Children are Different:
The Juvenile Brain and the Justice System

National Association of Women Judges Webinar November 28, 2023

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Children are Different: The Juvenile Brain and the Justice System

BJ Casey, Ph.D.

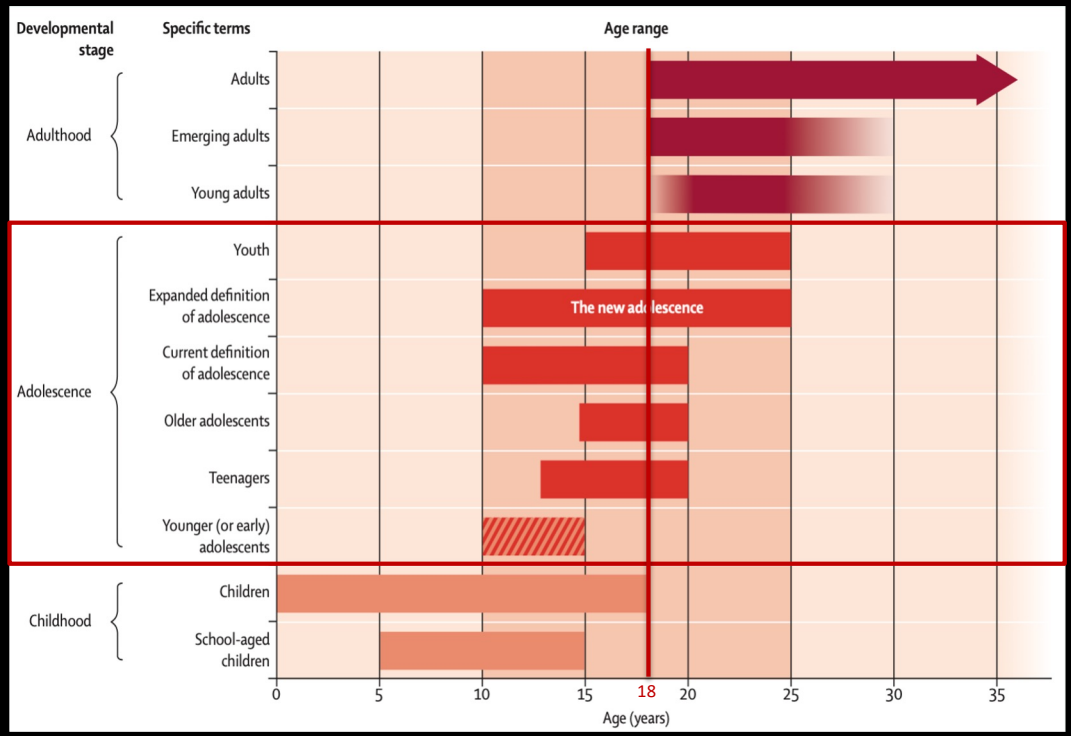
Christina L. Williams Professor of Neuroscience
Director, Fundamentals of the Adolescent Brain (FAB) Lab
Barnard College – Columbia University
The Justice Collaboratory of Yale Law School

Expanding definition of adolescence given evidence of significant neurocognitive development into the 20s

Assigning adult status to children in our legal system is not based on science.

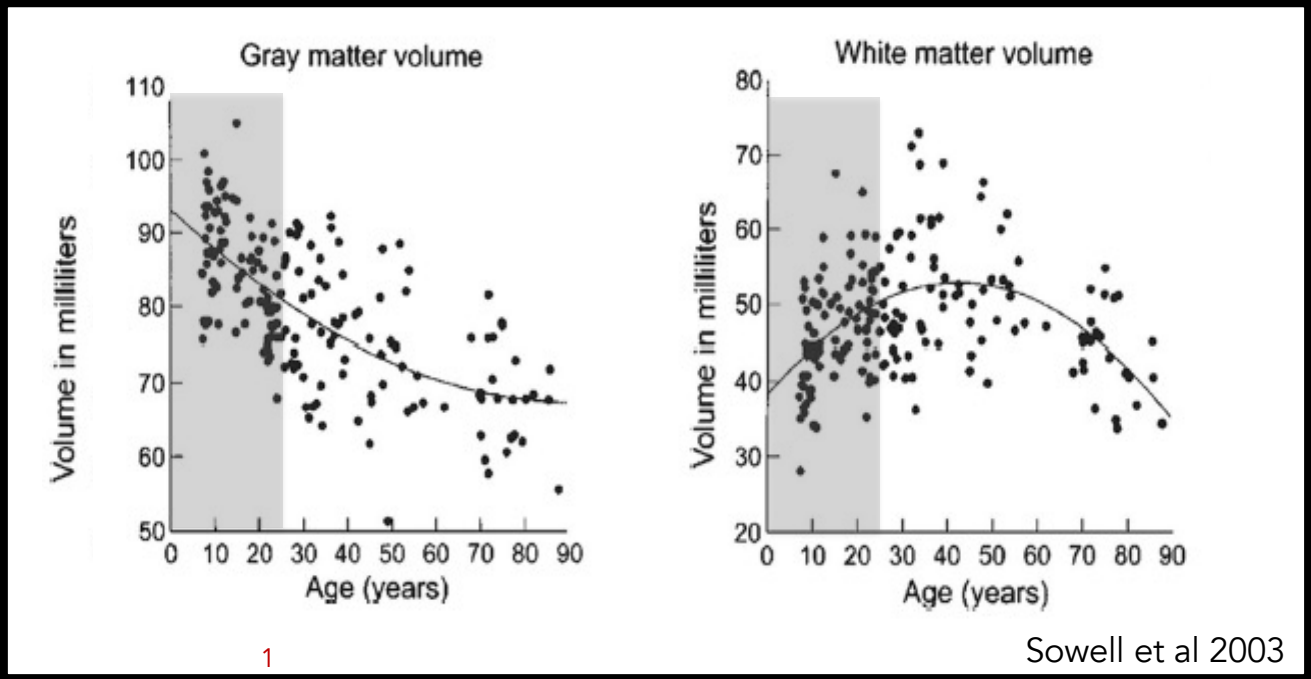
Many national and international organizations acknowledge continued maturity into the 20s (NIH, WHO, UN)

Many US laws/policies recognize continued maturation into early 20s (extended age for parent insurance coverage, foster care, buy alcohol)



Sawyer et al, 2018

The brain has the capacity for change (plasticity) throughout the life course, especially during the first few decades of life



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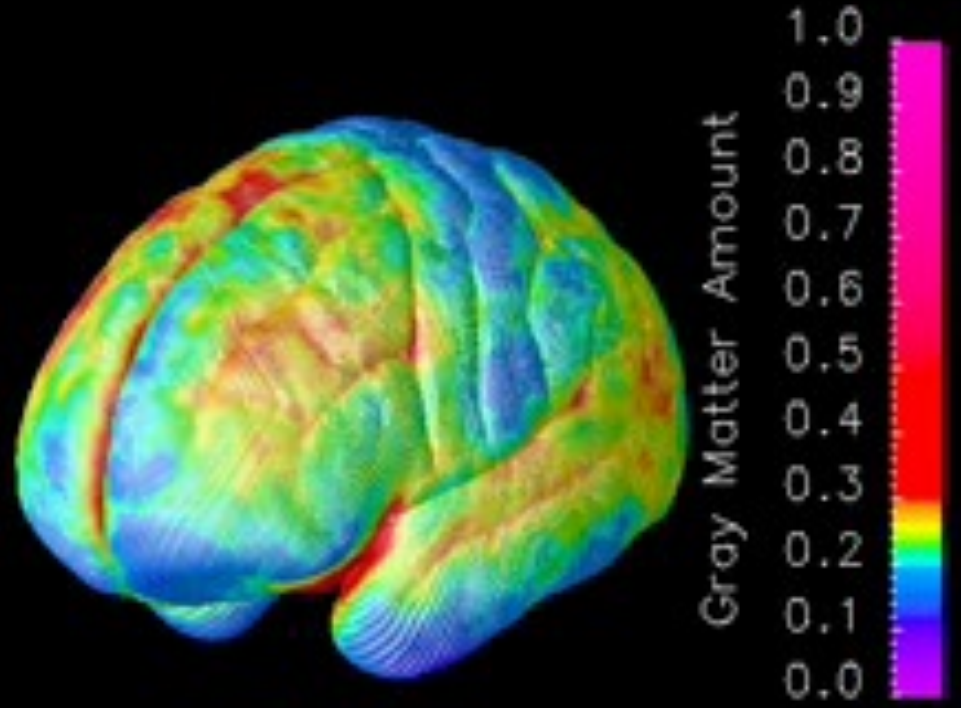
Sowell et al 2003

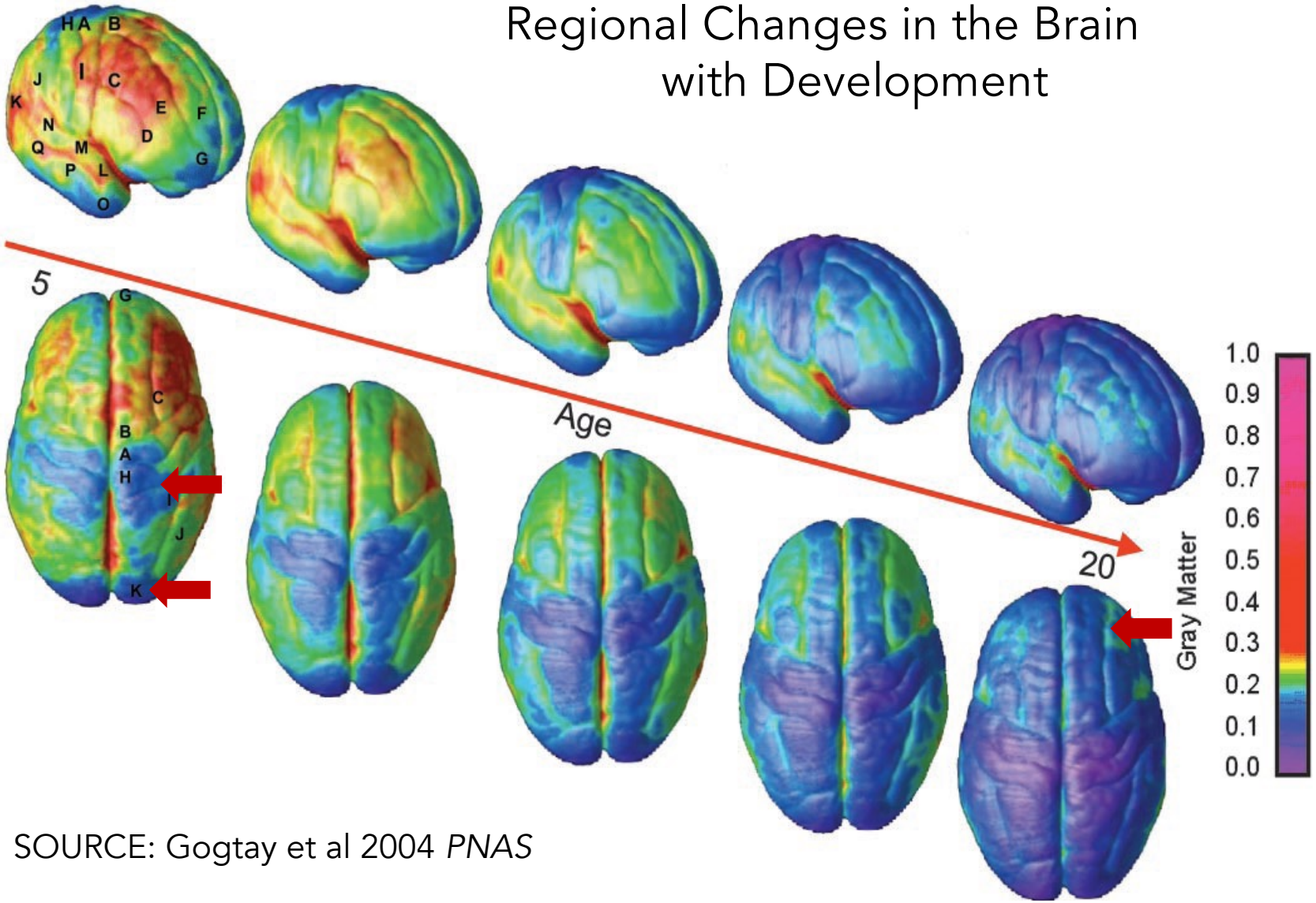
The developing brain has more connections (synapses) than the adult brain.

With age & experience synapses are pruned and fibers (axons) connecting brain cells (neurons) are strengthened (myelinated), that together increase speed/efficiency of neural communication.

Cortical Development from 5 to 20 years

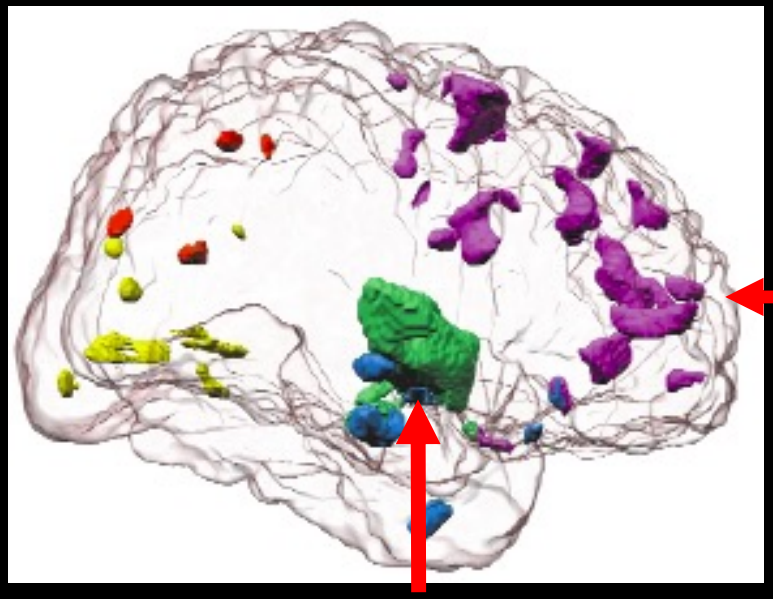


Regional Changes in the Brain with Development



SOURCE: Gogtay et al 2004 *PNAS*

Developmental changes in prefrontal cortex, but also in deep subcortical brain regions during adolescence



Focus has been on the prefrontal cortex given its involvement in decision making and self regulation

BUT there are changes in subcortical limbic regions involved in desire, fear and rage

SOURCE: Sowell et al 1999 *Nature Neuroscience*

IMBALANCE IN DEVELOPMENT OF ADOLESCENT BRAIN

between earlier developing subcortical regions involved
in emotional reactivity and later developing prefrontal regions involved
in regulation of these emotions

Video courtesy of Larkin McPhee PBS Documentary illustrating Casey et al 2008

Behavioral Changes during Adolescence are consistent with Brain Changes

There is a heightened sensitivity to external factors - rewards, threats, stress, social cues, and peers- combined with an underappreciation of risks and consequences of actions.

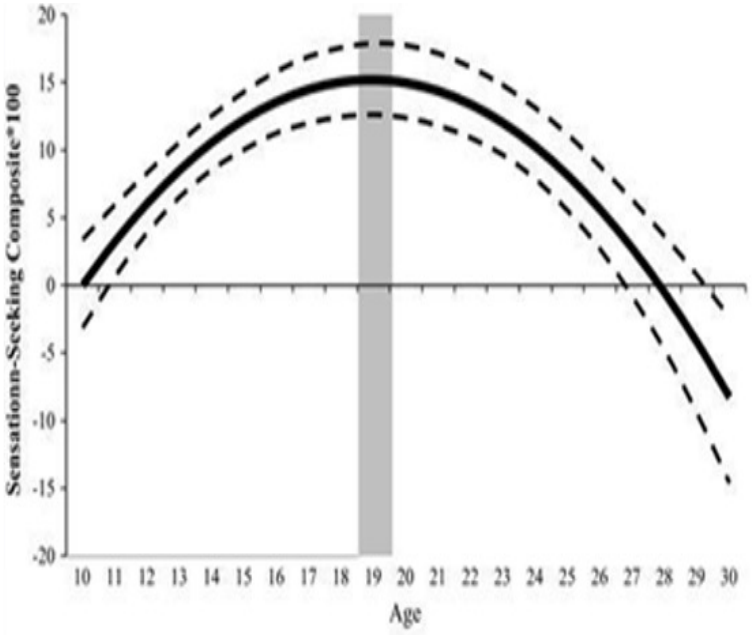
Bramms et al 2015; Breiner et al. 2018; Dreyfuss et al. 2014; Gardner & Steinberg, 2005; Galvan et al 2006; Geier et al 2011; Hare et al. 2008; Rahdar & Galvan, 2014; Somerville et al. 2011; Steinberg et al. 2009

Self regulation and decision-making under these emotionally arousing conditions show steady improvements into the 20s paralleling continued developmental changes in the prefrontal circuitry.

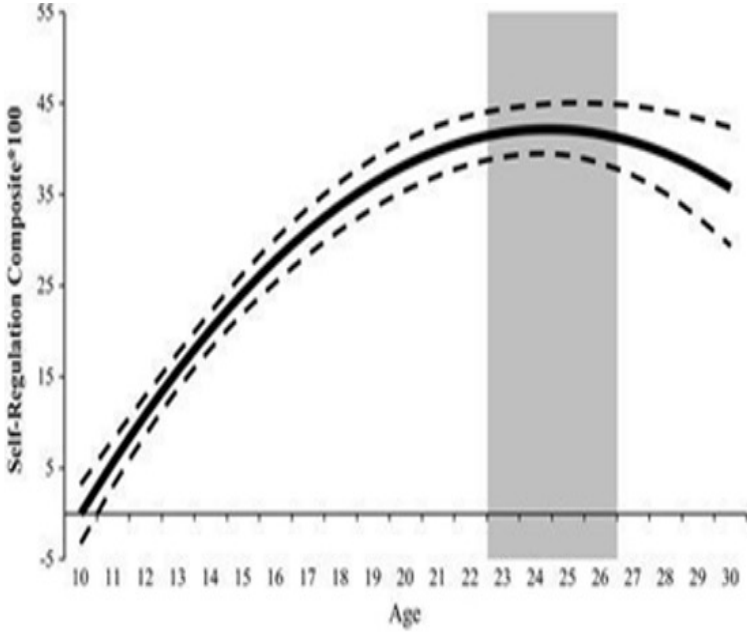
Cohen et al. 2016; Icenogle et al. 2019; Silvers et al 2016; Steinberg et al. 2018

Sensation-seeking peaks in the late teen years while self-regulation stabilizes by mid twenties

Sensation Seeking

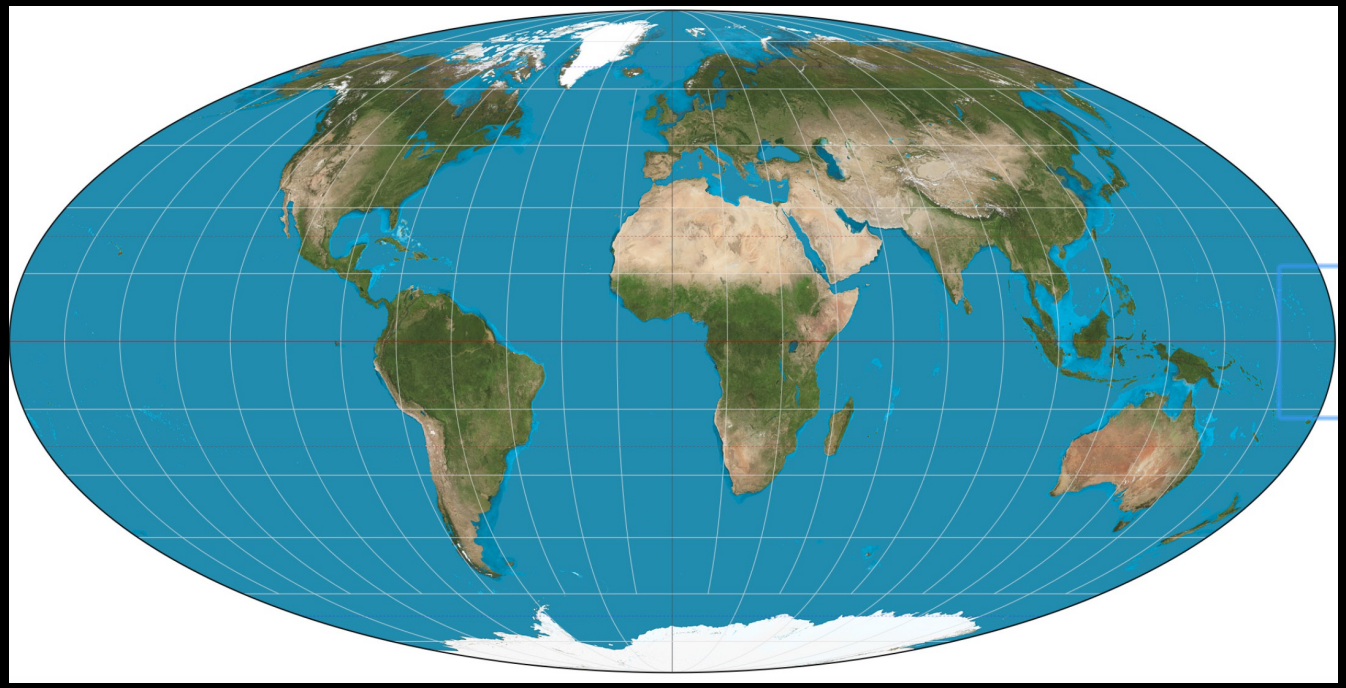


Self regulation



Steinberg et al., 2018

Findings are not specific to adolescents in US?

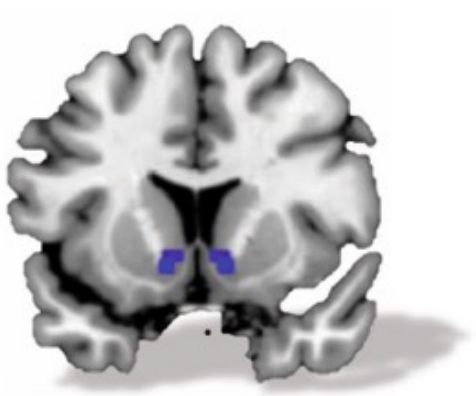


China (Shanghai)
Cyprus (Nicosia)
Colombia (Medellin)
India (Delhi)
Italy (Naples/Rome)
Jordan (Amman)
Kenya (Maseno)
Philippines (Manila)
Sweden (Trollhattan)
Thailand (Chiang Mai)
United States (Durham)

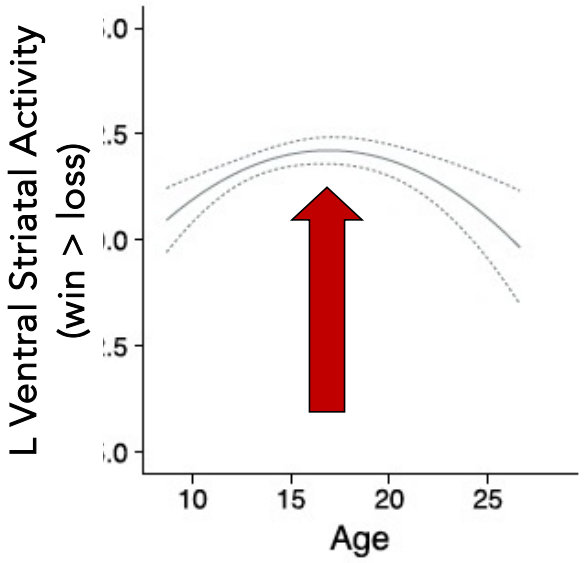
Icenogle et al., 2019

Sensitivity to rewards

Evidence of heightened sensitivity to rewards in the ventral striatum during adolescence



Ventral Striatum



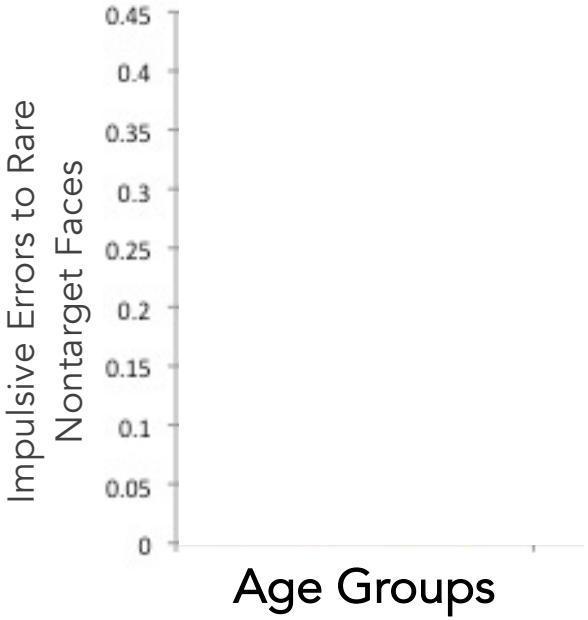
n>250 participants, tested 3 times

Bramms et al 2015; Crone & Konijn, 2018;
see also Galvan et al. 2006; Geier et al 2010

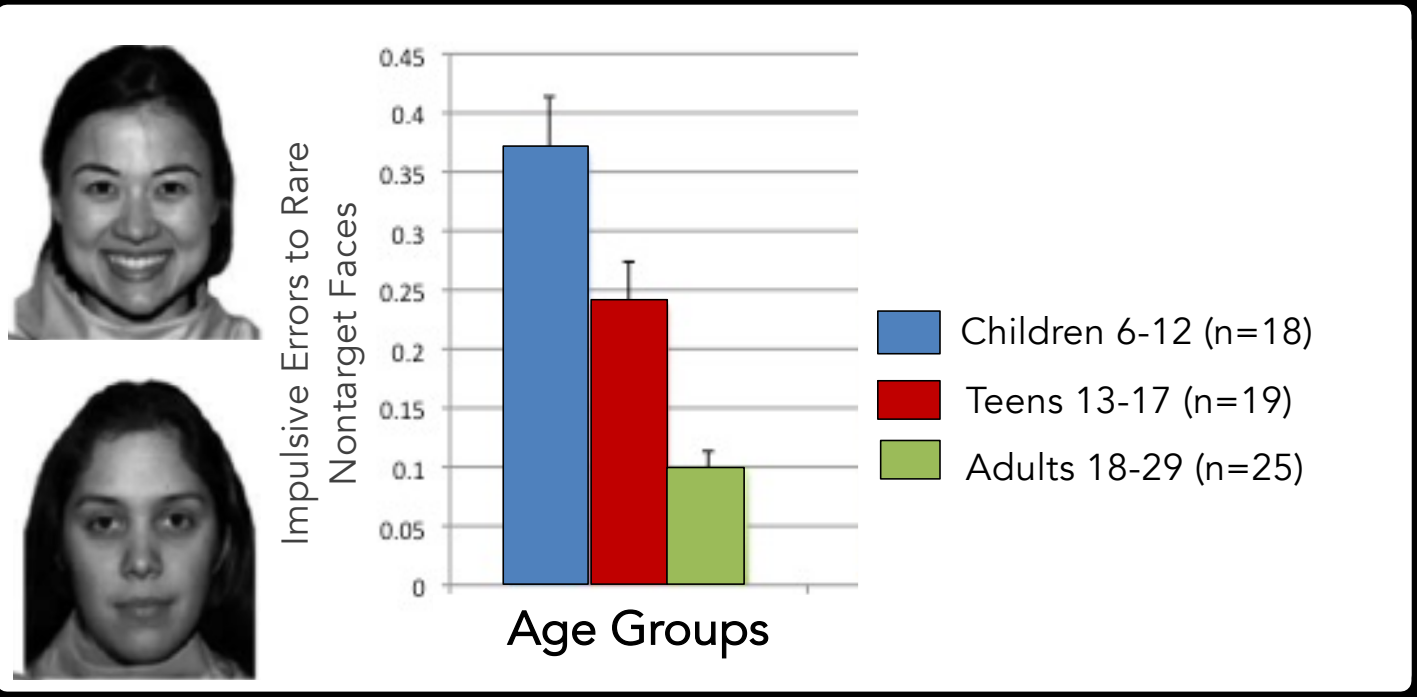
Sensitivity to social cues associated with positive outcomes

Tottenham et al 2009 The NimStim setof facial expressions. *Psychiatry Research*

Development of impulse control to social cues



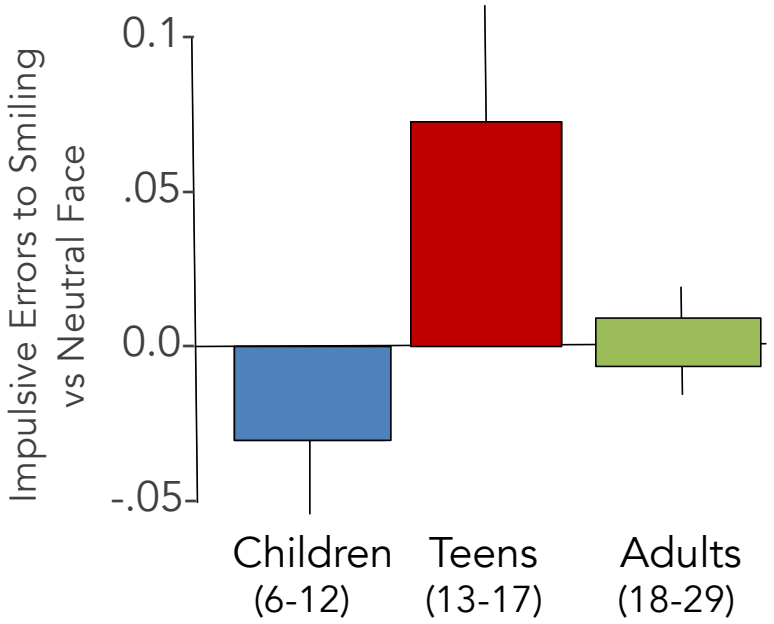
Development of impulse control to social cues



Children are more impulsive than adolescents who are more impulsive than adults

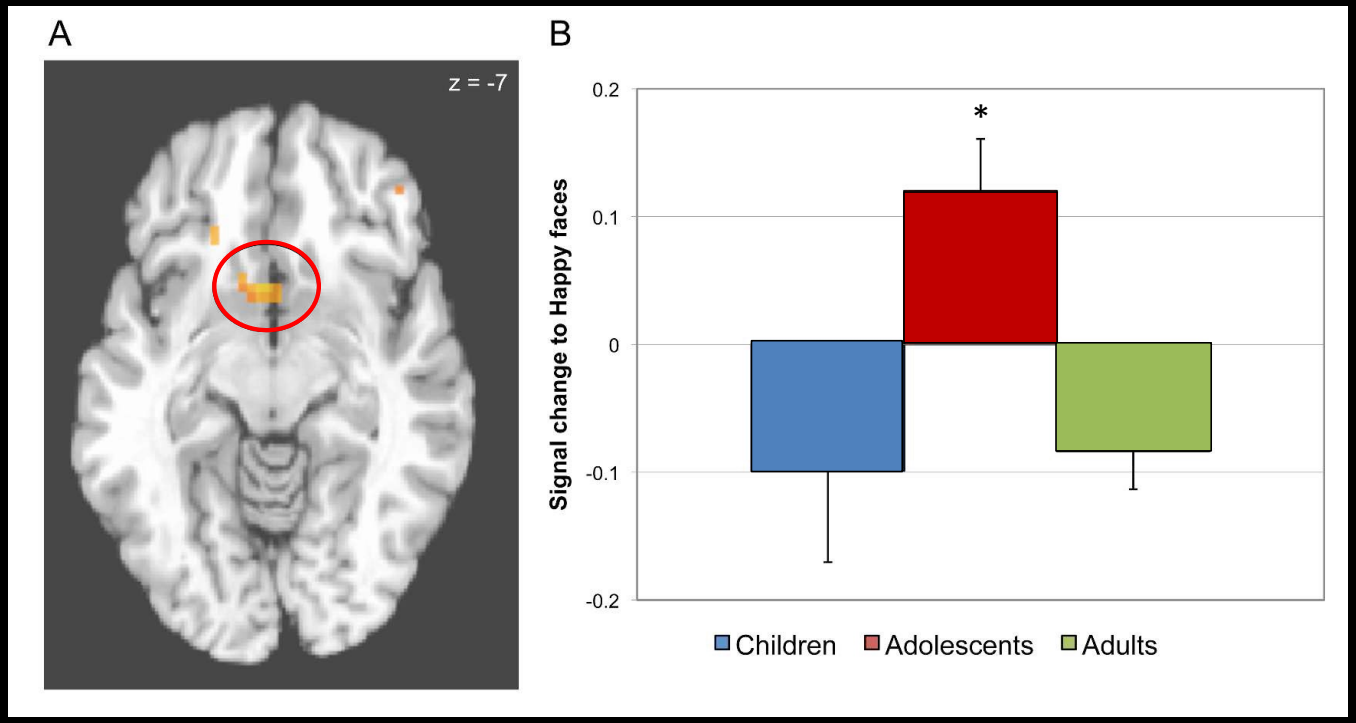
Somerville, Hare & Casey 2011 *JoCN*

Teens, unlike children and adults, are more impulsive to positive social cues



Somerville Hare & Casey 2011 JoCN

Teens show more activity in the ventral striatum to positive social cues than children and adults

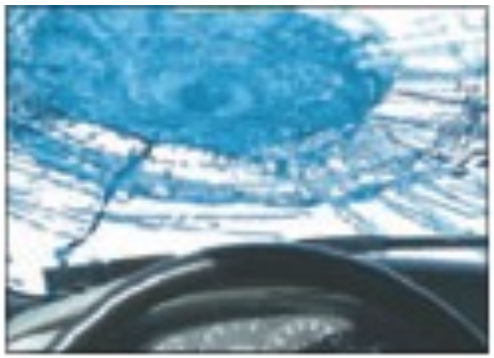


Somerville Hare & Casey 2011 JoCN

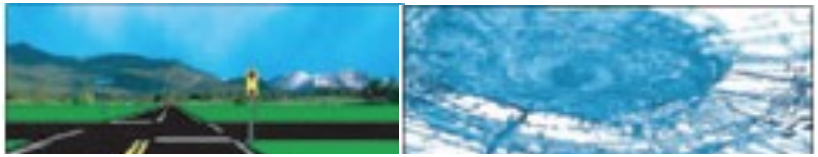
Developmental Science

Chein, Albert, O'Brian, Uckert & Steinberg, 2011

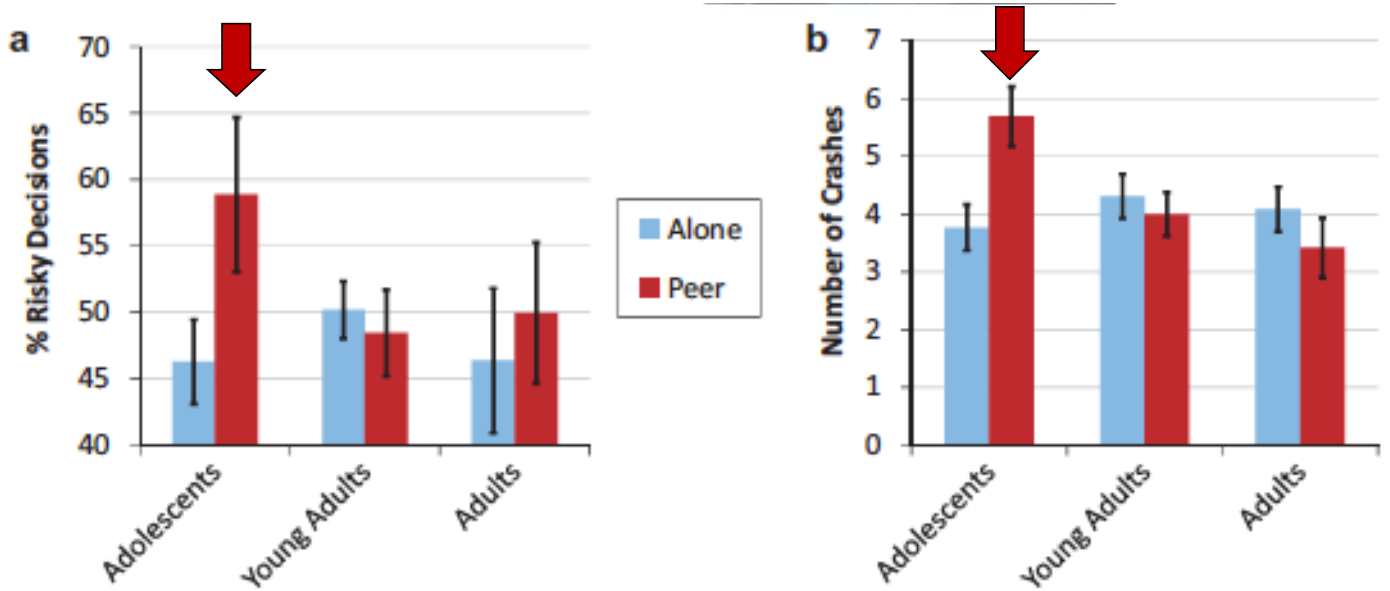
Do you or don't you go through the yellow light?



Adolescents make more risky decisions and crashes when with a peer than when alone



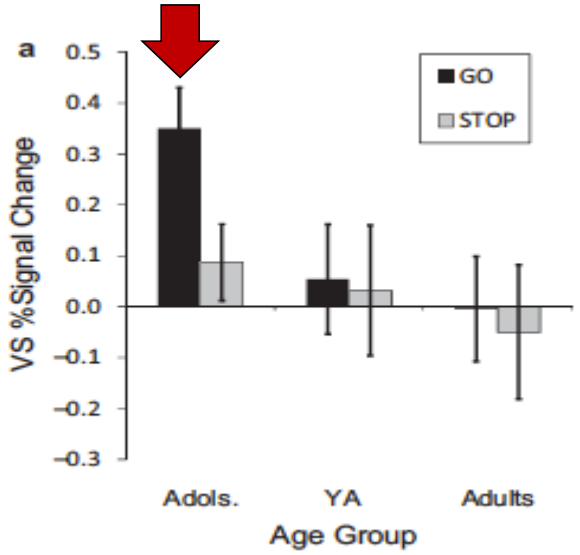
Teens are quite capable of making decisions similar to adults in nonarousing situations (alone), but in emotionally or socially charged situations (with peer) their decision making is diminished.



n=40, adolescents: 14-18 years, young adults: 19-22 years, adults: 24 to 29 years

Chein et al., 2011

Increased ventral striatum activity in adolescents when making a risky decision in the presence of a peer

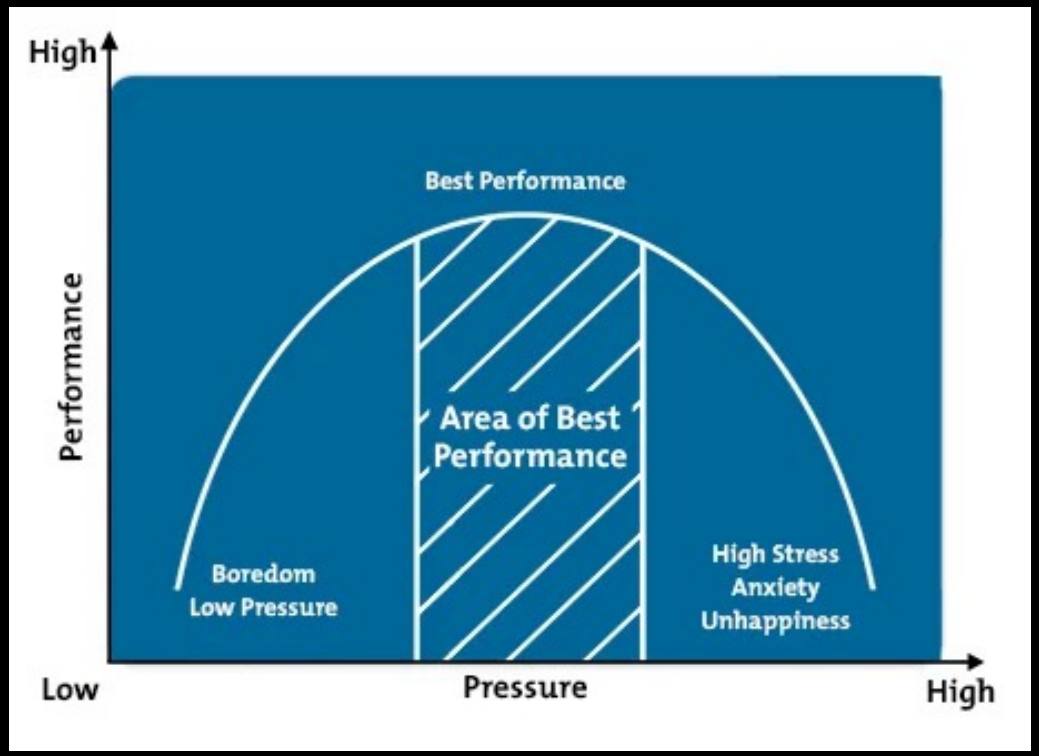


Chein et al., 2011

Probing Cognitive Capacity under Stress and Threat

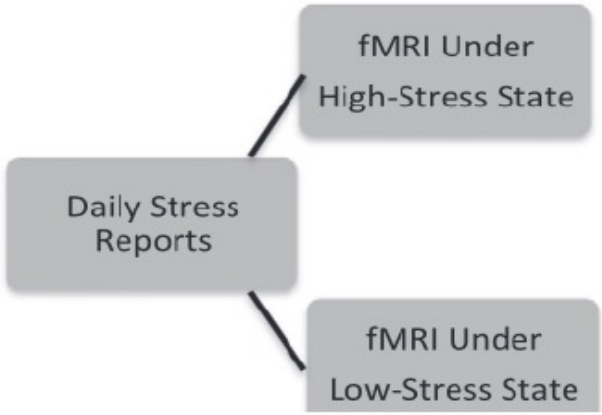
"We're trying to make our stress tests more realistic."

Stress is any type of change that causes physical, emotional or psychological strain



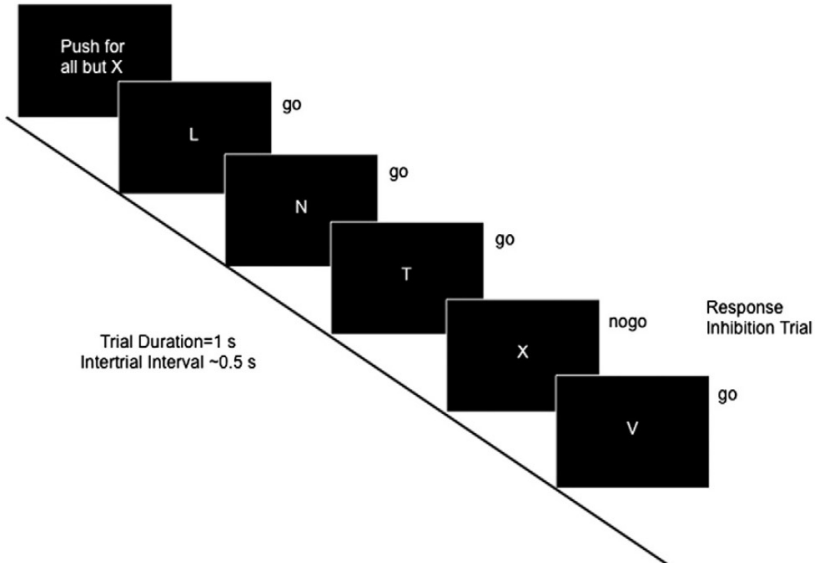
How does high daily stress affect impulse control in adolescents and adults?

Ecological Momentary Assessment (EMA)



Contacted 3x daily over 2 weeks about level of stress on 7 point scale where 1=no stress and 7=high stress.

fMRI Go/No-go task

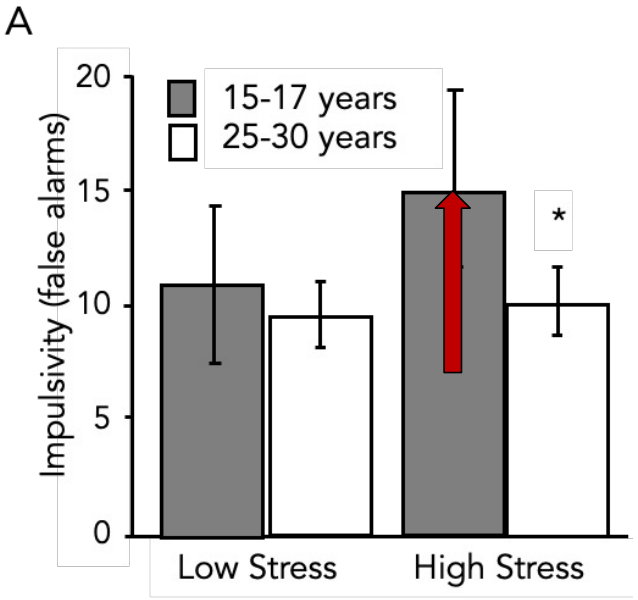


A. Rahdar, A. Galván / NeuroImage 92 (2014) 267–273

How does high daily stress affect impulse control in adolescents and adults?

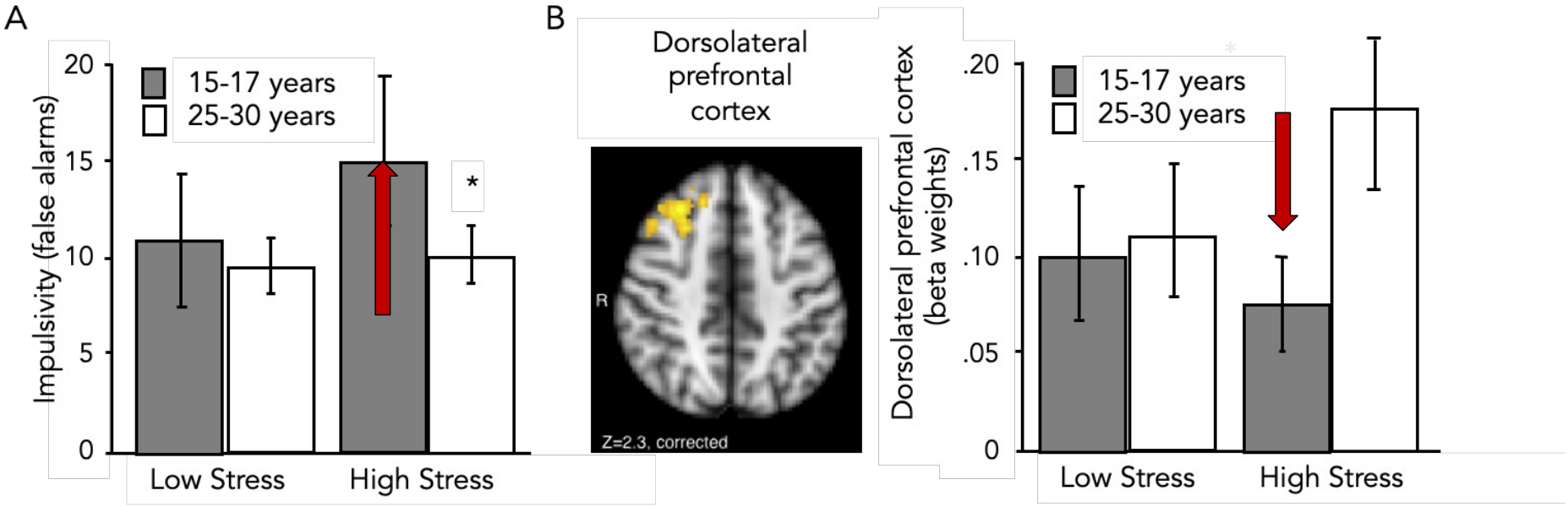
Rahdar & Galvan 2014

High daily stress is associated with increased impulsivity in adolescents



Rahdar & Galvan 2014

High daily stress is associated with increased impulsivity and diminished prefrontal activity in adolescents



Teens are no more impulsive than adults in nonarousing situations (low stress), but in emotionally charged situations (high stress) their impulse control is diminished.

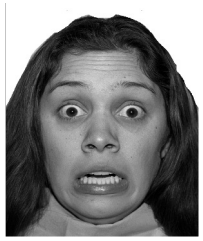
Rahdar & Galvan 2014

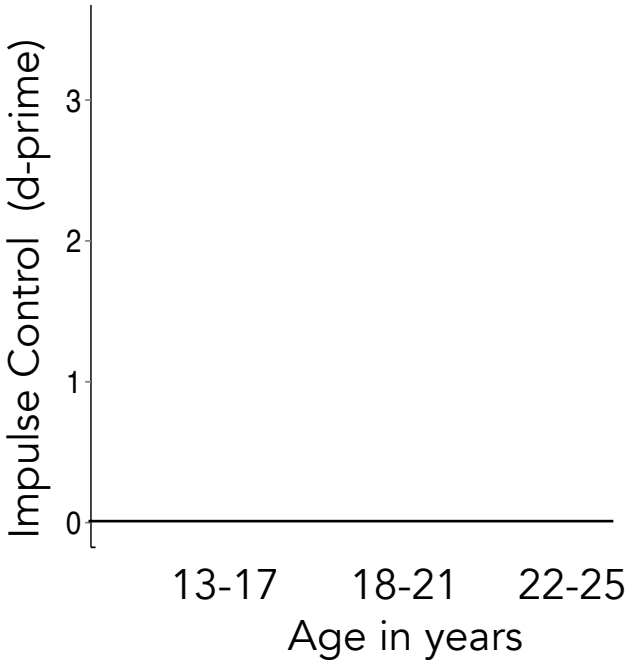
Cognitive Capacity Under Threat

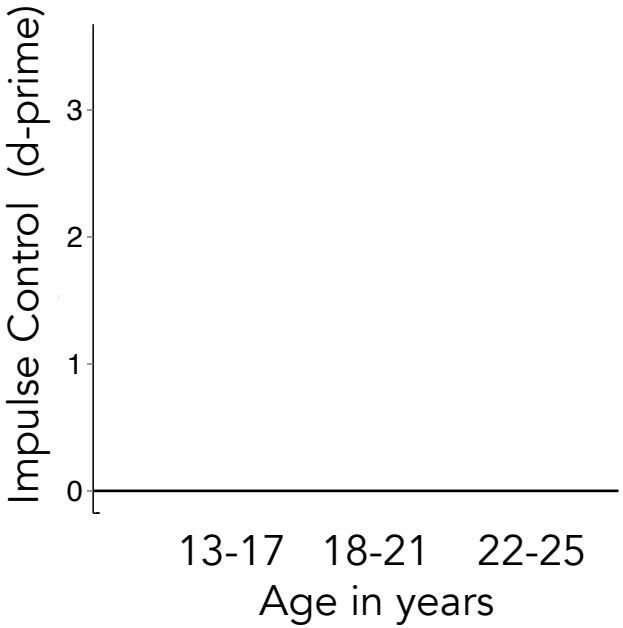
Impulse Control to Cues of Potential Threat

Impulse Control under Sustained Threat

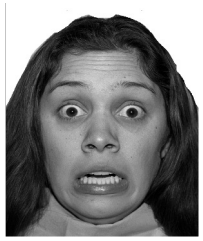
Impulse Control under Threat

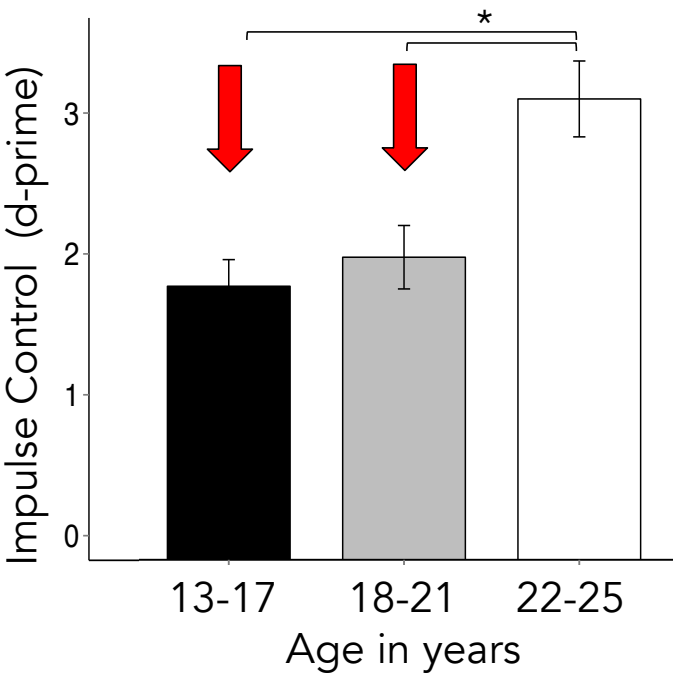


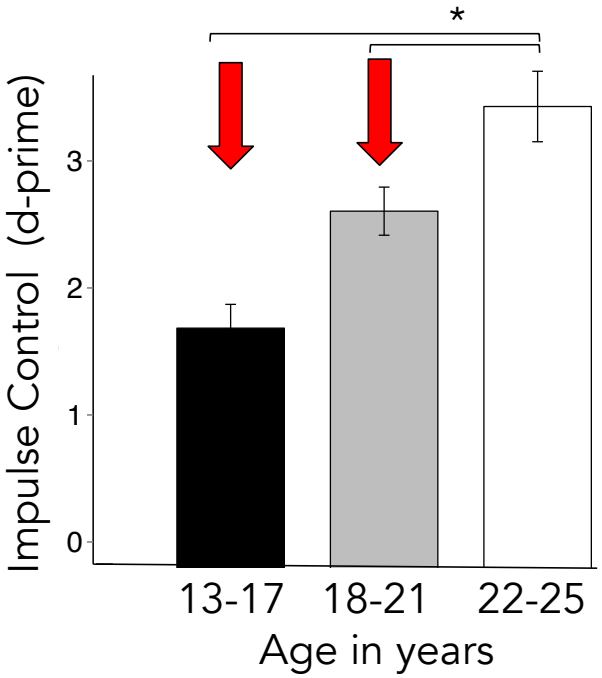




Impulse Control under Threat:
Individuals under 21 perform significantly worse than those over 21



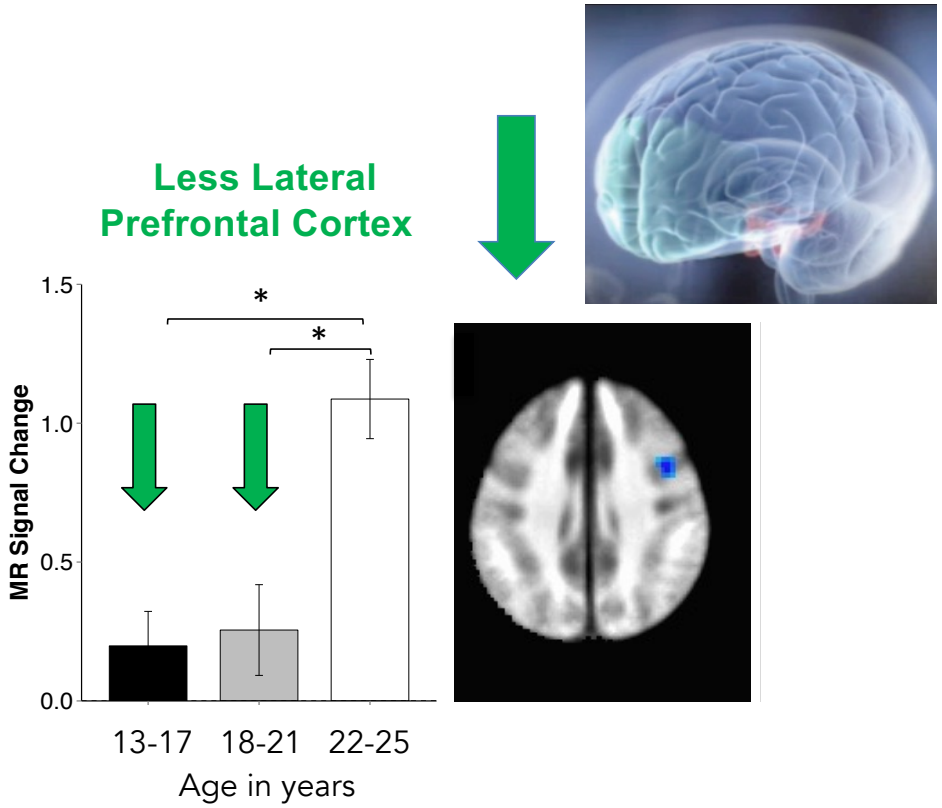




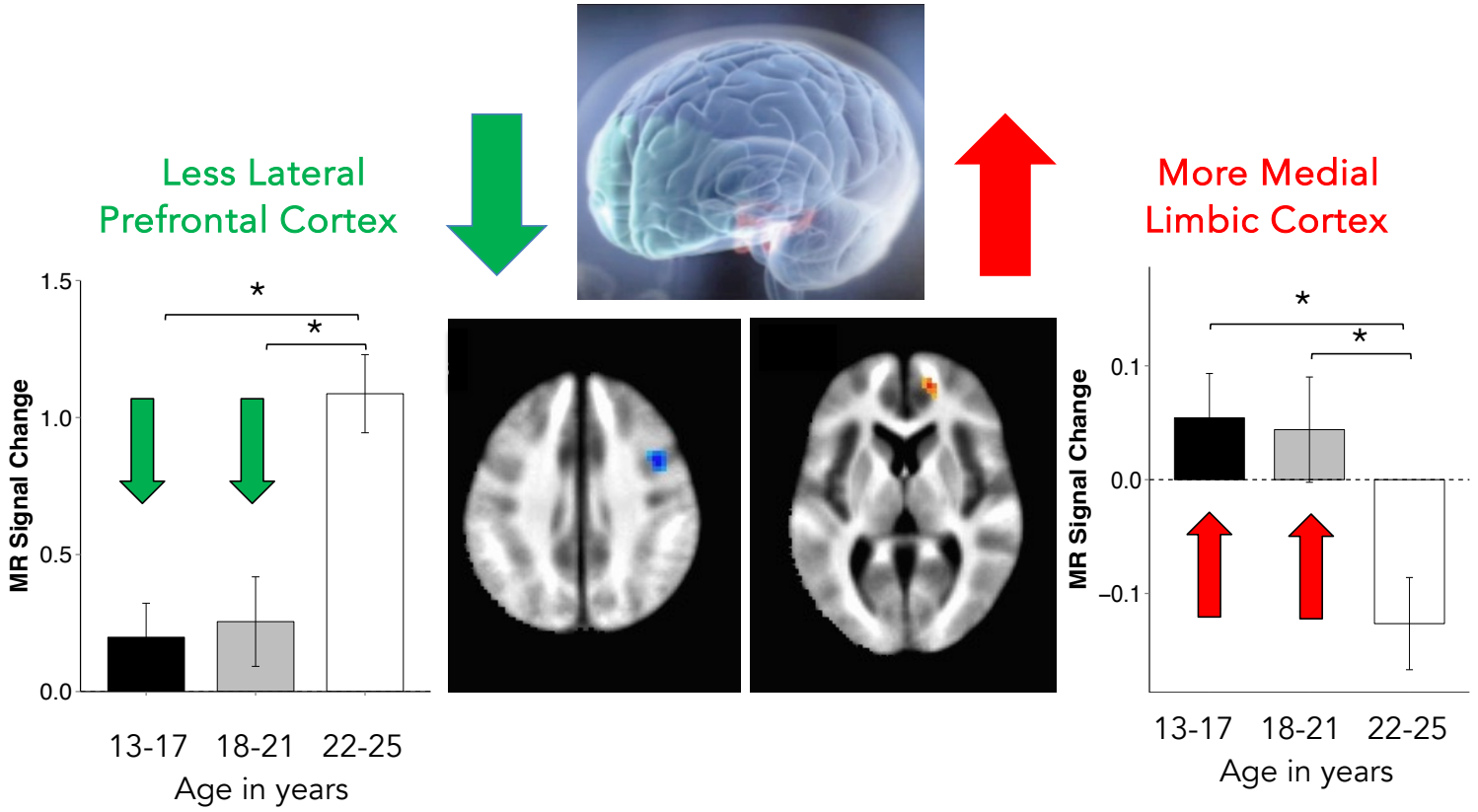
Cohen et al. 2016 *Psychological Science*

Patterns of brain activity under conditions of threat when performing the impulse control task

18-21 year olds look more like 13-17 year olds, showing less lateral prefrontal activity, than individuals over 21

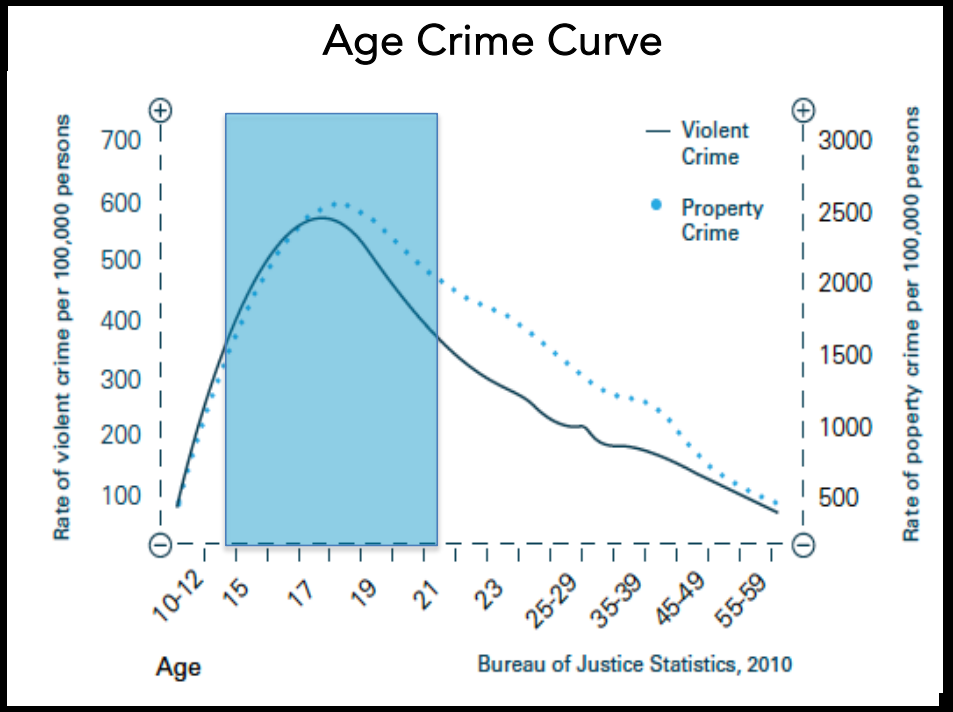


18-21 year olds, like 13-17 year olds , show less lateral prefrontal activity AND more limbic cortical activity than those over 21



Cohen et al. 2016 *Psychological Science*

Changes in brain and behavior during the extended period of adolescence show a similar developmental pattern as the age crime curve



Development of extreme behaviors

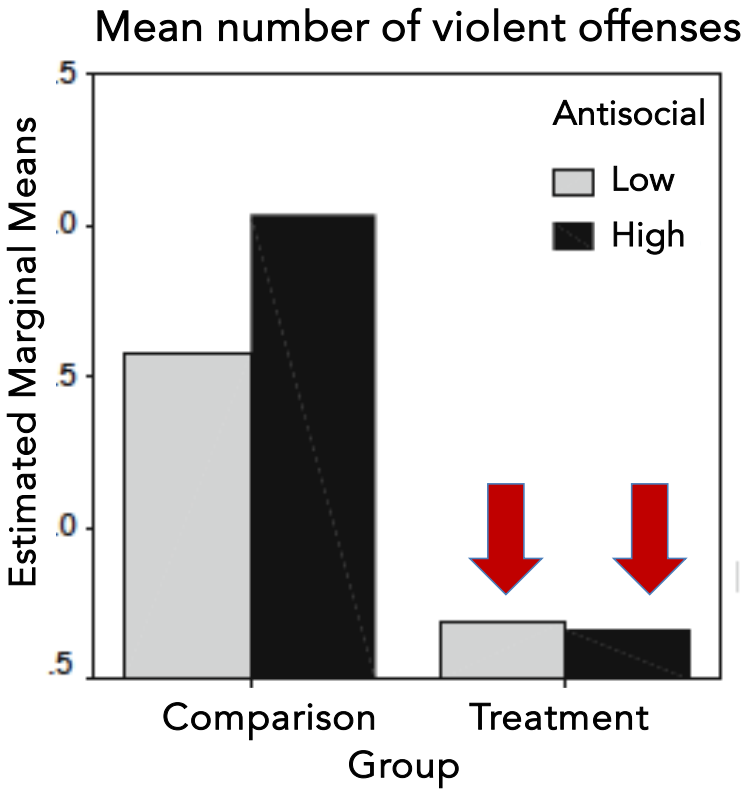
Approximately 1% of US adults have clinical levels of psychopathic traits.
American Psychological Association, 2022

Of 1170 justice involved youth, 84% showed a decrease in psychopathic traits from age 16 to 24 years. Baskin-Sommers et al, 2015; Hawes et al, 2018

The majority of youth who commit crimes desist as they mature into adulthood. Moffit, 2018; Casey et al 2022; Baskin-Sommers et al 2022

These extreme behaviors decline even more with youth targeted interventions

These extreme behaviors decline even more with youth targeted interventions



Adapted from Caldwell et al., 2011

Even justice-involved youth high on antisocial traits showed lower violent offending after receiving Mendota youth focused intervention.

Suggests counter to common beliefs, these youth are not "treatment resistant" or even "less responsive to treatment". It is about getting the *right* treatment.

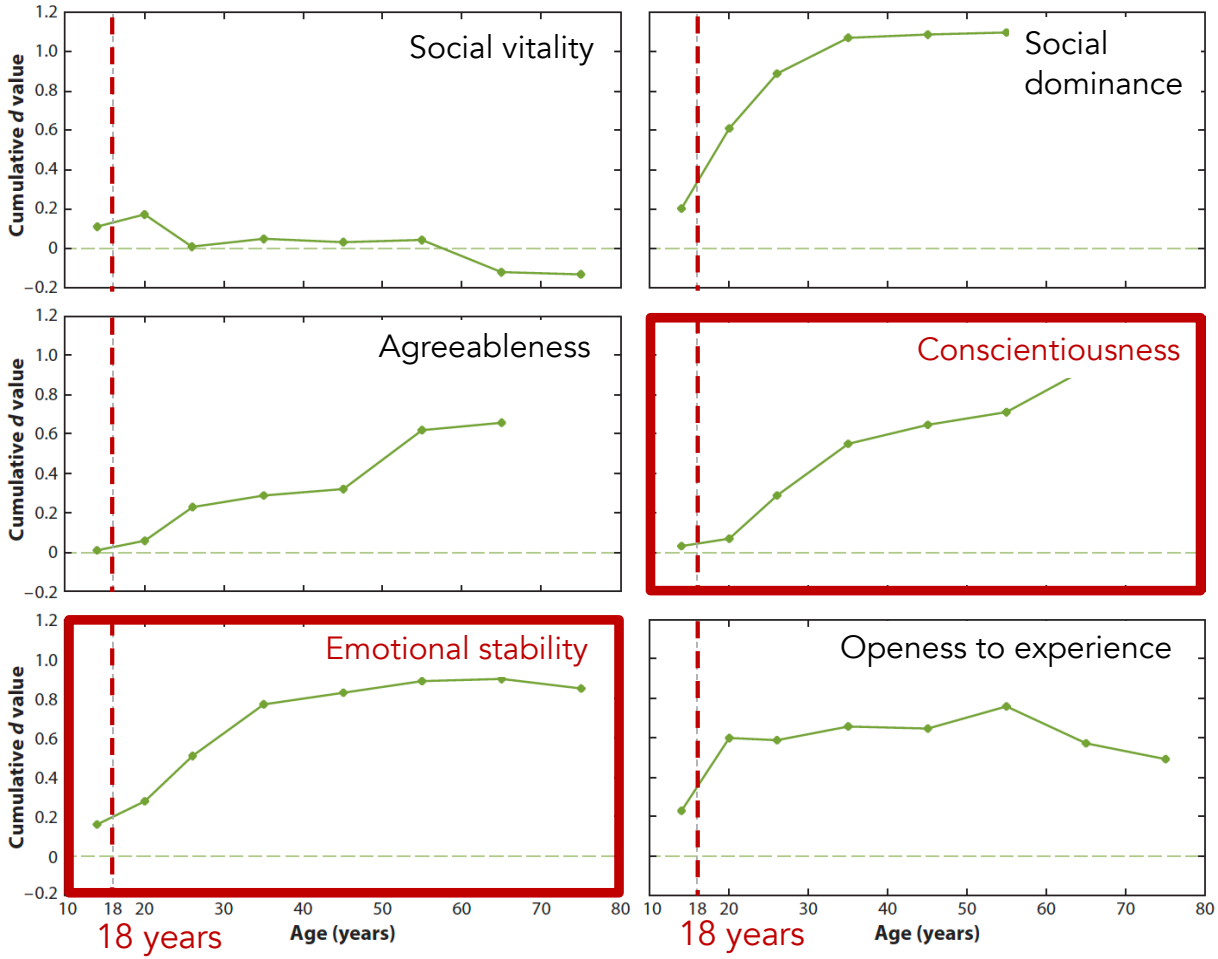
Baskin-Sommers et al., 2022

Changes in personality traits from childhood to old age

Personality not only develops throughout childhood/adolescence, but changes through-out the life course.

Majority of change in these traits occurs after age 18
-emotional stability
-conscientiousness

Changes in personality traits from childhood to old age



Roberts & Mroczek 2008; see also Harris et al. 2016, Soto et al. 2011

Summary of Scientific Evidence

- Scientific evidence shows changes in brain and behavior over the life course, especially during the extended period of adolescence.
- Adolescents can make good decisions, but when in emotionally or socially charged situations this capacity is diminished.
- Science now shows the majority of youth who engage in antisocial behavior show a decline in criminal behavior with age AND with targeted interventions, this decline is even greater.
- An accumulation of evidence shows that there are changes in personality over the life span beyond childhood and adolescence.
- Assigning adult status to children is not supported by science.

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Children are Different: The Juvenile Brain and the Justice System

Marsha Levick, J.D.

Chief Legal Officer and Co-Founder, Juvenile Law Center
Adjunct Professor of Law
University of Pennsylvania Carey Law School

Juvenile Law Center
Fighting for the rights and well-being of youth