The Changing Brain Lab

Penn
University of Pennsylvania

Adolescent brain development & plasticity: Implications for education

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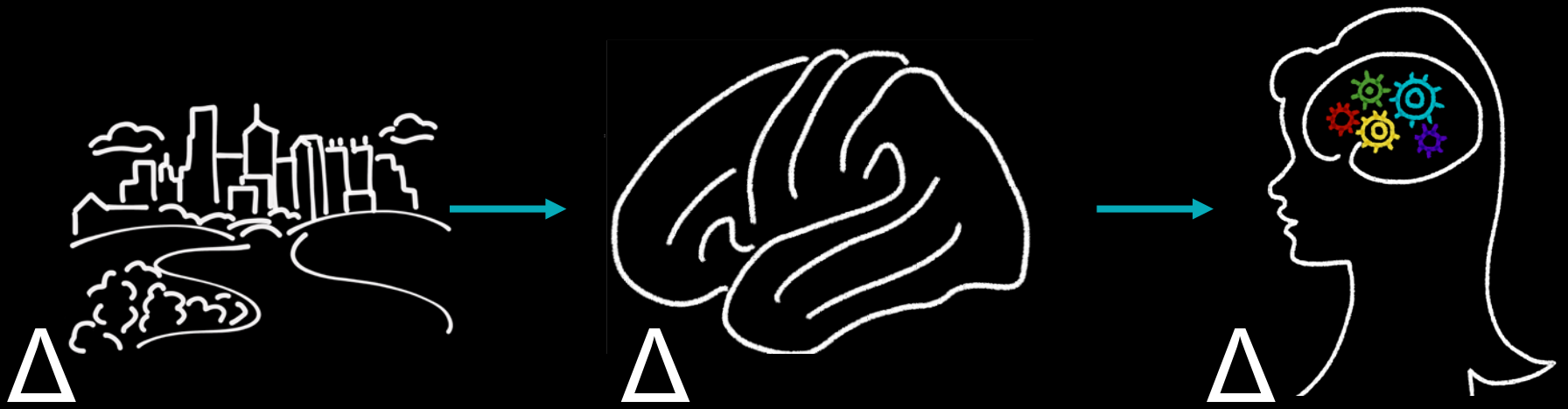
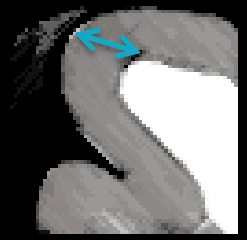


Neural correlates of the income achievement gap

Family income

12-16 year olds
Free lunch *n* = 23
Paid lunch *n* = 35



Cortical Thickness

Multiecho highres MRI (Tisdall et al., 2012)

Rated for quality

FreeSurfer 5.3

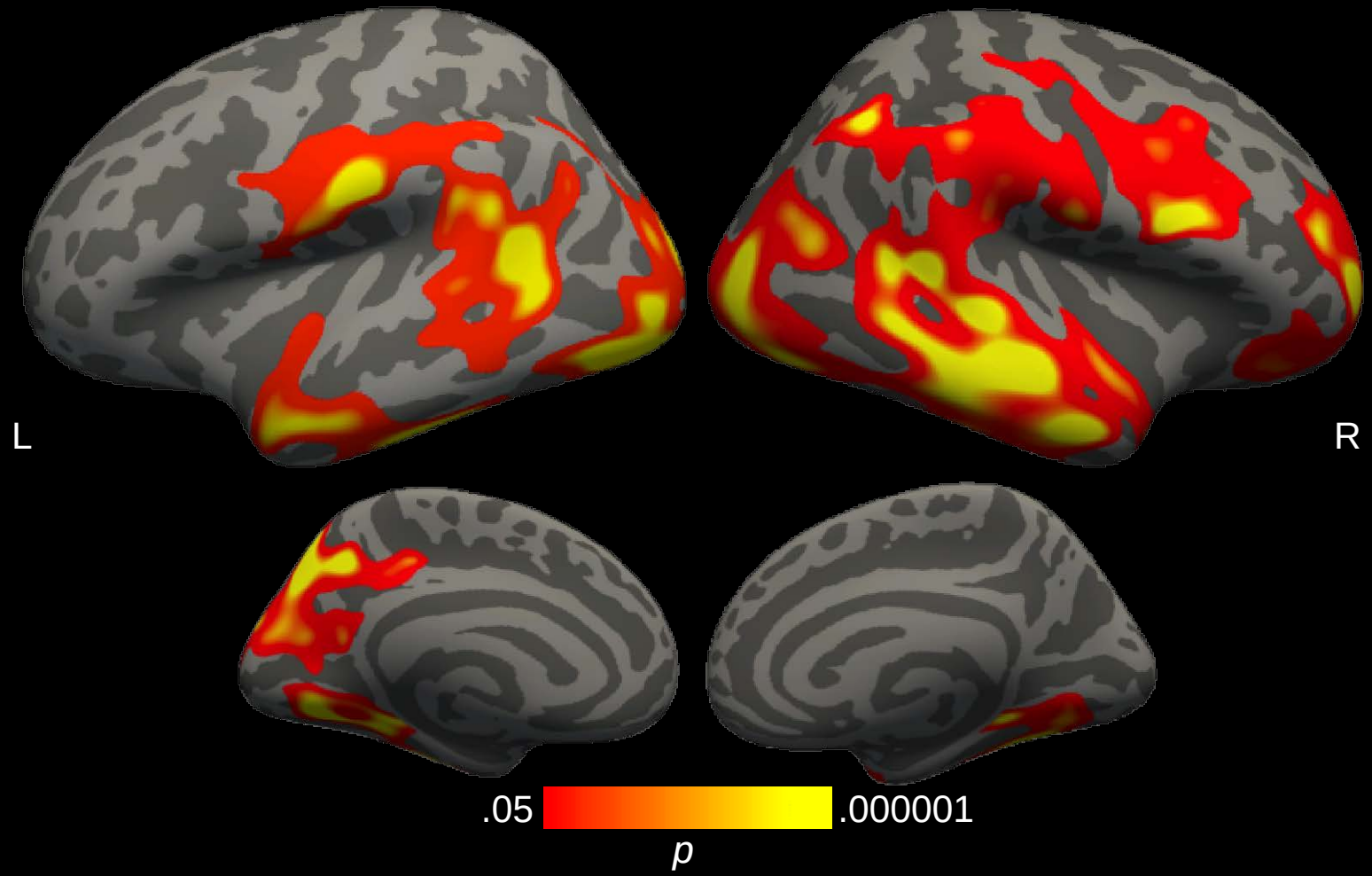
Academic achievement

Standardized 7th & 8th grade test scores acquired through state database

Lawson et al., 2013; Noble et al., 2012, 2015; Jednorog et al., 2012, Luby et al., 2012; Hanson et al., 2013

Mackey et al., *Psych Sci,* 2015

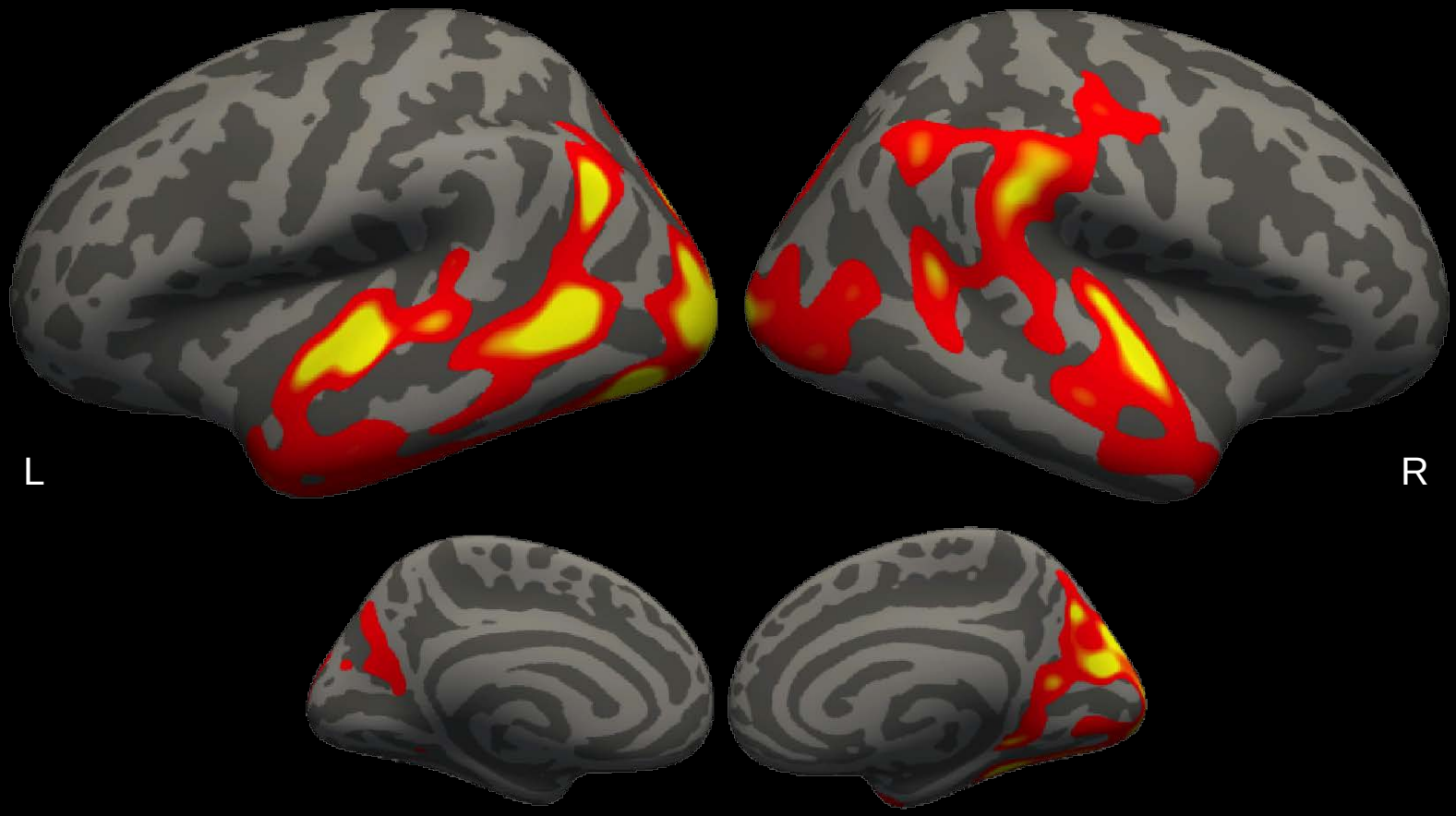
Cortex is thicker in higher income students



Mackey et al., *Psych Sci,* 2015

Cortical thickness is positively correlated with test scores

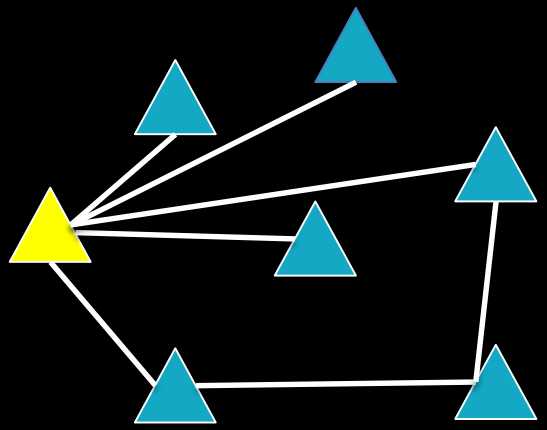
Corrected for multiple comparisons
Cluster-forming $p < .05$, cluster-wise $p < .05$



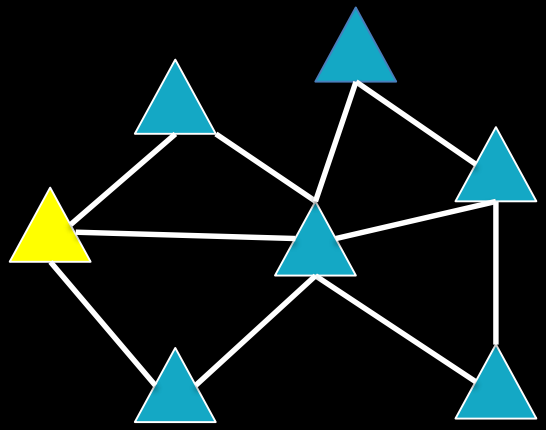
Mackey et al., *Psych Sci,* 2015

Does SES impact the timing of functional development?

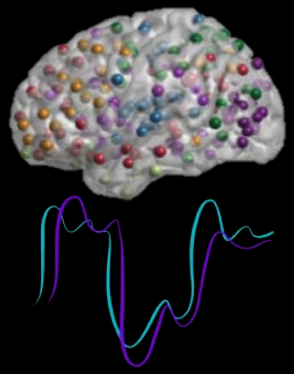
Ursula Tooley &
Danielle Bassett
PNC

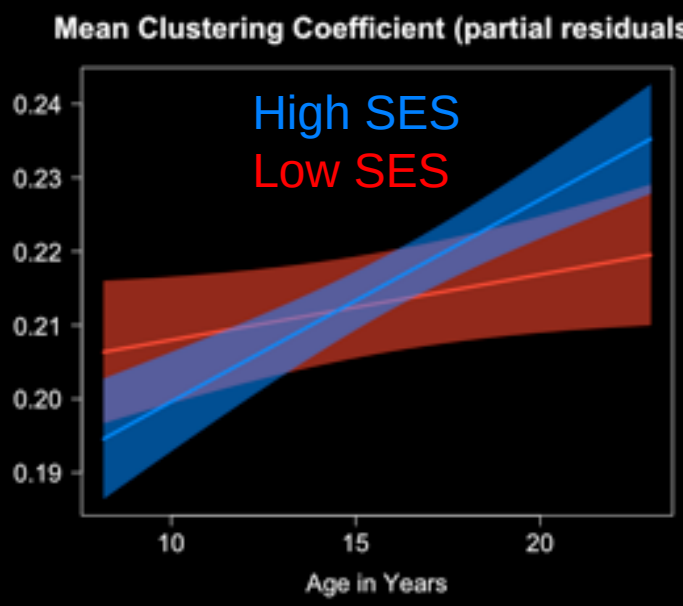


Low clustering coefficient



High clustering coefficient

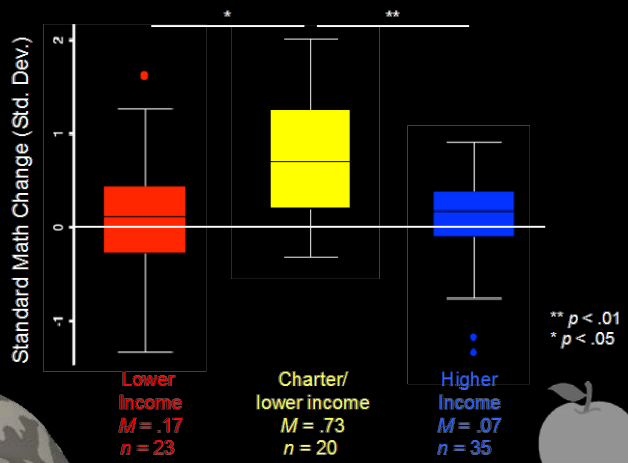


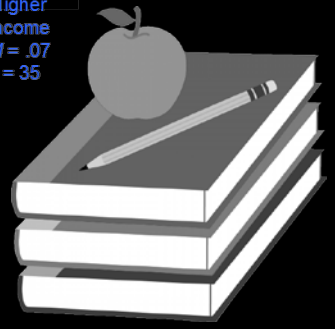


Tooley et al, *in prep*

Individual differences in learning in charter schools

Julia Leonard





Charter school attendance

(Angrist et al., 2013)

Greater hippocampal volume & connectivity

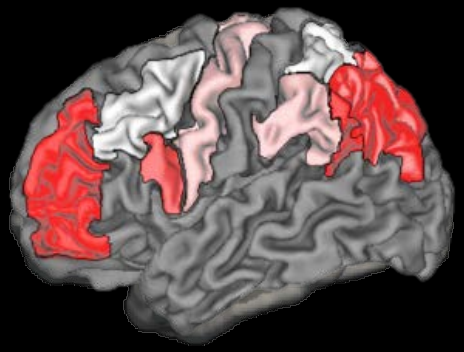
(Cho et al., 2011 & 2012; Wilkey et al., 2017; Supekar et al., 2013)

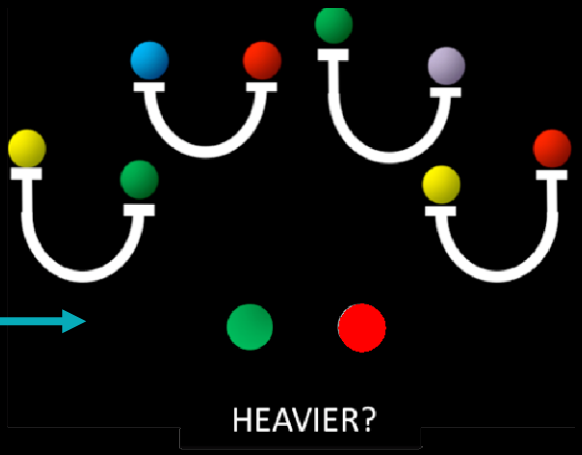
Academic achievement

Change in standardized 7th & 8th grade test scores acquired through state database

Leonard et al, *in prep*

Can education improve reasoning in young adults?

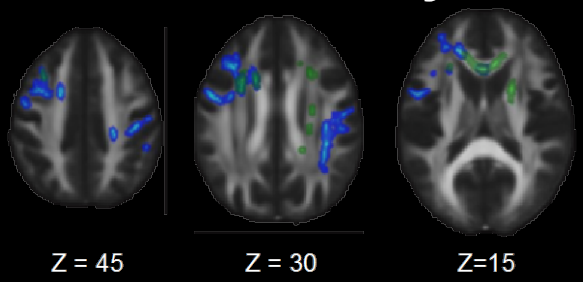




Δ Reasoning experience

Δ Frontoparietal connectivity

Δ Reasoning ability

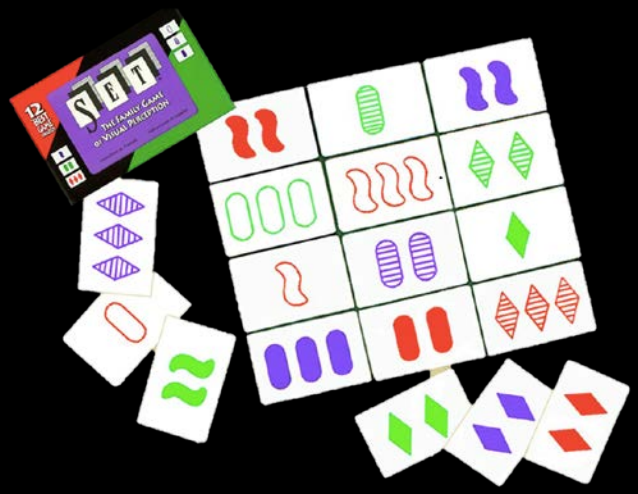


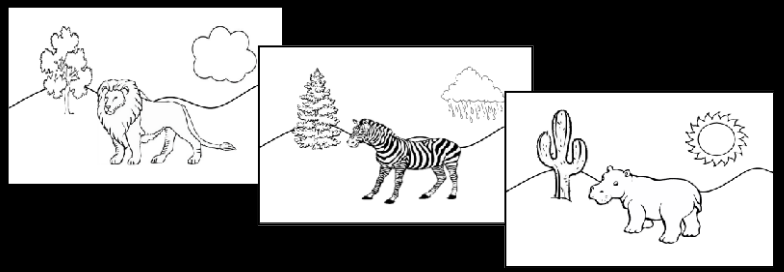
Mackey et al., *JNeuro*, 2013

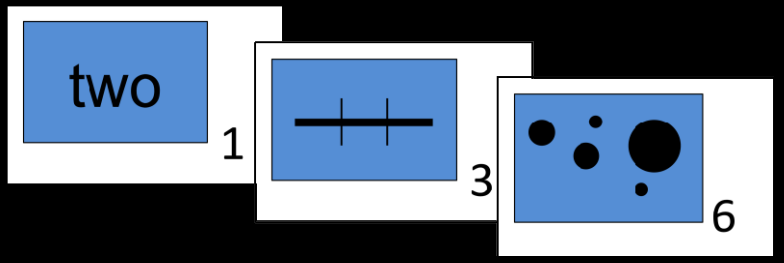
Mackey et al., *Front. Neuroanat,* 2012

Can education improve reasoning in childhood?

- Games can improve reasoning and processing speed in children from low SES backgrounds (Mackey et al., Dev Sci., 2011)

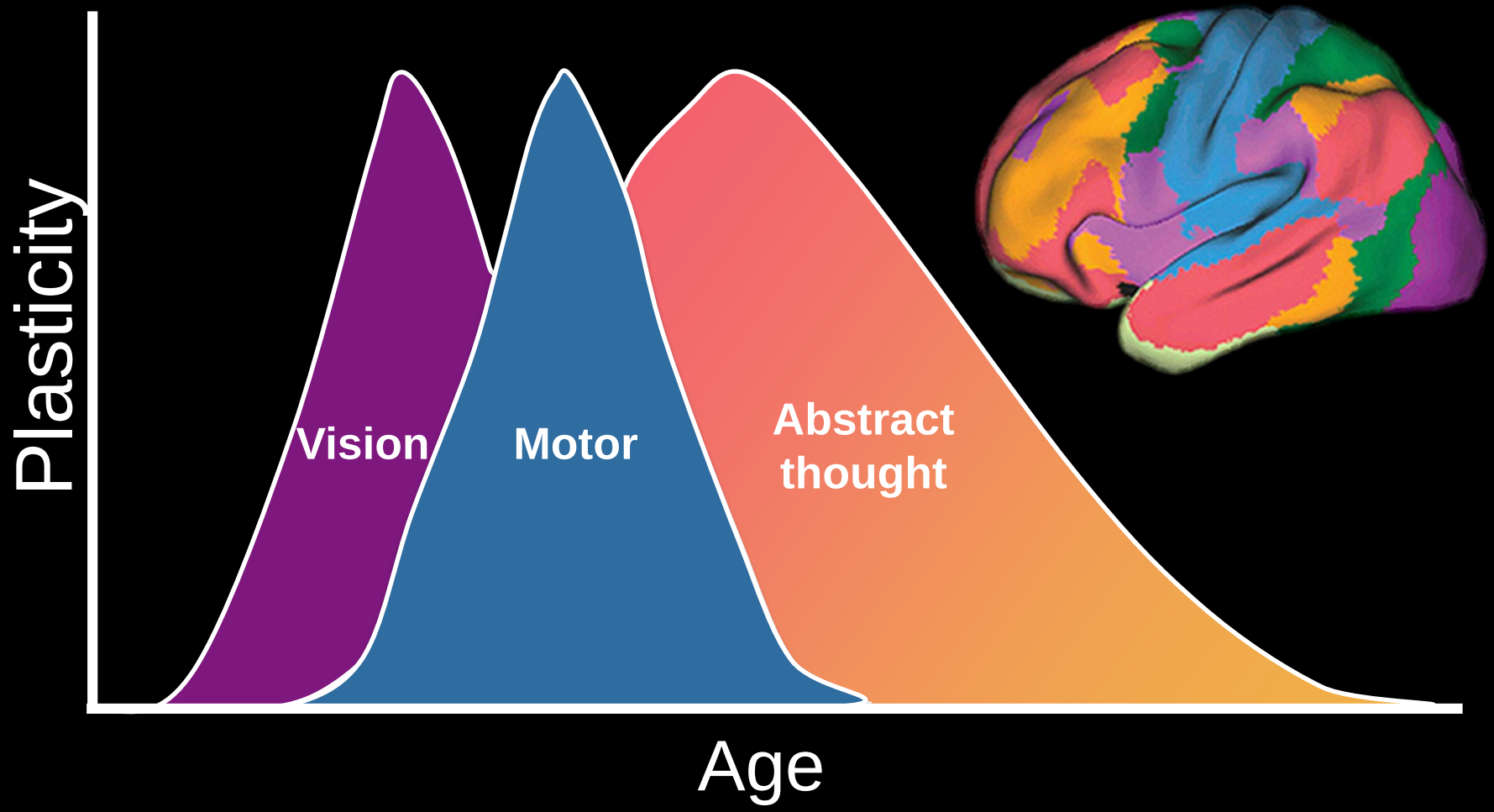






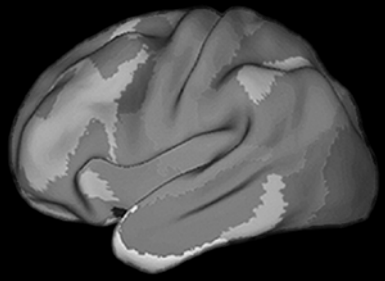
- Games can be integrated into classroom instruction, and bigger cognitive gains correlate with bigger math gains (Mackey et al., MBE, 2017)

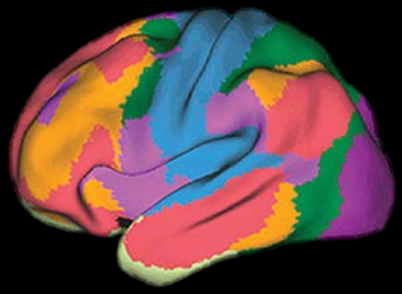
When is the best time to improve reasoning skills?



Adapted from Hensch & Bilimoria, 2012

Conclusions





General

Specific

Income

Cognitive interventions

Stress

Schools

Language

- Societal influences on brain development differ in breadth of effect.
- Earlier influences may have the potential to affect the brain more broadly, but tailoring the timing of specific interventions, especially in adolescence, may maximize their effects.

Acknowledgments

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