Neurobiological Development In Young Adulthood (YA)

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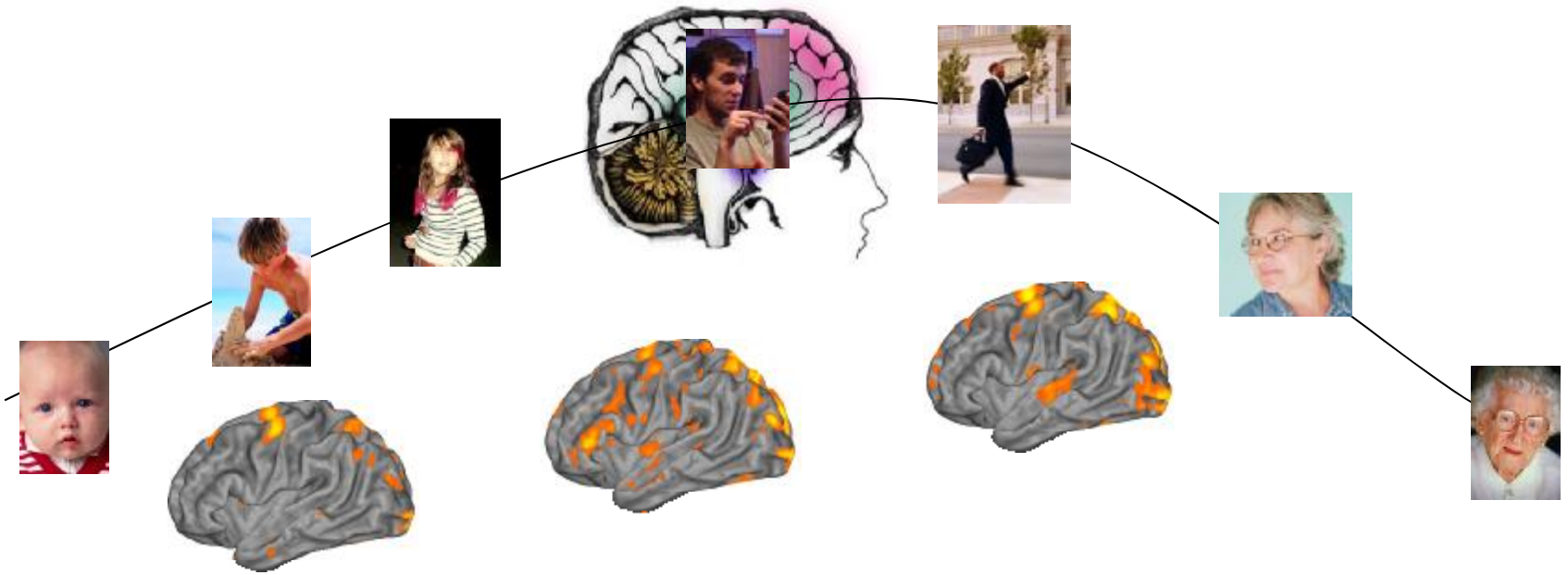

Young Adulthood YA (18-26y)

- Distinct from adolescence
- Significant neurobiology has reached adult levels
- Significant change in environment
  - Semi-independence and responsibility
  - Planning for the future

theschoolphilly.com

watisorange.org

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Plasticity

- Evolutionary process for adapting brain/behavior to fit environment
  - Experience-Expectant - Species survival
    - Biological timeclock – Early Development
  - Experience-Dependent - Individual trajectory
    - Habits vs. New Experiences - **YA**
  - Brain processing
    - Progressive (synaptogenesis, myelination)
    - Regressive (synaptic pruning, apoptosis)

Brain Structure

Brain Structure

Gray Matter <u>Thins</u>: *Neurons*

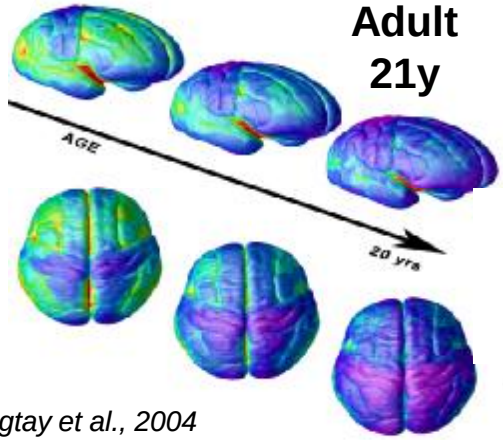
Synaptic Pruning 

Huttenlocher 1990

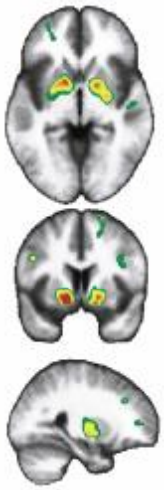
Child

Adolescence

Adult 21y



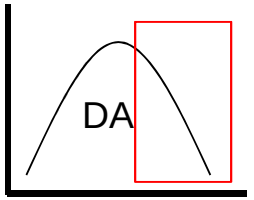
Gogtay et al., 2004



Sowell et al., 1999

12-16y v. 23-30 y

Dopamine availability peaks: *Neurochemistry*

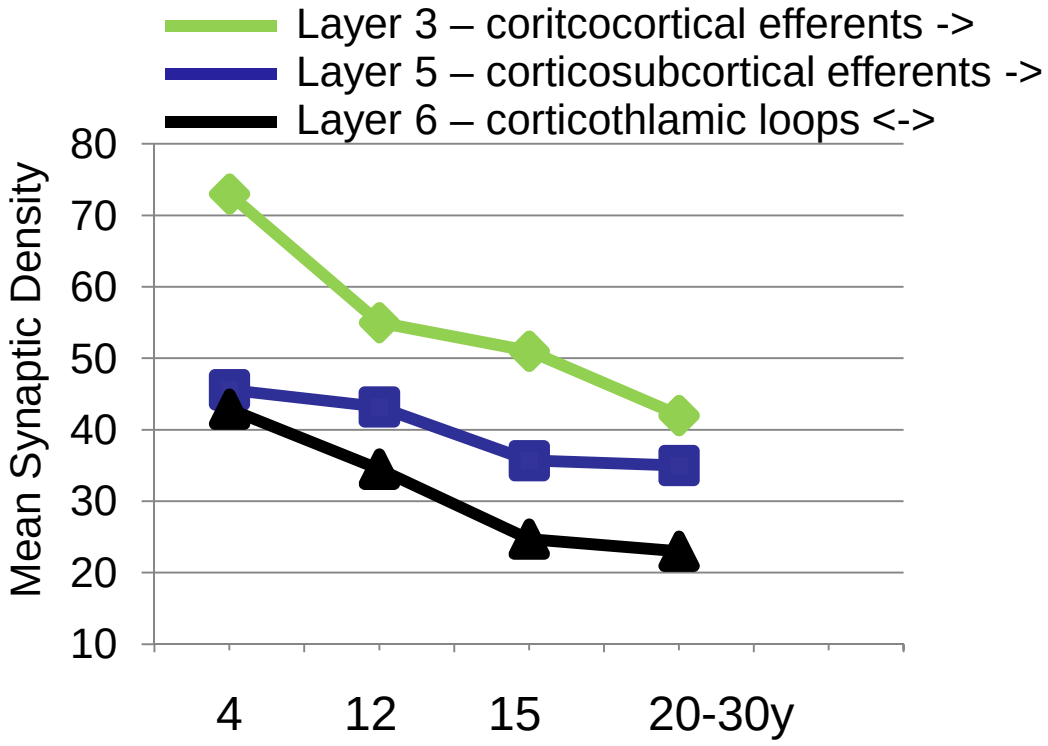


Children Adolescents Adults

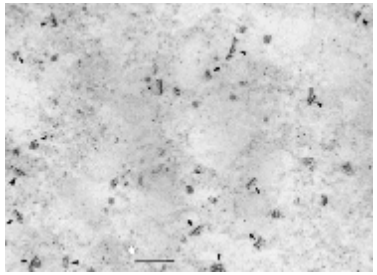
Luciana et al, 2010

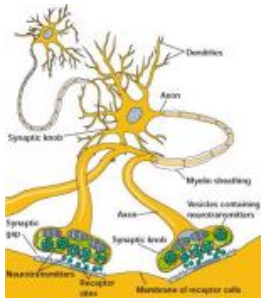
•Prefrontal executive and striatal motivational systems are late to mature

Continued Maturation: *Prefrontal Cortex*

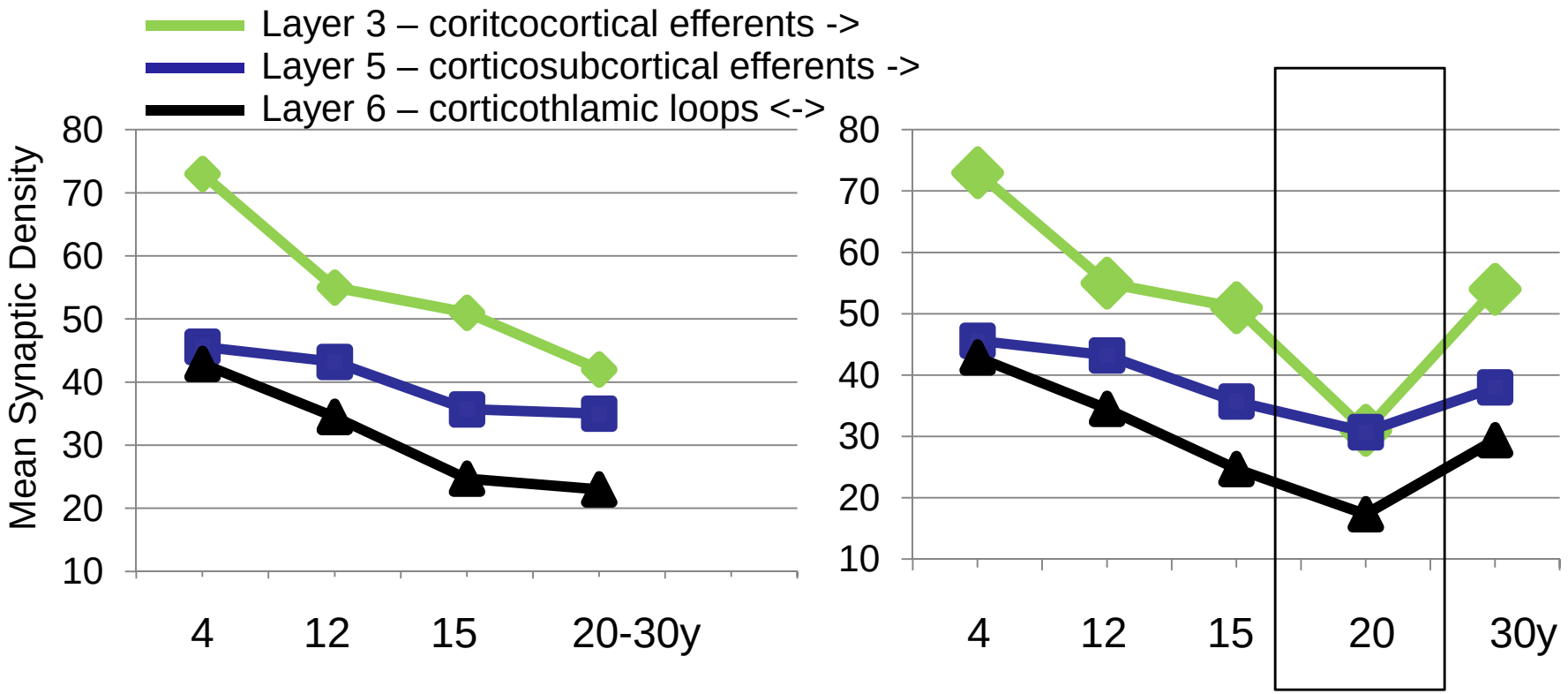


Huttenlocher & Dabholkar, 1997

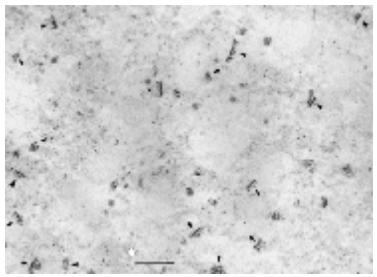


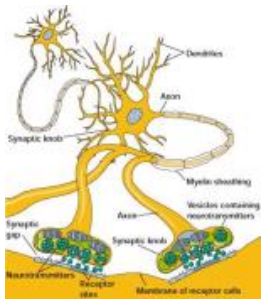


Continued Maturation: *Prefrontal Cortex*

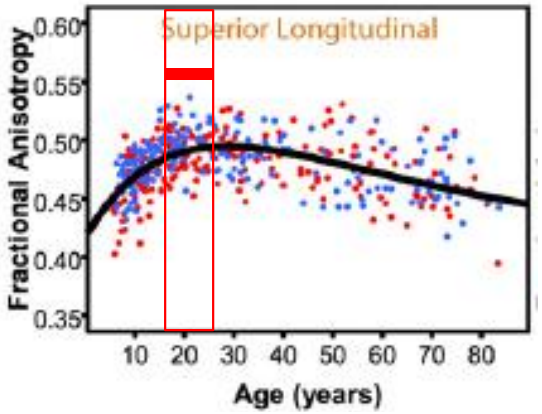


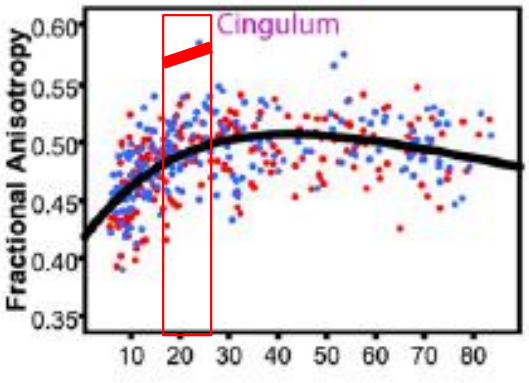
Huttenlocher & Dabholkar, 1997

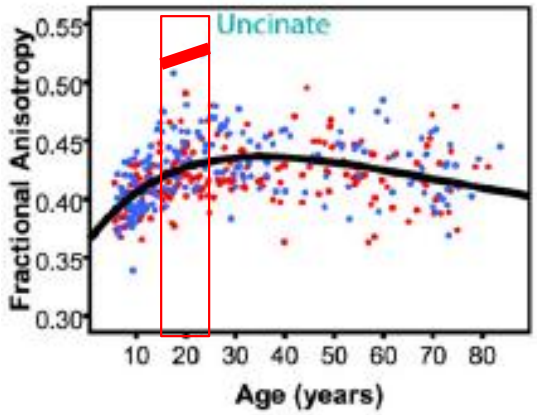




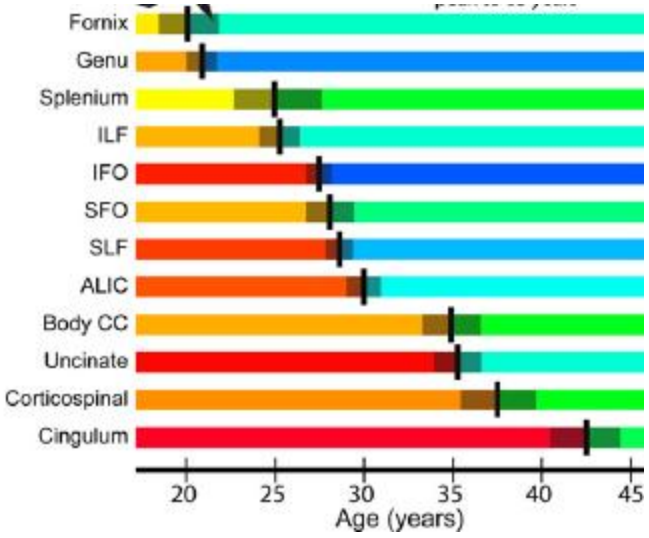
Continued White Matter Maturation



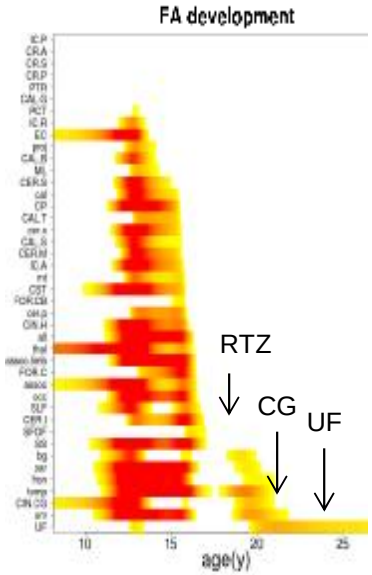




Age of Peak FA



Lebel et al 2012

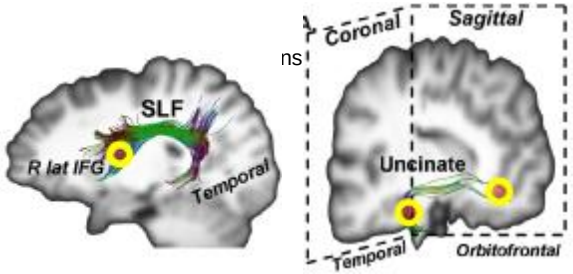


Simmonds et al in prep

White Matter Thickens: *Axons*

Myelination

Yakovlev 1967

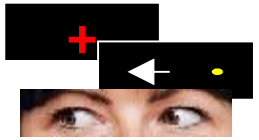


Asato et al., 2010

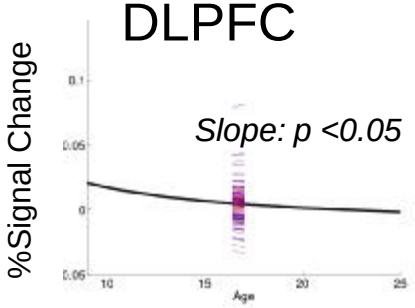
Brain Function

Neurobehavioral Indices

Cognitive Control



DLPFC

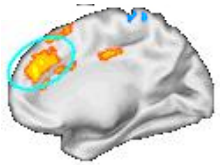


Ordaz et al., under review

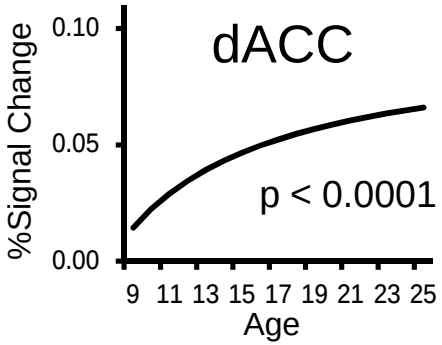
Error

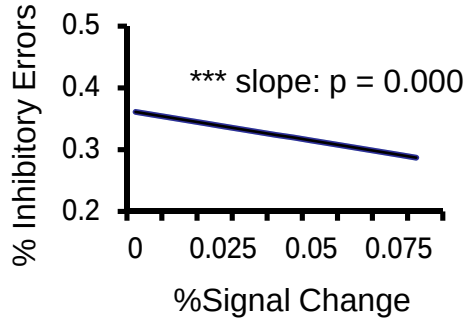
Adolescents
13-17yo

Adults
18-30yo



Velanova et al., 2008





Ordaz et al., under review

Adults 18-27y; Adolescents 13-17 y; Children 8-12y

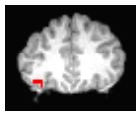
- Prefrontal processes are on-line by adolescence
- Error/performance monitoring continues to increase through adulthood

Reward Motivation

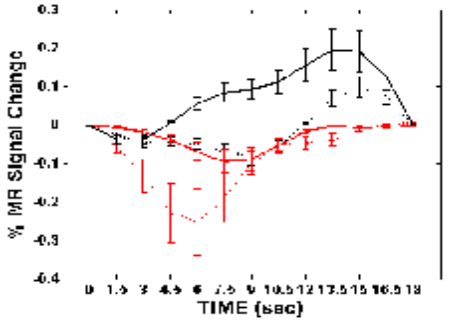
Reward System

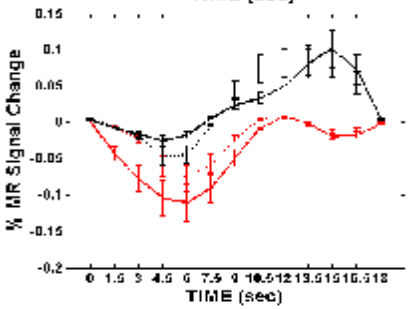
VS
Rewards

OFC
Cog Control

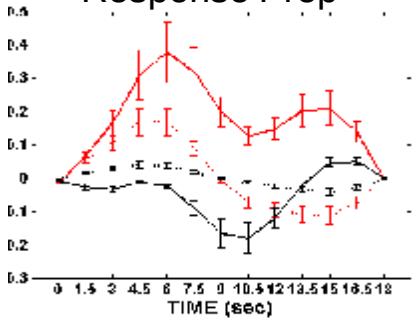


Reward Cue



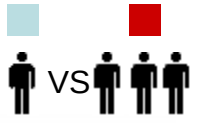


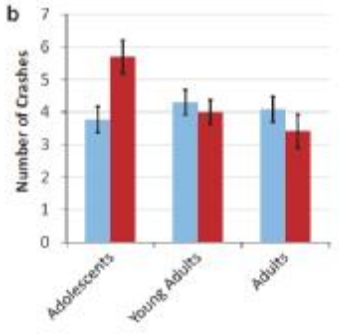
Response Prep

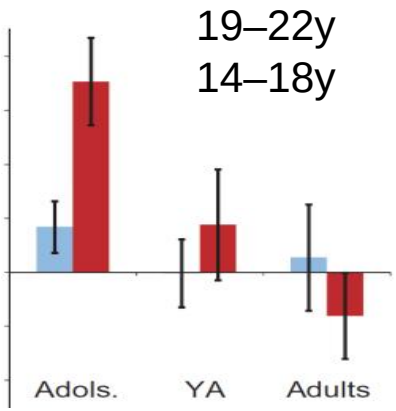


18-30y
13-17y

Geier et al., 2009







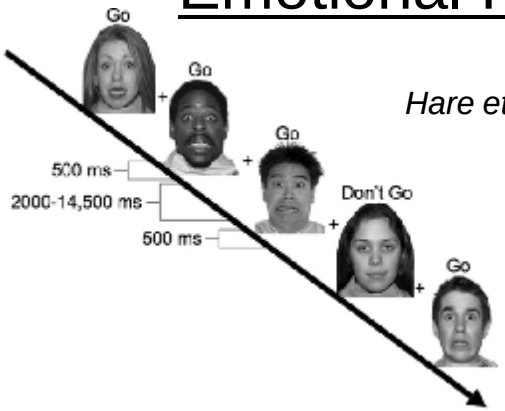
Chein - Steinberg et al., 2011

- Adults show better performance that is not affected by rewards
- Adults engage and dampen reward reactivity quicker
- Adults show less functional reactivity in VS to rewards including peer related rewards.
- Adults show greater engagement of executive reward processing in OFC.

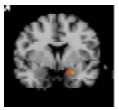
Socioemotional Processing

Emotional Processing

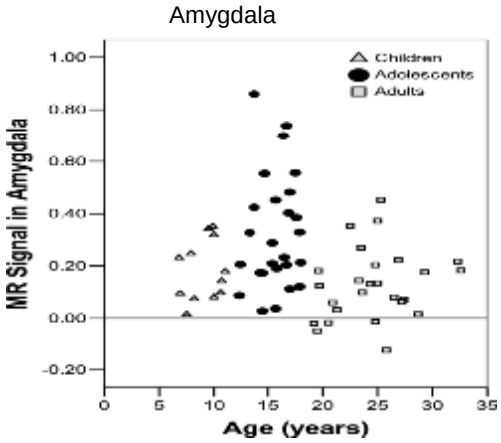
Emotional Regulation



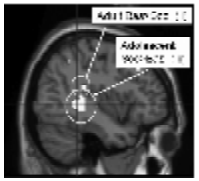
Hare et al., 2008



19-32y
13-18y
7-12y



Social Emotional Processing

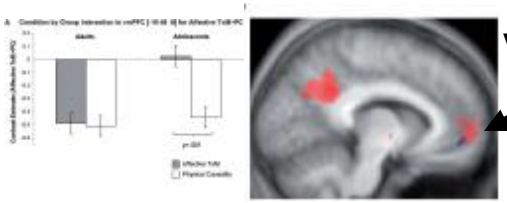


Guilt
Embarrassment

22-32y
10-18y

Burnett et al., 2009

Processing of Intentions



vmPFC

24-40y
11-16y

Sebastian et.al, 2012

- *There is a decline in emotional reactivity and increased ability to assess another's emotion from adolescence to adulthood*

Conclusions

- YA have access to mature prefrontal executive systems
- There is continued maturation of systems supporting performance monitoring and socioemotional processing
- *A mature prefrontal executive system guided by continuing maturation in socioemotional processing may support a shift in the pursuit of long term life goals.*

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