

**“Mental Illness and Treatment:
Past, Present and Future”**

**“Nature v. Nurture: Can Your Genes
Make You Murder? ”**

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Nature v. Nurture: Can Your Genes Make You Murder?

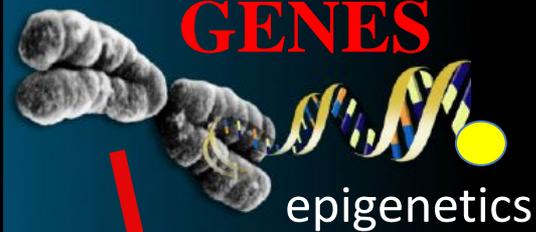
- 1- Are we all basically the same or different?
Self and identity
- 2- Brain imaging and genetics of behavior.....
and misbehavior- Is there a Criminal Brain?
- 3- A Curious Personal Misadventure

Nature v. Nurture: Can Your Genes Make You Murder?

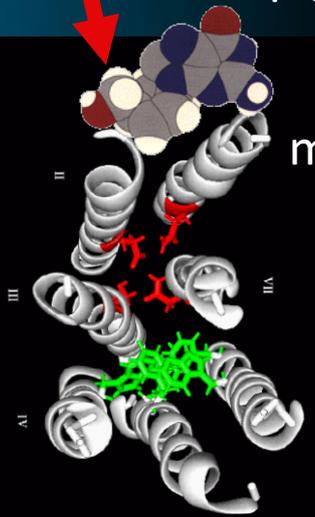
1- Are we all basically the same or different?
Self and identity

**Defining SELF using a
reductionist approach...**

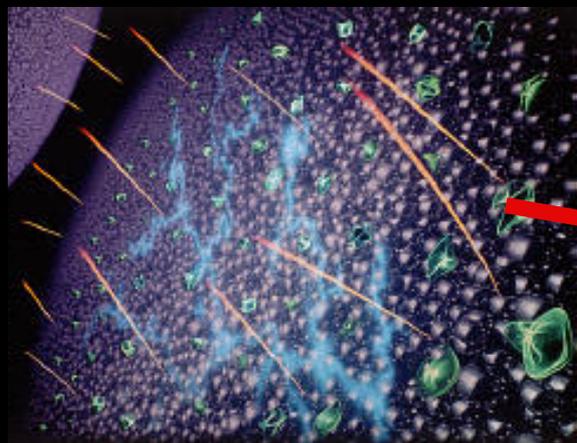
GENES



mRNA



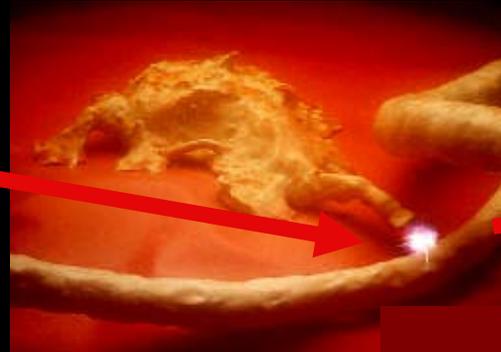
Synaptic molecules



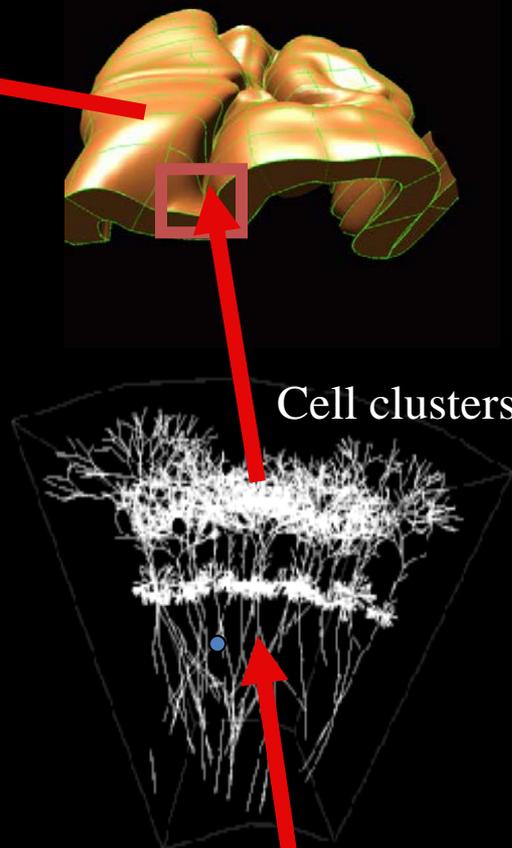
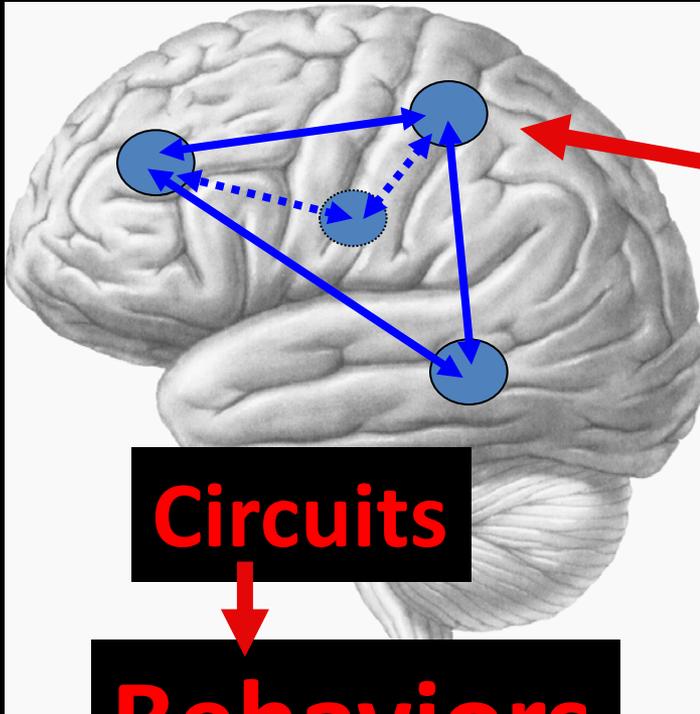
Circuits

Behaviors

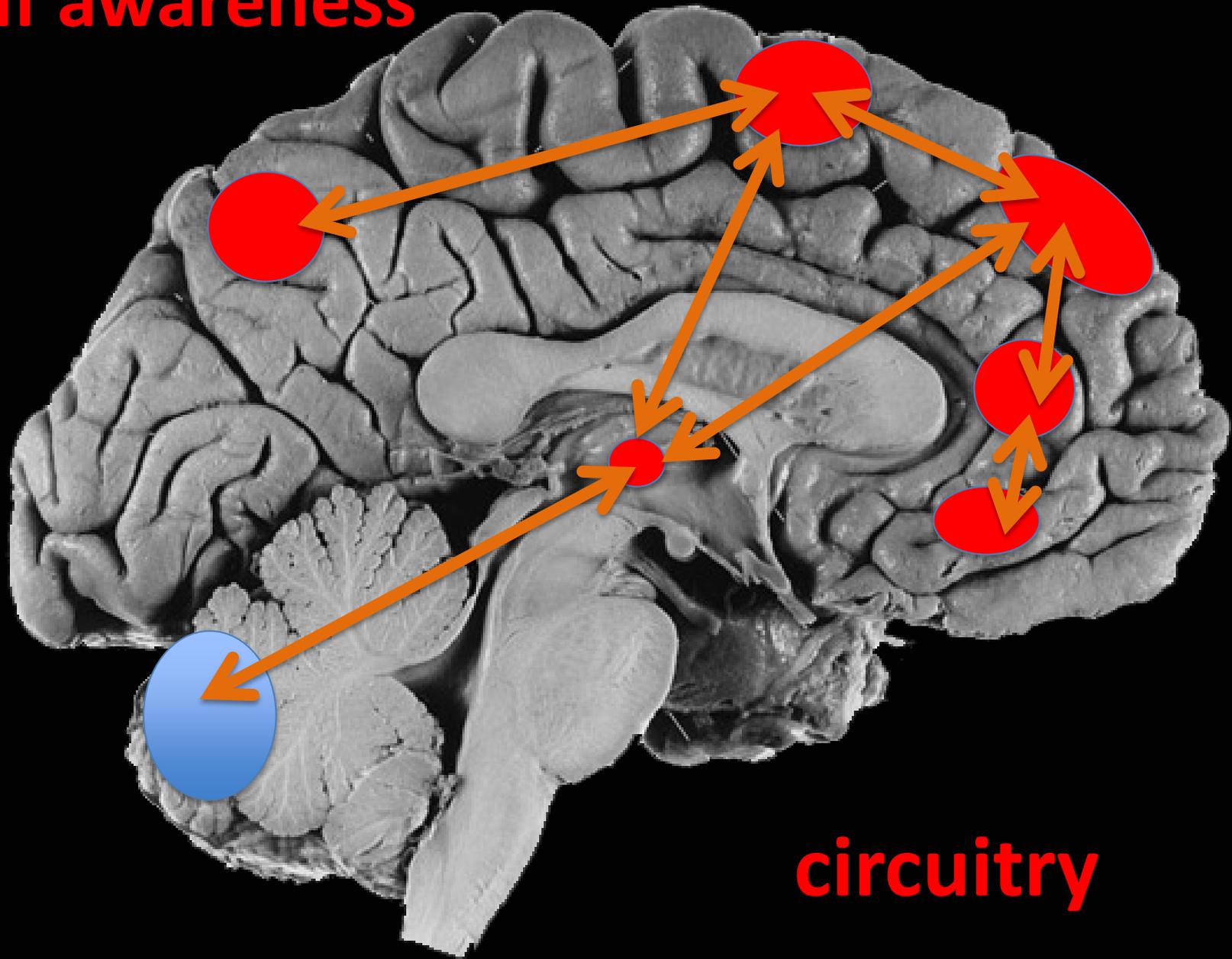
Synapses



Brain areas



Self awareness

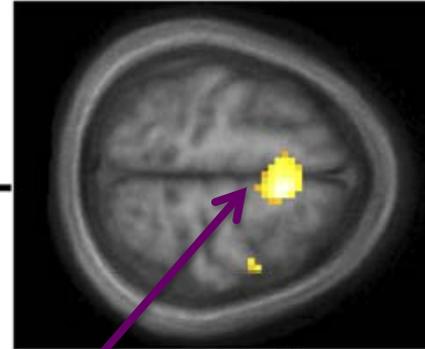
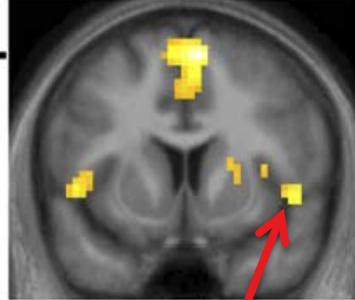
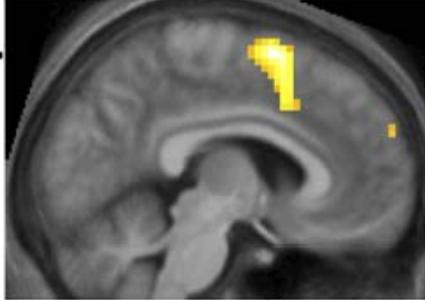


circuitry

Neural Correlates of Hate

Semir Zeki*, John Paul Romaya PLoS ONE | www.plosone.org

October 2008 | Volume 3 |



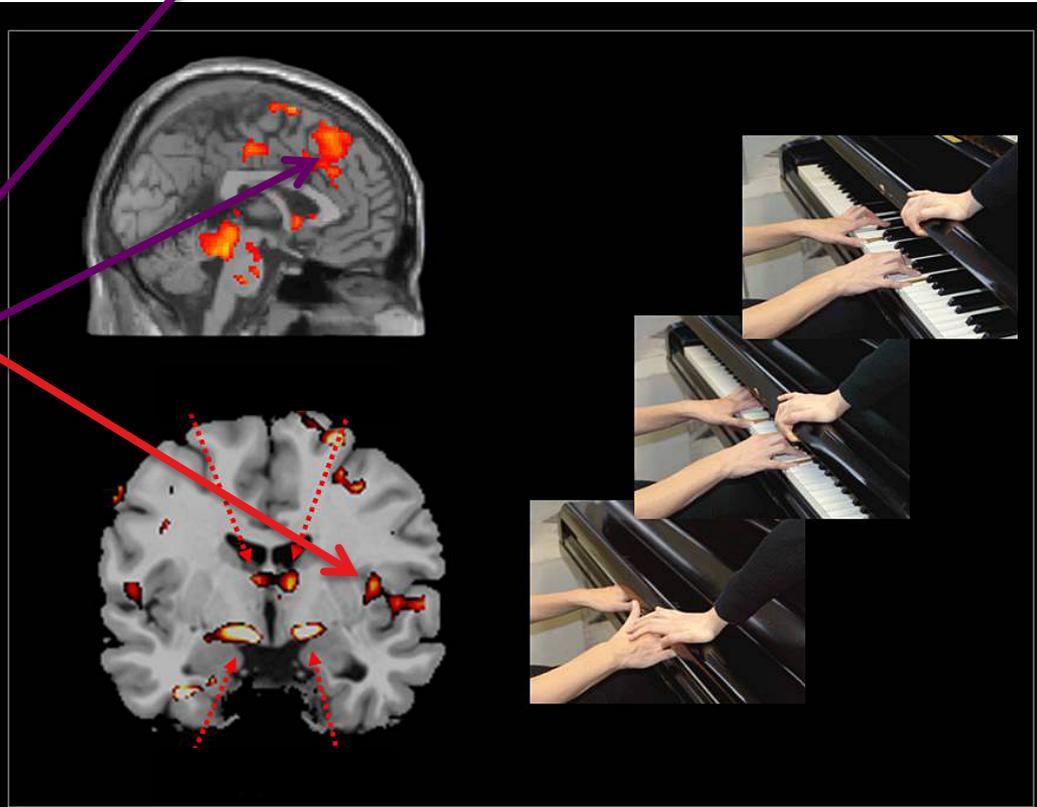
Bullies and Sadism-

Jean Decety

Insula...

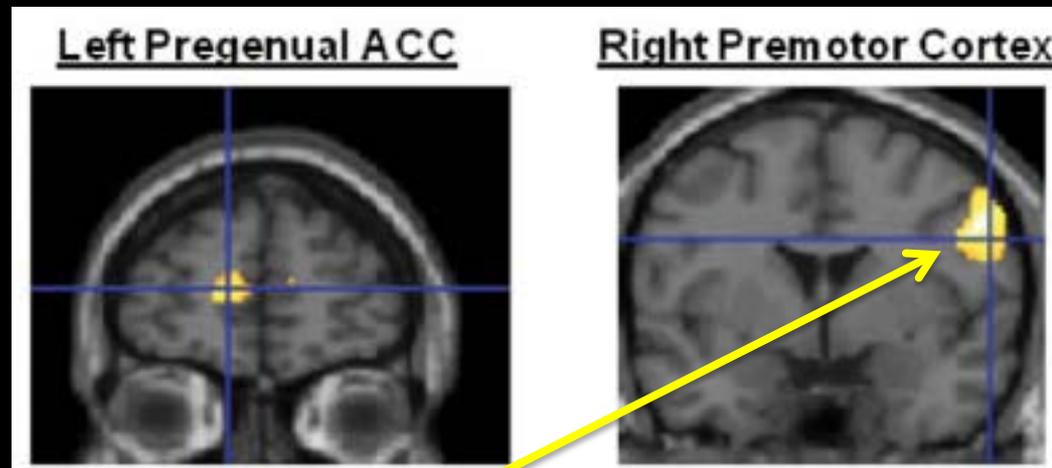


SMA



Decreased premotor cortex volume in victims of urban violence with PTSD.

Rocha- Rego et al 2012



Volume reduction in the premotor cortex that is observed in victims of urban violence with PTSD may be associated with a **disruption in the dynamical modulation of the safe space around the body. events.**

Nature v. Nurture: Can Your Genes Make You Murder?

1- Are we all basically the same or different?
Self and identity

From a biologist's point of view
we can ask....

How many unique humans can there be?



How many unique humans can there be?

GENES (45% of “genome”)

~21,000 coding genes

~10 promoters per gene

~4,000,000 RNA regulators

~ 4,000,000 SNPs (single nucleotide polymorphisms)

~100 copy number variants (CNVs) per person

~500,000 insertion-deletions (INDELS) per person

~ 100,000 transversions

NON CODING transposons (55% of genome)

So about the same number as genes, but also tissue specific

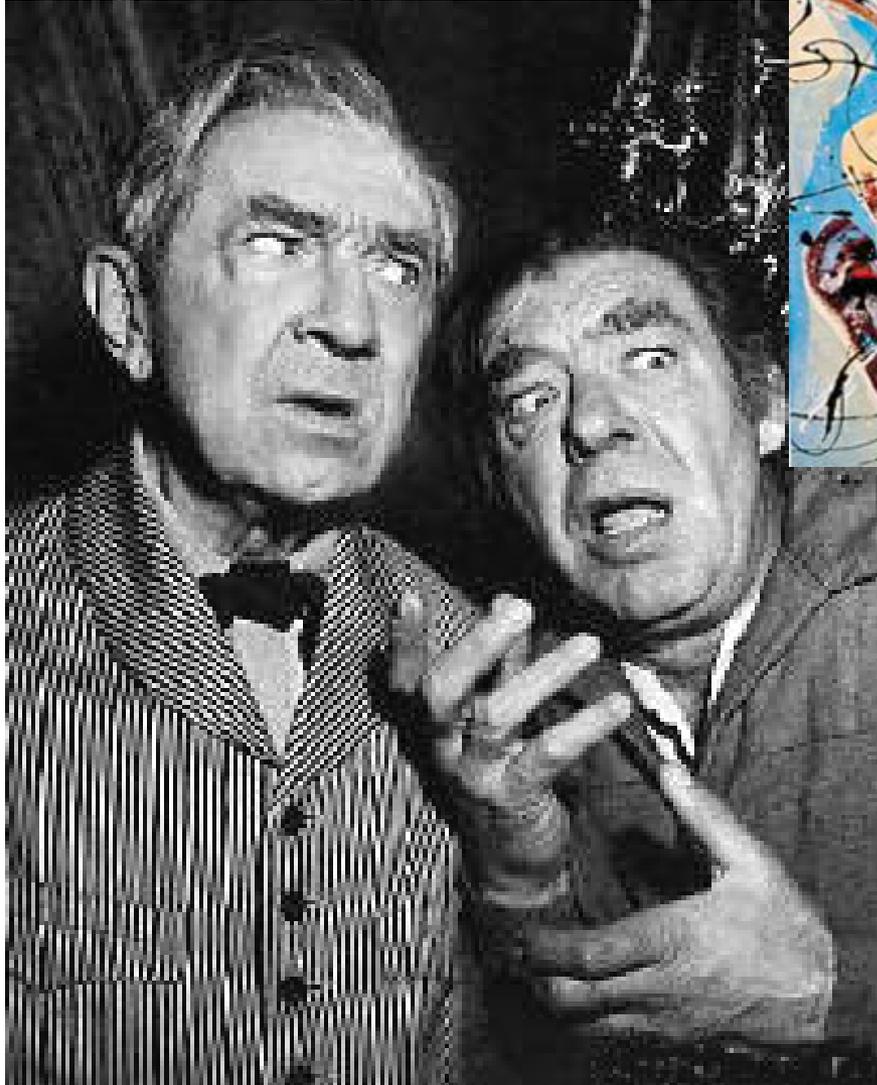
= 10^{61} number based on genetics + $10^{9?}$ epigenetic combos

= 10^{70} number of possible individuals + $10^{10?}$ mutations

How many unique humans can there be?

GENES (45% of "genome")

~21,000 coding genes



Rubik's cube is

genetics + 10^9
mutations of
an extended |

on stars per ga
the number o



10^{23} atoms in the universe

How many unique humans can there be?

...so, referencing this otherwise useless chart....

$1 \times 10^3 = 1$ thousand	$1 \times 10^{36} = 1$ undecillion	$1 \times 10^{69} = 1$ duovigintillion
$1 \times 10^6 = 1$ million	$1 \times 10^{39} = 1$ duodecillion	$1 \times 10^{72} = 1$ trevigintillion
$1 \times 10^9 = 1$ billion	$1 \times 10^{42} = 1$ tredecillion	$1 \times 10^{75} = 1$ quattuorvigintillion
$1 \times 10^{12} = 1$ trillion	$1 \times 10^{45} = 1$ quattuordecillion	$1 \times 10^{78} = 1$ quinvigintillion
$1 \times 10^{15} = 1$ quadrillion	$1 \times 10^{48} = 1$ quindecillion	$1 \times 10^{81} = 1$ sexvigintillion
$1 \times 10^{18} = 1$ quintillion	$1 \times 10^{51} = 1$ sexdecillion	$1 \times 10^{84} = 1$ septenvigintillion
$1 \times 10^{21} = 1$ sextillion	$1 \times 10^{54} = 1$ septendecillion	$1 \times 10^{87} = 1$ octovigintillion
$1 \times 10^{24} = 1$ septillion	$1 \times 10^{57} = 1$ octodecillion	$1 \times 10^{90} = 1$ novemvigintillion
$1 \times 10^{27} = 1$ octillion	$1 \times 10^{60} = 1$ novemdecillion	$1 \times 10^{93} = 1$ trigintillion
$1 \times 10^{30} = 1$ nonillion	$1 \times 10^{63} = 1$ vigintillion	$1 \times 10^{96} = 1$ untrigintillion
$1 \times 10^{33} = 1$ decillion	$1 \times 10^{66} = 1$ unvigintillion	$1 \times 10^{99} = 1$ duotrigintillion
		$1 \times 10^{100} = 1$ googol

Soooo....

How many unique humans can there be?

1×10^{81} = 1 sexvigintillion

And there are **10^{82} atoms in the universe**

About the same as the number
of possible unique humans...

So no two humans will ever be the same...

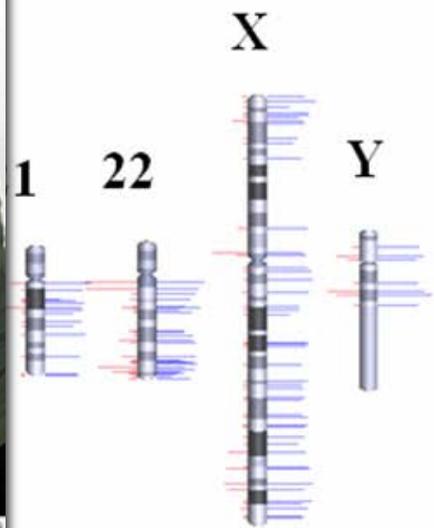
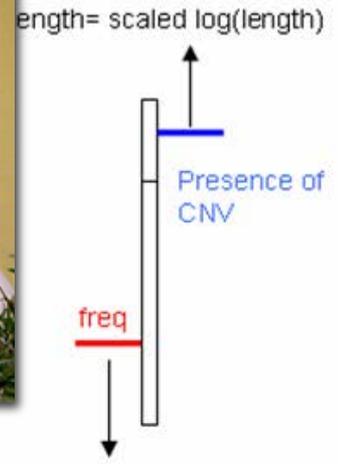
WAIT!

Aren't identical twins genetically identical?



NO, they aren't-Copy Number Variation (CNV)

1 ruins that "identical" stuff pretty quickly



**...at least I know who
my biological mother and father are....**



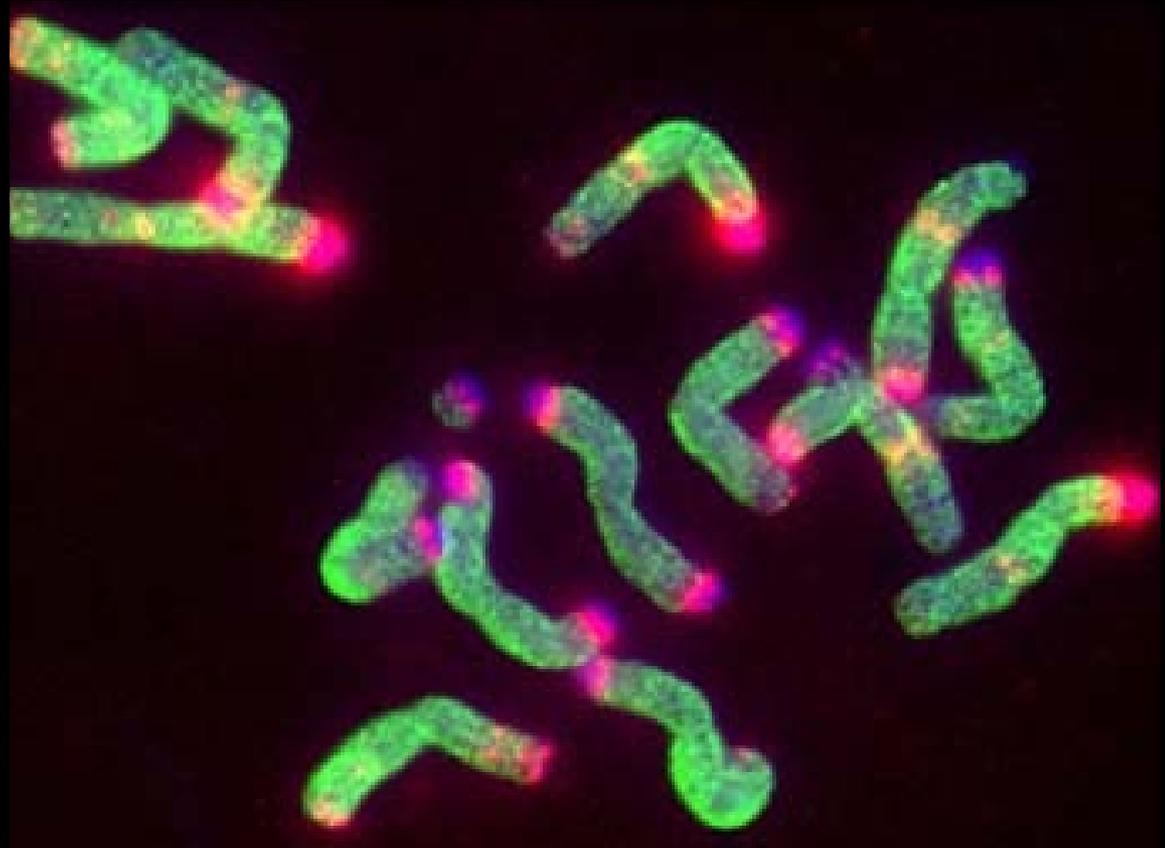
**I was tested genetically and my mother
is my genetic mother and if my father
is my genetic father....**

that's at least some consolation...

Well, **maybe**

....but **transposons**

can muddy that end of the gene pool too..





So, we are CHIMERAS to some extent



Our identity?

We are all unique

**And in a sense, we are stardust, we are golden,
and we are billion year old carbon....**

Each of us is a one in 10^{81} rare event



But then again, we are also.....

The Thing



The main points implied so far:

- 1) Besides clinical assessments, the way that psychiatric patients and other people will be characterized is through a combination of brain imaging and genetics
- 2) Sweeping generalizations on the 'causes' of behavior are far too simplistic to be useful; every individual, even identical twins are biologically unique.
- 3) People with the same talents and weaknesses and other behaviors use different combinations of brain circuits, and genetic and neurotransmitter interactions.
- 4) As such their motivations, sense of right and wrong, and what their intended outcomes are unique to them.

So, do all these little genetic differences between every human really matter? Isn't a tomato, after all is said and done, still a tomato?



One example- the male vs female brain.....

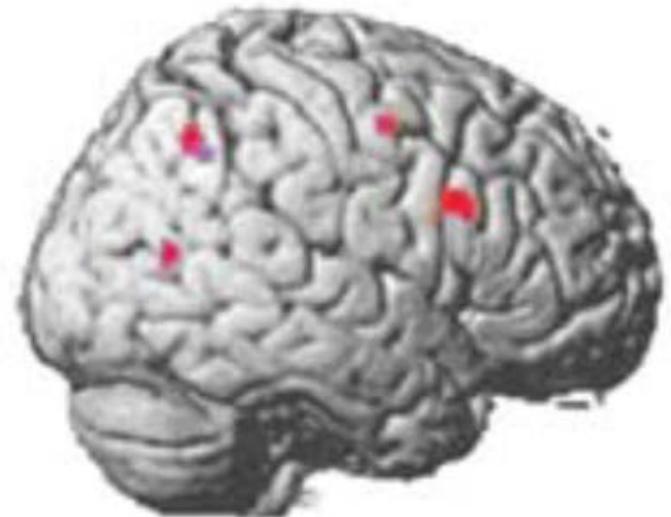
Gender: A major determinant in drug response to nicotine in smoking addicts

Brain areas more active in female smokers during an attention task

Placebo

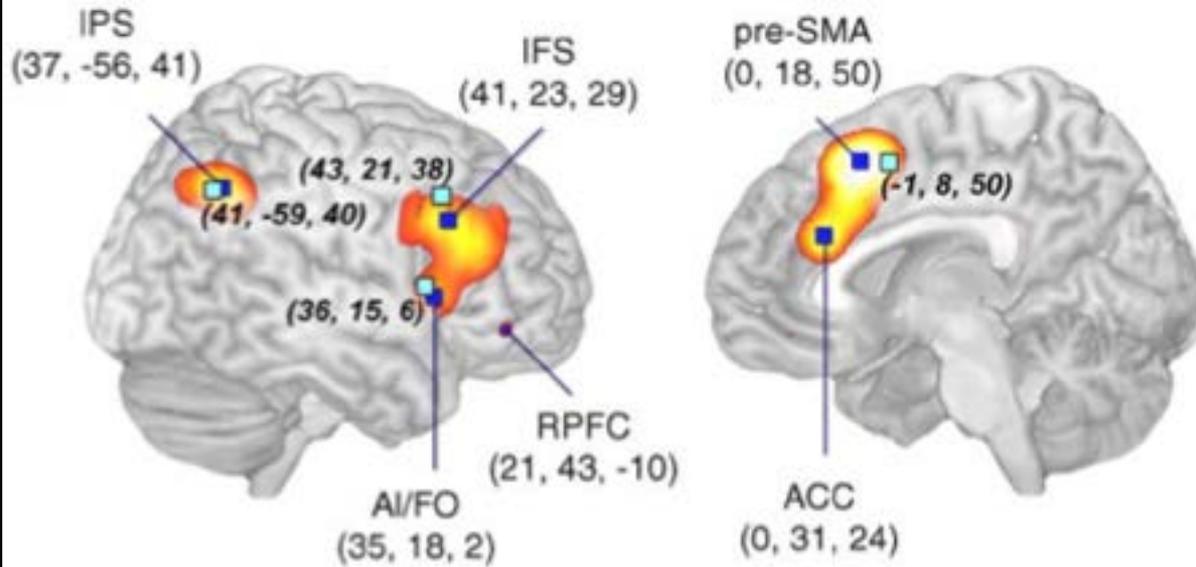


Nicotine

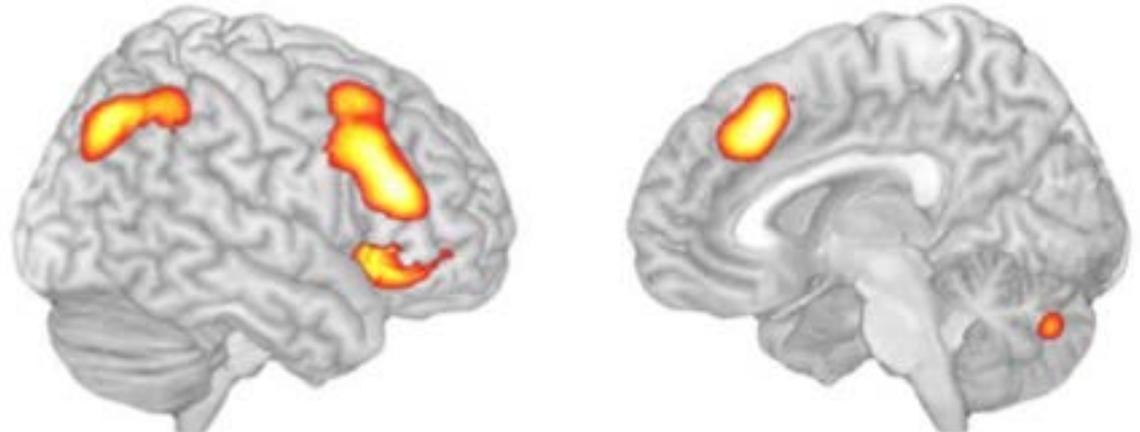


MULTIPLE DEMAND/ FLUID INTELLIGENCE

(a) Multiple Demand (MD)



(b) Fluid Intelligence



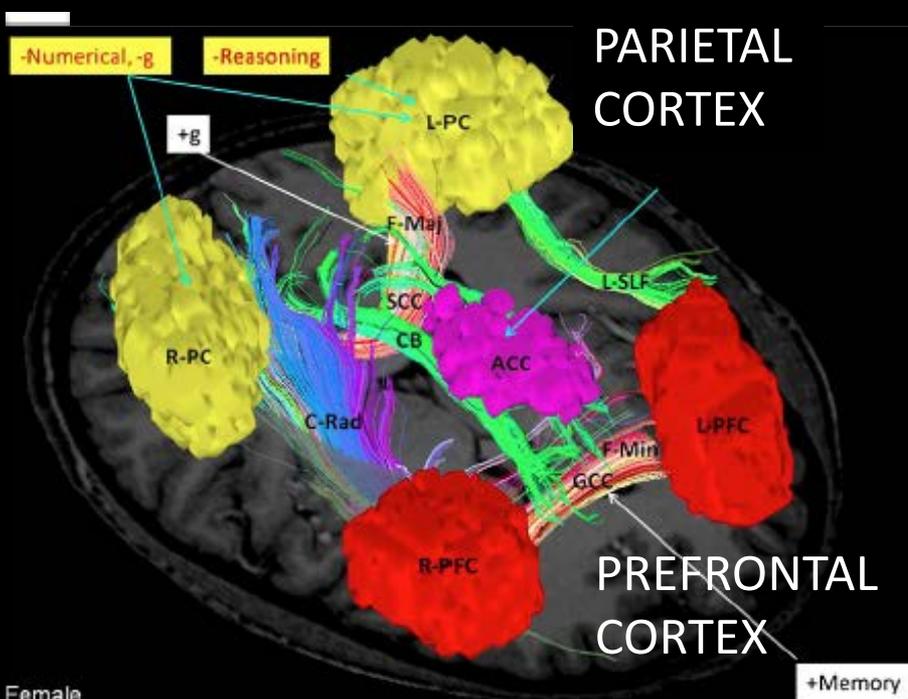
Duncan 2010

IQ, Memory, Numerical, Spatial Abilities

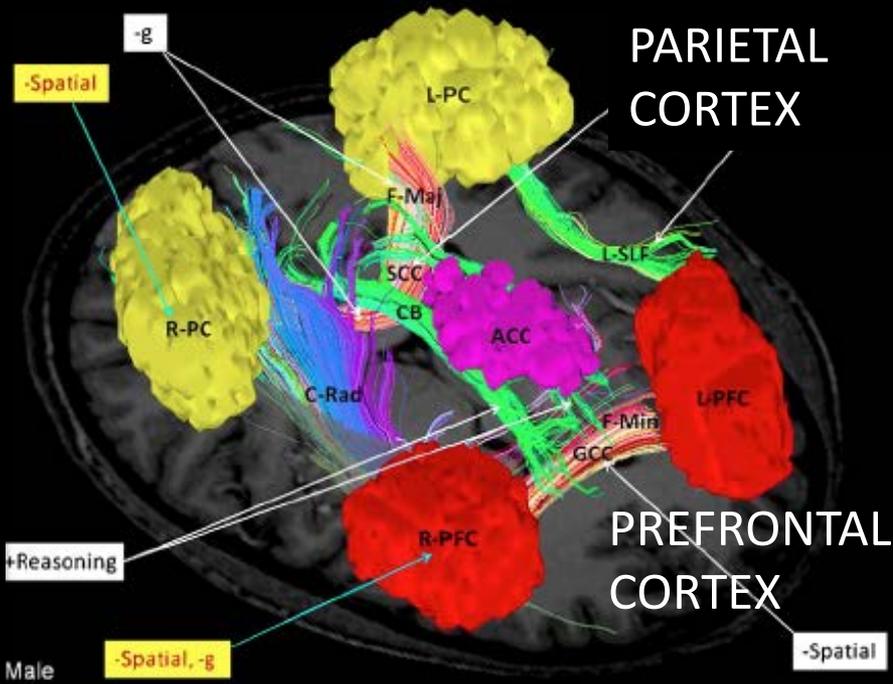
(in males and females
with the same scores)

Brain activity is
negatively correlated
with ability and IQ,
BUT connections are
positively correlated
with ability in FEMALES

Female



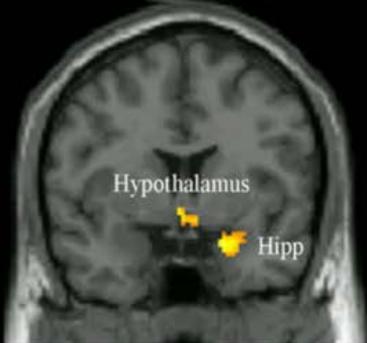
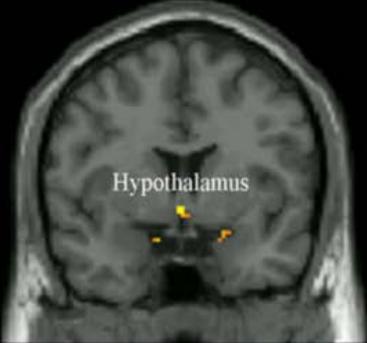
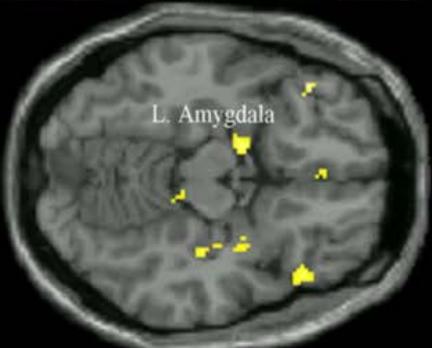
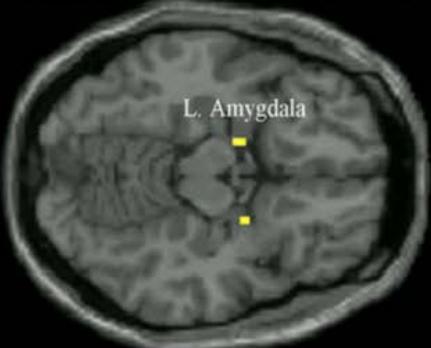
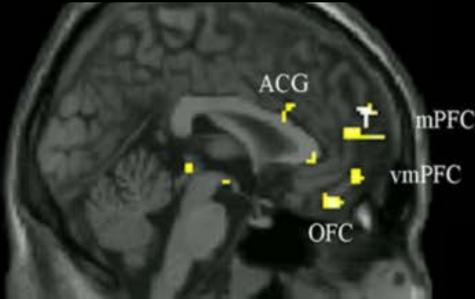
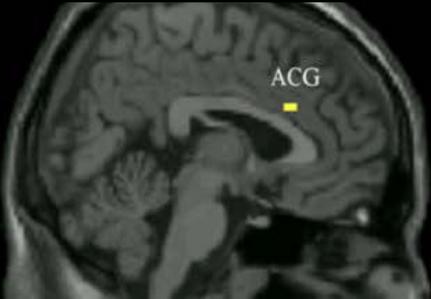
Male



Gender and menstrual cycle differences of stress

early follicular phase

menstrual phase



Men vs Women

Men vs Women

Goldstein et al 2010

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THE MODEL I'LL USE.....

Psychopathy- A three legged stool model

Psychopathy



Abuse

High vulnerability
genetic alleles

Functional brain loss
orbital/medial PFC, amygdala

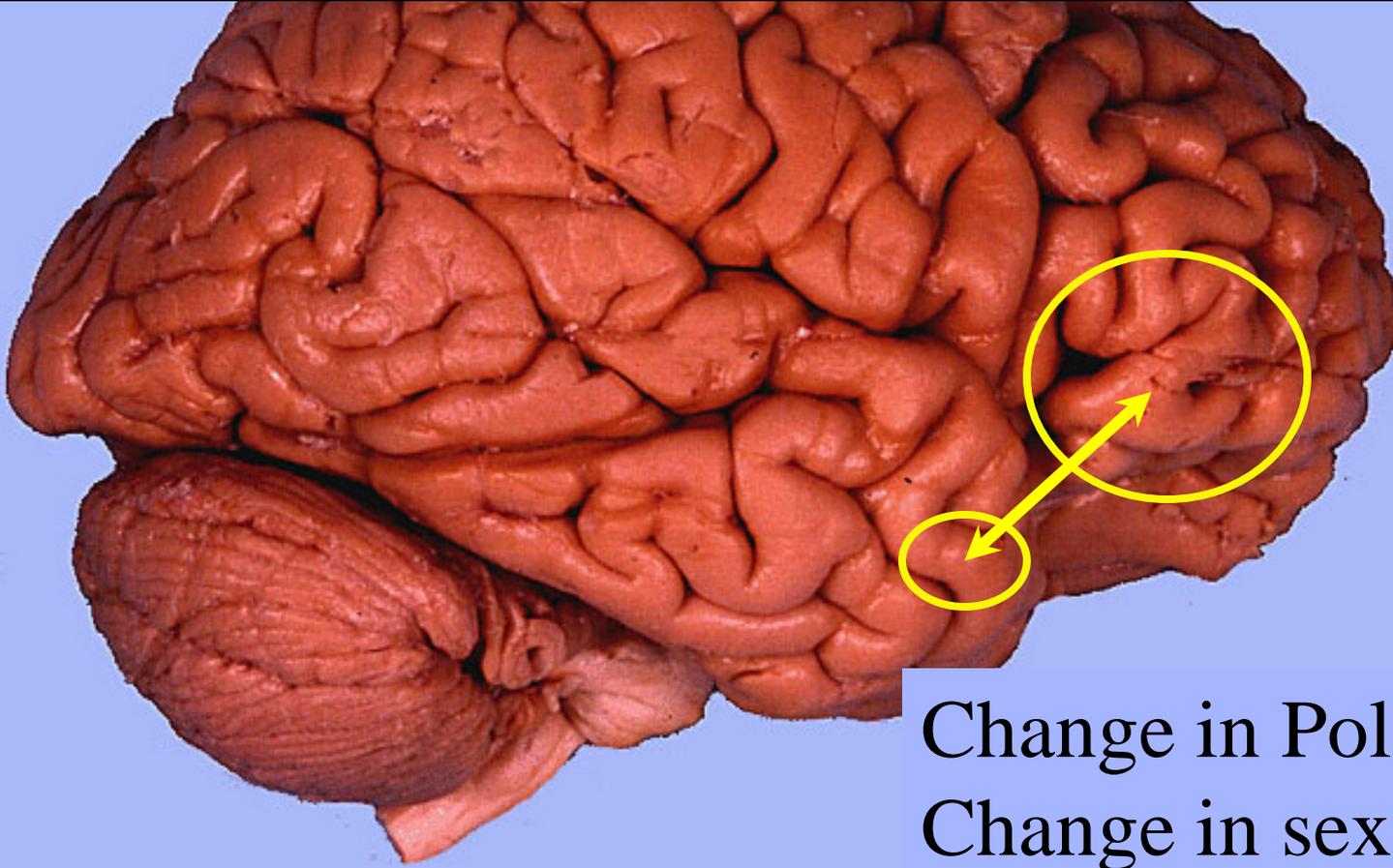
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BRAIN AREAS INVOLVED.....

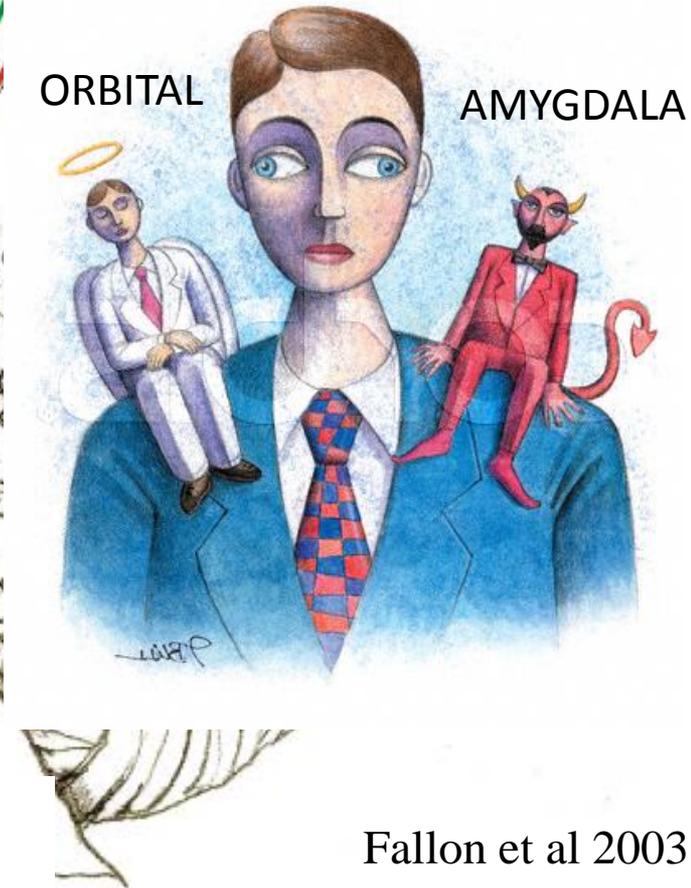
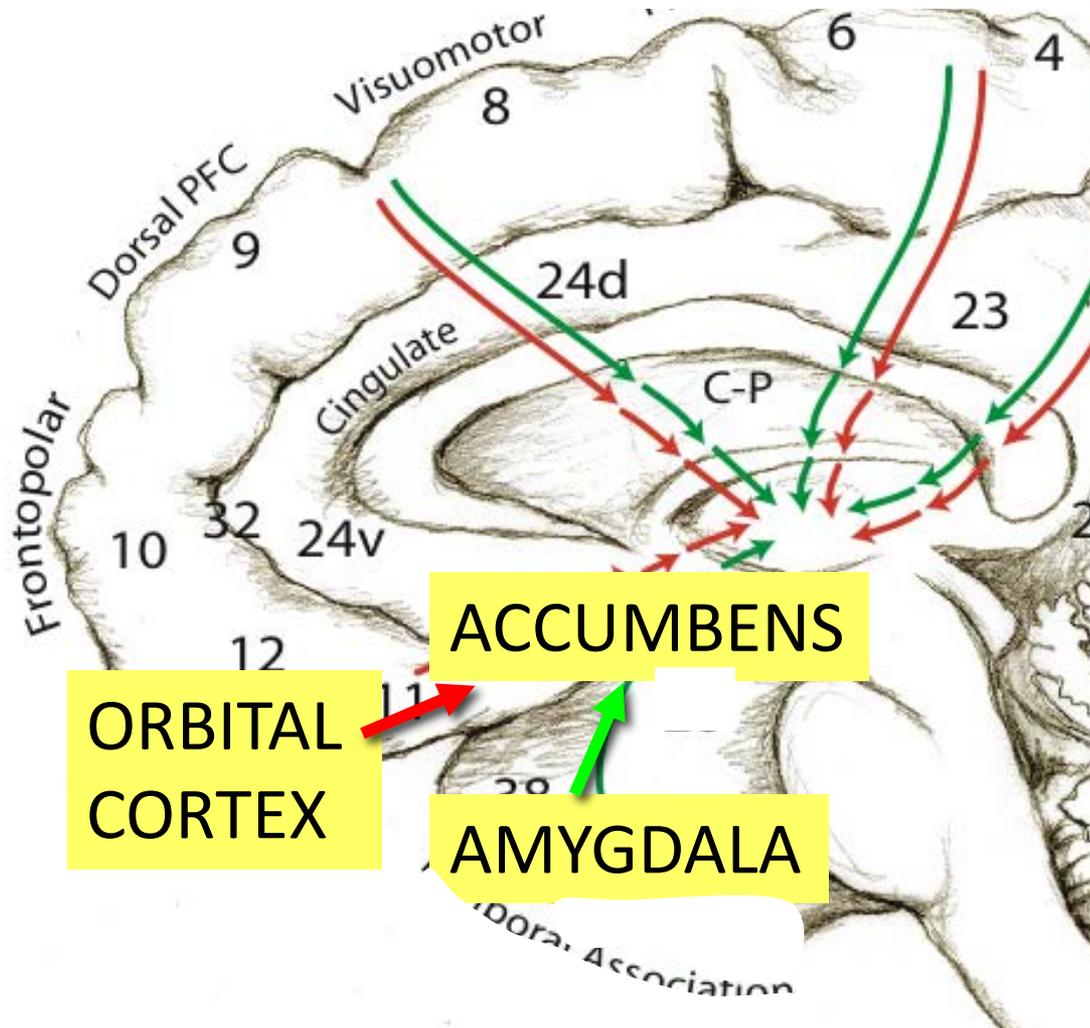
The concept of **disinhibition or release of inhibition** in brain function- the role of the frontal lobe



Fronto-temporal dementia

Change in Politics
Change in sexuality,
humor
Increase of artistic
expression

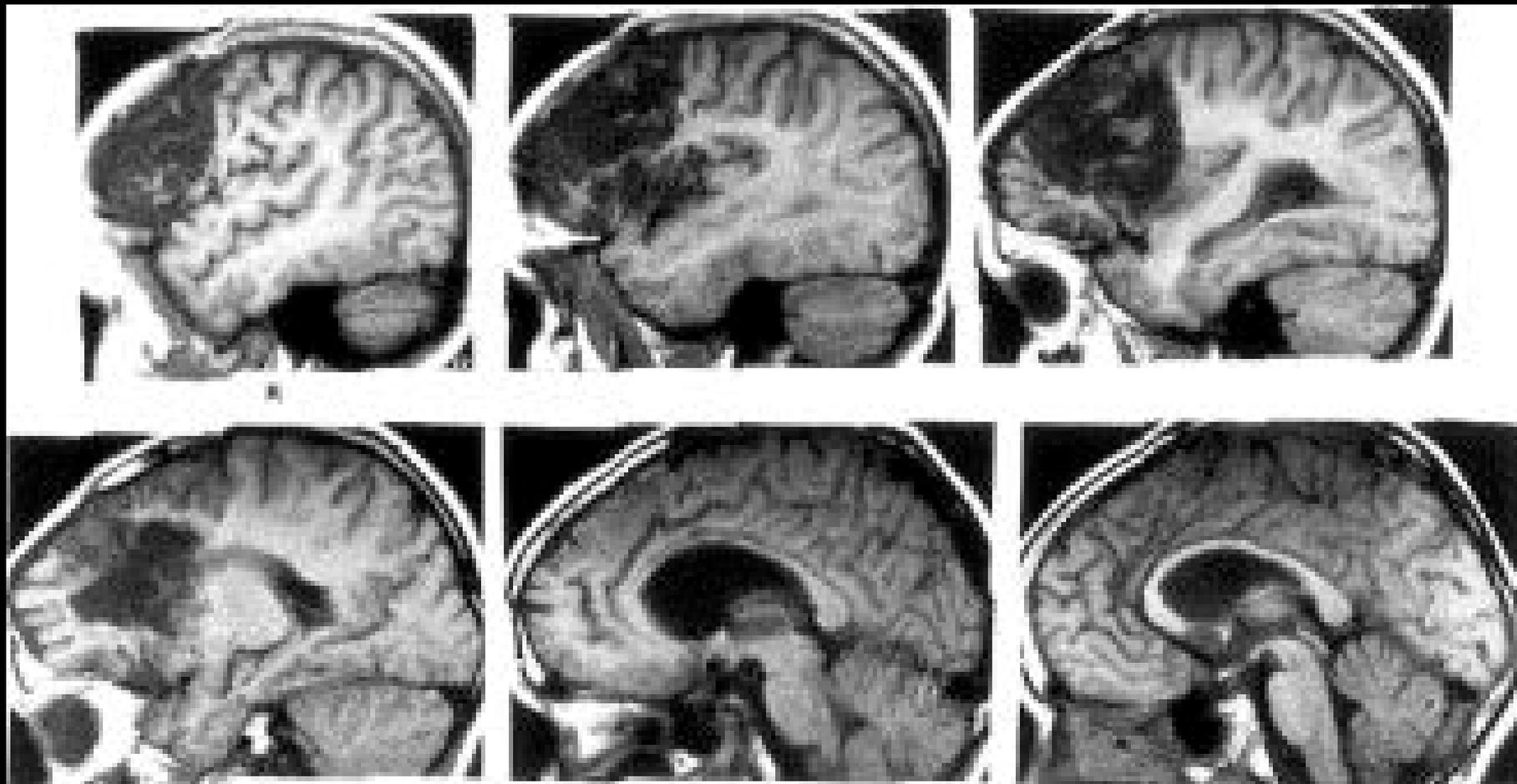
Areas competing for control of behavior



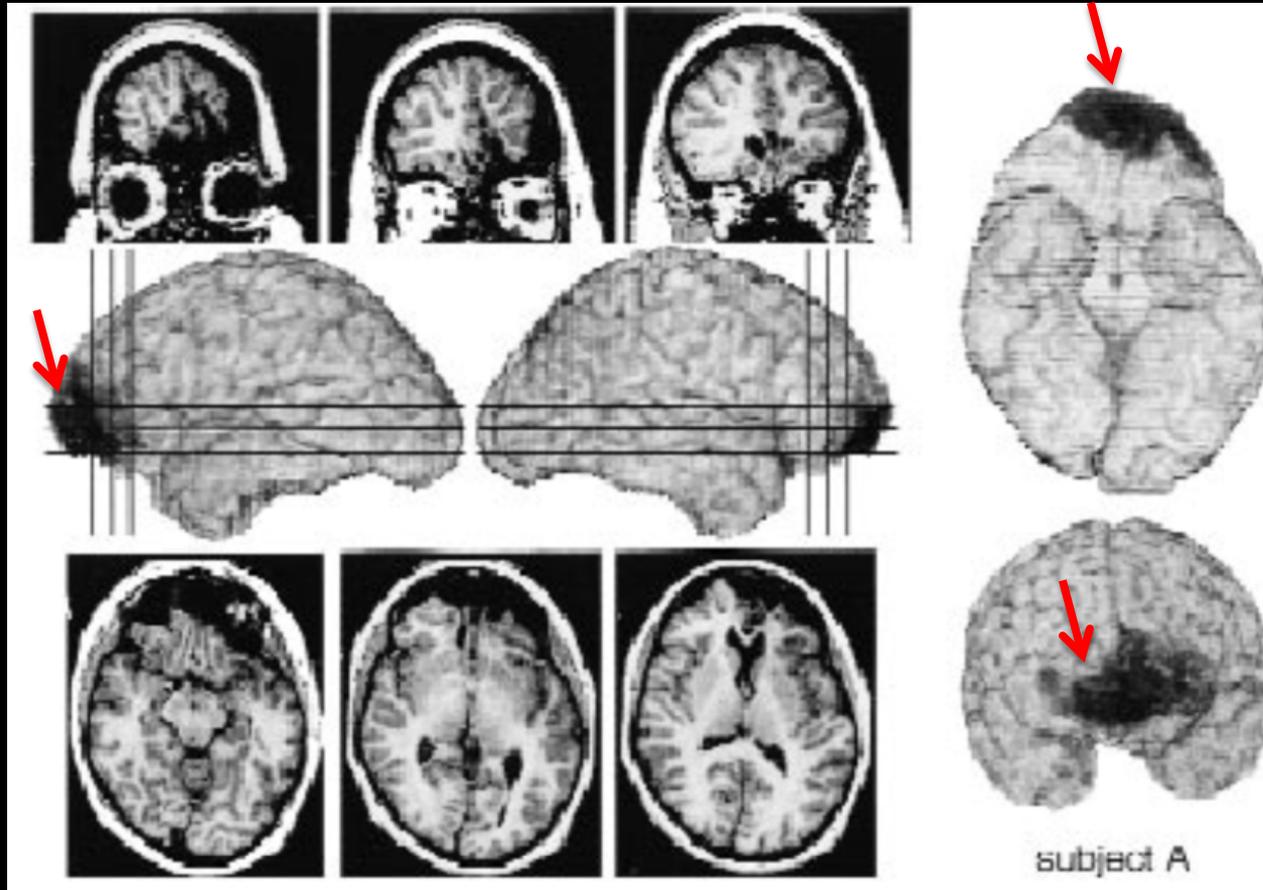
Fallon et al 2003

Dorsal (upper) types of prefrontal damage

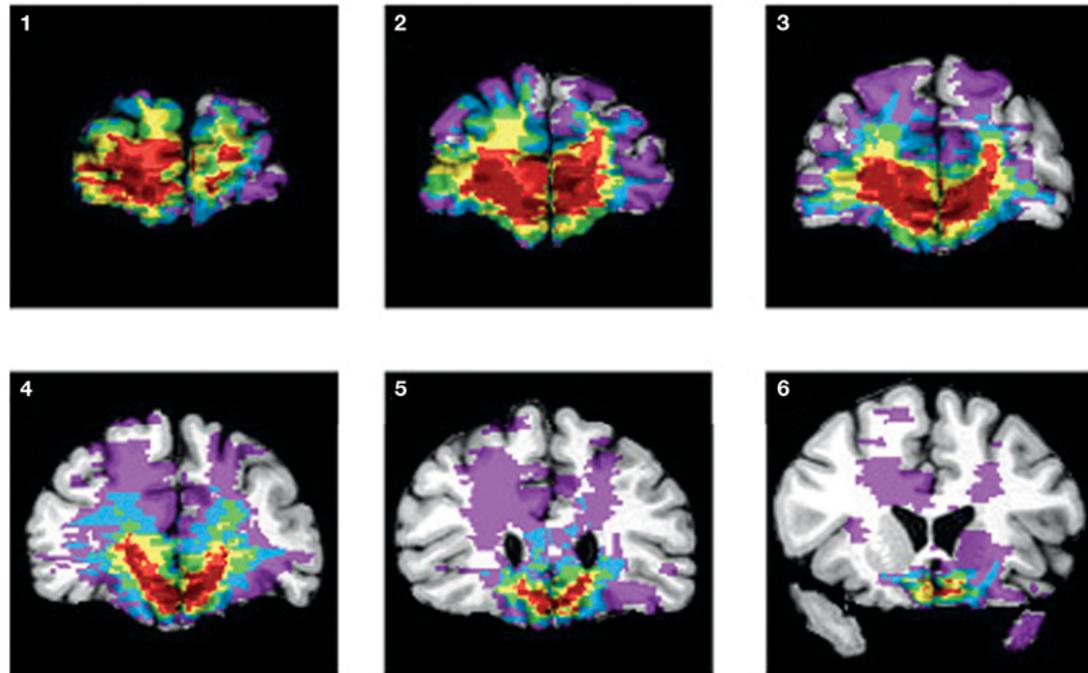
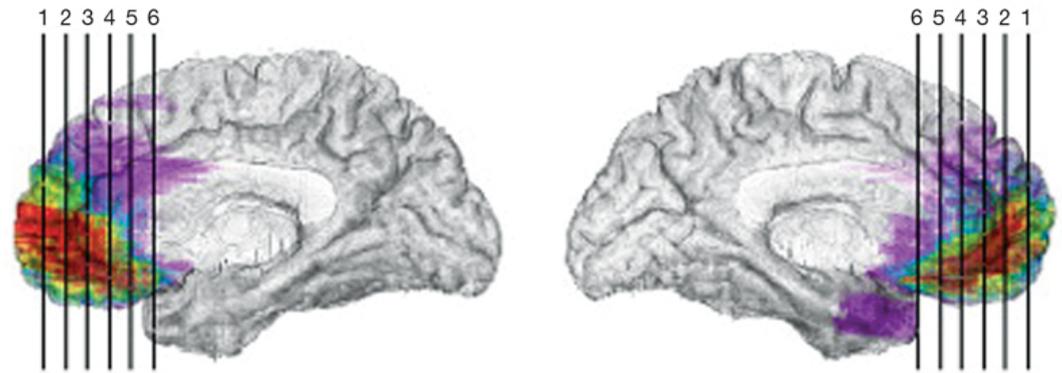
Dorsal type damage- visuospatial and attentional loss, **no emotional, personality, behavioral or morality loss**



Orbital/medial prefrontal cortex lesions - lack of moral reasoning



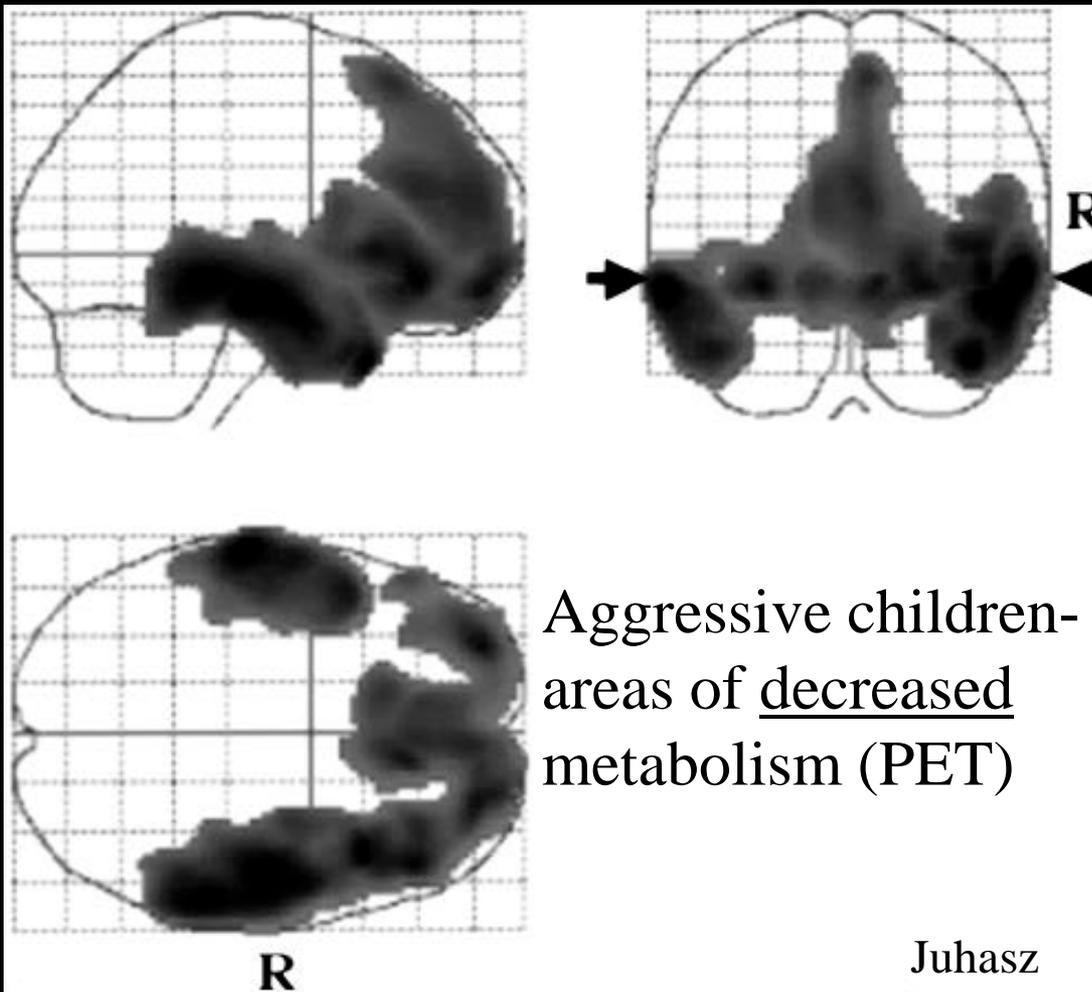
Ventromedial and orbital prefrontal cortex lesions and moral judgment



“abnormally 'utilitarian' pattern of judgments on **moral dilemmas** that pit compelling considerations of aggregate welfare against highly emotionally aversive behaviors (for example, having to sacrifice one person's life to save a number of other lives)”

Koenigs et al 2008 Nature
See also Blair 2008

Orbital cortex damage incurred later in life (as a later teen or adult) may have trouble inhibiting impulsive/aggressive behaviors but may have enough 'help' from other areas to keep the impulses under control as long as stressors from the environment or internally do not become severe and protracted.



So, **WHEN** the prefrontal damage in **childhood** occurs matters greatly for later adolescent and adult behavior

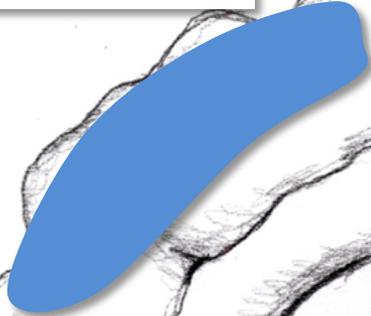
Onset of adaptive behaviors in infants and children



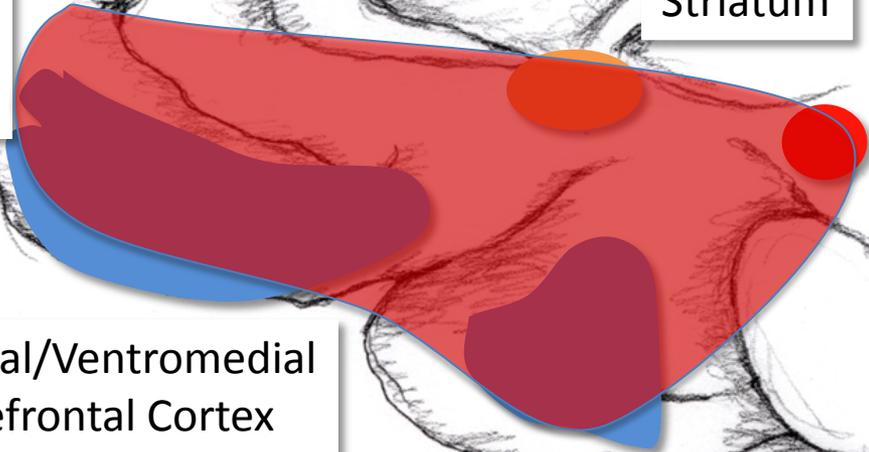
Onset in months	Behavior	
0	Exhibits walking reflex when held upright	
0	Exercises all human facial expressions	
0	Distinguishes mother's breast by smell	
0	Stage 1 fear to stimuli and physical support changes	
0	Reflexive turning to sound	
0.5	Loss of reflexive turning	
0.75	Loss of walking reflex	
1	Coos	Critical Period 1
1.25	Social smile	
2	Laughs	
3	Shows handedness preference	
3.5	Discriminates mother's from father's voice	
4.5	Makes raspberry sound	
6	Sits alone for 30 sec or more	
6	Color perception like adult	
7	Loses fear 1, gets fear 2 of strangers, crowds	
12	1 Year old	
	Walks alone	
17	7-20 word vocabulary	
24	2 Years old	Critical Period 2
	Adult visual acuity	
30	Can climb up a tree but not down	
30	3 word sentences, can work a remote better than you	

The immature prefrontal system

Dorsal Prefrontal Cortex



Anterior Cingulate Cortex



Striatum

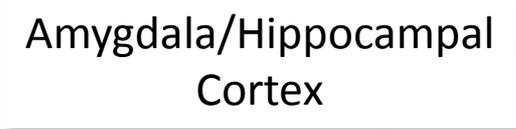


Midbrain Dopamine

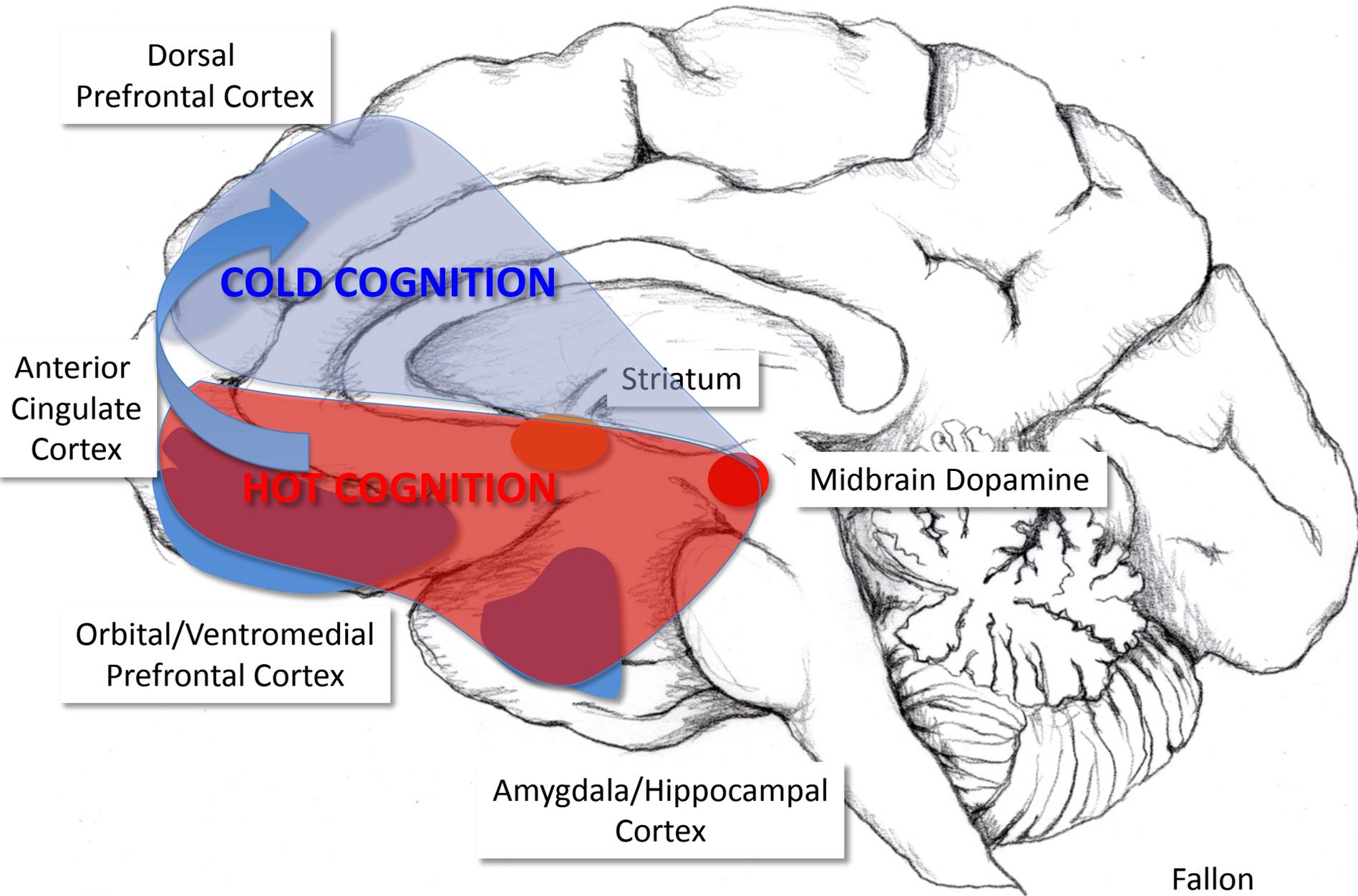


Orbital/Ventromedial Prefrontal Cortex

Amygdala/Hippocampal Cortex



The maturing (and switching) teenage prefrontal system



The mature adult prefrontal system in balance

Dorsal Prefrontal Cortex

COLD COGNITION

mens rea?

Striatum

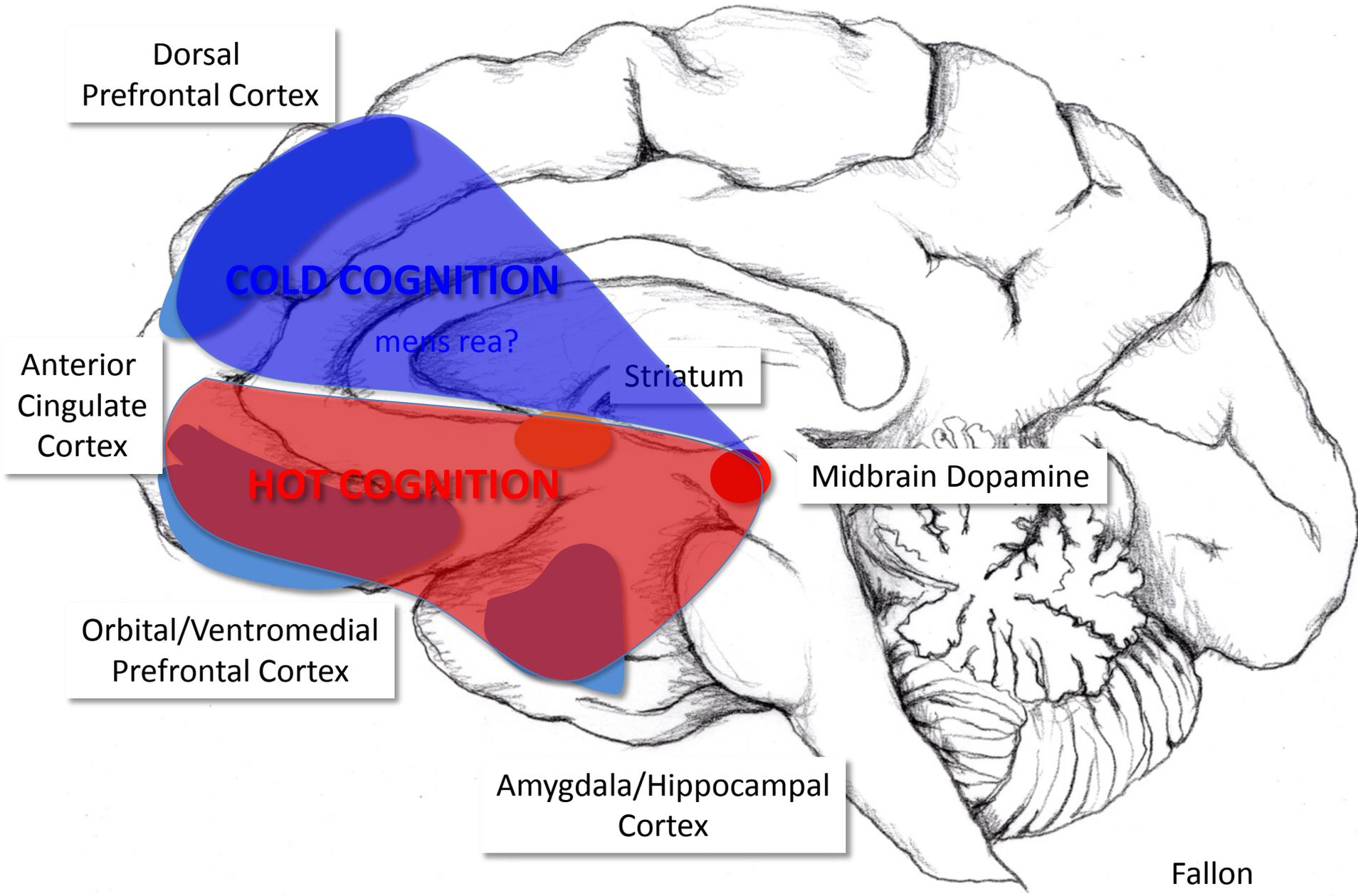
Midbrain Dopamine

HOT COGNITION

Orbital/Ventromedial Prefrontal Cortex

Amygdala/Hippocampal Cortex

Fallon



Robert Hare's Psychopathy Checklist-Revised (PCL-R) is the diagnostic tool commonly used to assess Psychopathy

Factor 1: Aggressive narcissism

- * Glibness/superficial charm
- * Grandiose sense of self-worth
- * Pathological lying
- * Conning/manipulative
- * Lack of remorse or guilt
- * Shallow affect
- * Callous/lack of empathy
- * Failure to accept responsibility
for own actions

Factor 2: Socially deviant lifestyle

- * Need for stimulation/proneness to boredom
- * Parasitic lifestyle
- * Poor behavioral controls
- * Early behavioral problems
- * Lack of realistic, long-term goals
- * Impulsivity
- * Irresponsibility
- * Juvenile delinquency
- * Revocation of conditional release

Traits not associated with any factor

- * Promiscuous sexual behavior
- * Many short-term marital relationships
- * Criminal versatility

PCL-R Factor 2 is particularly strongly correlated to antisocial personality disorder and criminality and with reactive anger, anxiety, increased risk of suicide, criminality, and impulsive violence.

Psychopathy is defined in psychiatry as a personality disorder characterized by lack of empathy or conscience, poor impulse control and manipulative behaviors. Psychopathy has no true equivalent in DSM-IV-TR's, where it is most strongly correlated with antisocial personality disorder and the ICD-10 dissocial disorder. Hare describes psychopaths as intraspecies predators who use charm, manipulation, intimidation, and violence to control others and to satisfy their own selfish needs. Lacking in conscience and in feelings for others, they take what they want without guilt or regret.

THESE PCL-R FACTORS ARE DIVIDED INTO 4 FACETS:

Interpersonal

Affective

Lifestyle

Antisocial

Psychopathy is associated with criminal recidivism, but only the antisocial facet is strongly associated with violent recidivism. The interpersonal facet is not associated at all (Wallinius et al 2012)

Psychopathy itself is associated most with those who are extraverted, arrogant, deceitful, low neuroticism, agreeable, open, and conscientious

PRIMARY PSYCHOPATH

does not respond to punishment, apprehension, stress, or disapproval. They seem to be able to inhibit their antisocial impulses most of the time, not because of conscience, but because it suits their purpose at the time. They don't follow any life plan, and it seems as if they are incapable of experiencing any genuine emotion.

SECONDARY PSYCHOPATH

Is a risk-taker, but are also more likely to be stress-reactive, worriers, and guilt-prone. They expose themselves to more stress than the average person, but they are as vulnerable to stress as the average person. They are daring, adventurous, unconventional people who began playing by their own rules early in life. They are strongly driven by a desire to escape or avoid pain, but are unable to resist temptation.

Both primary and secondary psychopaths can be subdivided into:



DISTEMPERED PSYCHOPATH

is the kind that seems to fly into a rage or frenzy more easily and more often than other subtypes. Their frenzy will resemble an epileptic fit. They are also usually men with incredibly strong sex drives

CHARISMATIC PSYCHOPATH

is charming, attractive liars. They are usually gifted at some talent or another, and they use it to their advantage in manipulating others. They are usually fast-talkers, and possess an almost demonic ability to persuade others out of everything they own, even their lives.

Psychopathology as a spectrum? That is, a qualitatively distinct disorder, or just a “quantitative trait”?

Fully Dimensional- anti-social personality traits may be distributed in the normal population, but does the “psychopathic killer” merely have the highest range of these traits, as opposed to being qualitatively different than “normals” or “supernormals,” or are they Really qualitatively different (something that public policy makers and the legal system may not want at all)

PSYCHOPATHY DIMENSIONALITY RANGE



CAUTION

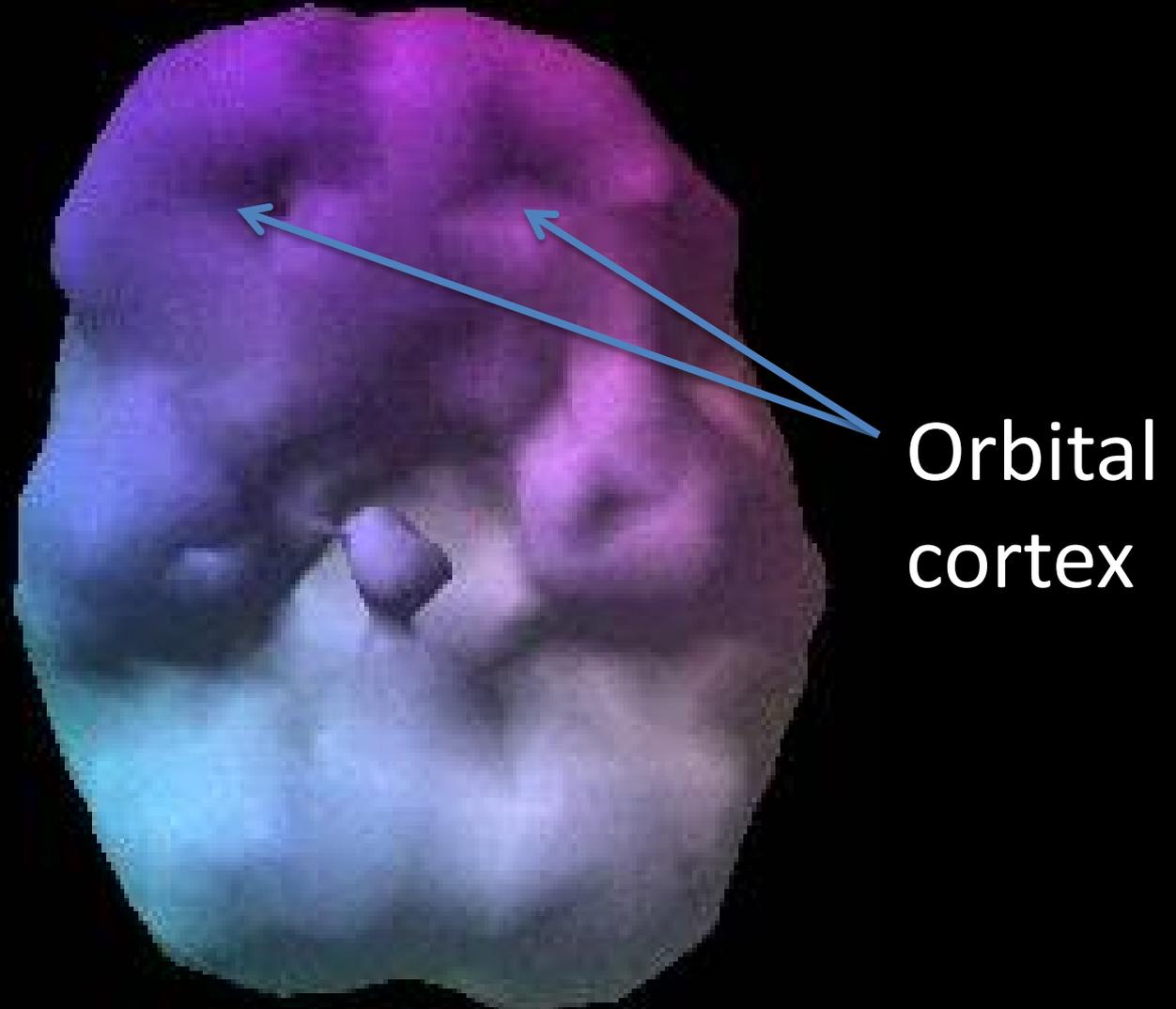
In spite of all the talk about psychopathy, especially in the media and casual conversations, **the diagnosis is VERY far from one of scientific/clinical consensus.**

Virtually nothing is known from the kind of careful psychiatric imaging genetics studies carried out in the past decade in tens of thousands of patients with schizophrenia, the former **“final frontier” in psychiatry**

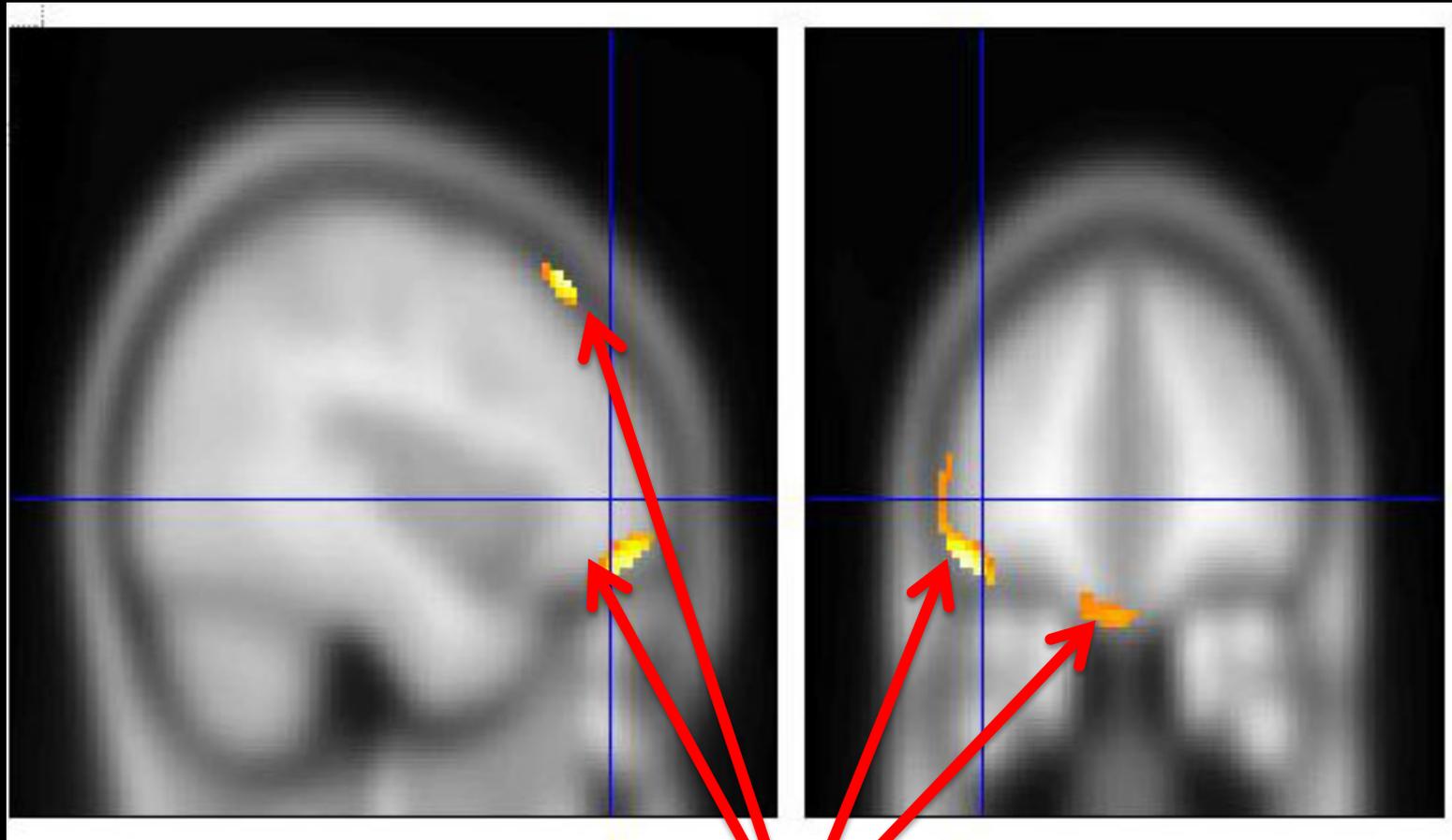
And because of legal/privacy issues, **almost nothing comprehensive is known of these pathologies in criminals.**

As such, consideration of the actual imaging and genetic and psychometric data is of more use now than the singular diagnosis **“psychopathy”**

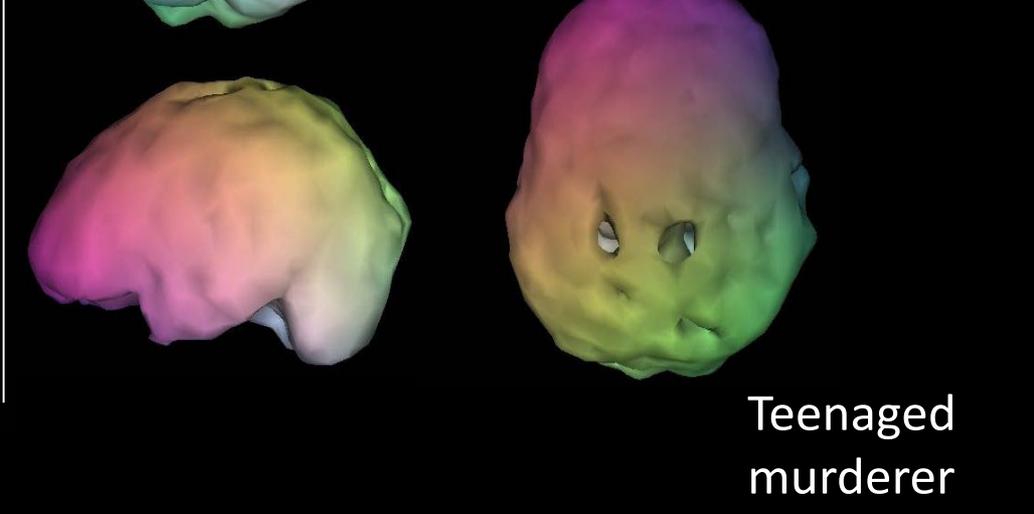
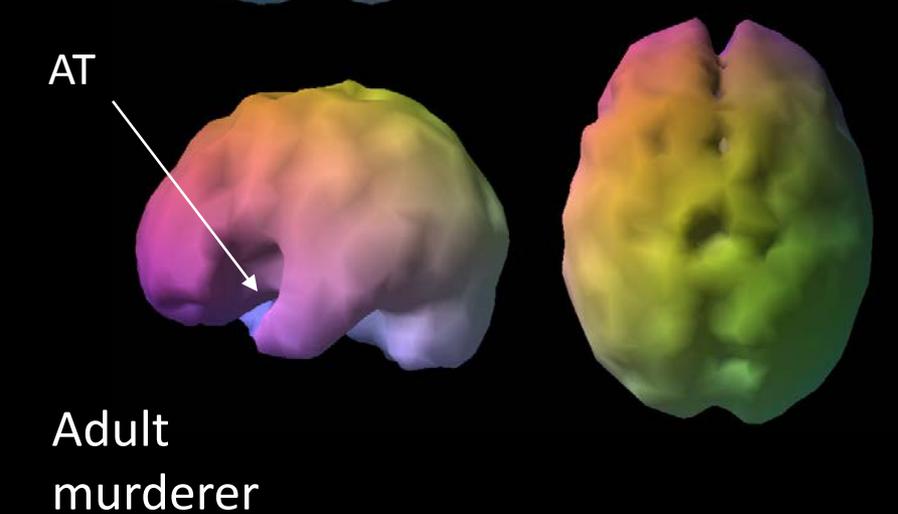
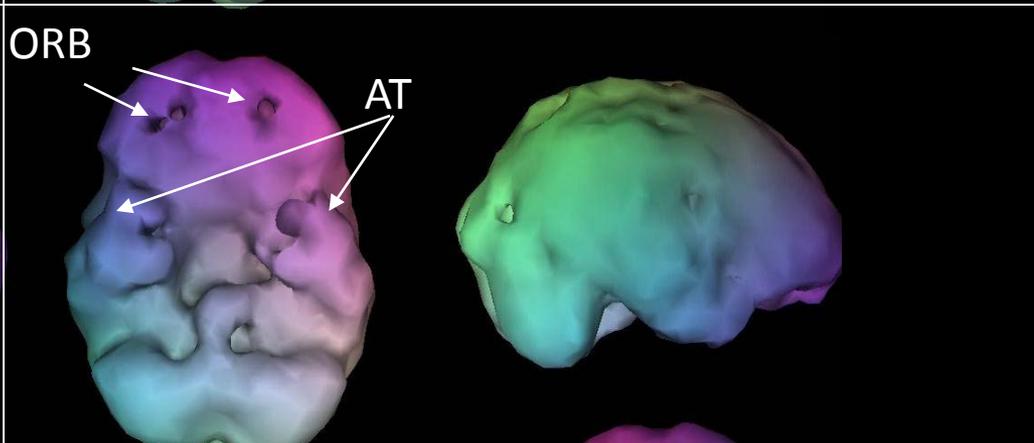
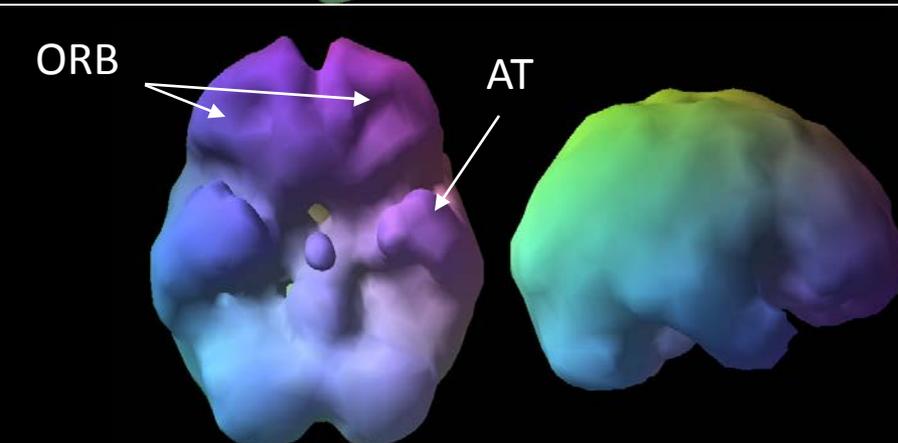
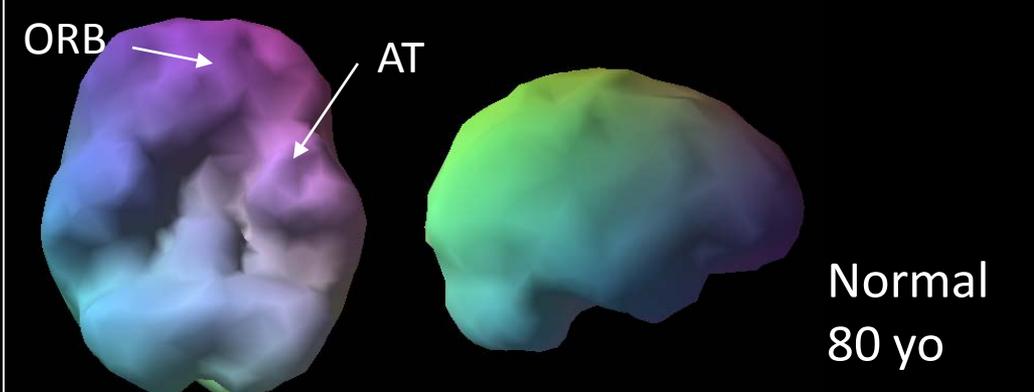
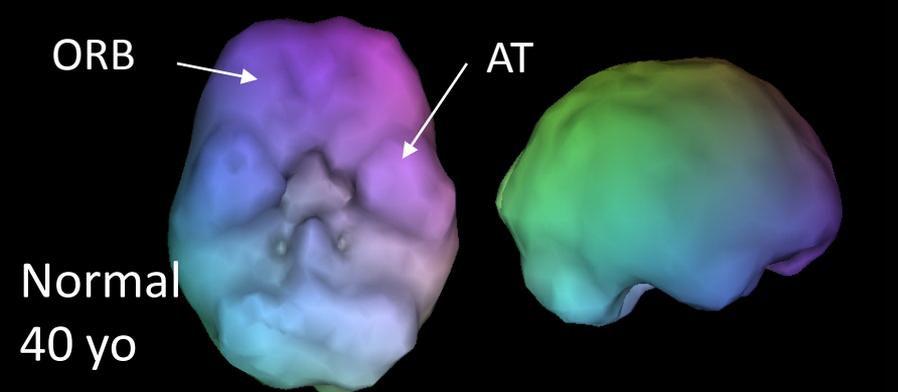
Impulsive murderer



Summary finding of areas of decrease in the brains of **impulsive murderers**

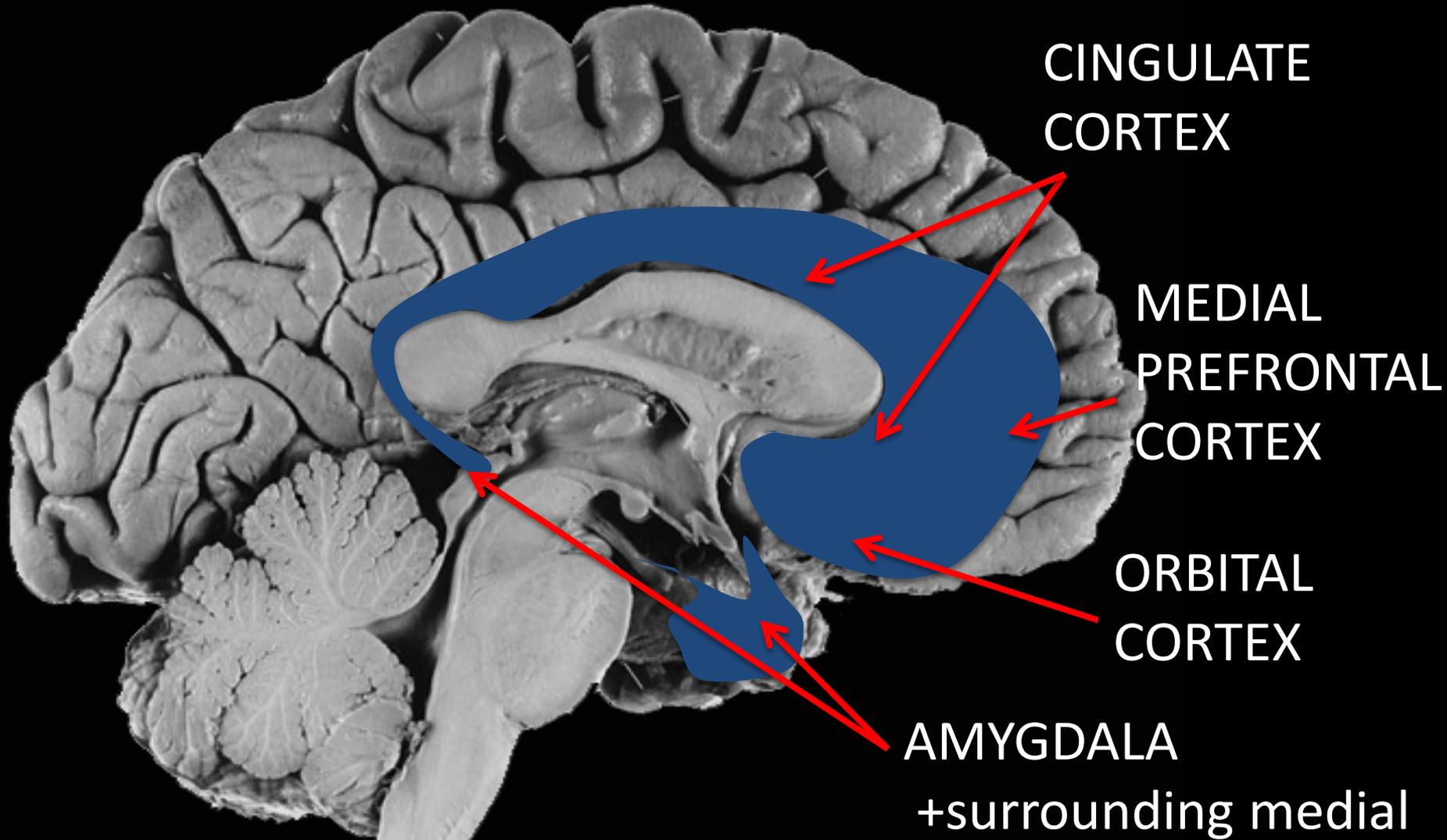


Dorsal and Inferior prefrontal
and medial orbital cortex



Orbital cortex (ORB) and anterior temporal cortex (AT) Amen et al

Underactive areas of the psychopath brain



CINGULATE
CORTEX

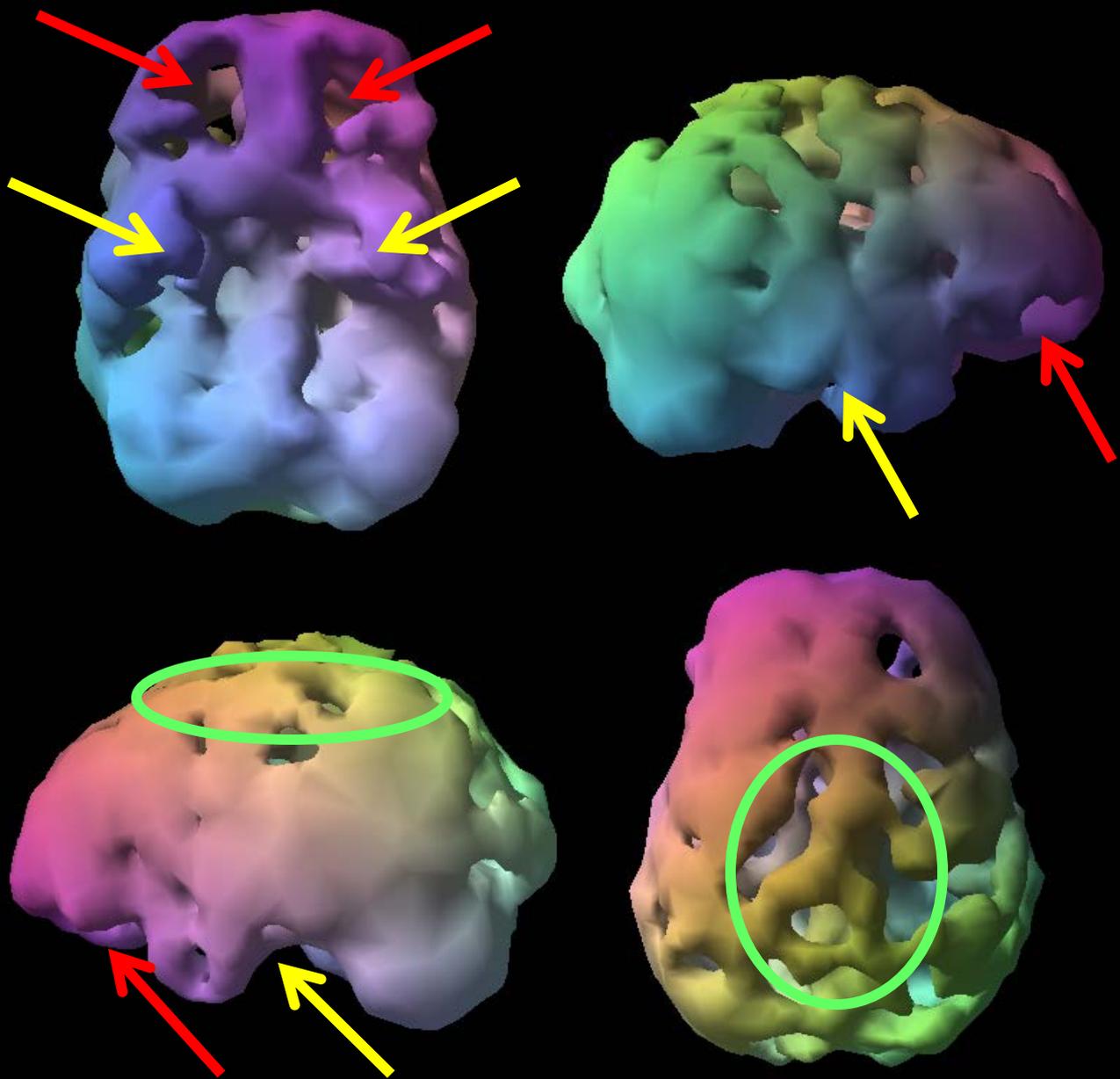
MEDIAL
PREFRONTAL
CORTEX

ORBITAL
CORTEX

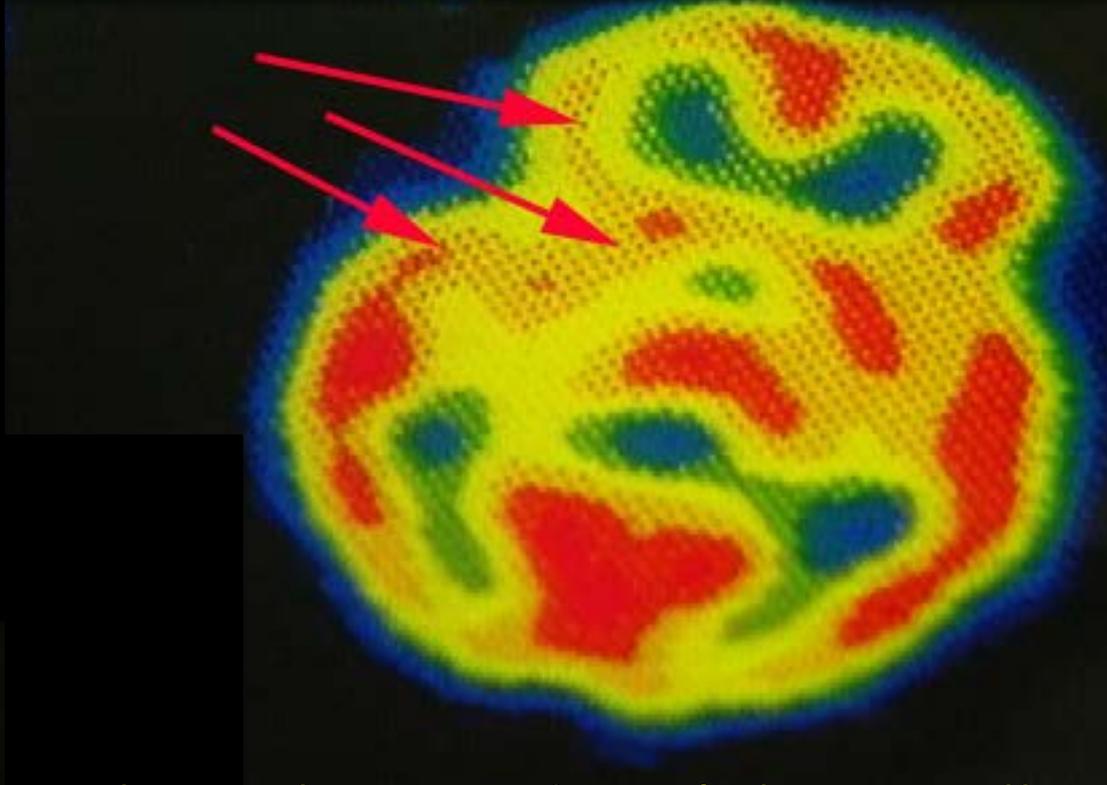
AMYGDALA
+surrounding medial
temporal lobe

Collectively called the "LIMBIC LOBE"

Psychopathic murderer with drug abuse + brain trauma



Unidentified subject- Blind guess on traits-
psychopath plus speech/reading disorder



So, the psychopathic murderer's brain will typically show the limbic lobe damage, but may also have additional damage to other brain areas with additional associated symptoms



GENES associated
with aggression,
violence, and
psychopathy

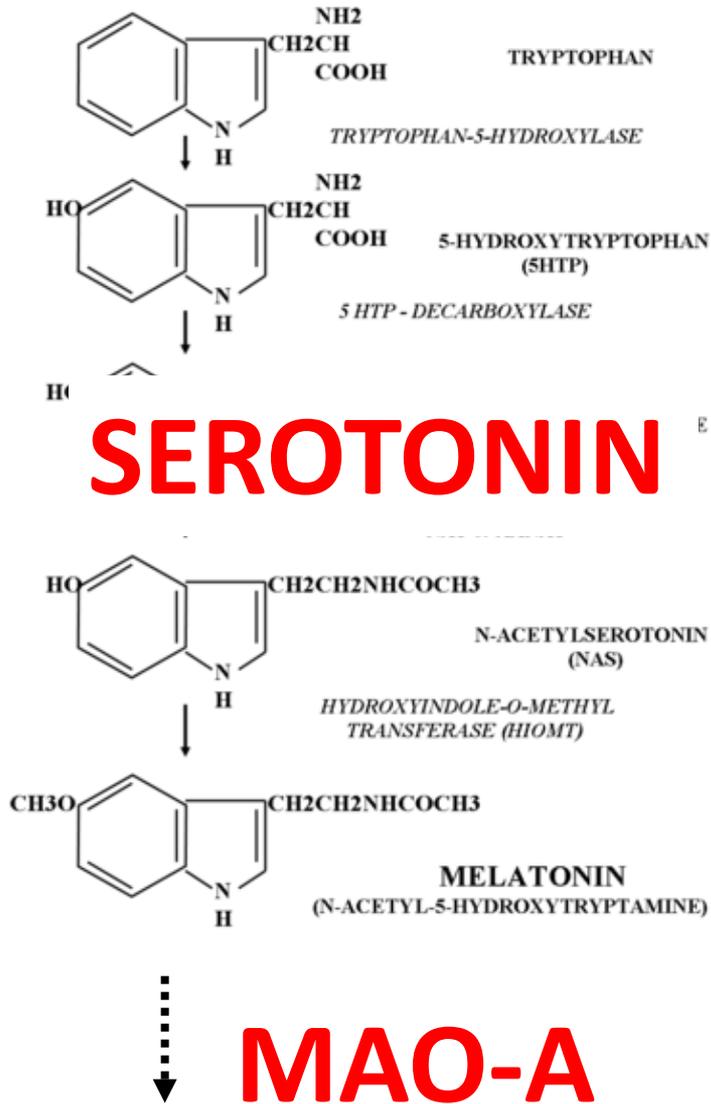
MAO-A ; The first “warrior gene”

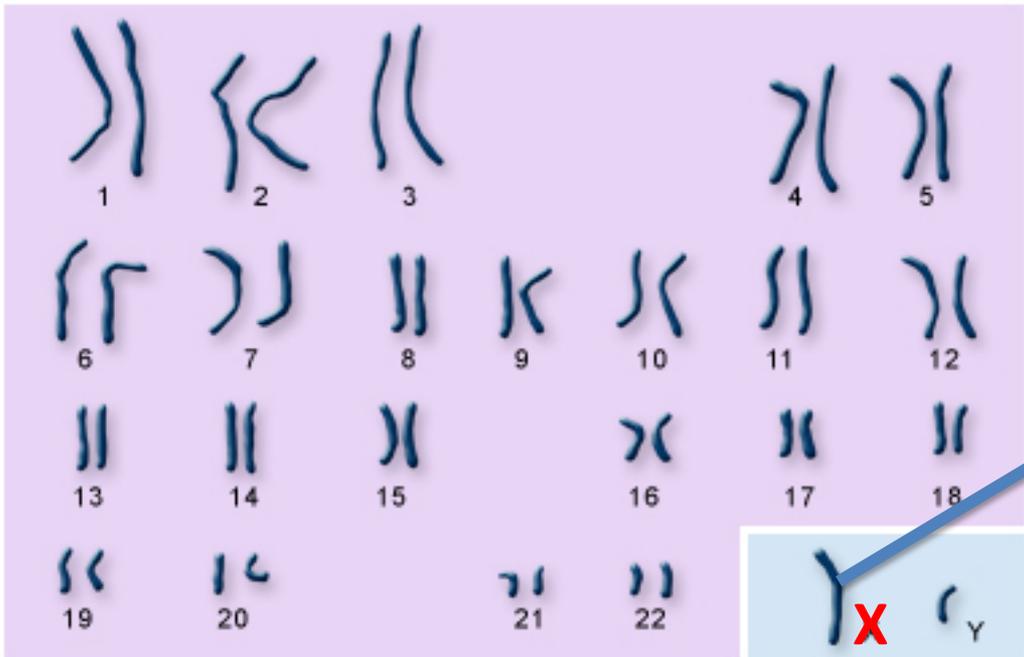
A Dutch kindred with a missense mutation in the *MAO-A* gene was described : hemizygous males, representing functional gene knockouts, exhibited impulsively violent criminal behavior for generations (Brunner et al 1993)

There is one major group of single nucleotide polymorphisms (SNPs) in the MAO-A gene; A combination in one group results **is low MAO-A activity and high serotonin levels and is associated with High Risk for violence and aggression**

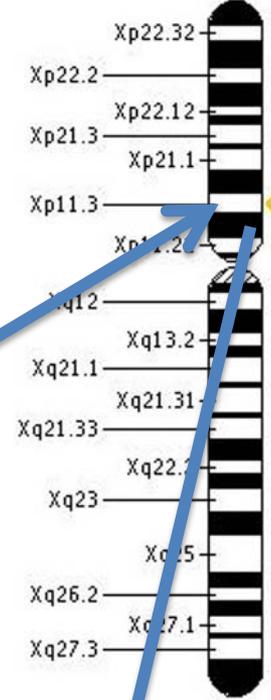


The MAO-A enzyme breaks down serotonin





X CHROMOSOME



**MAOA
GENE**

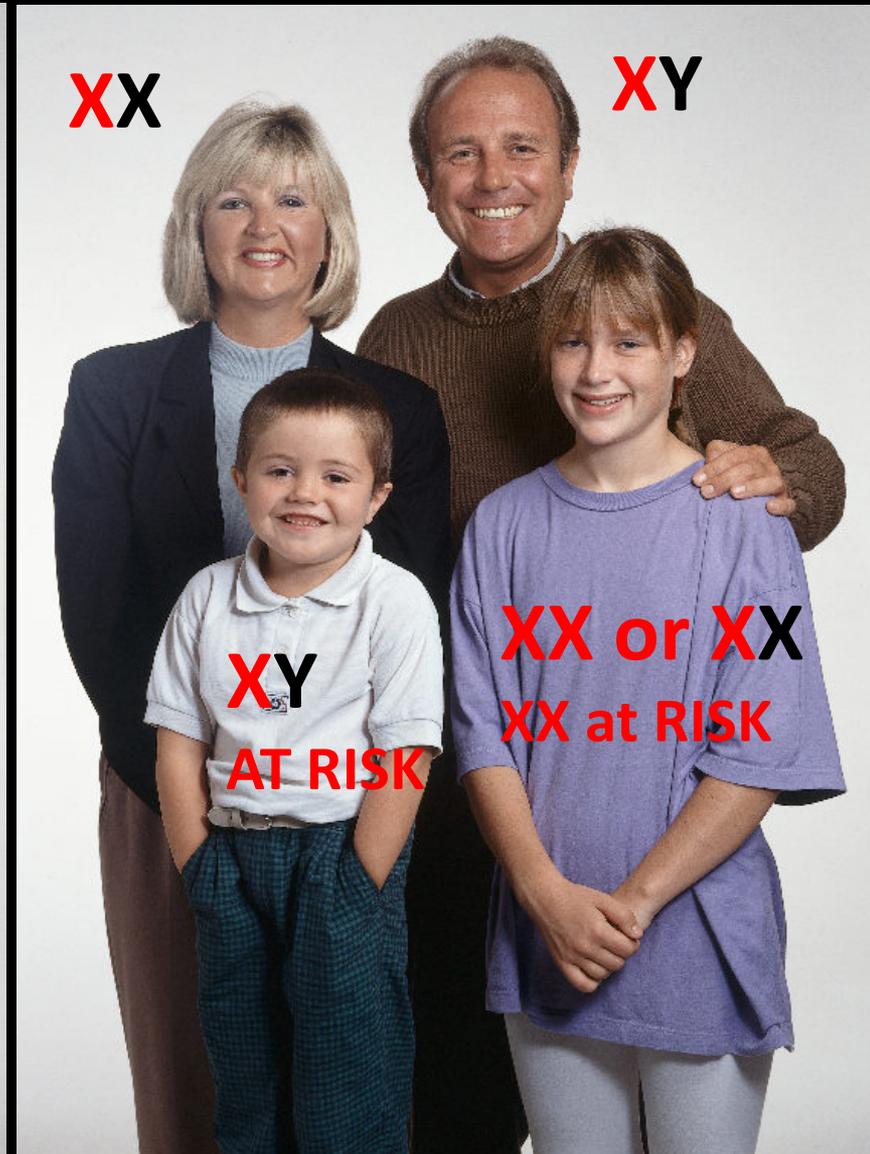
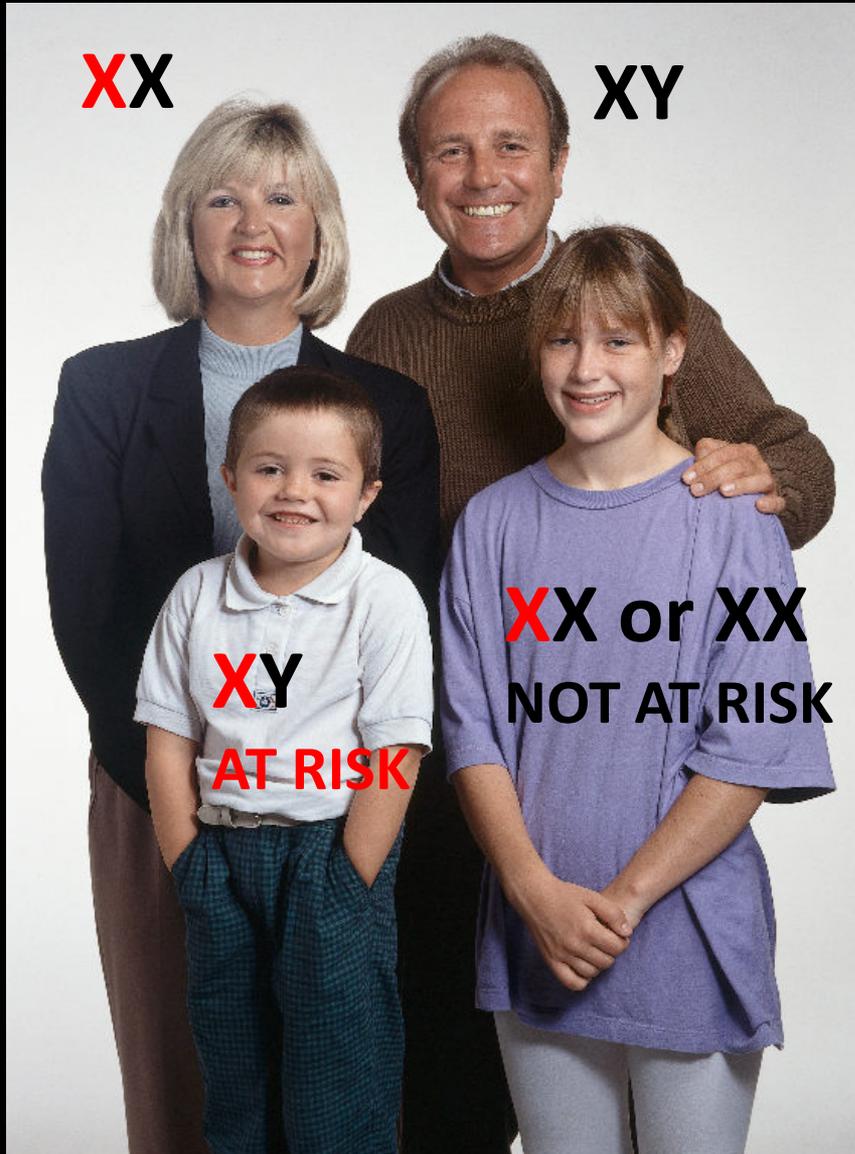


The MAO-A is coded for on the X chromosome

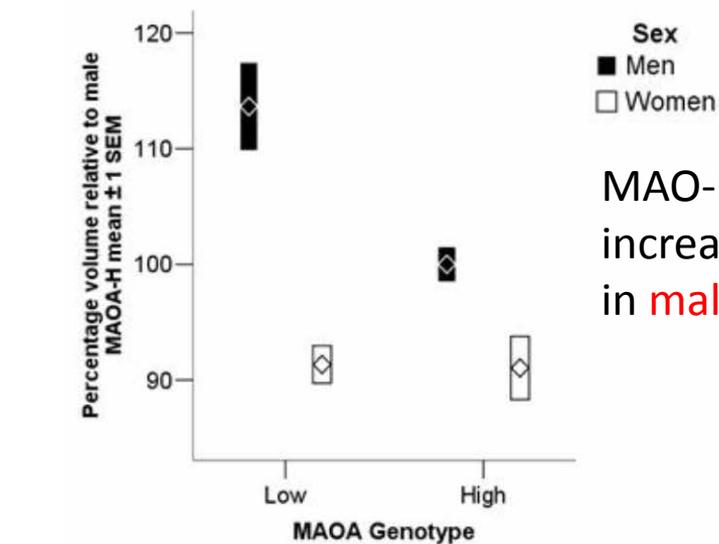
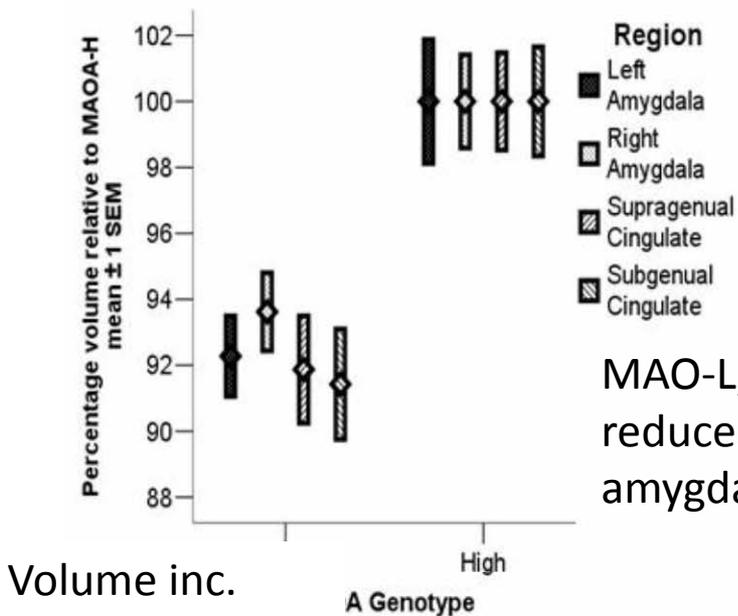
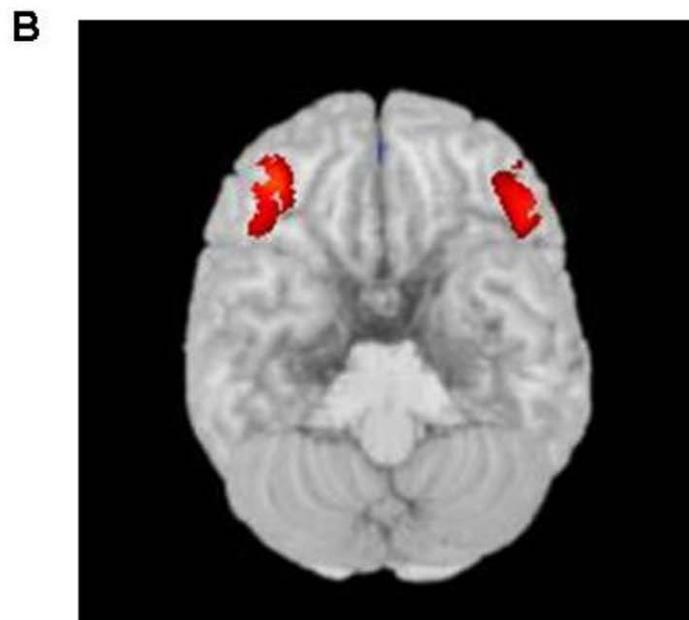
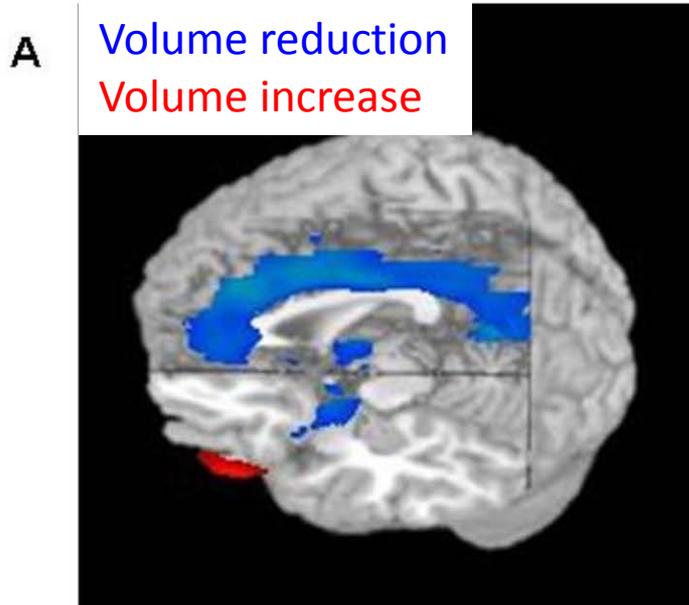
1.000	JIM
1.000	SUBJECT A
1.000	SUBJECT B
0.733	SUBJECT C
0.667	SUBJECT D
0.562	SUBJECT D

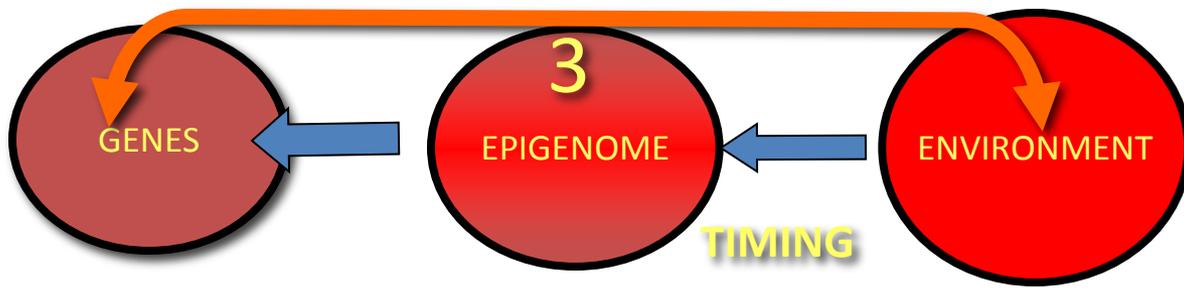
A	A	G	G	G	T	A	C	G	A	G	A	A	A	G	A
A	A	G	G	G	T	A	C	G	A	G	A	A	A	A	A
A	A	G	G	G	T	A	C	G	A	G	A	A	A	A	A
A	A	G	G	G	T	A	A	A	G	G	A	A	G	G	A
A	A		G	G	T	A	A	A	G	G	A	A	G	G	A
A	A	G	G	G	T	A	A	C	A	G	A	G	G	A	G

THE MAO-A IS LOCATED ON THE X CHROMOSOME SO IF THE MOTHER PASSES THE HIGH RISK ALLELE TO THE SON HE IS AT RISK- CHANCES ARE THAT DAUGHTERS WON'T BE



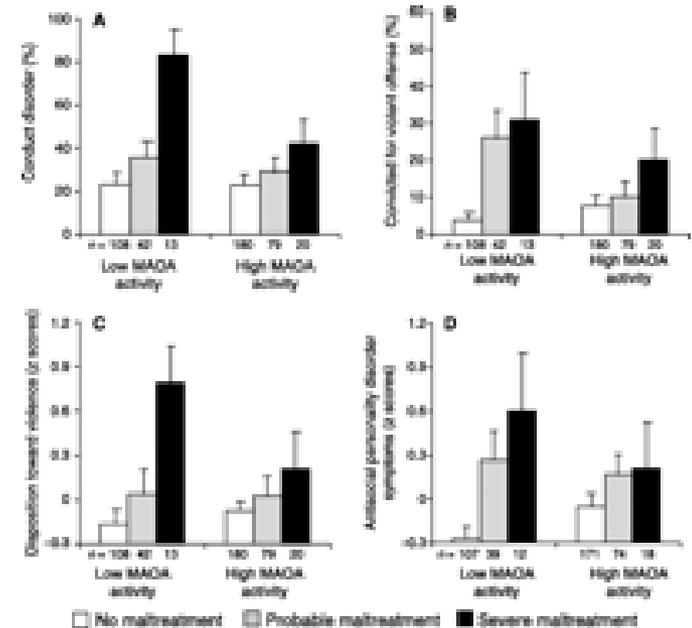
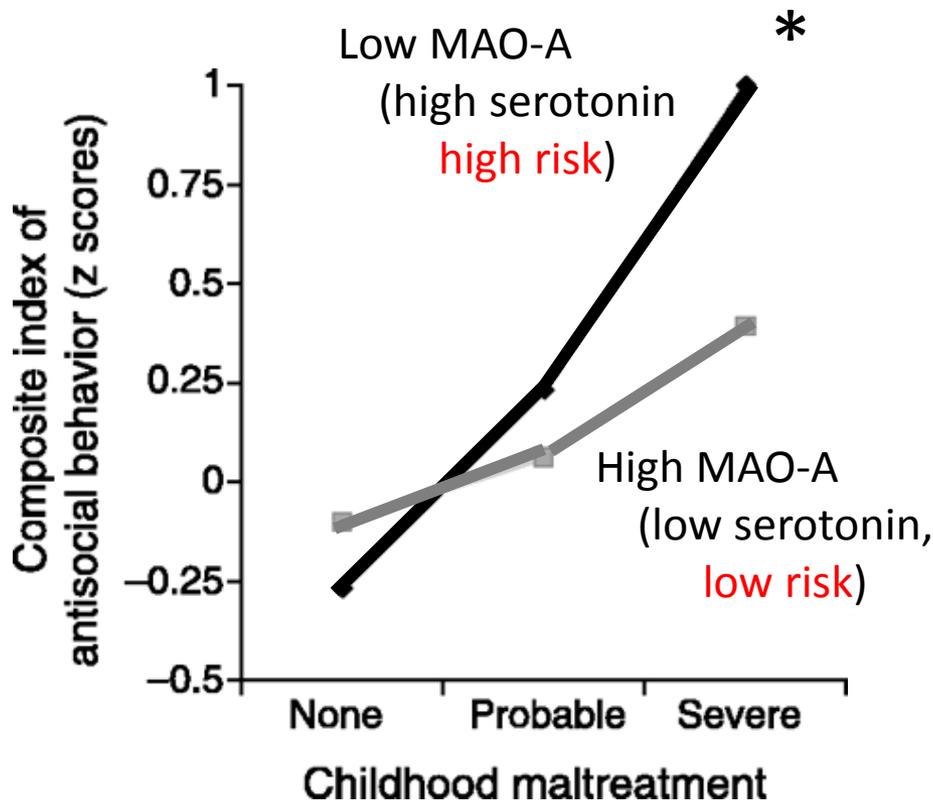
Structural data: MAOA Low vs High MAO-A expression

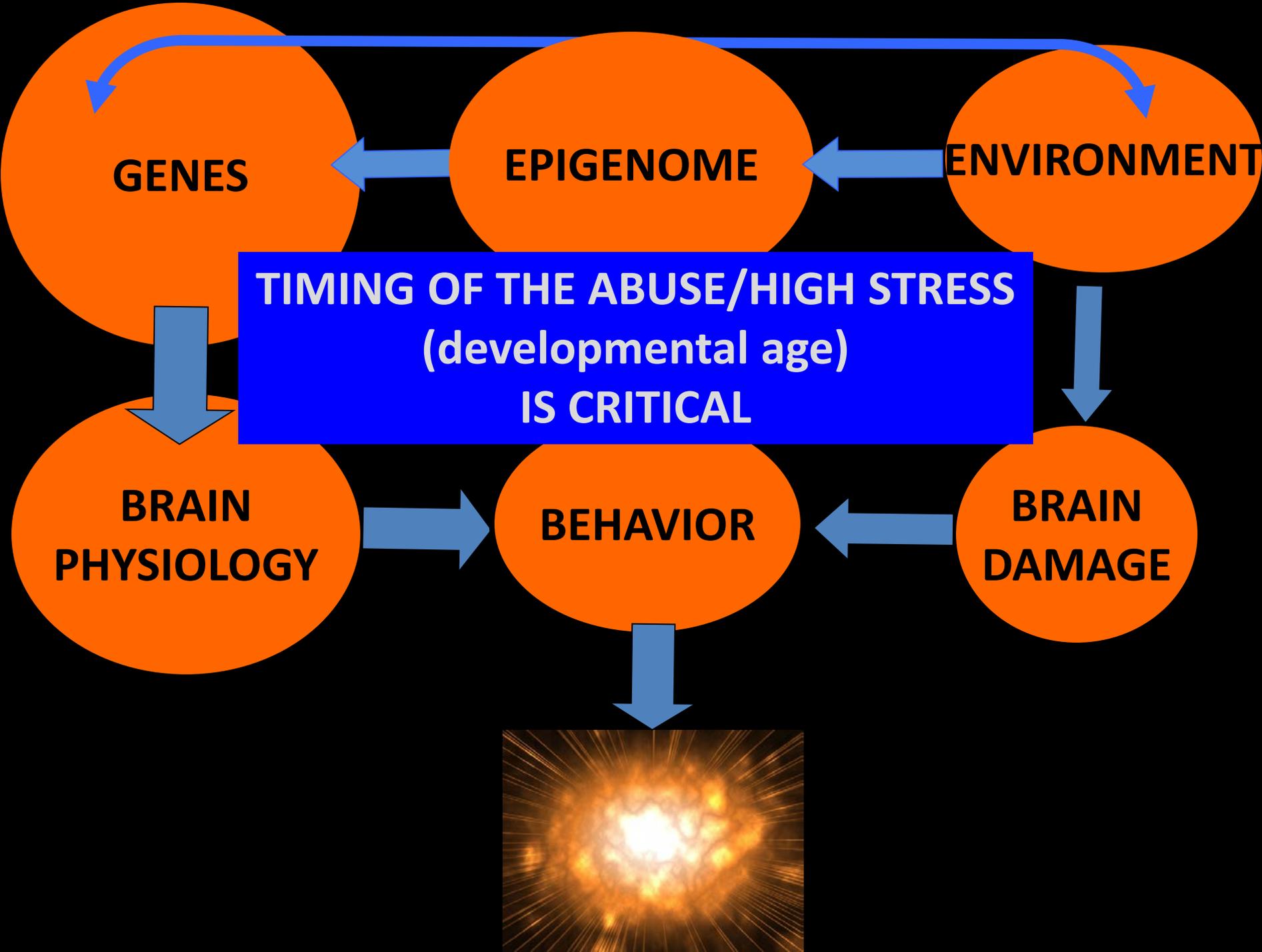




VIOLENCE RELATED CANDIDATE GENE eg MAOA-L

Caspi (2002) found that the high risk genotype (ie low levels of MAOA; high levels of serotonin) affects responses to harsh environmental stressors. The genetically high risk individuals who were also maltreated as children were much more likely to develop antisocial personality disorder, and convicted for violent crimes.





GENES

EPIGENOME

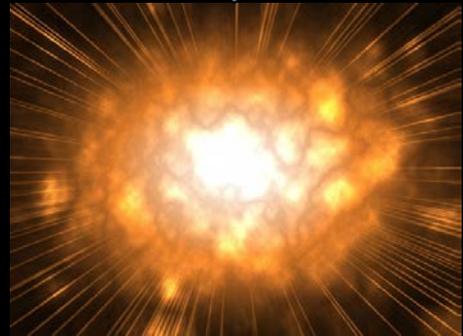
ENVIRONMENT

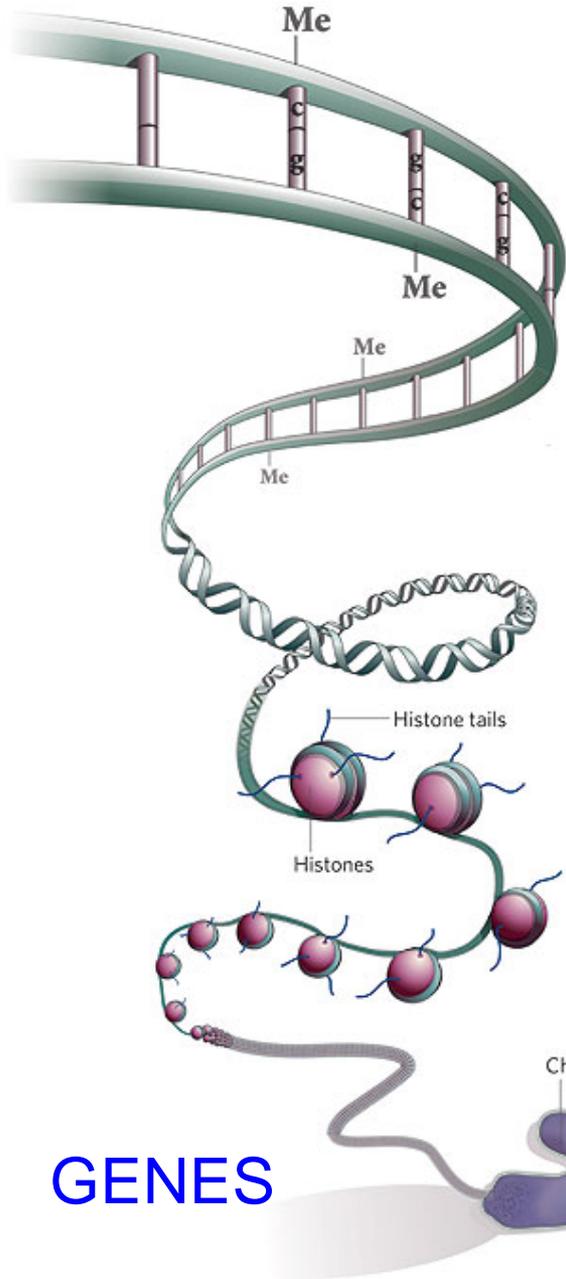
**TIMING OF THE ABUSE/HIGH STRESS
(developmental age)
IS CRITICAL**

**BRAIN
PHYSIOLOGY**

BEHAVIOR

**BRAIN
DAMAGE**





The two main components of the epigenetic code

DNA methylation
Methyl marks added to certain DNA bases repress gene activity.

DNA METHYLATION

HISTONE MODIFICATION

Histone modification
A combination of different molecules can attach to the 'tails' of proteins called histones. These alter the activity of the DNA wrapped around them.

EPIGENETIC EFFECTS

EXTREME STRESS

COCAINE

EARLY TRAUMA

MATERNAL BEHAV

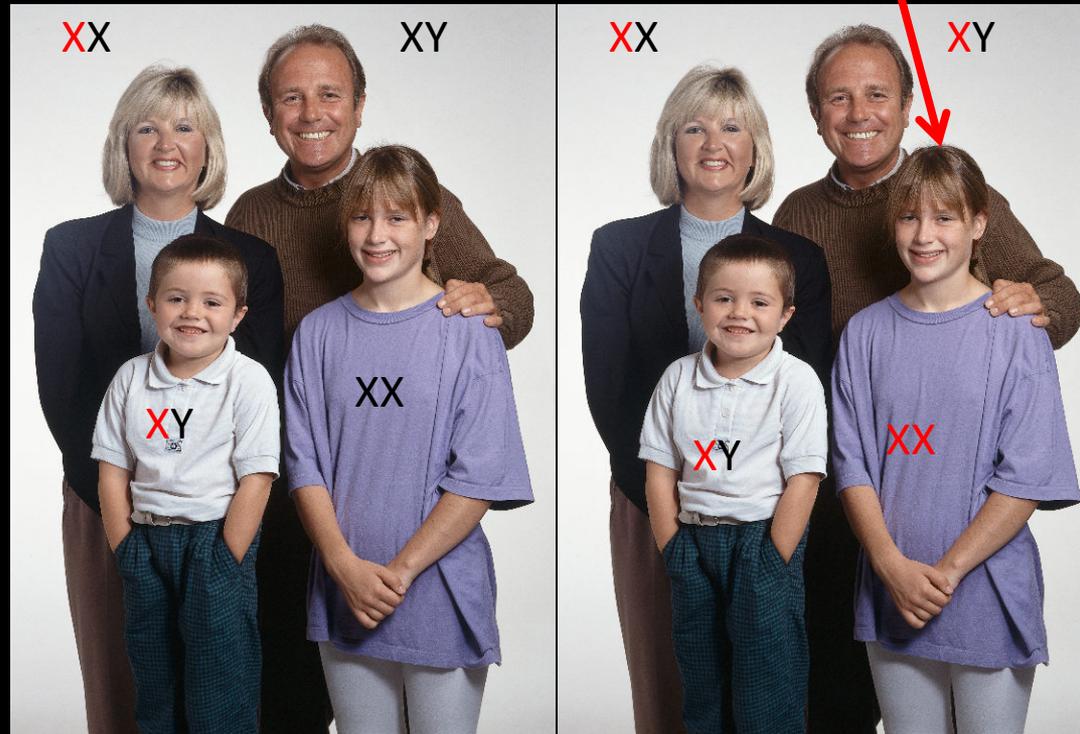
TOXINS

FOODS



Long term societal dangers... the warrior society

Concentrating more aggression producing genes in a violent society and the effect on the females.



Hypothesis

Transgenerational violence



MAOA-L (“warrior gene”)

“High Risk” serotonin transporter

5HT2A serotonin receptor

NE transporter

TH [TPH1,2]

Androgen receptor- example next slide

DAGK1

DBH

COMT

NOS1

Vasopressin AVPR1A

+ low empathy alleles

Aggression
and violence
related alleles
of GENES

Testosterone Administration Decreases Generosity in the Ultimatum Game

Paul J. Zak^{1*}, Robert Kurzban², Sheila Ahmadi³, Ronald S. Swerdloff⁴, Jang Park¹, Levan Efremidze¹, Karen Redwine¹, Karla Morgan⁵, William Matzner¹

How do human beings decide when to be selfish or selfless? In this study, we gave testosterone to 25 men to establish its impact on prosocial behaviors in a double-blind within-subjects design. We also confirmed participants' testosterone levels before and after treatment through blood draws. Using the Ultimatum Game from behavioral economics, we find that men with artificially raised T, compared to themselves on placebo, were 27% less generous towards strangers with money they controlled (95% CI placebo: (1.70, 2.72); 95% CI T: (.98, 2.30)). This effect scales with a man's level of total-, free-, and dihydrotestosterone (DHT). Men in the lowest decile of DHT were 560% more generous than men in the highest decile of DHT. We also found that men with elevated testosterone were more likely to use their own money punish those who were ungenerous toward them. Our results continue to hold after controlling for altruism. We conclude that elevated testosterone causes men to behave antisocially.

TESTOSTERONE AND ITS ANDROGEN RECEPTOR

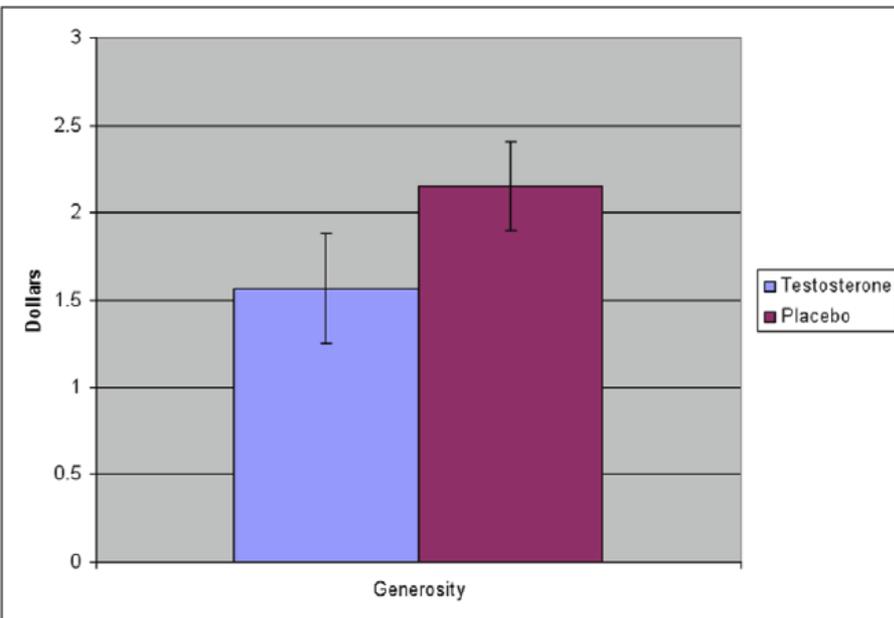


Figure 3. Generosity (UG offer - UG punishment threshold) by participants on placebo was \$2.15 compared to \$1.57 when the same individuals were given Androgel®, a 27% reduction ($p = .035$; bars in graph are SEs). More participants on Androgel® relative to placebo showed negative generosity by setting a punishment threshold above than their own offer to DM2 (9.6% vs. 2.9%).

HEDONIC HOT SPOT

AFFECTS THE **TYPE OF EMPATHY** ONE HAS AND DOESN'T HAVE

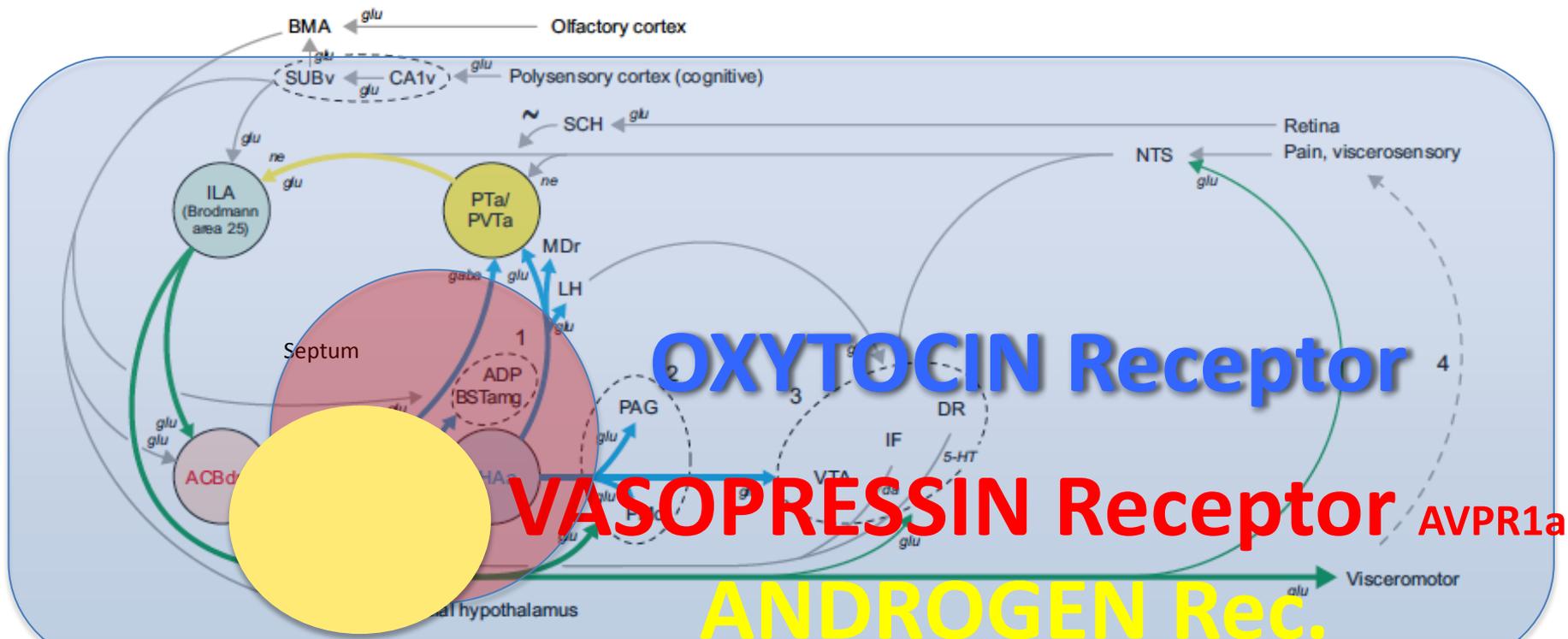
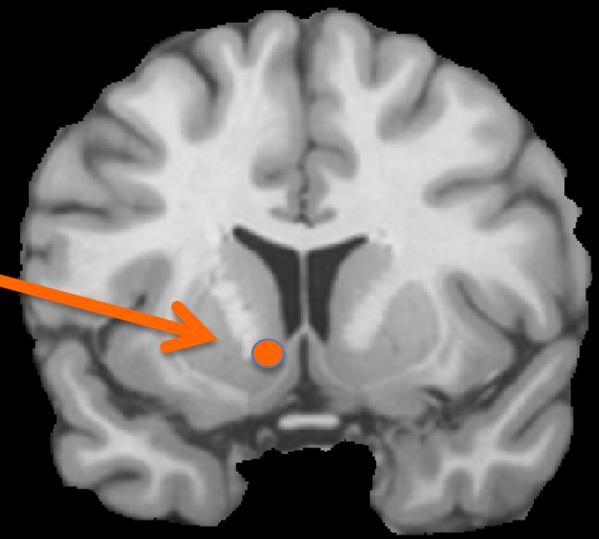


Fig. 2. Structural organization of ACBdm-related neural circuitry. The four nodes of a closed loop (ACBdm > LHAa > PTa/PVTa > ILA > ACBdm; colored circles on left) are emphasized as a test bed for the experimental double-COIN network tracing strategy used to identify the origin, course, and termination of each pathway described in the text. Note a triple descending projection from the cerebral hemisphere (29) to LHAa: excitatory from ILA, inhibitory from

The Three Legged Stool model of psychopathy

Psychopathology



ABUSE (eg TRAUMA)

High vulnerability
genetic alleles

Functional brain loss
orbital/medial PFC, amygdala

Nature v. Nurture: Can Your Genes Make You Murder?

- 1- Are we all basically the same or different?
Self and identity
- 2- Brain imaging and genetics of behavior.....
and misbehavior- Is there a Criminal Brain?
- 3- A Curious Personal Misadventure

Self and Identity

What if you were to find out that you are not at all what you think your are ...and this realization happened at, 60 years of age?



PET & EEG SCAN & SEROTONIN RECEPTOR GENE COMPARISON

FAMILY MEM 1

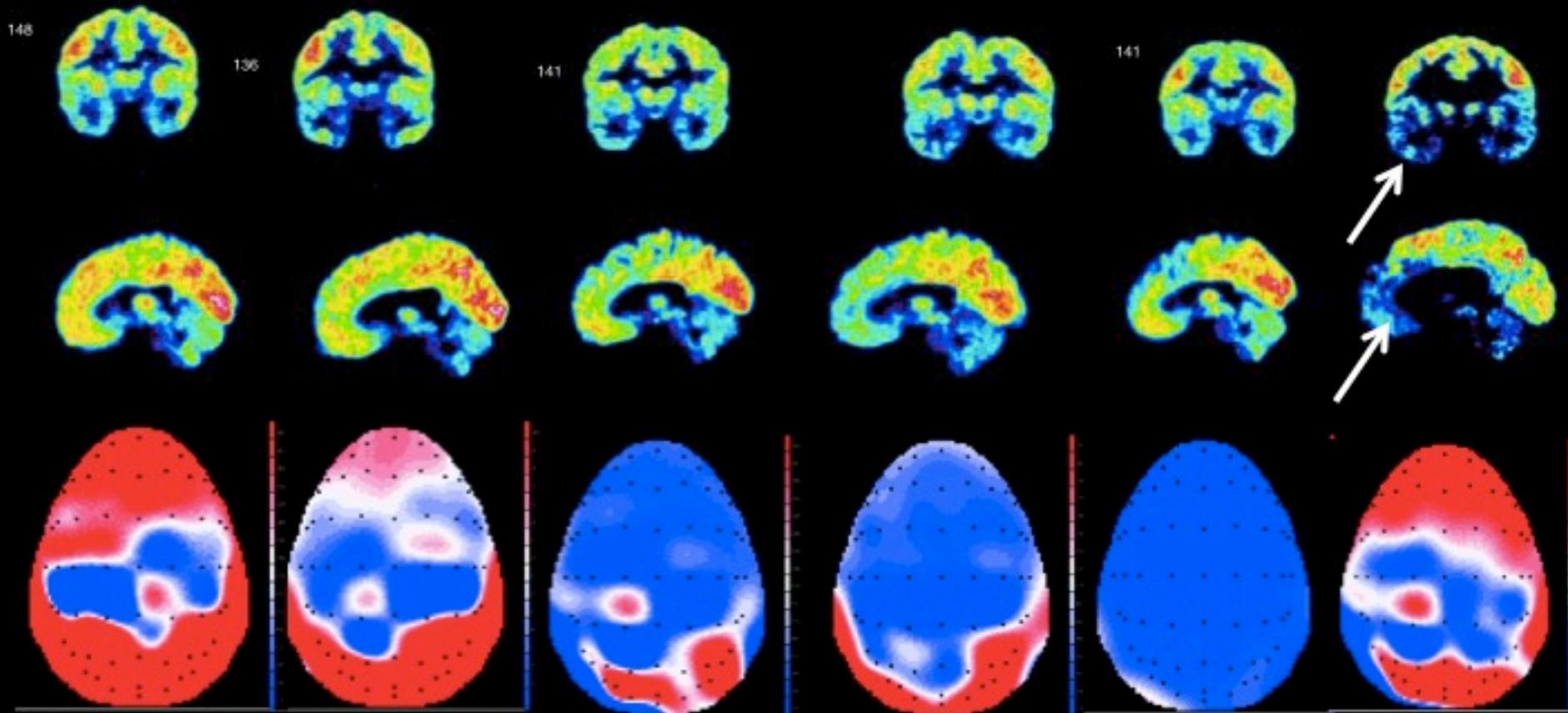
2

3

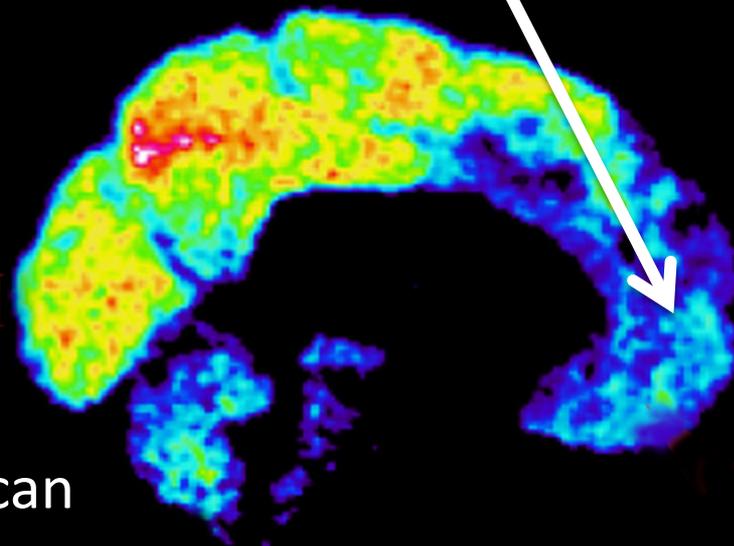
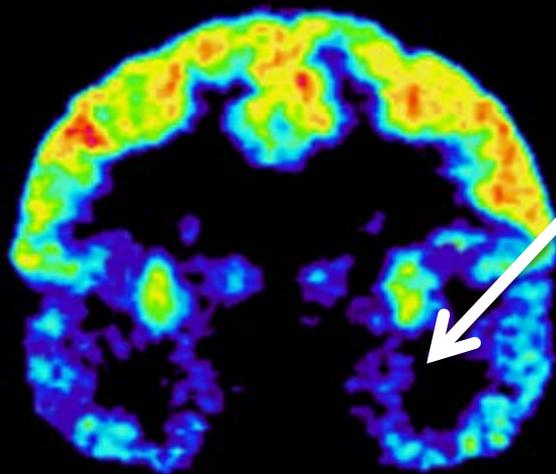
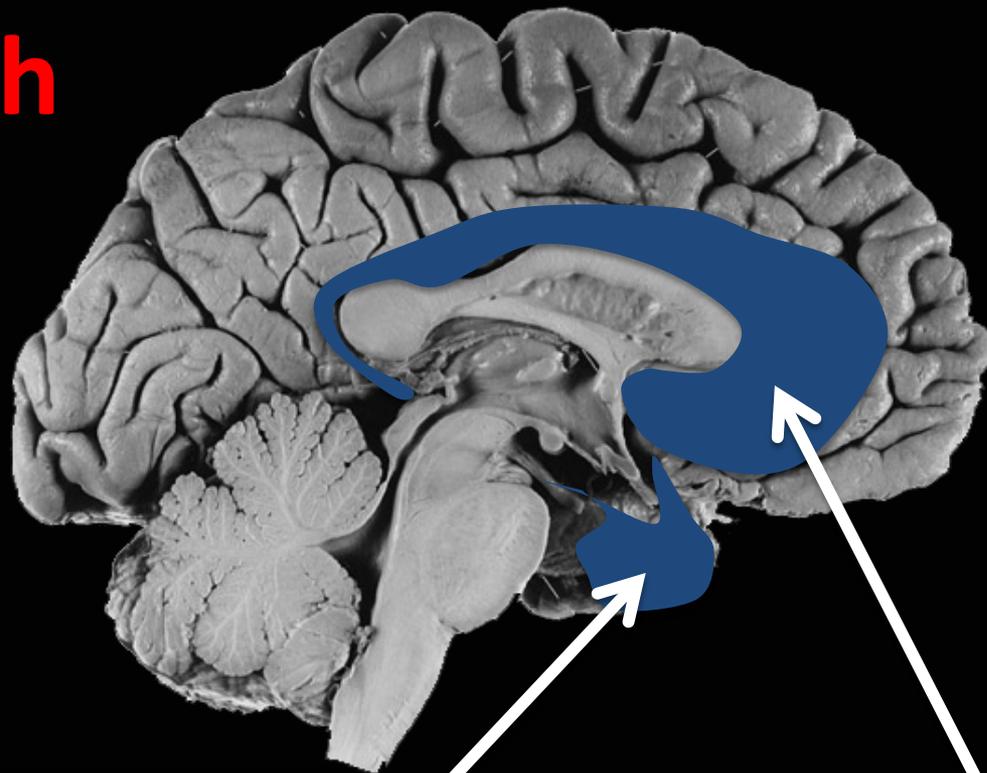
4

5

6



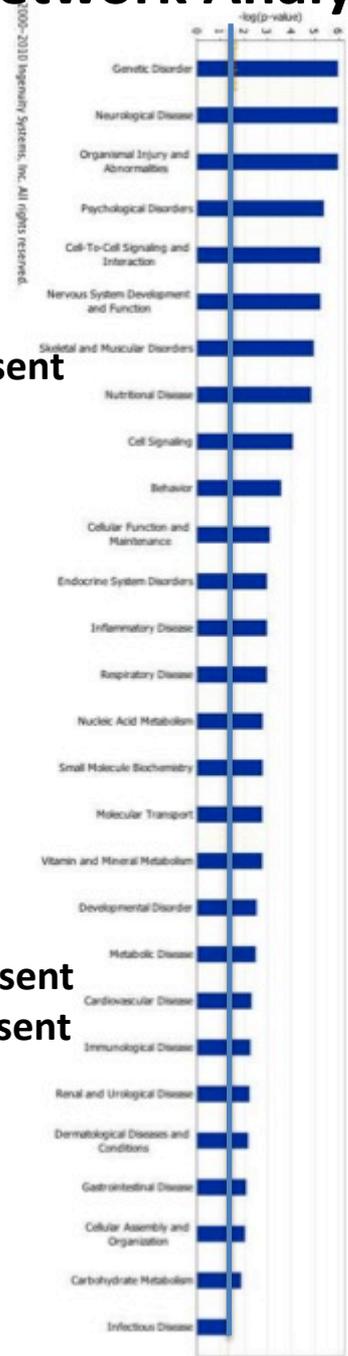
Psychopath



My PET scan

Genetic Interaction-Network Analysis

Asthma- 1 yo-present
Allergies-1 yo-present
Panic attacks-18-35 yo
“Death yips”- existential terror of not existing~ 5,000 times ~ 18yo-present (depression?)
OCD- 10-17yo
Hyperreligiosity- 9-18yo
Hypertension- 18yo-present
Obesity- 18yo-present,variable
Essential Tremor 18yo-present
Addictions- 18yo-present
Hypomania- 18yo-present
High Risk Behaviors- 18yo-present
Put others, family, friends at risk
Impulsivity- 18yo-present
Insomnia ~4hrs sleep/night 25yo-present
High flat empathy, bonding 18yo-present
Aggressive- 18yo-present
Hedonistic, fun loving 18yo-present
Extremely individualistic
Creative bursts
Pressure of speech 25yo-present
Rarely sick, resistant to infection



← Total genetic disorder risk
 ← Neurological disorders risk
 ← Neural organizational injury
 ← Psychological disorders and psychopathology
 ← Nervous system development

 ← Behavioral pathology
 ← C
 ← e
 ← Respiratory disorders
 |
 u
 |
 a
 ← Metabolic disorder, obesity
 r

 p
 a
 t
 h
 o
 | Infectious diseases

Hare Psychopathy Checklist

Factor 1

Core Personality traits- Aggressive narcissism
(correlated with extraversion, positive affect, sociability)

1. Glibness/superficial charm
2. Grandiose sense of self-worth
3. Pathological lying
4. Cunning/manipulative
5. Lack of remorse or guilt
6. Emotionally shallow
7. Callous/lack of empathy
8. Failure to accept responsibility for own actions

Factor 2

Socially deviant lifestyle - People with Anti-Social Personality Disorder
score high in these (correlated with criminality)

1. Need for stimulation/proneness to boredom
2. Parasitic lifestyle
3. Poor behavioral control
4. Promiscuous sexual behavior
5. Lack of realistic, long-term goals
6. Impulsiveness
7. Irresponsibility
8. Juvenile Delinquency
9. Early behavioral problems
10. Revocation of conditional release

Hare Psychopathy Checklist

Factor 1

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(correlated with extraversion)

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8. Failure to accept responsibility

Factor 2

Socially deviant lifestyle
score high in these (correlated with antisociality)

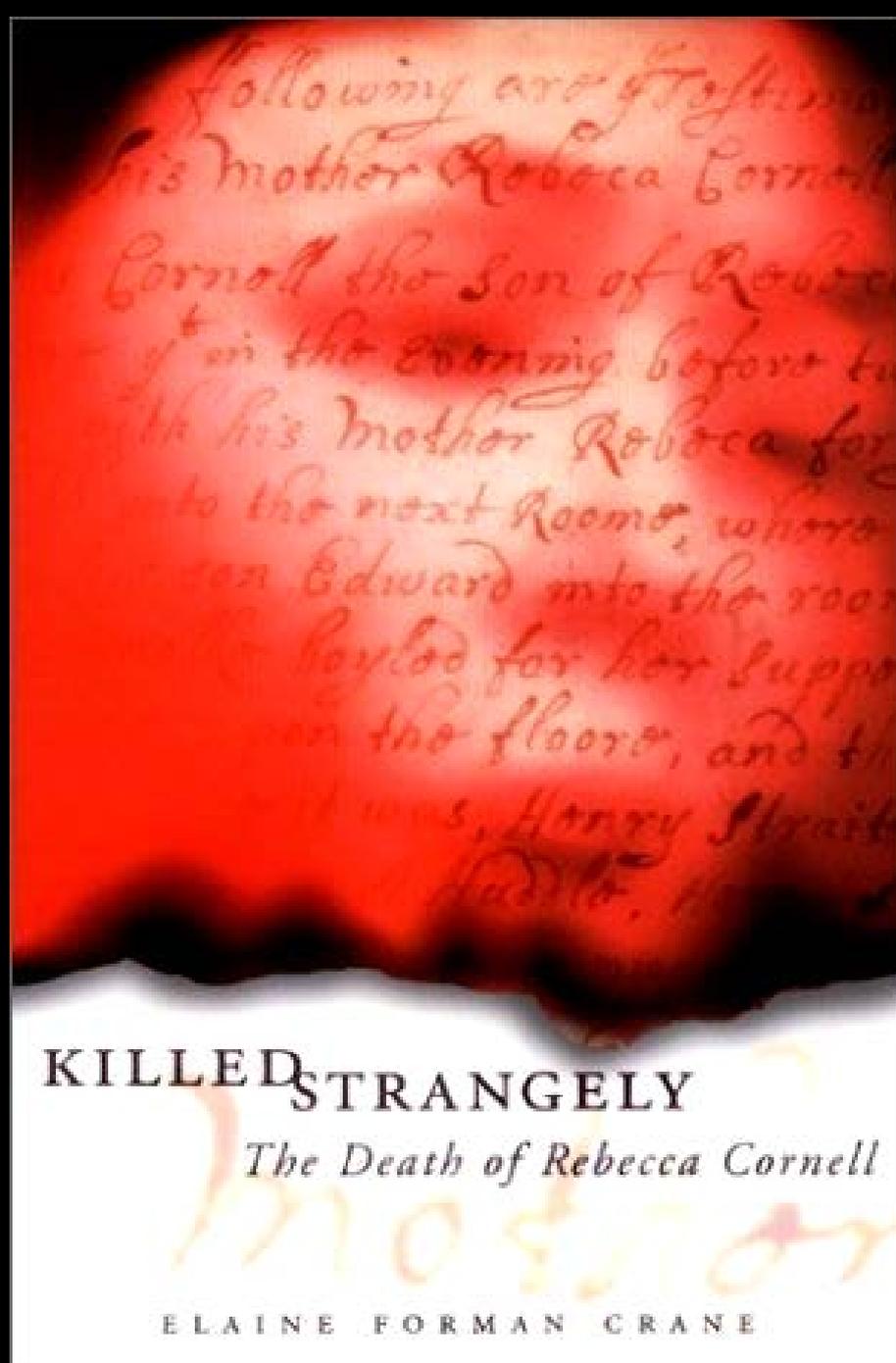
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9. Early behavioral problems

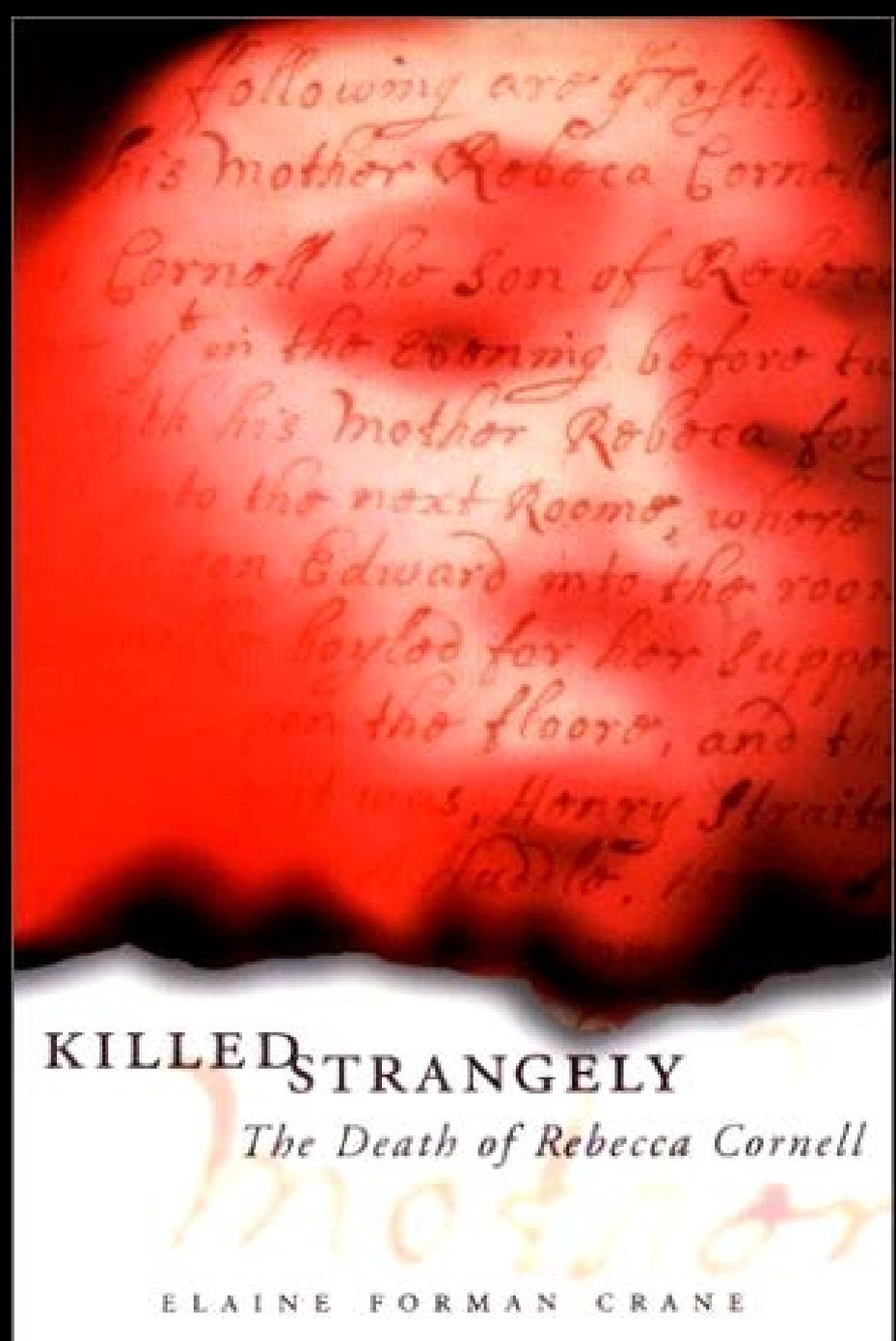
10. Revocation of conditional release



At about the same
time, my mother
told me to read
this book



First case of
matricide in the
USA (colonies)
1667 was a
grandfather



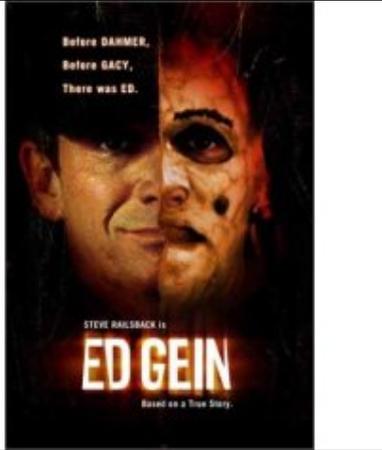
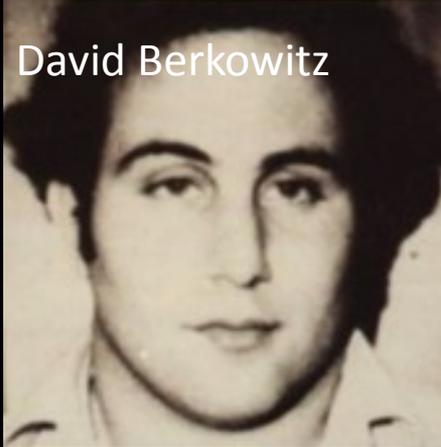


And seven more men
in my paternal line
were murderers....
plus cousin Lizzie Borden



Then why didn't I turn out like one of these?

David Berkowitz



Karla Faye Tucker

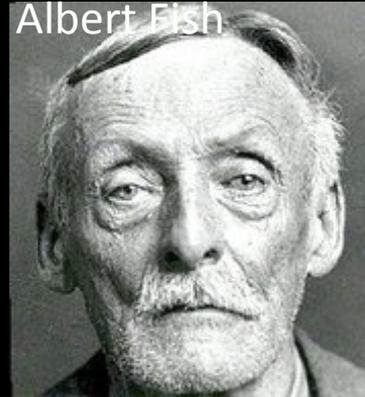


MANSON, Charles Milles

TED



Albert Fish

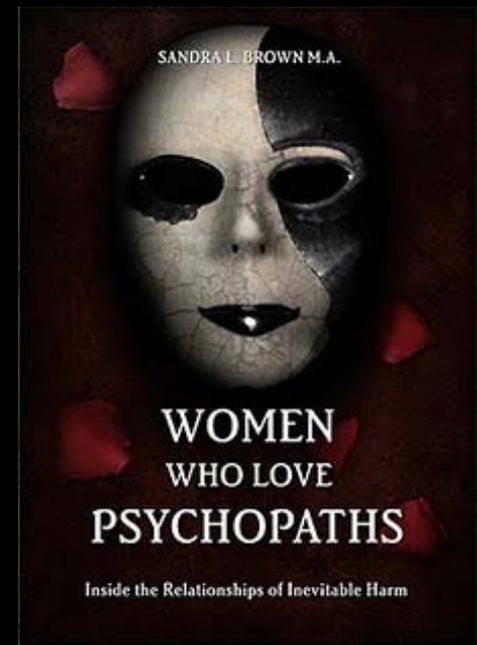
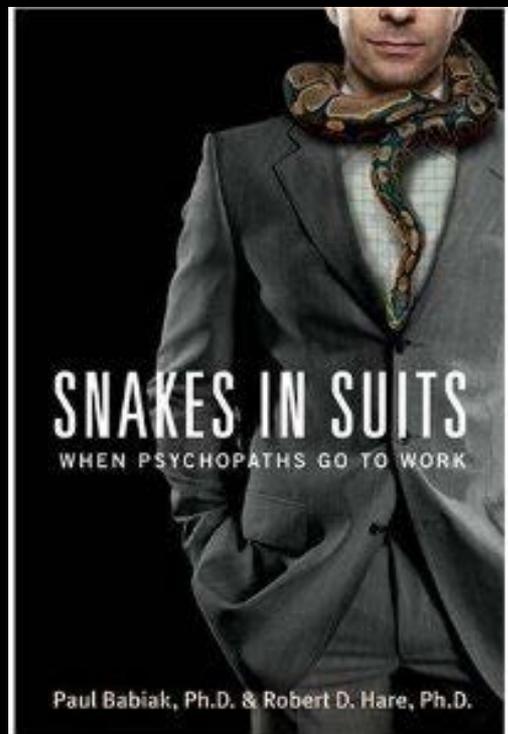


FALLON

jeffrey dahmer



Aileen Wuornos

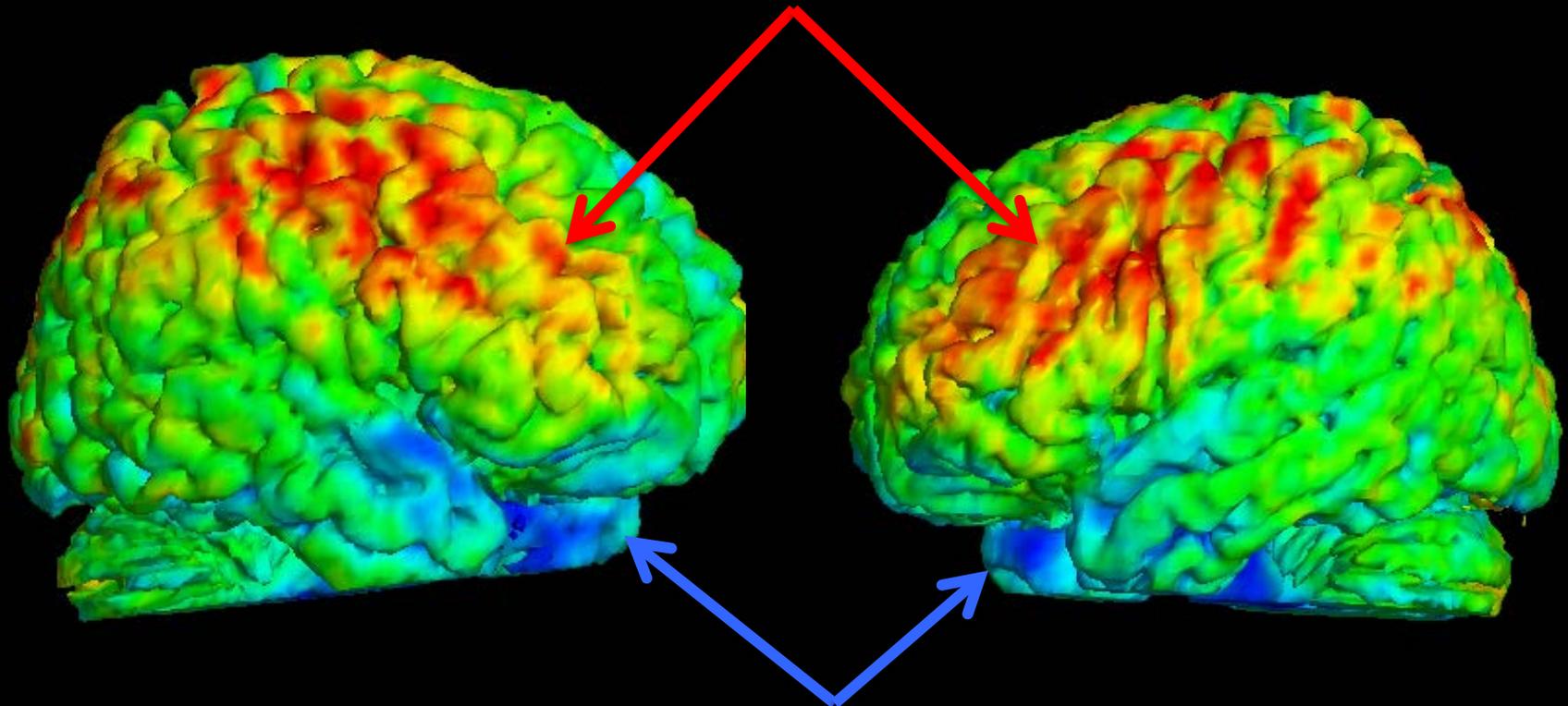


**Or one of these
successful psychopaths?**



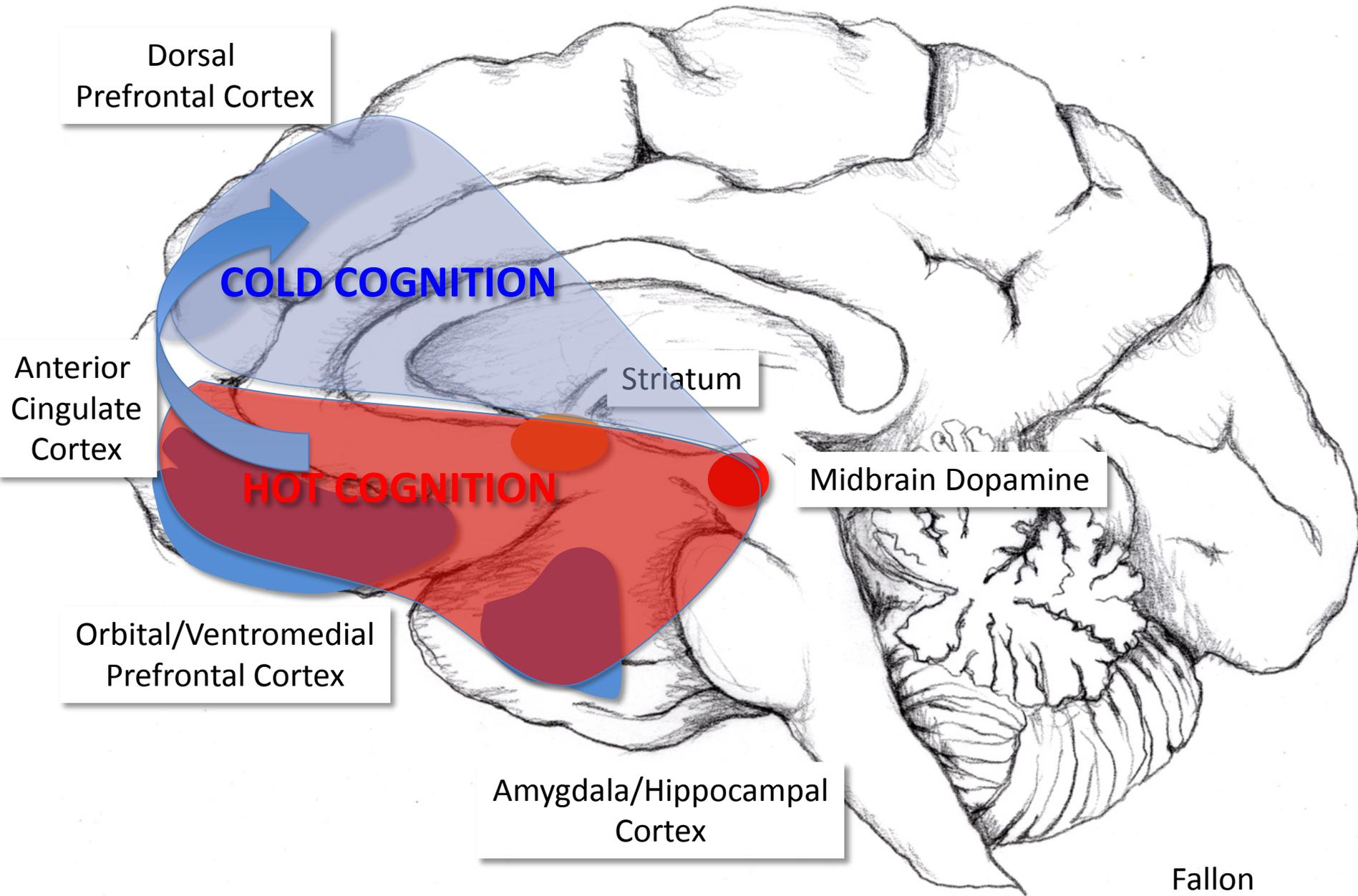
Why did my brain develop abnormally?

Brain activity too high in the cold cognition areas



Brain activity too high in the hot cognition areas related to emotion, aggression, ethics, morality, empathy

The maturing (and switching) teenage prefrontal system



What is missing in my “three legged stool” of psychopathy?

Psychopathology



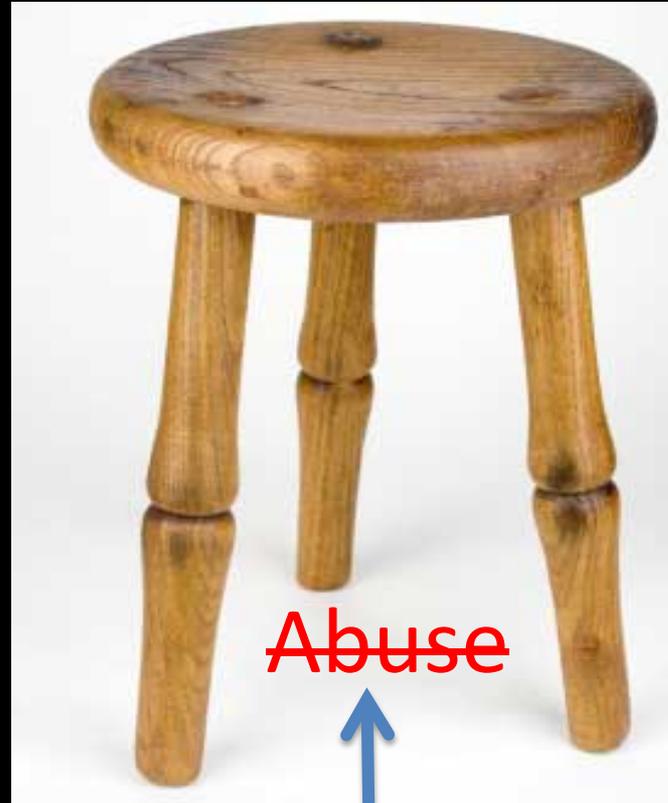
High vulnerability
genetic alleles

Functional brain loss
orbital/medial PFC, amygdala

Psychopathology



**“HIGH RISK”
SEROTONIN
TRANSPORTER**



~~Abuse~~

Love &
Nurturing

**I DON'T CARE
WHAT THE WORLD
KNOWS
ABOUT ME**



**BUT I HOPE
MY MOTHER
NEVER
FINDS OUT.**



Fronto-temporal Dementia

None of these people were artistic before they became demented



Figure 1



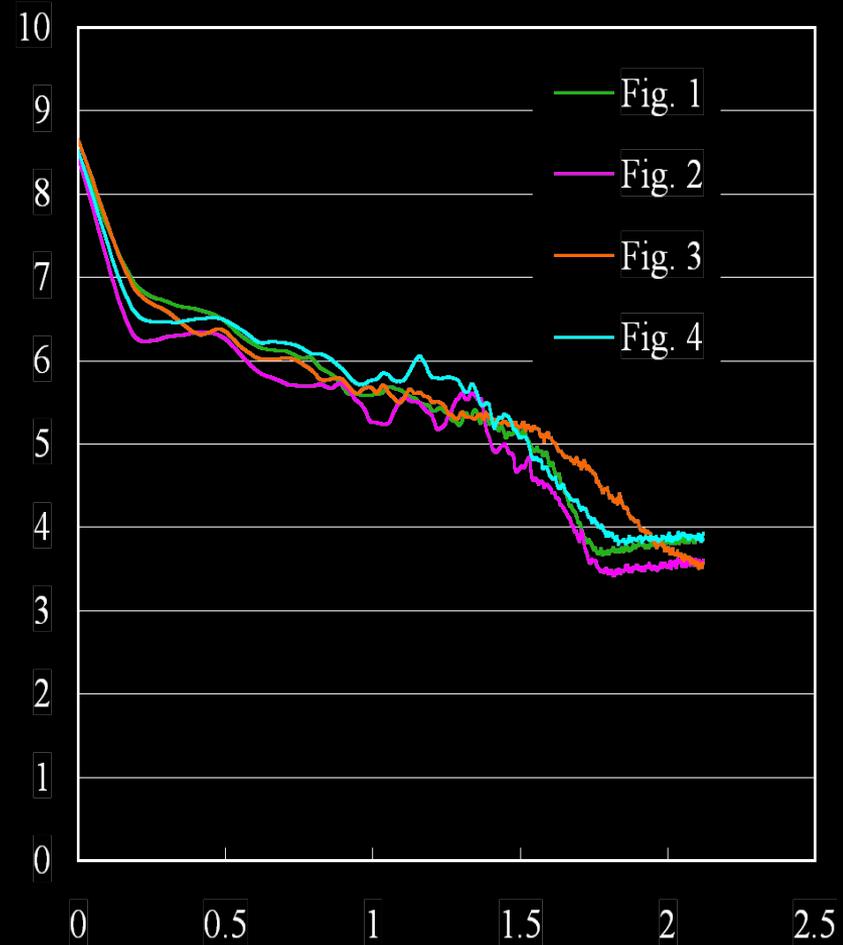
Figure 2



Figure 3



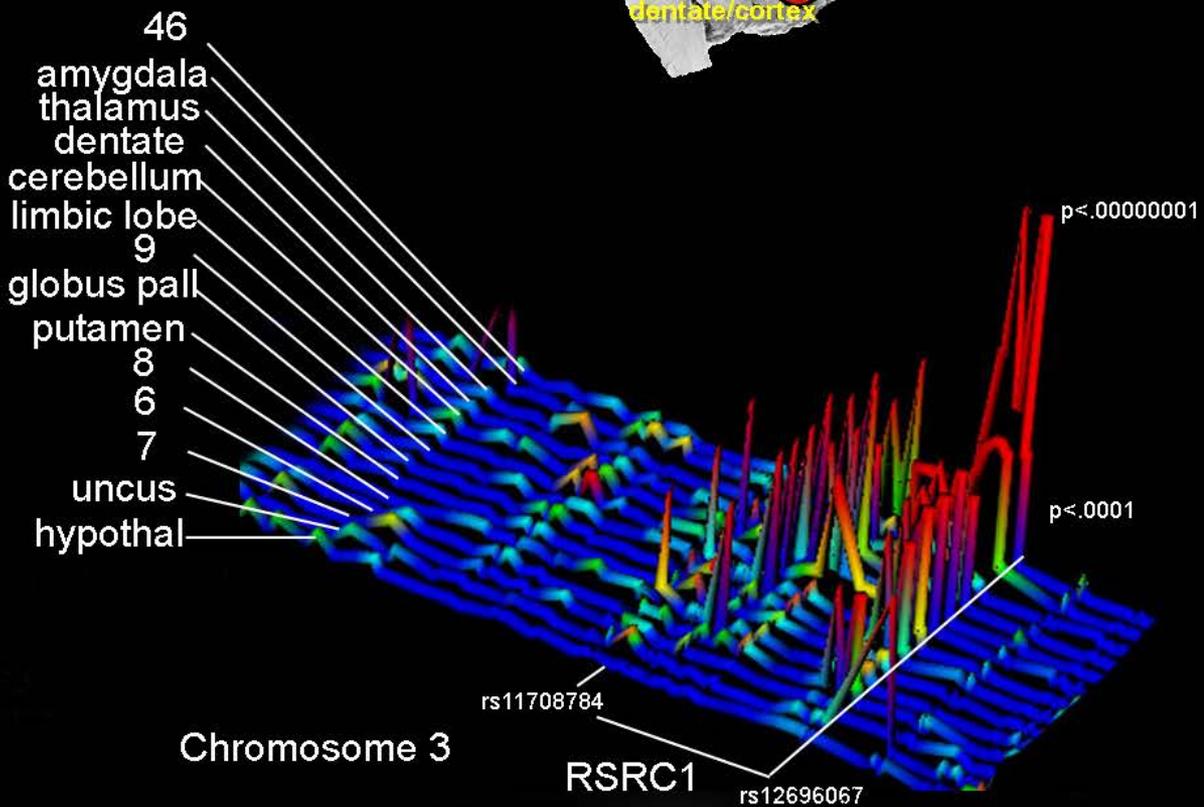
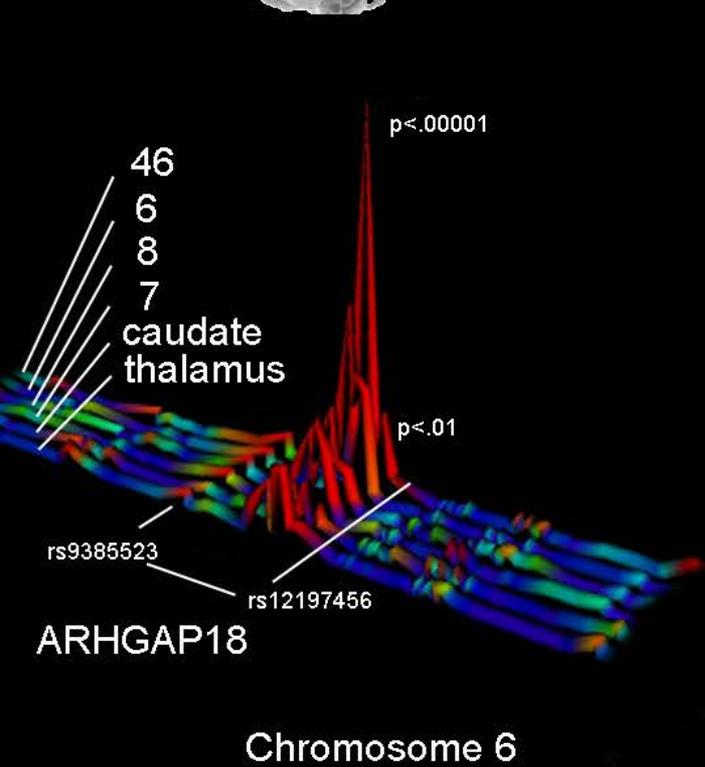
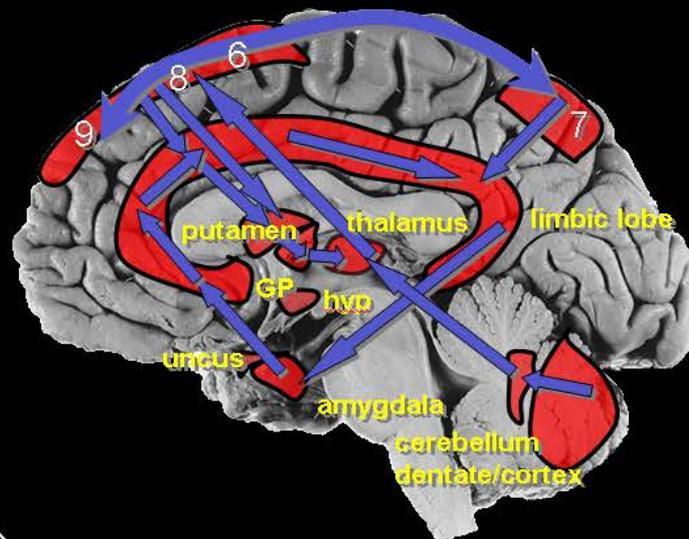
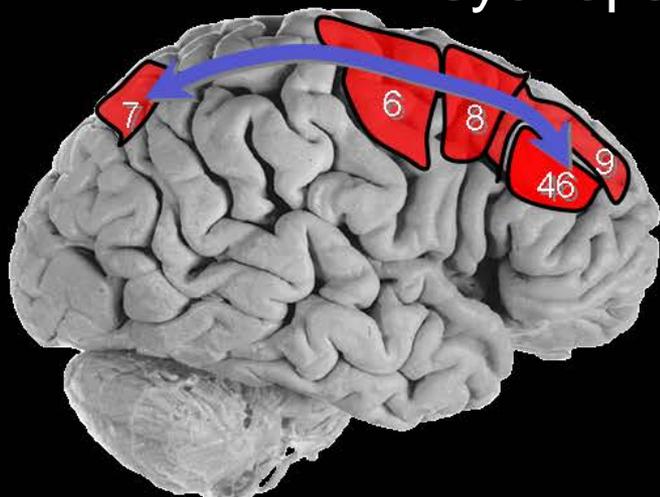
Figure 4



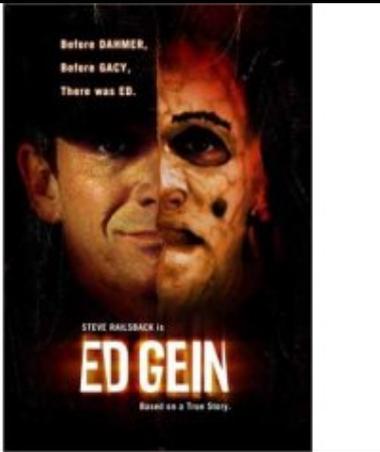
(Miller et al 1998)

Hara, Shankle, Fallon 1/F analysis

Psychopathology: Gene Discovery



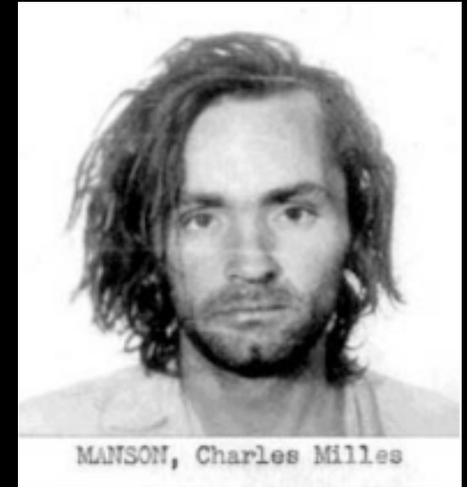
David Berkowitz



Karla Faye Tucker



Charles Manson



TED

Albert Fish



John Gacy



jeffrey dahmer

Aileen Wuornos

What's next?

