Inventing ourselves: the secret life of the teenage brain

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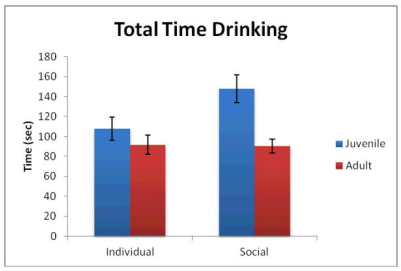
Adolescence

A unique period of biological, psychological and social development.

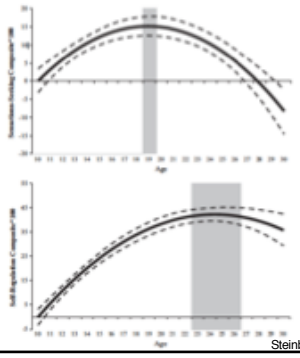
Some adolescent-typical behaviours are common across species, culture and history

Adolescent (but not adult) mice drink more alcohol when with other mice



Logue et al. *Dev Science* (2014)

Adolescent-typical behaviour across 11 cultures

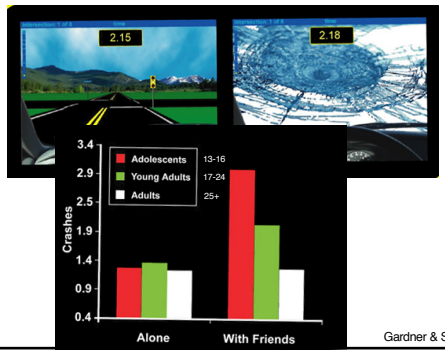


Sensation-seeking

Self-regulation

Steinberg et al. *Dev Science* (2017)

Peer influence on risk taking



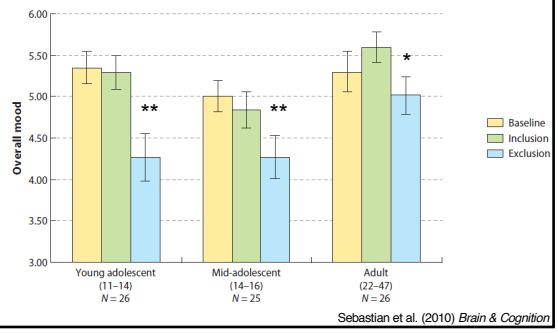
Gardner & Steinberg (2005)

Cyberball: an experimental social exclusion manipulation

Cat Sebastian

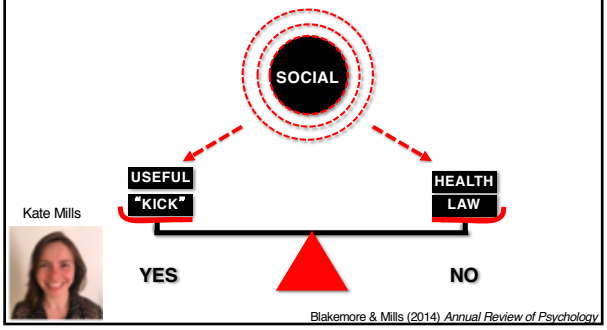
Williams et al. (2000) *JPSP*

Adolescents are hypersensitive to social exclusion



Sebastian et al. (2010) *Brain & Cognition*

SHALL I DRIVE REALLY FAST?



Kate Mills

Blakemore & Mills (2014) *Annual Review of Psychology*

Social influence on risk perception

N = 563 (313 female), aged 8-59

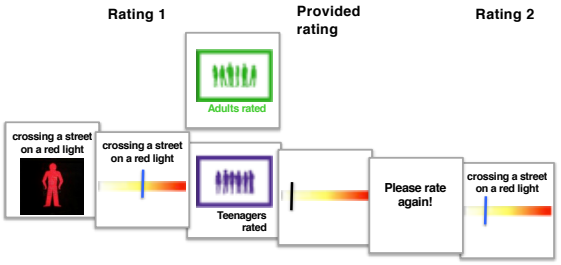
Maarten Speenkenbrink

Lisa Knoll

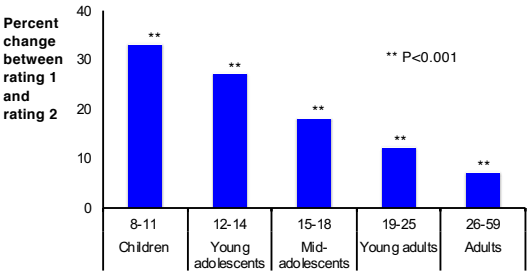
Lucia Magis

Social influence on risk perception

N = 563 (313 female), aged 8-59

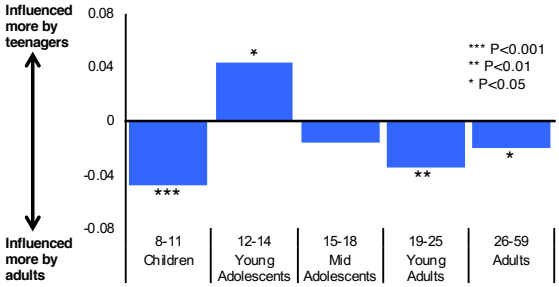


All age groups show social influence effect



Knoll et al (2015) *Psych Science*

Young adolescents' risk perception is influenced more by other teenagers than by adults



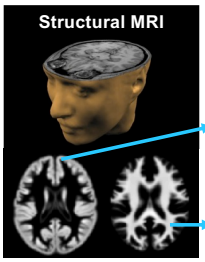
Replicated in a new cohort (N = 590; Knoll et al. 2017)

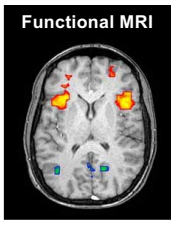
Knoll et al (2015) *Psych Science*

Summary

Peer influence is an important determinant of adolescent-typical behaviour

Magnetic Resonance Imaging (MRI)





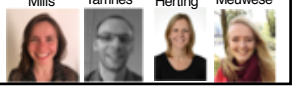
Grey matter contains cell bodies and synapses

White matter contains axons

Structural brain development in four cohorts

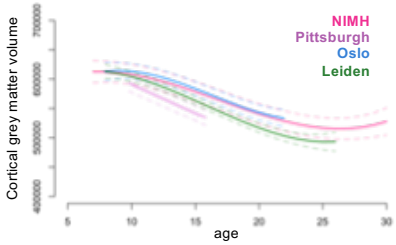
Total N = 391 participants
Total MRI scans = 852

Kate Mills | Christian Tamnes | Megan Herting | Rosa Meuwese



Cortical grey matter volume

N = 391 participants; 852 scans

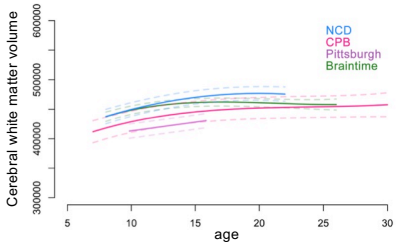


Grey matter volume decreases around 1.5% annually during adolescence

Mills et al. (2016) *Neuroimage*

Cerebral white matter volume

N = 391 participants; 852 scans



White matter volume increases up to 1% annually during adolescence.

Mills et al. (2016) *Neuroimage*

Why does grey matter decrease and white matter increase during adolescence?

Myelination

Axonal growth

Synaptic pruning

→ Neuroplasticity during adolescence

Summary

Peer influence is an important determinant of adolescent-typical behaviour

Grey matter decreases and white matter increases in adolescence

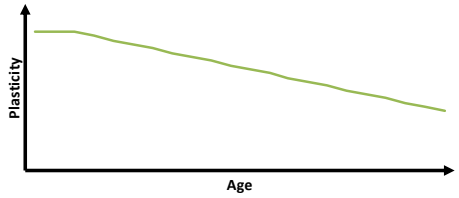
A Critical Period for Social Isolation in the Rat

DOROTHY F. EINON
M. J. MORGAN
Psychological Laboratory
University of Cambridge
Cambridge, England

Social deprivation in adolescent rats has more damaging effects on behaviour and brain development than deprivation in juvenile or adult rats

Einon & Morgon (1977); Van Hoeve et al. (2013); Burke et al. (2017)

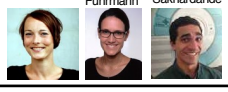
"Brain plasticity and the ability to change behavior decreases over time" (National Scientific Council on the Developing Child, 2014).



Do plasticity and learning decline across development?

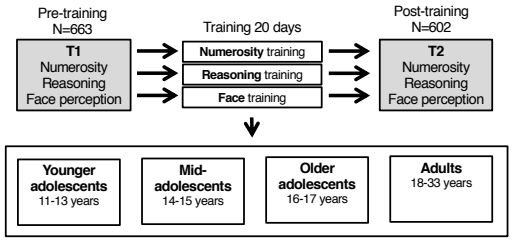
Fuhrmann et al. (2015)

Are there sensitive periods for learning in adolescence?



Does learning decline across development?

N = 663, aged 11-33 years



Knoll et al. (2016) *Psych Science*

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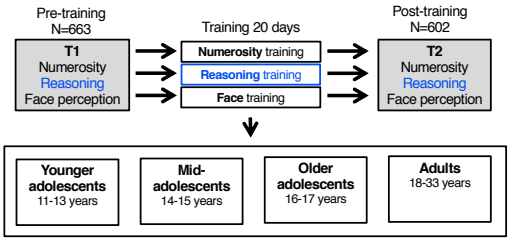
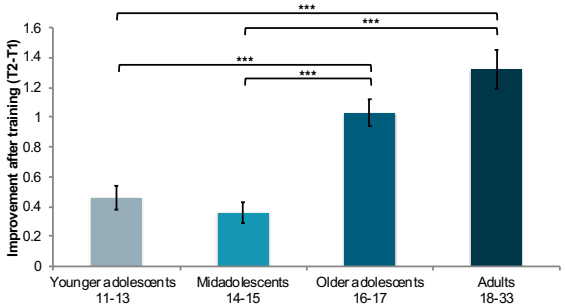


Knoll et al. (2016) *Psych Science*

Non-verbal relational reasoning

based on Raven's matrices (Raven, 1960)

The ability to learn non-verbal reasoning improves over adolescence



Learning does not always decline with age

*** P<0.001

Knoll et al. (2016) *Psych Science*

Summary

Peer influence is an important determinant of adolescent-typical behaviour

The brain develops structurally and functionally in adolescence

Adolescence may be a sensitive period of brain development?

Individual differences are huge (Foulkes & Blakemore, *Nature Neuroscience*, in press)

Funding

Royal Society University Research Fellowship

wellcome trust

Nuffield Foundation

The Leverhulme Trust

JACOBS FOUNDATION

erc

MRC Medical Research Council

Developmental Cognitive Neuroscience lab

Post-docs
Saz Ahmed
Guillaume Barbalat
Gabriele Chierchia
Kathrin Cohen Kadosh
Iroise Dumontheil
Lucy Foulkes
Lisa Knoll
Lara Menzies
Stefano Palminteri
Susanne Schweizer

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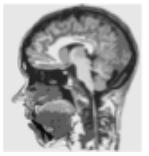

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