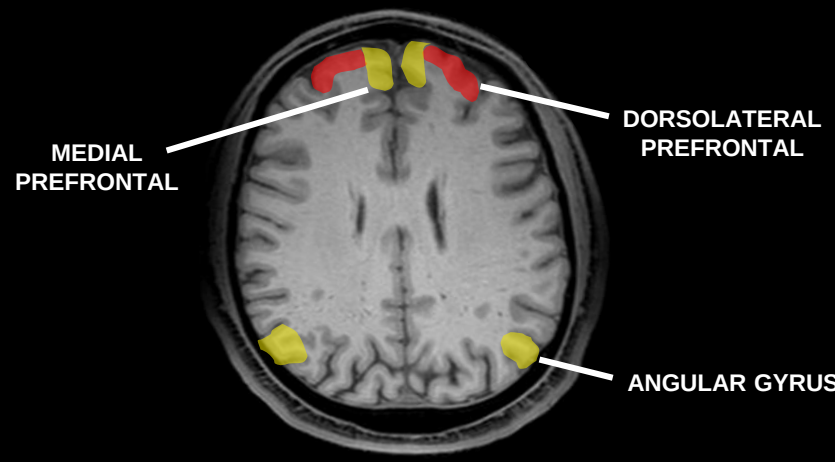




All lesions functionally connected to:
OFC, vmPFC, medial PFC, anterior temporal, NA







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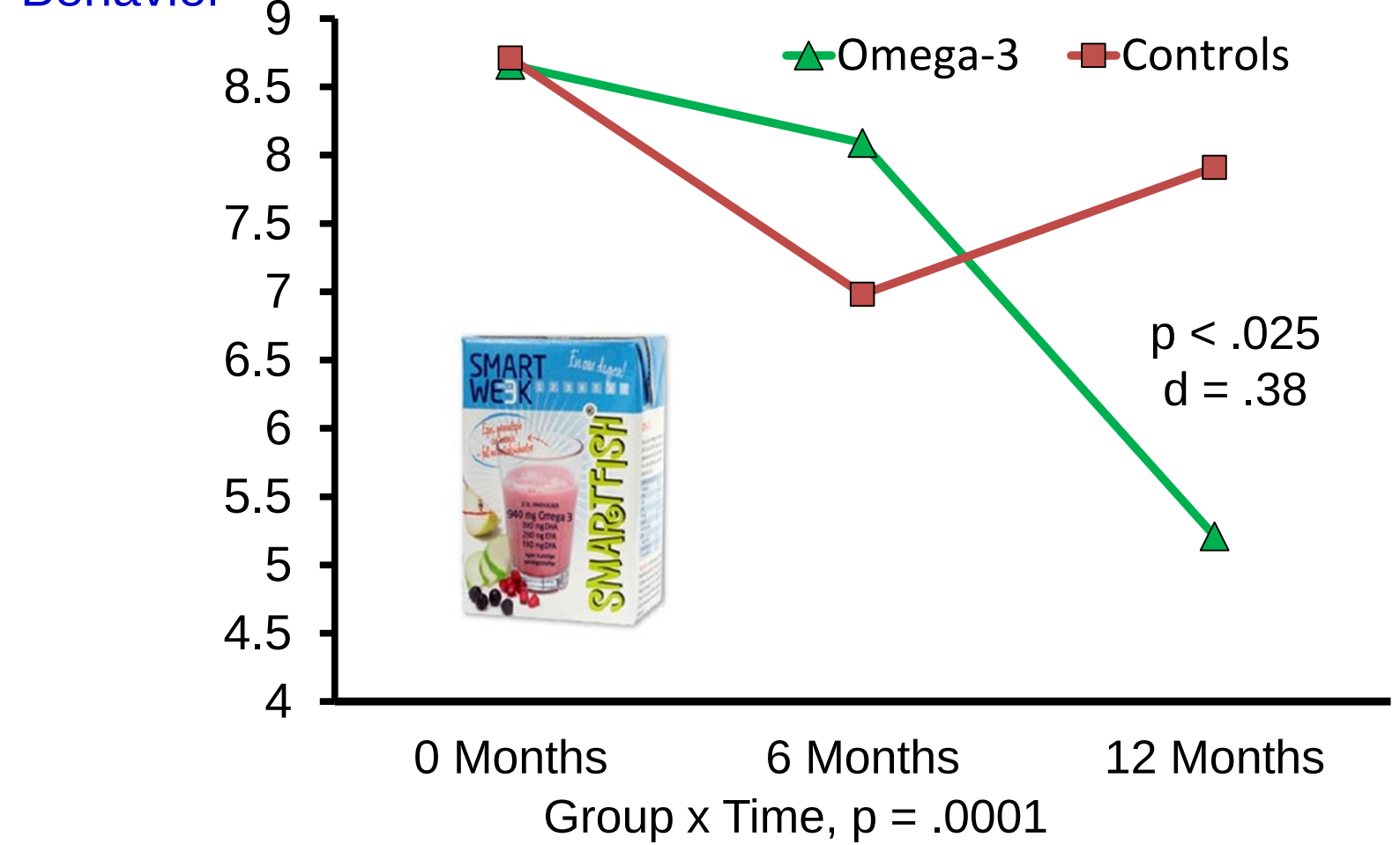
Omega-3 and Child Antisocial Behavior

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



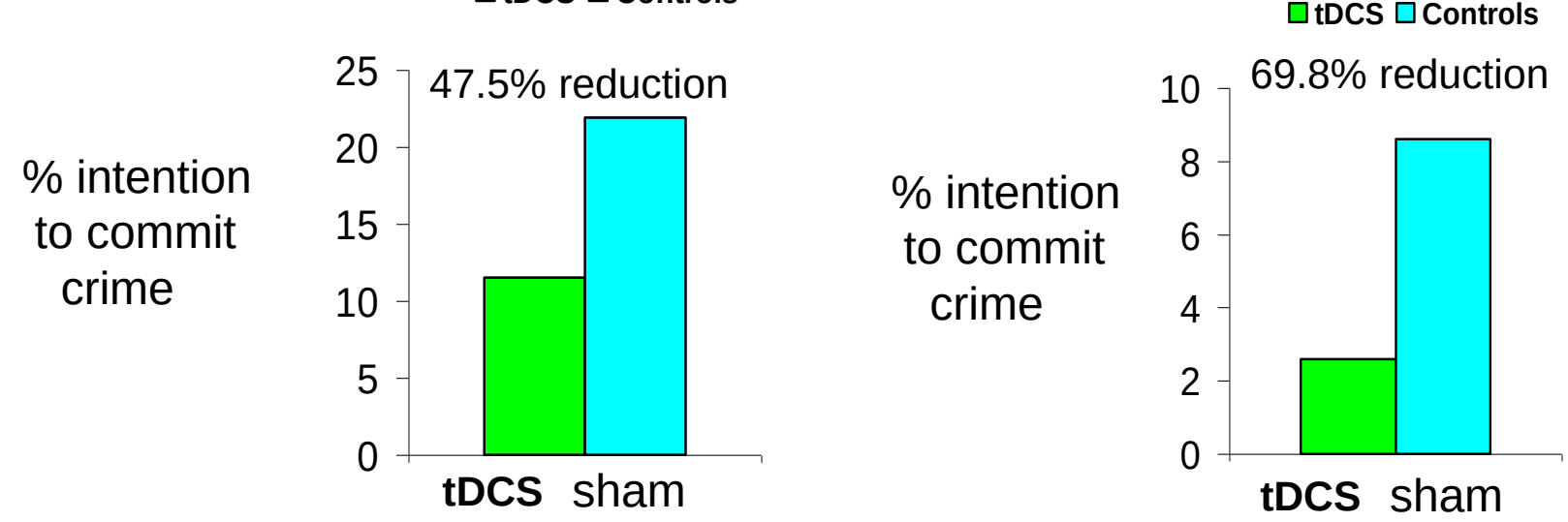
Transcranial Direct Current Stimulation (tDCS) and Criminal Intent

Choy et al. (2018) *J. Neuroscience*

Double-blind, stratified, randomized controlled trial

39 tDCS stimulation

42 sham stimulation



Physical assault

Sexual assault

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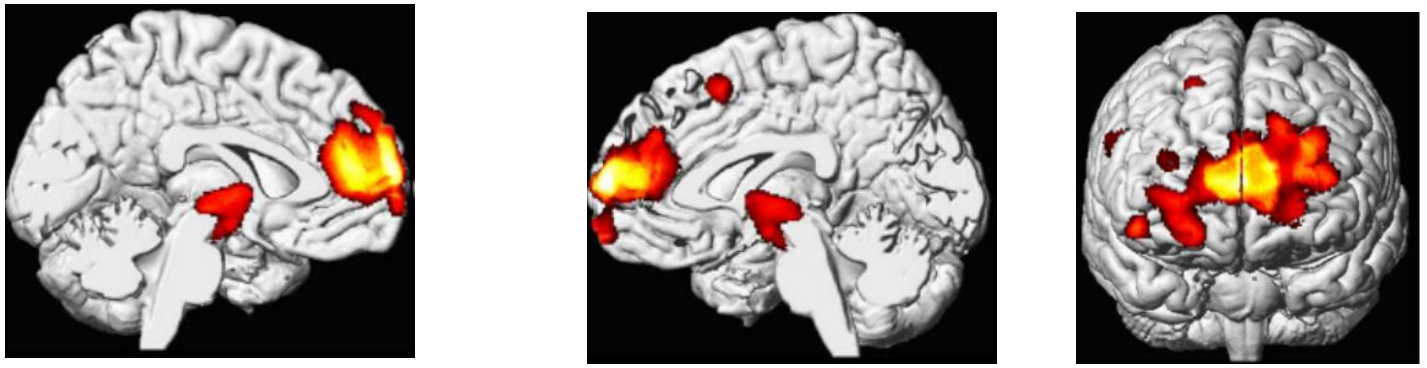
Childhood Lead Exposure and Adult Brain Volume:

Effect of Gender Cecil (2008)

Males

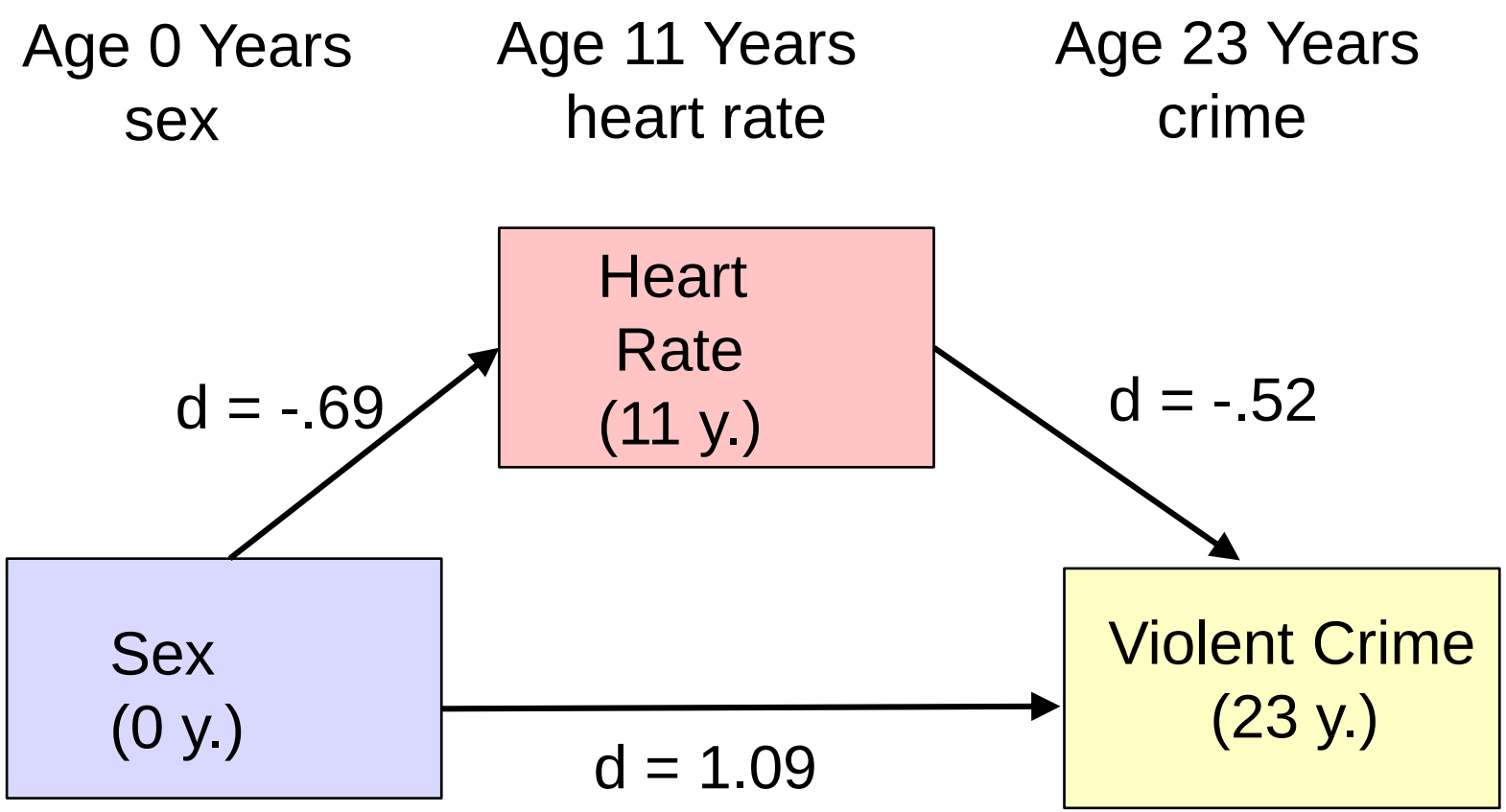


Females

	Males	Females
Lead levels (3y)	13.6 (6.3)	13.1 (5.5)

Low Heart Rate Explains The Sex Difference in Violent Crime

Choy et al. (2017) *Criminology, 55,* 465-487

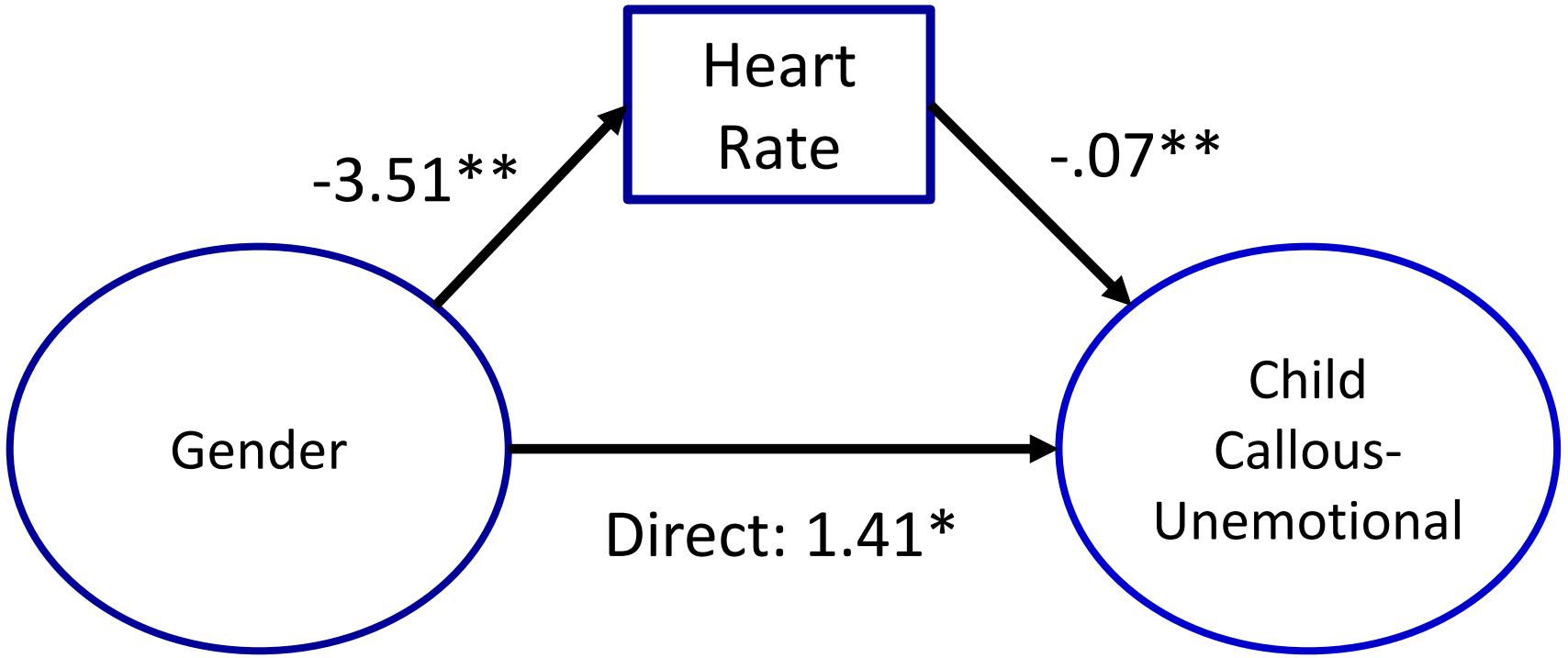


Low Heart Rate Explained 38.1% of the Sex Difference in Crime

Heart Rate Partially Explains Sex Differences in Child Callous-Unemotional Traits

Ling et al. (2019)

378 11-12 y old boys and girls in Philadelphia

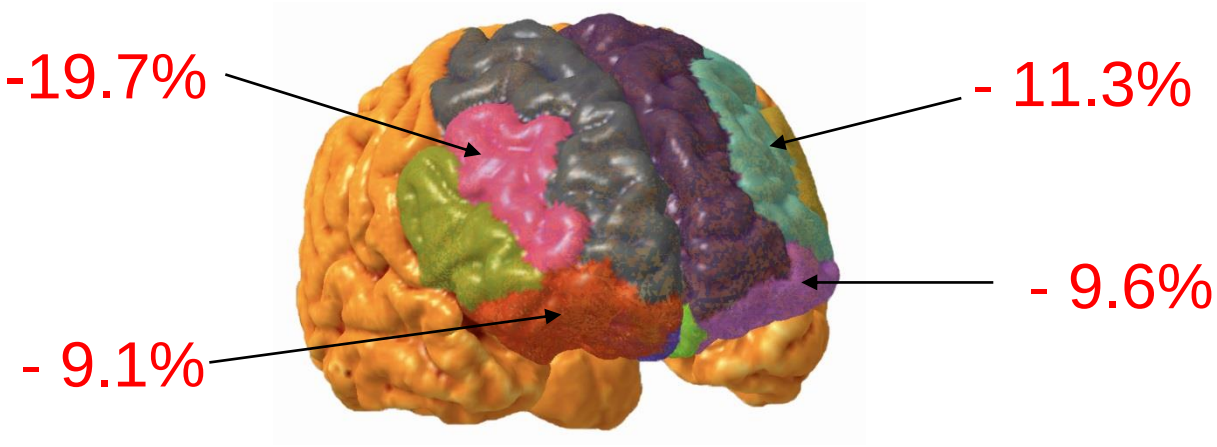


Low heart rate explains 61.5% of the gender difference in callous-unemotional

Sex Differences in Prefrontal Gray Volume

Raine et al. (2001). *Molecular Psychiatry, 16,* 227-236

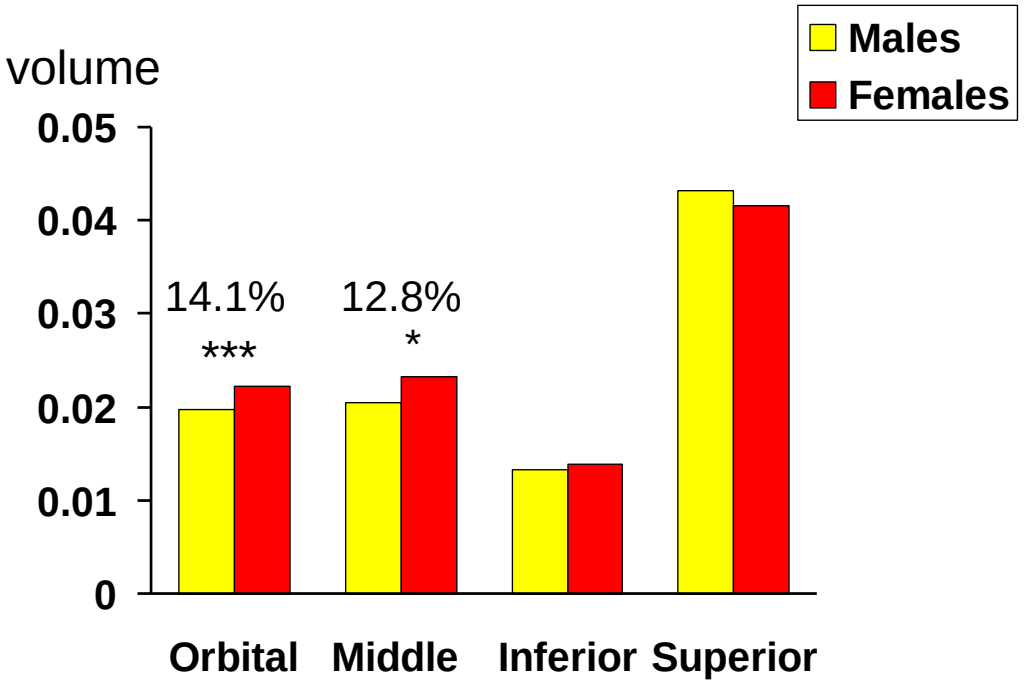
Reduced prefrontal gray in antisocial personality disorder



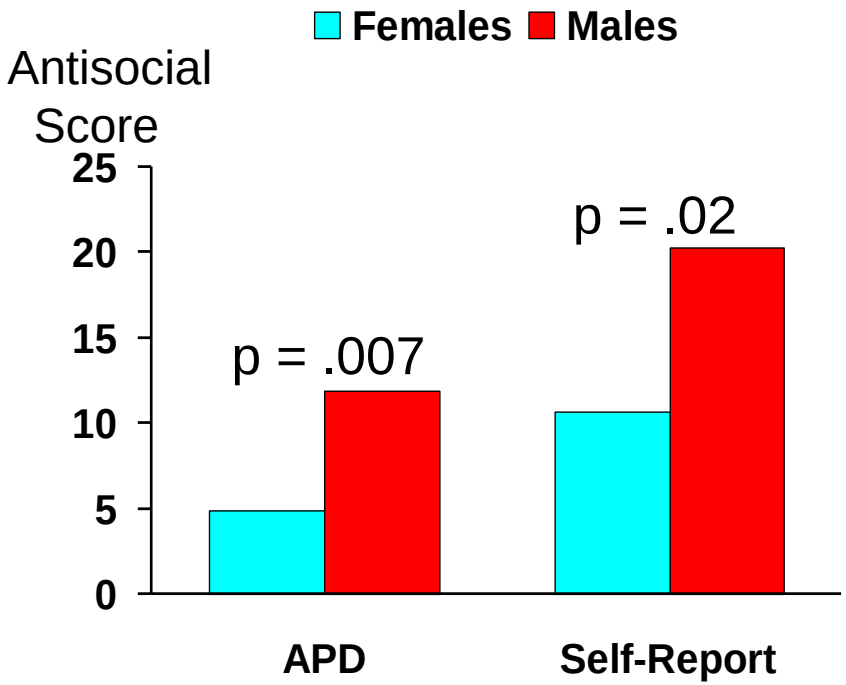
Prefrontal gray volume – antisocial adult correlations

	Males (N = 72)		Females (N = 12)	
	APD Score	Self-report	APD Score	Self-report
Orbito-frontal	-.37**	-.27*	-.58*	-.66*
Middle PFG	-.25*	-.34**	-.41	-.62*
Superior PFG	-.09	-.18	-.22	-.11
Inferior PFG	-.09	.07	-.14	-.06

Sex differences in prefrontal gray



Sex differences in antisocial behavior



% reduction in sex difference after correcting for sex differences in brain volume

	Orbital + Middle
APD	51.3
SRC	52.6
p	.40

ADRIAN RAINE - NEURODEVELOPMENTAL

1. A neurodevelopmental perspective: Can it make a difference?

2. Early influences on development: MPAs, birth, nutrition, smoking, alcohol, responsibility

3. Neural mechanisms: Prefrontal, striatum, CSP, amygdala

4. Neuromoral perspective: Converging evidence

5. Prevention strategies: Omega-3, tDCS

6. Why males? Vulnerable male brain, low heart rate, prefrontal