

New frontiers in developmental neuroscience: *Intersections with legal policy*

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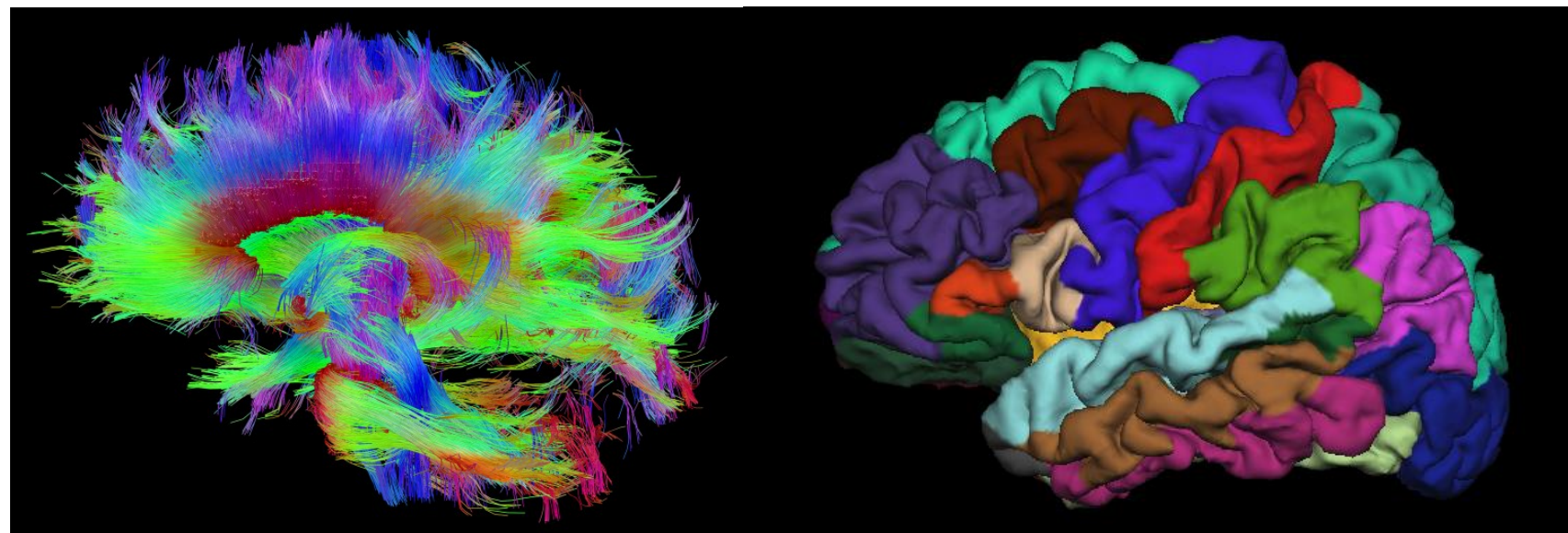


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Affective
Neuroscience
&
Development
Laboratory



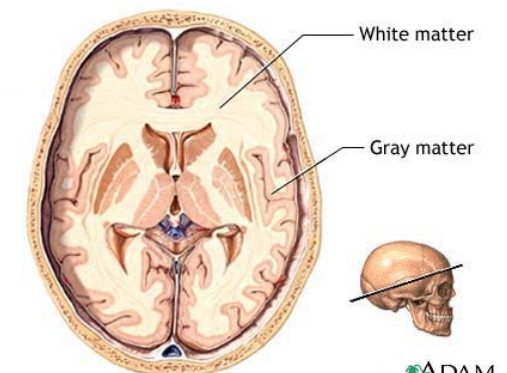
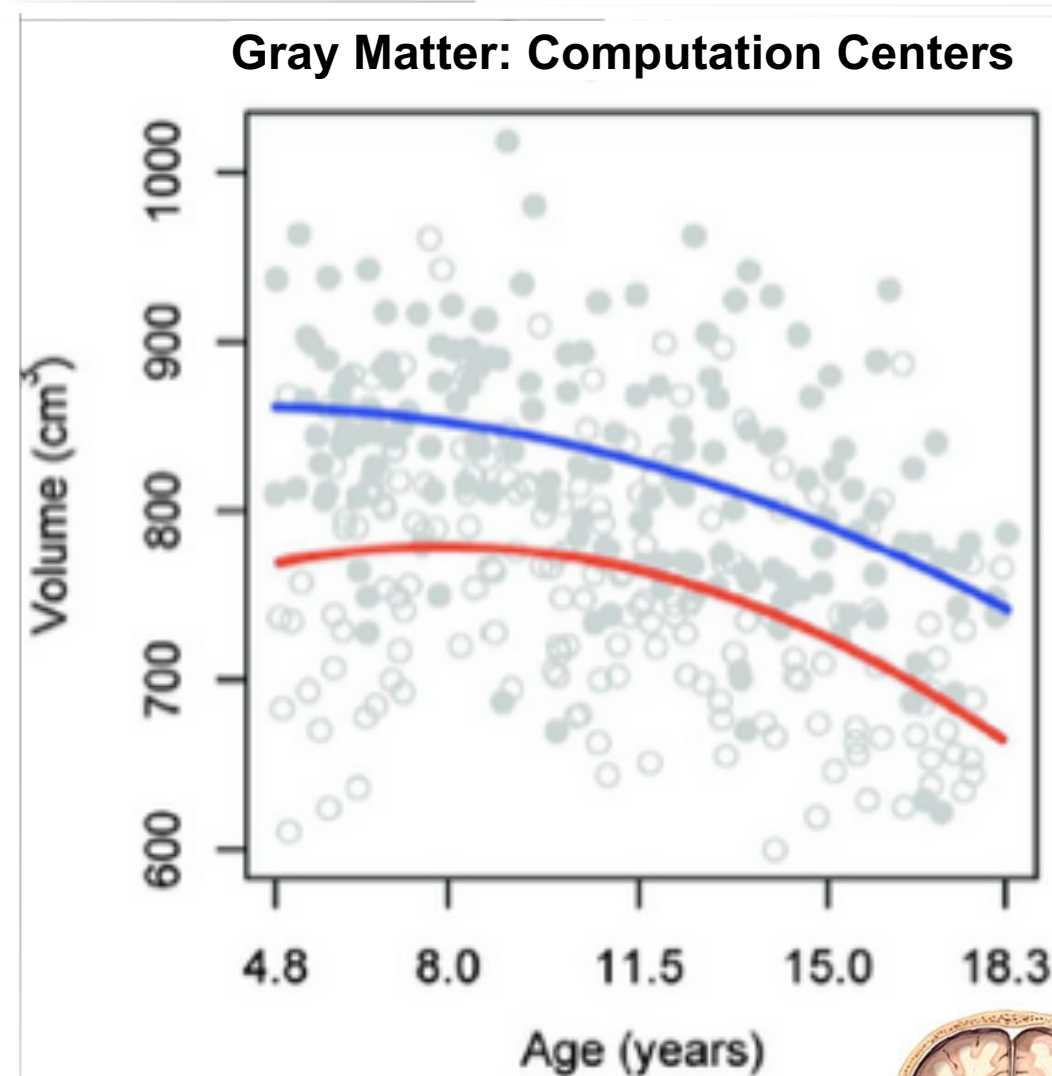
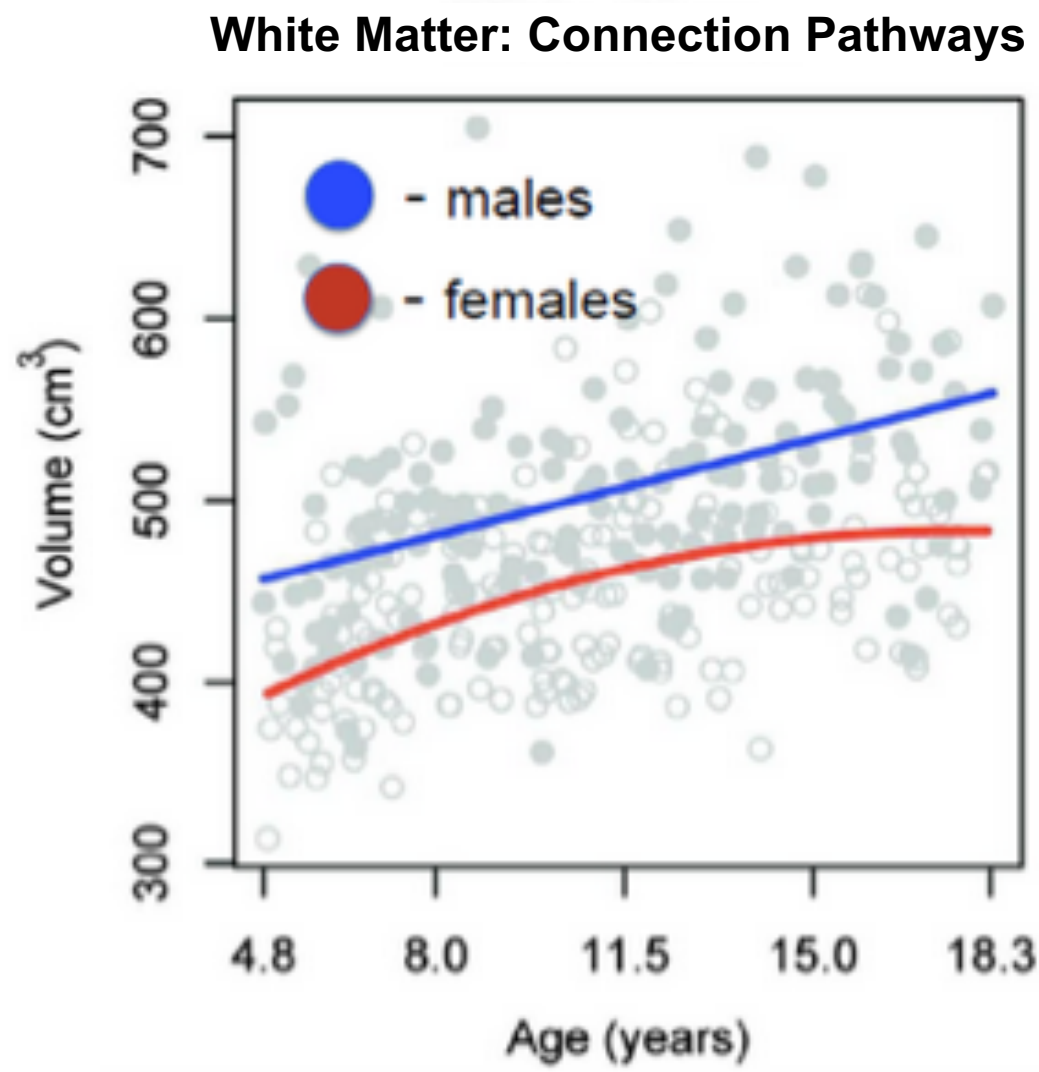
How do we study brain development?



The timeline of brain maturity

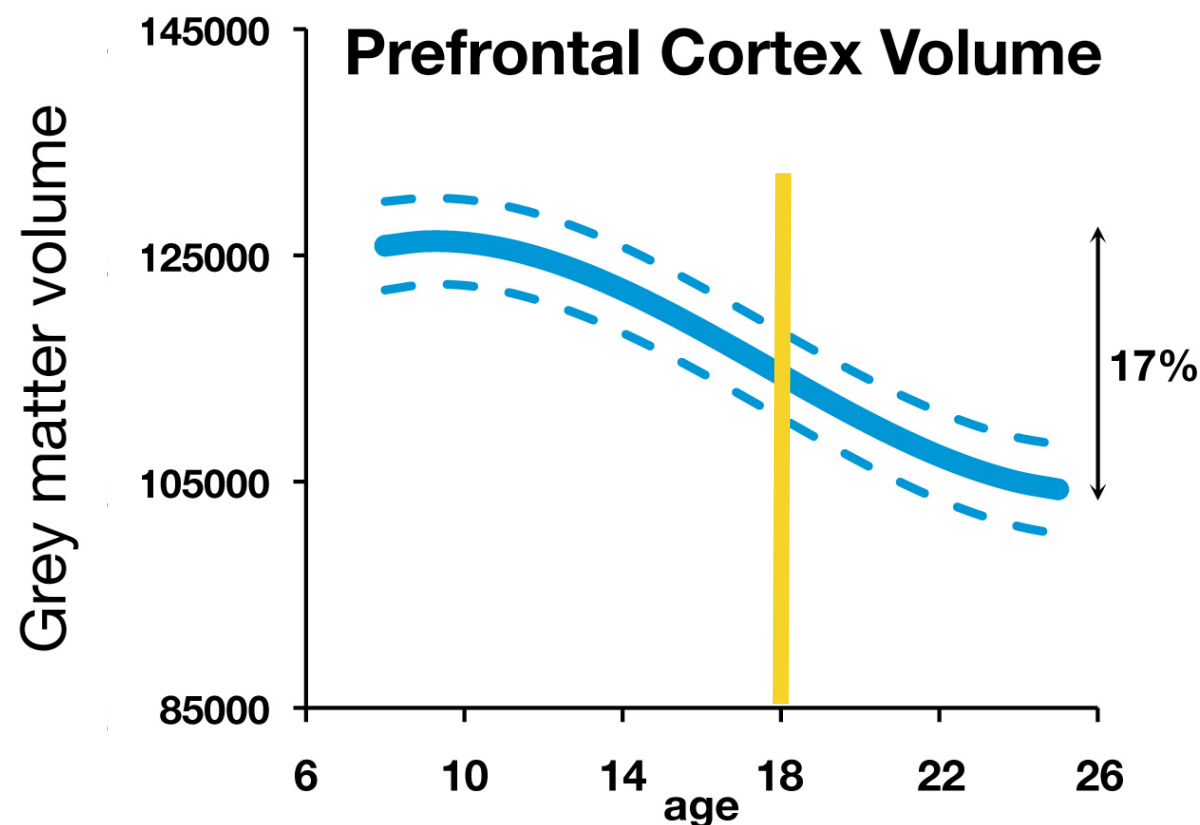
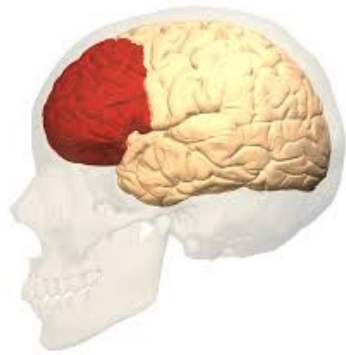
What do we know?

- The brain is continuing to develop during adolescence, on multiple levels.



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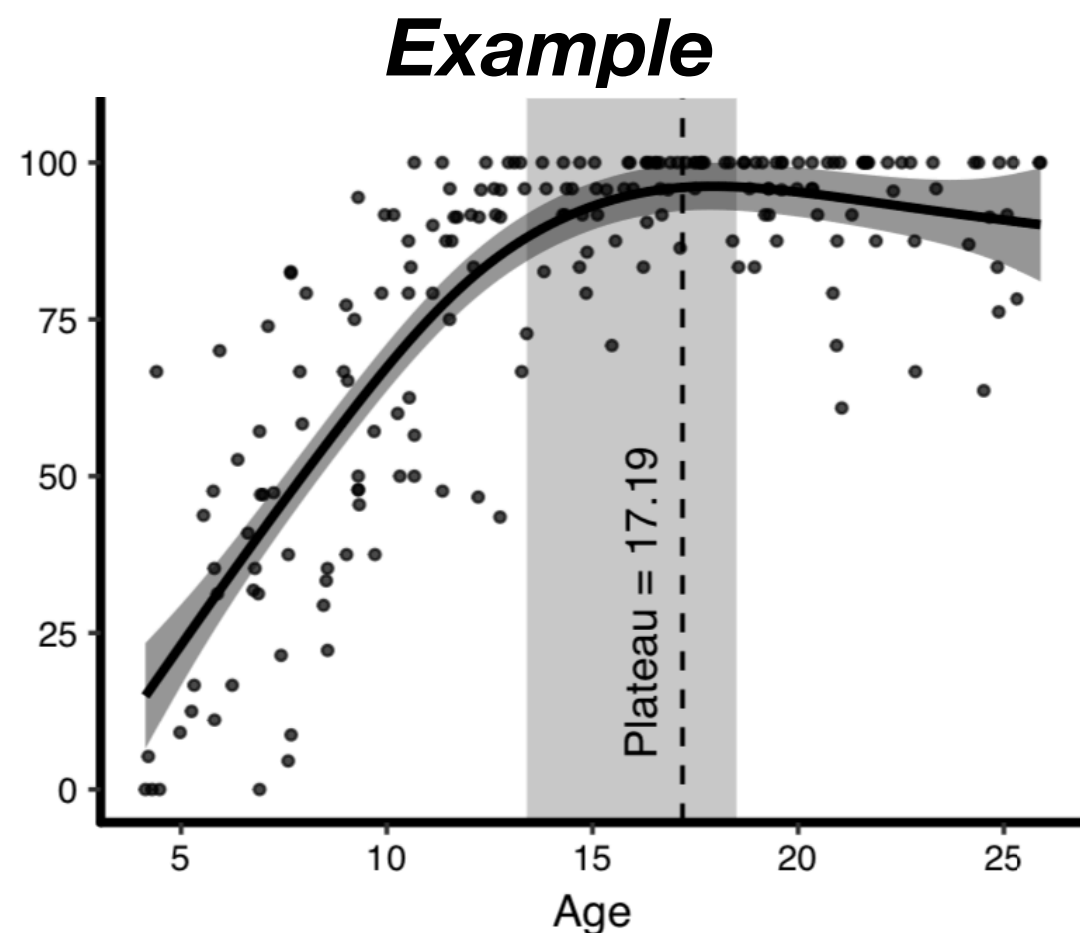


The prefrontal cortex, which is critical for planning, decision making, and self-control has an especially late developmental trajectory.

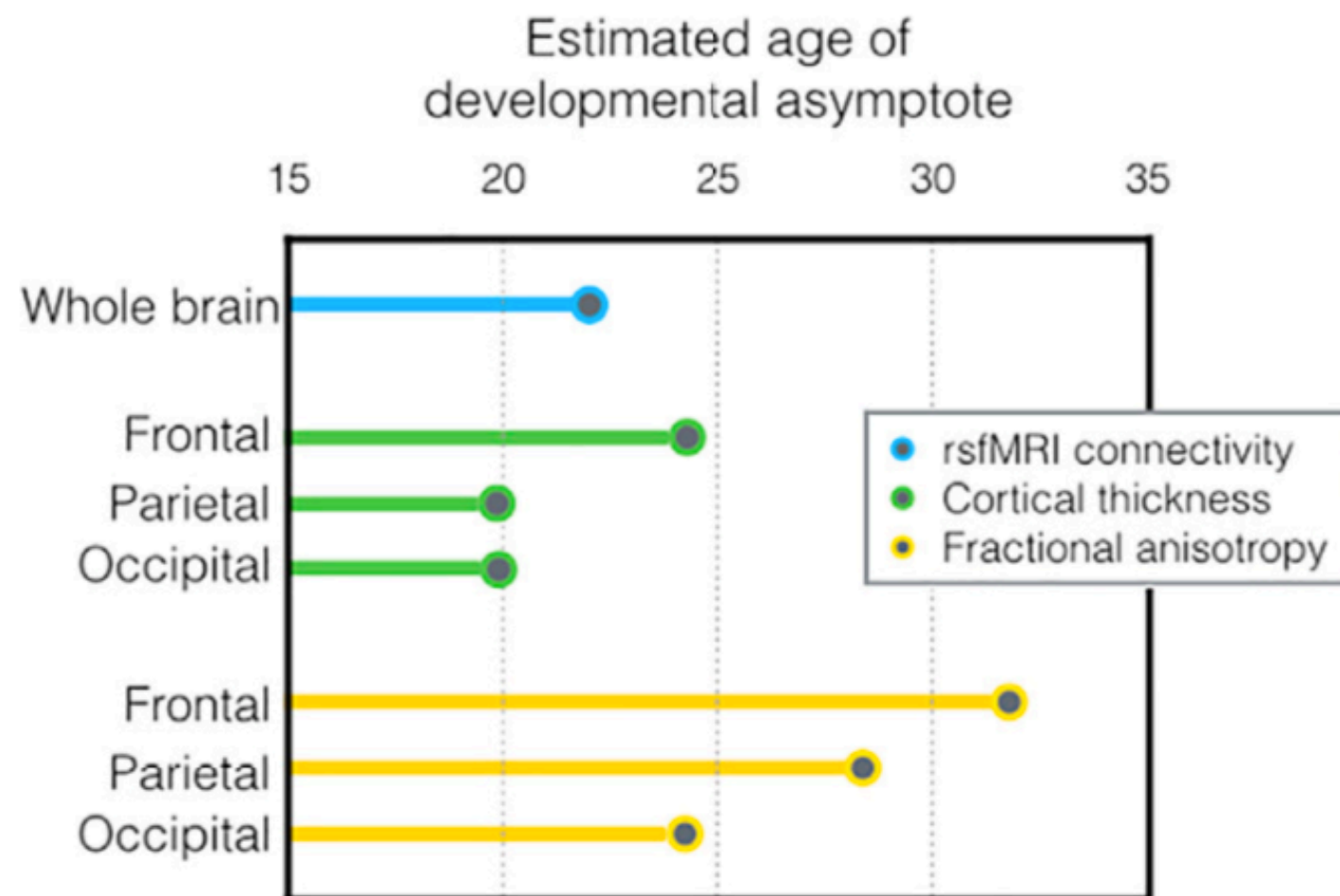
The prefrontal cortex is continuing to develop well past age 18.

How has the science advanced more recently?

- Tools developed to quantify when the brain is *largely* mature



Method in Nook et al., 2020

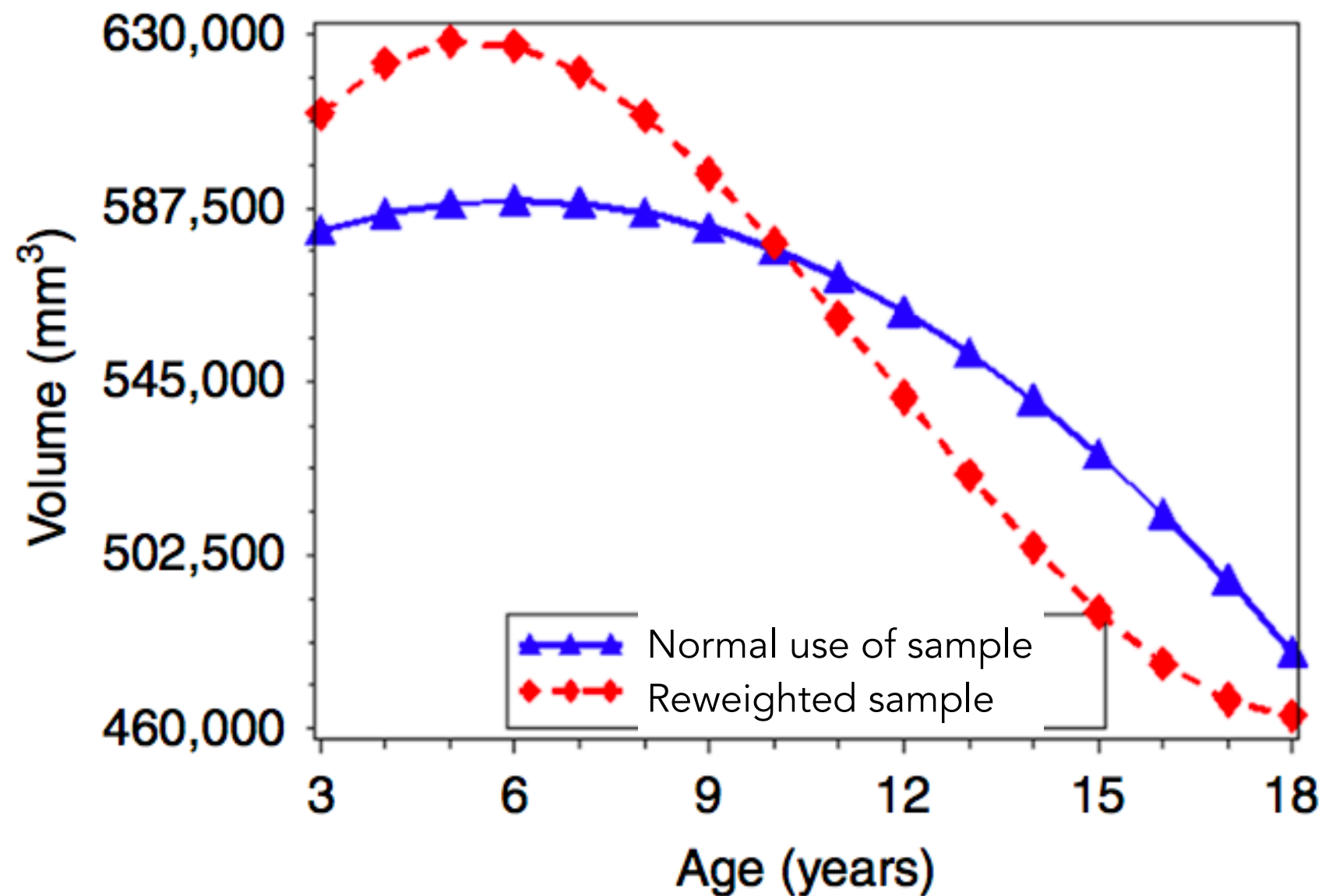


Somerville

- Somewhere between the early twenties and the early thirties

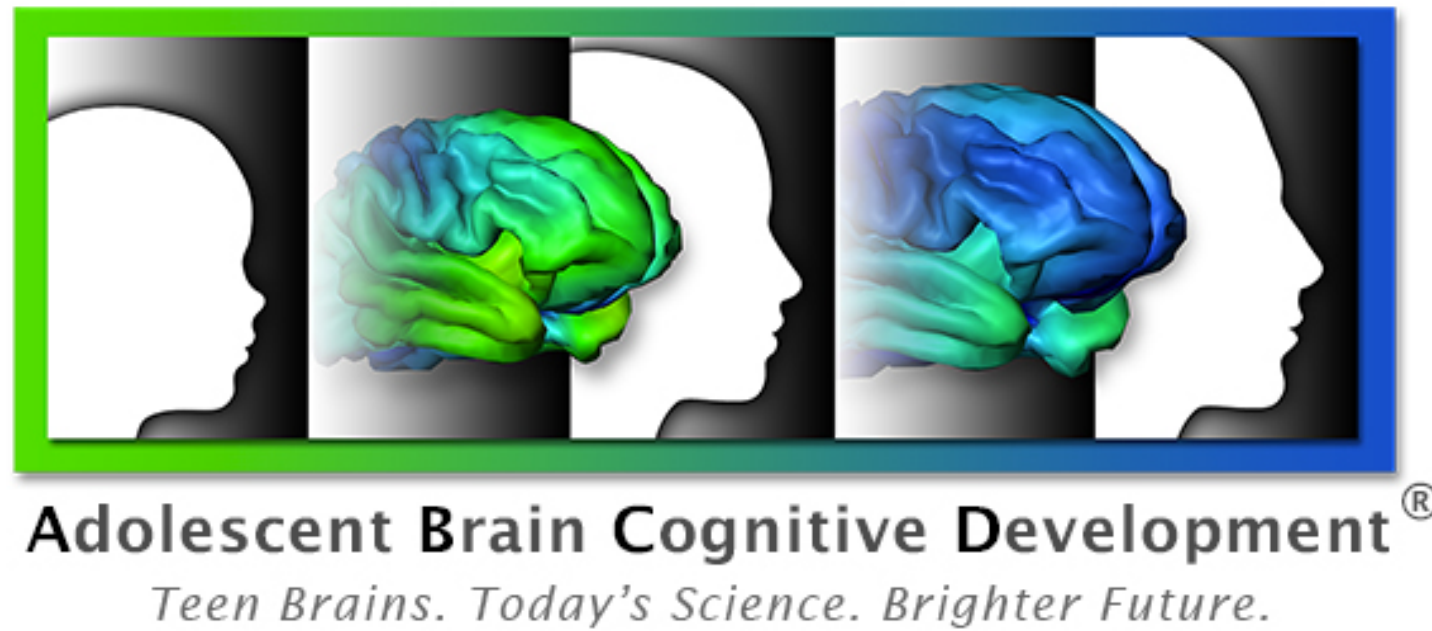
How has the science advanced more recently?

- Recognition that large and diverse datasets are essential

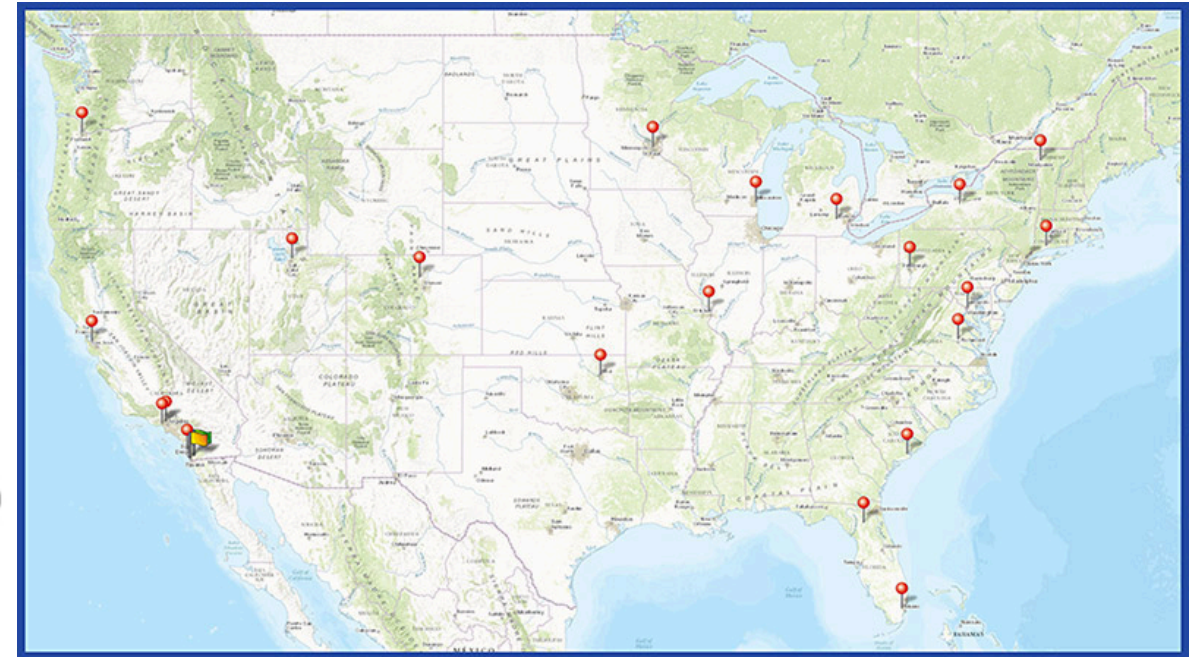


How has the science advanced more recently?

- Large, representative studies.



21 sites

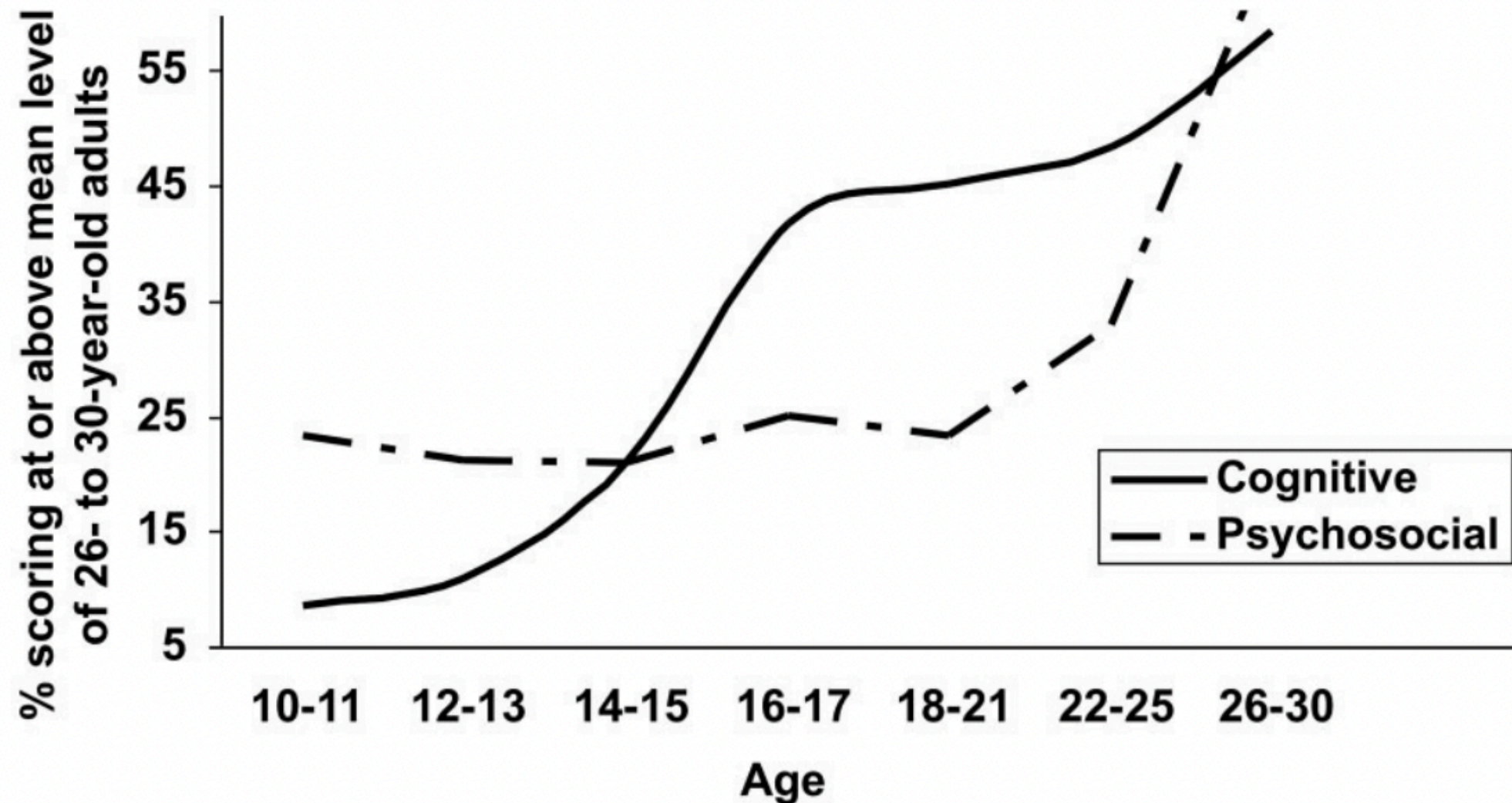


- Largest study of neurodevelopment and child health ever done in the USA
- 11,878 youth enrolled at age 9-10, will be tracked 10 years
- Demographics strictly mirror population of young people in USA

The timeline of behavioral maturity

What do we know?

- There is a developmental “mismatch” between basic *cognitive* maturity and *psychosocial* maturity.



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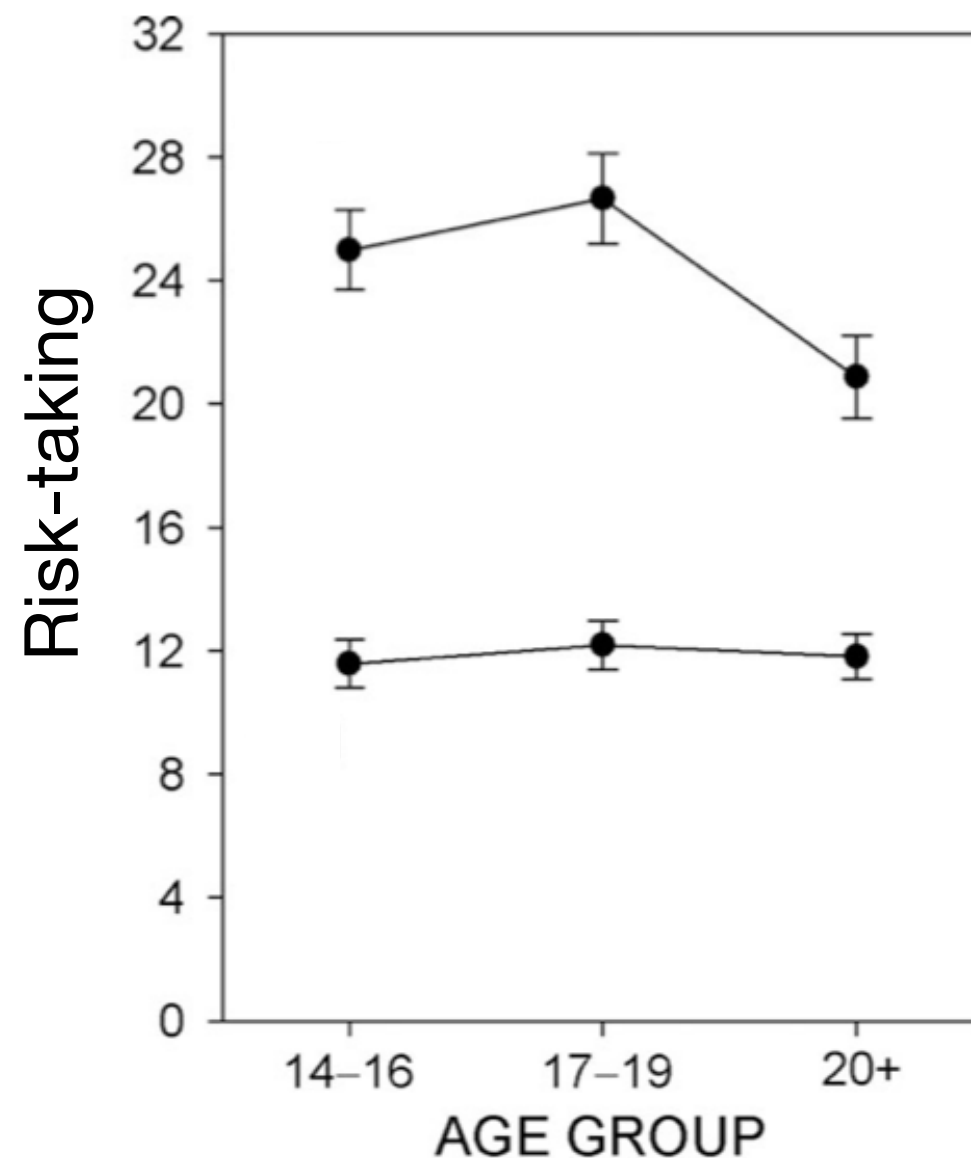
Indices of Psychosocial Maturity

Construct	Measure	Sample item
Risk perception	Benthin et al., 1993	“If you did this activity (e.g., had unprotected sex), how much are you at risk for something bad happening?”
Sensation seeking	Zuckerman et al., 1978	“I sometimes like to do things that are a little frightening.”
Impulsivity	Patton et al., 1995	“I do things without thinking.”
Resistance to peer influence	Steinberg & Monahan, 2007	“Some people think it’s better to be an individual even if people will be angry at you for going against the crowd. BUT Other people think it’s better to go along with the crowd than to make people angry at you.”
Future orientation	Steinberg et al., 2009	“Some people take life one day at a time without worrying about the future. BUT Other people are always thinking about what tomorrow will bring.”

What do we know?

- Adolescents differ from adults in several psychological domains relevant to decision-making.

Susceptibility to
excitement

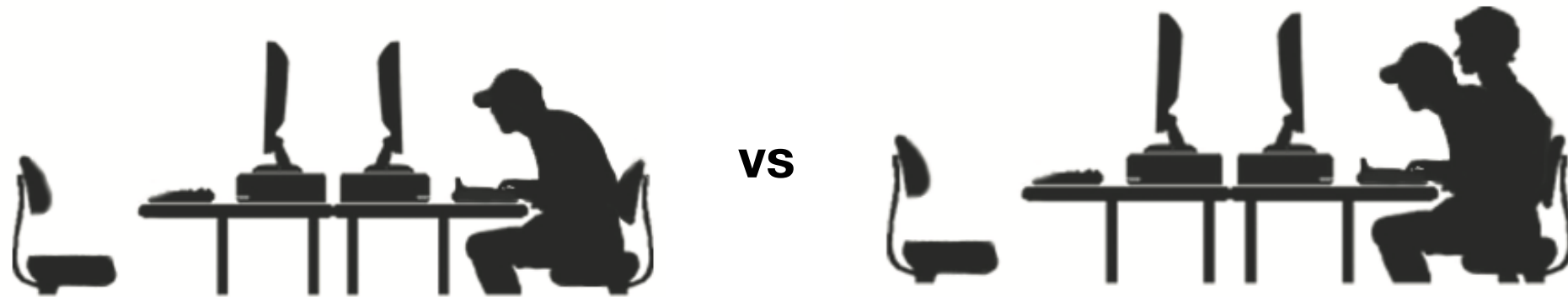


In a context that
encourages heat-of-moment

In a context that
encourages deliberation

What have we learned recently

- Having peers observe decisions increases adolescent risky decision making.

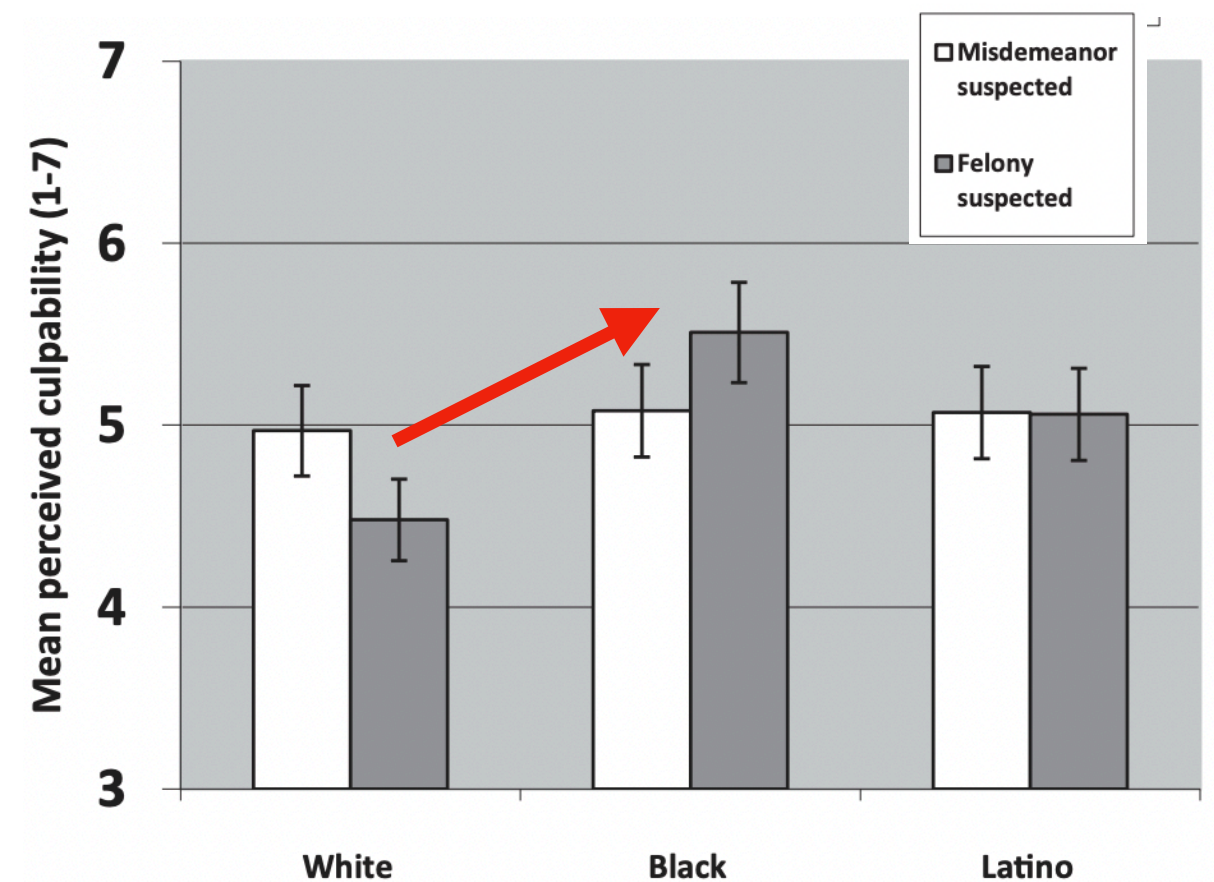
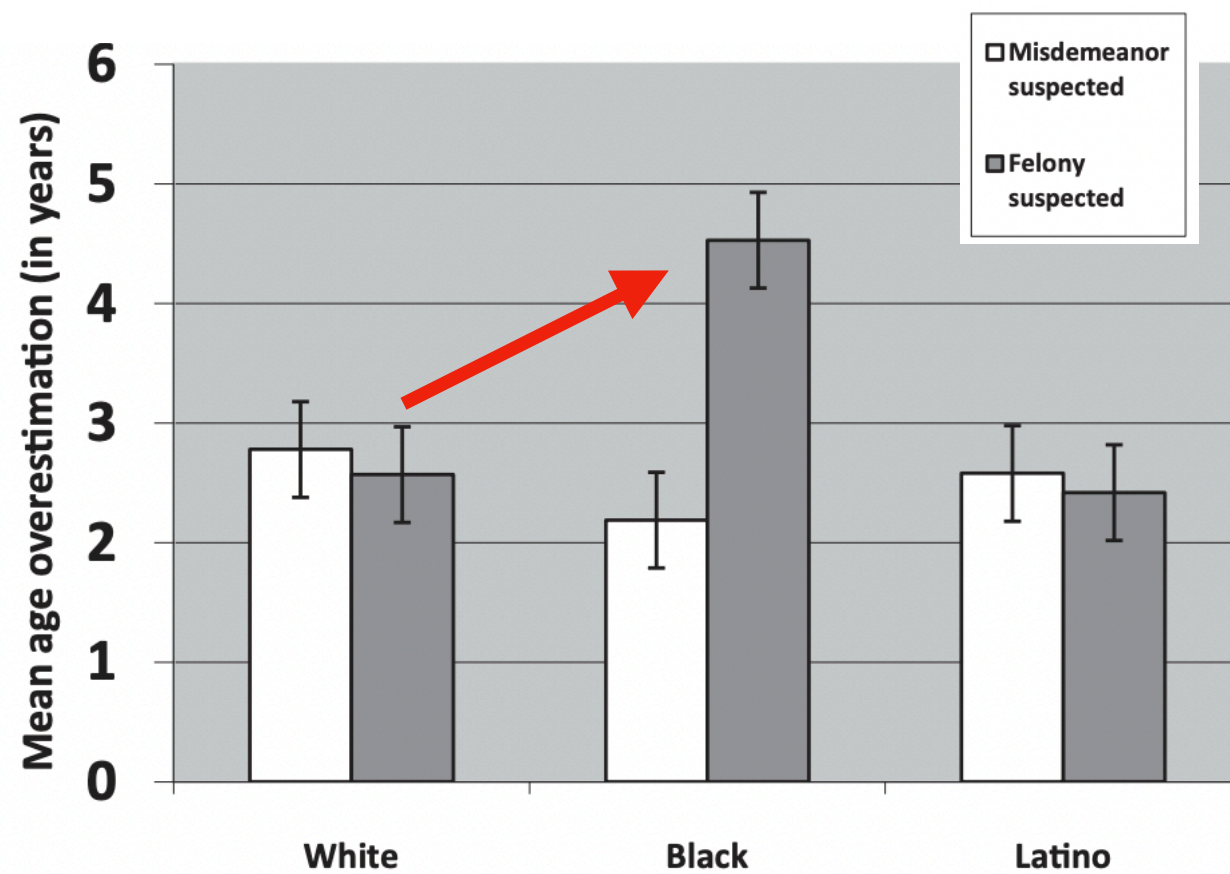


- Mere presence/observation only increases risky decisions a tiny bit.
- Active observation *by a peer who expresses pro-risk preferences* more than doubles the size of the effect (2.52x as risky).
- This effect is similar in size in earlier and later teenage years.

Perceptions and assumptions about maturity

Intersectionality - Youth and Race

- Black male youth are judged to be significantly older than they actually are.



Challenges to ethical translation that remain

- We lack a scientific consensus on when the brain is deemed 'mature'.
 - It changes throughout our entire lives.
 - What age it is "mostly done" depends on where and what measure you are looking at in the brain.
- Scientific insights are primarily about groups (people "on average"), and can be challenging to extrapolate to individual cases.
- Knowing about the brain on its own doesn't mean we can assume things must be true about a person's behavior.
- Considering how to responsibly use neuroscience evidence about brain development requires an integration of legal and scientific expertise.