



Adolescent Development and Risk Taking in Adolescence

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“adolescents are biologically inclined to act impulsively and instinctively when confronted with stressful or emotional decisions without understanding the consequences of their actions. “

Queen v F, 2 April 2008, High Court, Auckland

Brain expert calls for driving age to be raised to 18

NZ Herald November 29, 2007

- Adolescent risk taking
- Brain development & Decision making
- Implications for clinicians

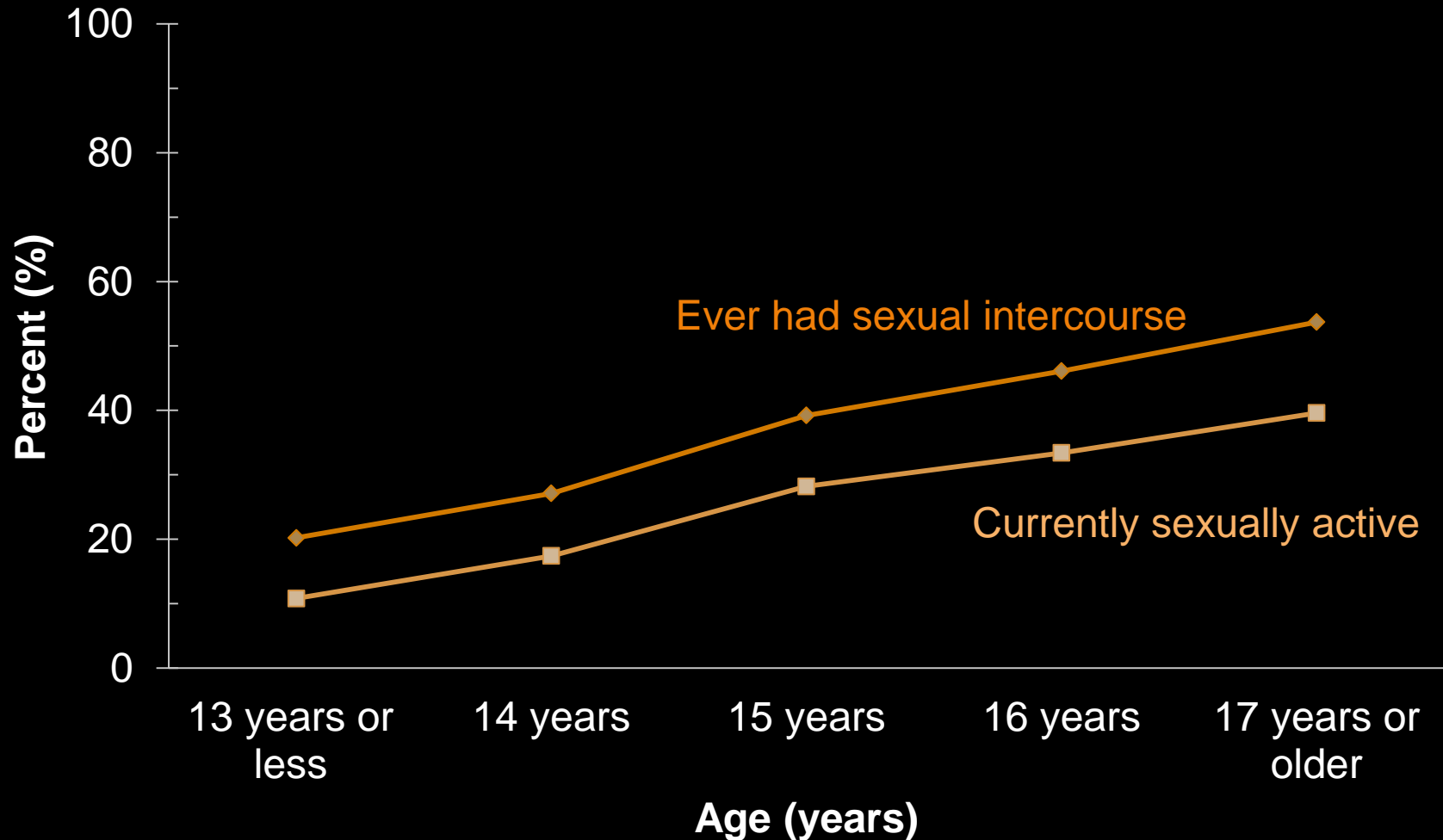
Risk taking – an adolescent task?

During adolescence there is a high mortality and morbidity rate from health risk behaviours

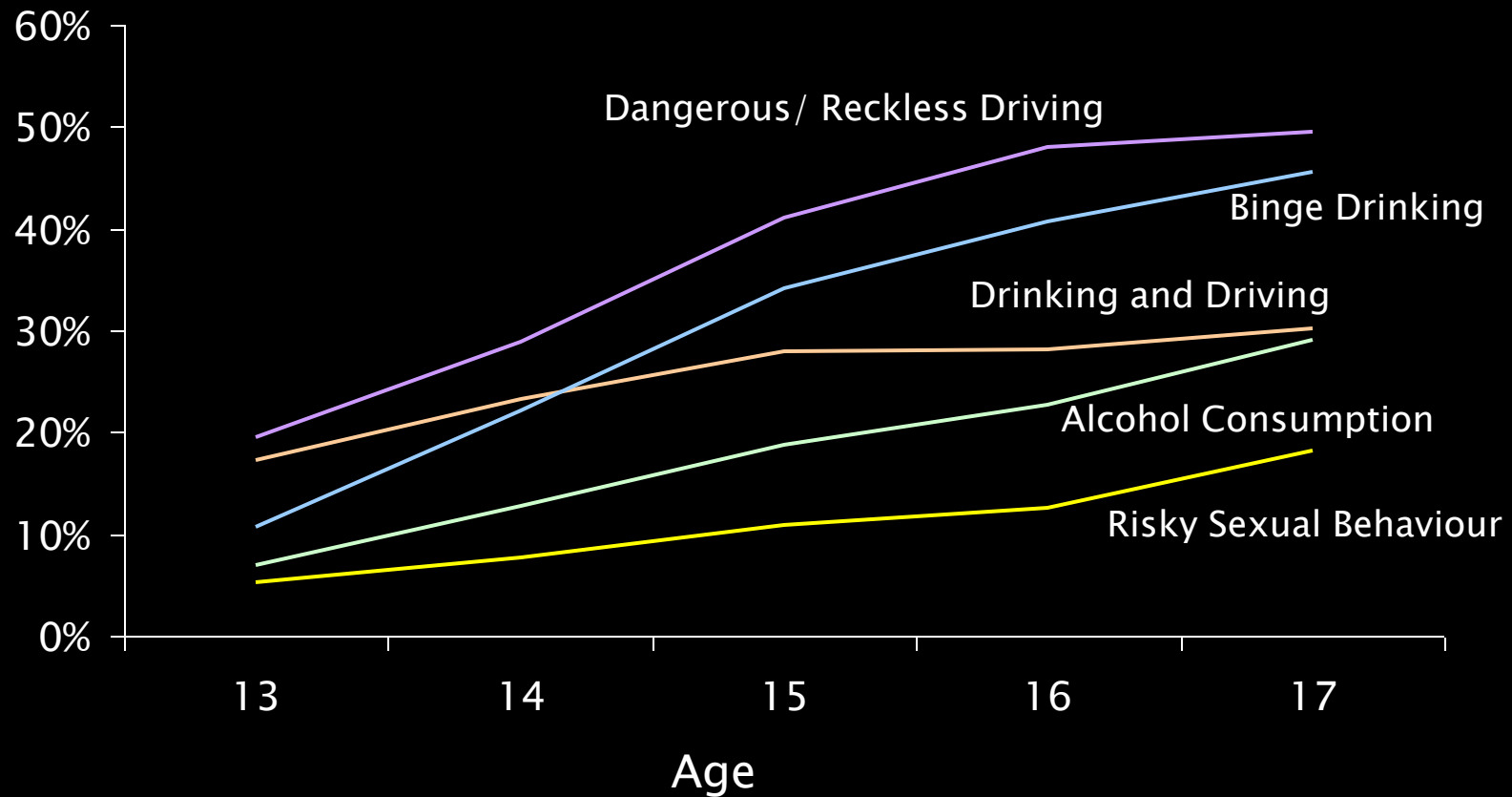
Many of these deaths are preventable

Yet taking risks is also part of growing up and learning independently from parents

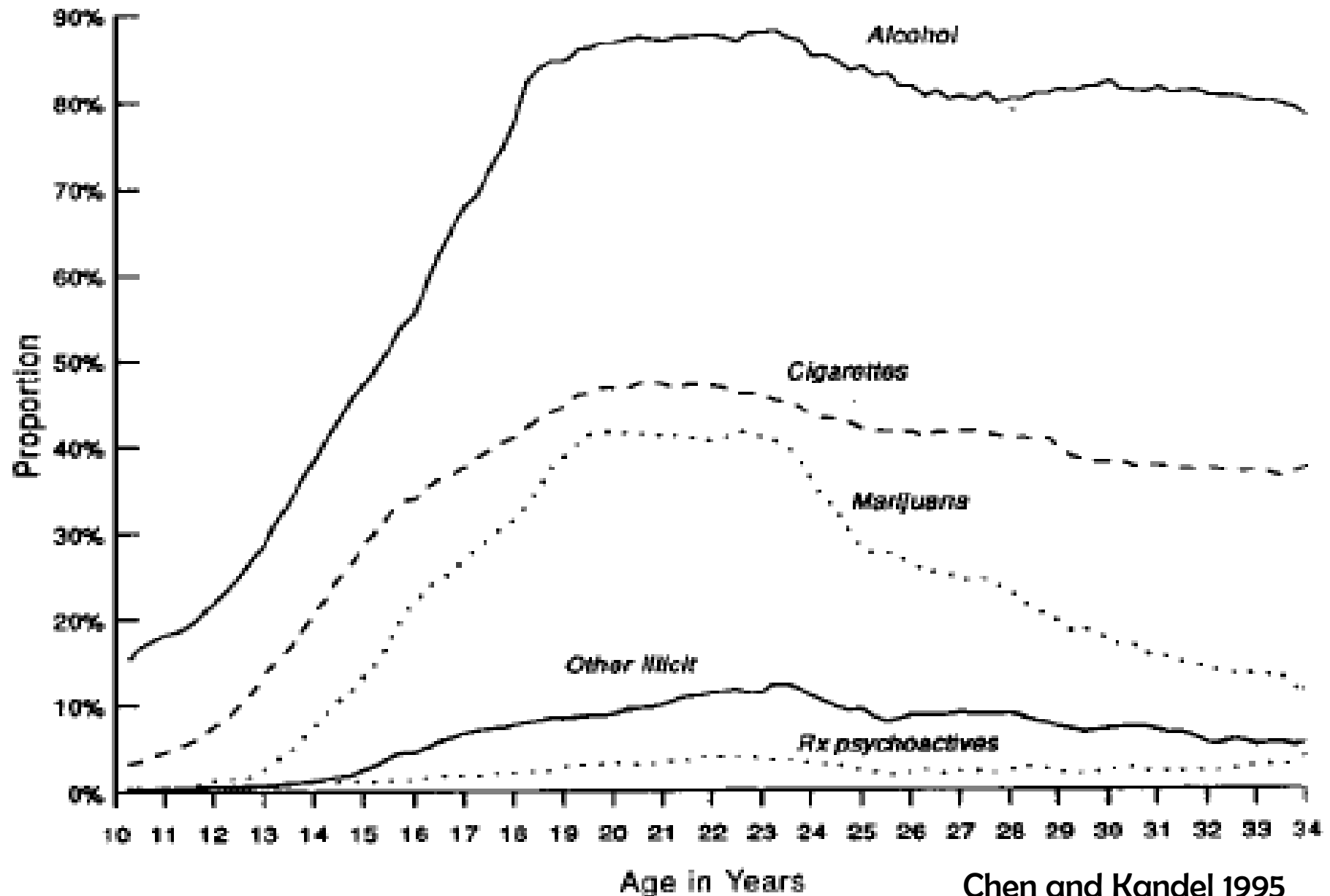
Percentages of students who have had sex



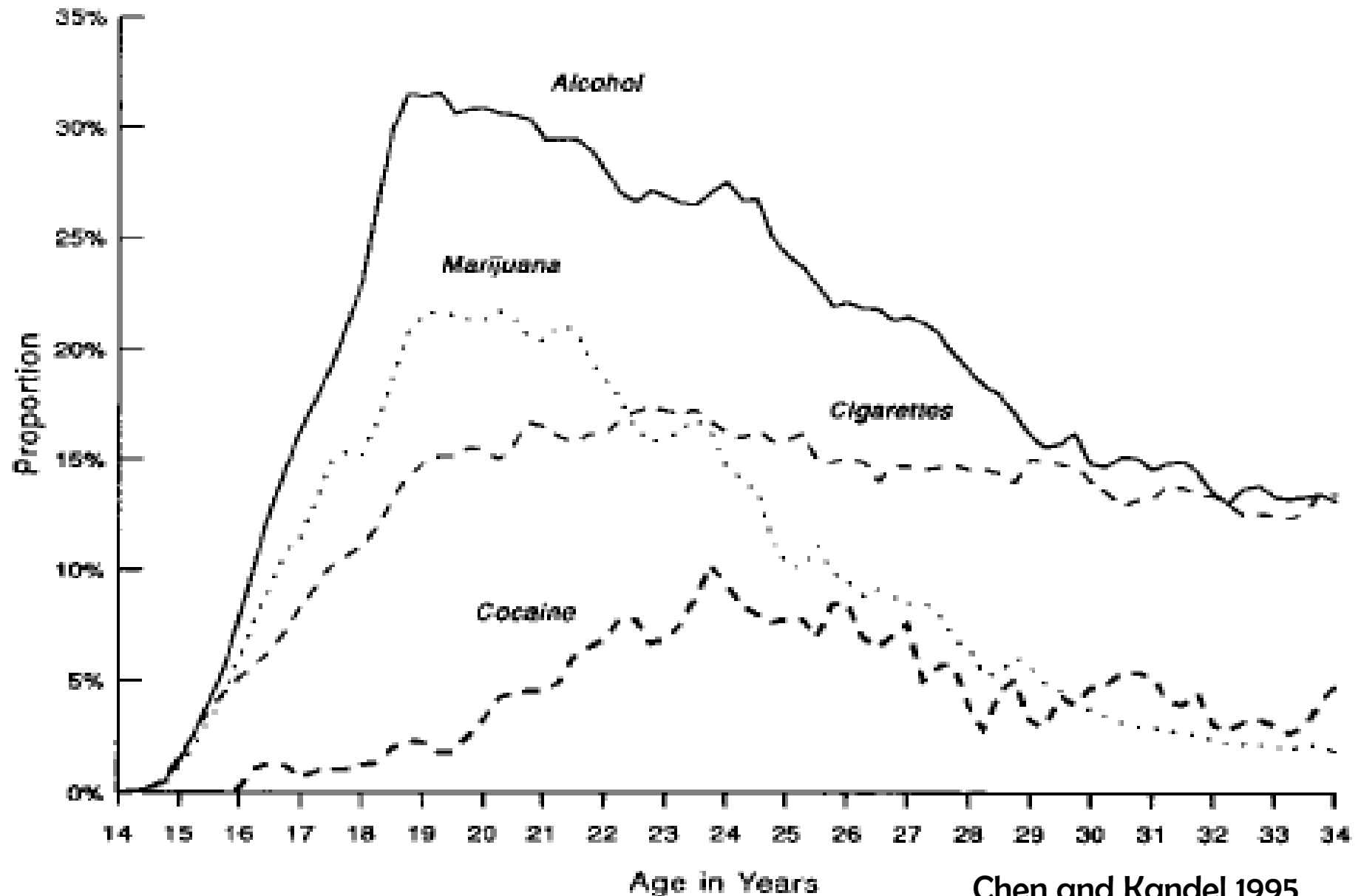
Prevalence of youth health risk behaviours by age



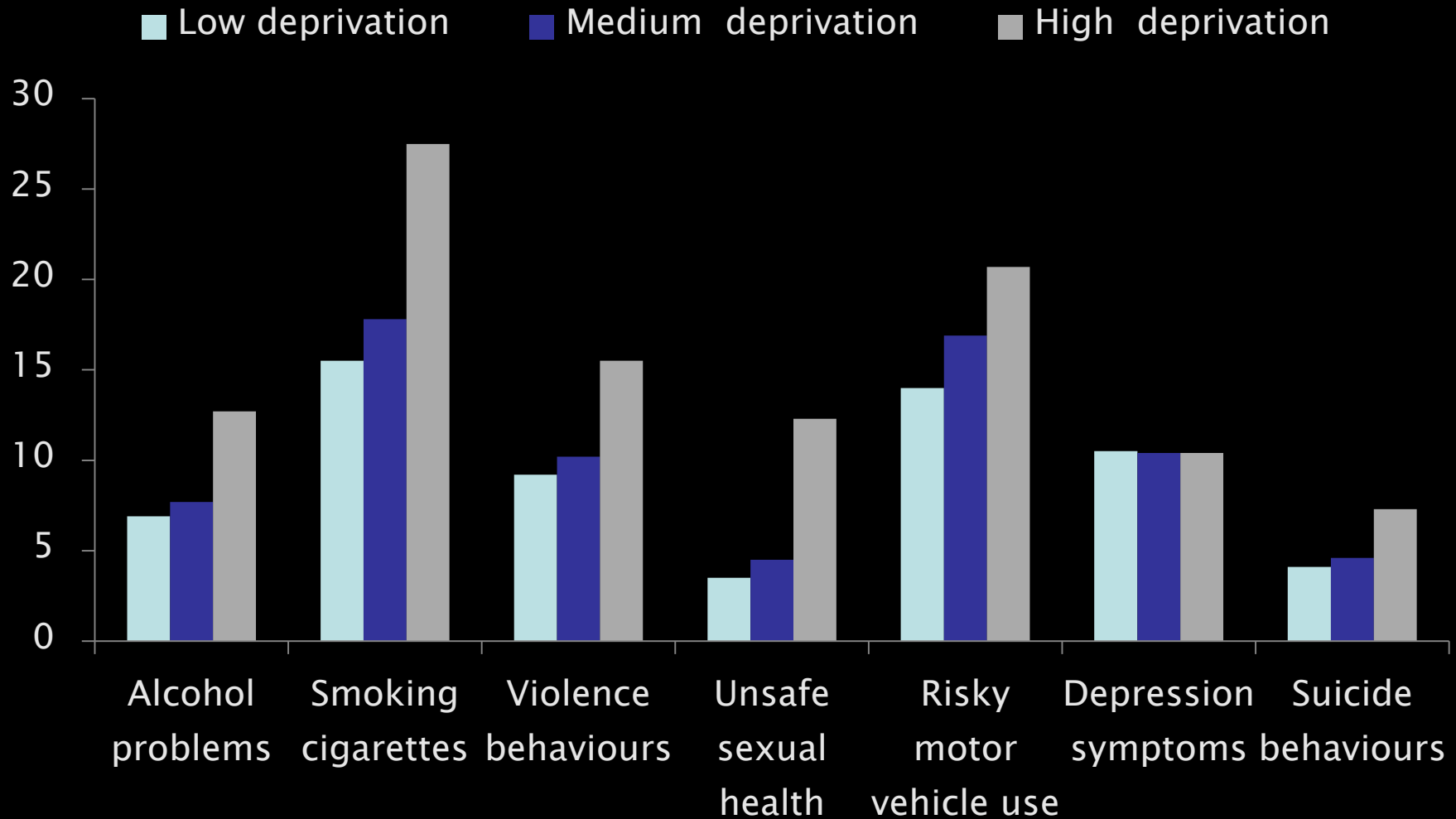
Current monthly use of alcohol, cigarettes, marijuana and other illicit drugs



Period of highest use of alcohol, cigarettes, marijuana and other illicit drugs



Social determinants of Youth Health



Myths about risk taking during adolescence

- Adolescents do not perceive themselves to be invulnerable and perceived vulnerability declines with age
- Adolescence typically overestimate risks such as HIV and cancer
- Young people demonstrate better competence in reasoning than adults

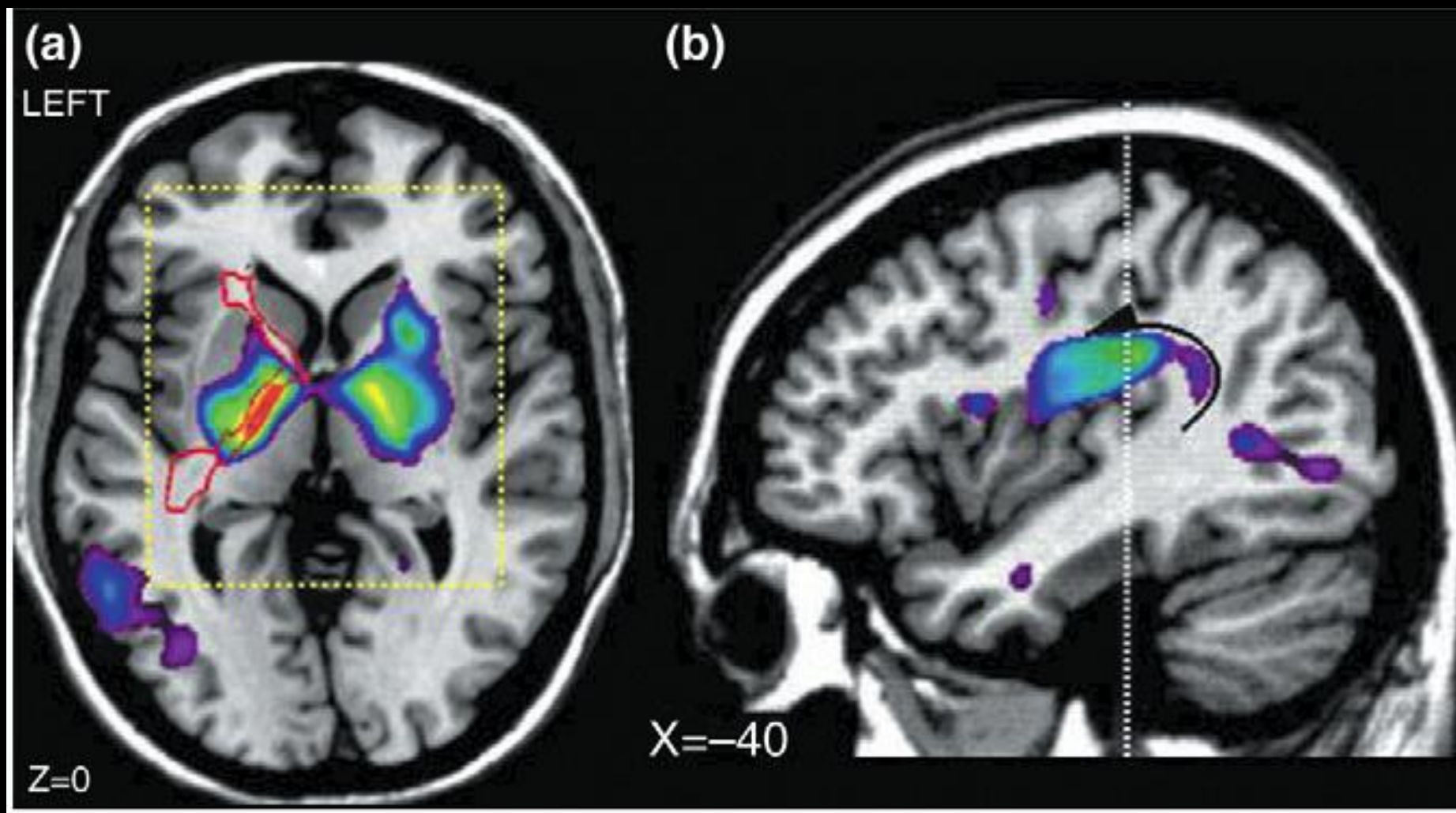
BRAIN DEVELOPMENT

White matter changes during adolescence

Findings from the NIMH data set of a combination of cross sectional (161 subjects) and longitudinal (329 scans)

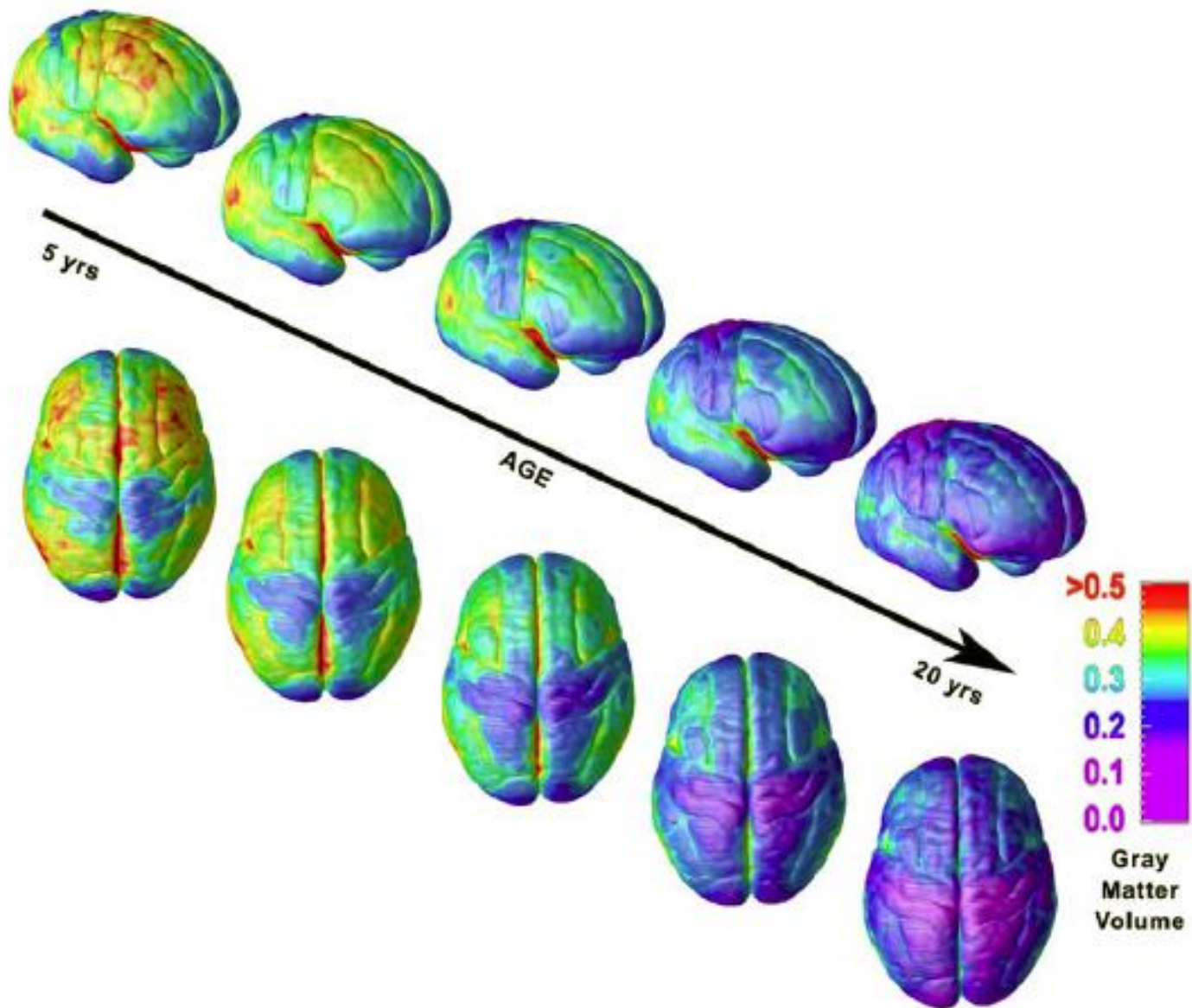
Steady increase in overall volume of white matter throughout the studies age range (4 to 21 years)

Some regional variations: e.g. internal capsule, left arcuate fasciculus

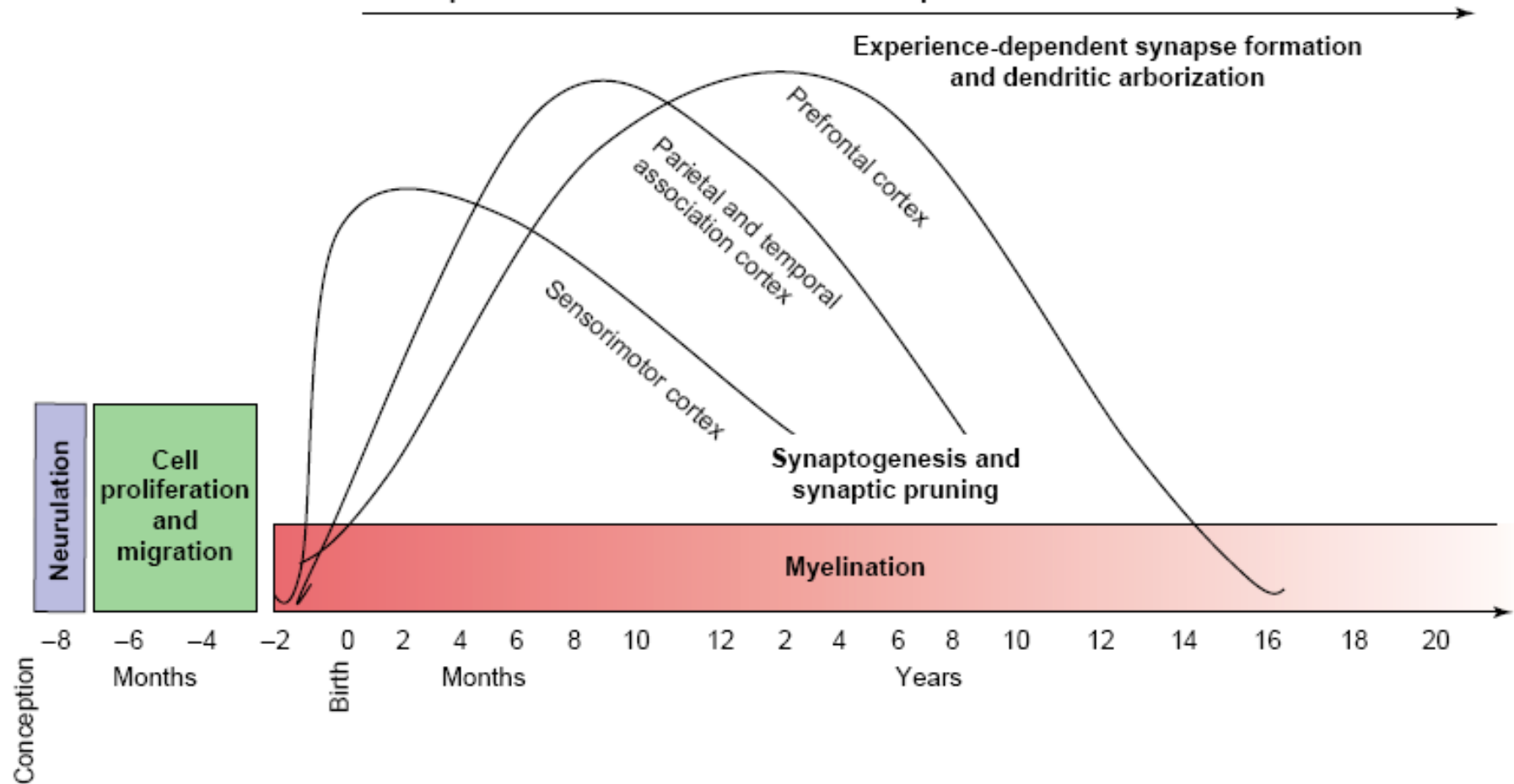


Grey matter changes during adolescence

- Subtle but significant decrease in grey matter volume in the frontal and parietal lobes during adolescence
- Loss of GM density was inversely correlated with local brain growth
- The frontal cortex loss of GM density continues well into adulthood (23– 30 years)
- While these changes have been attributed to synaptic pruning they could also reflect late myelination of white matter



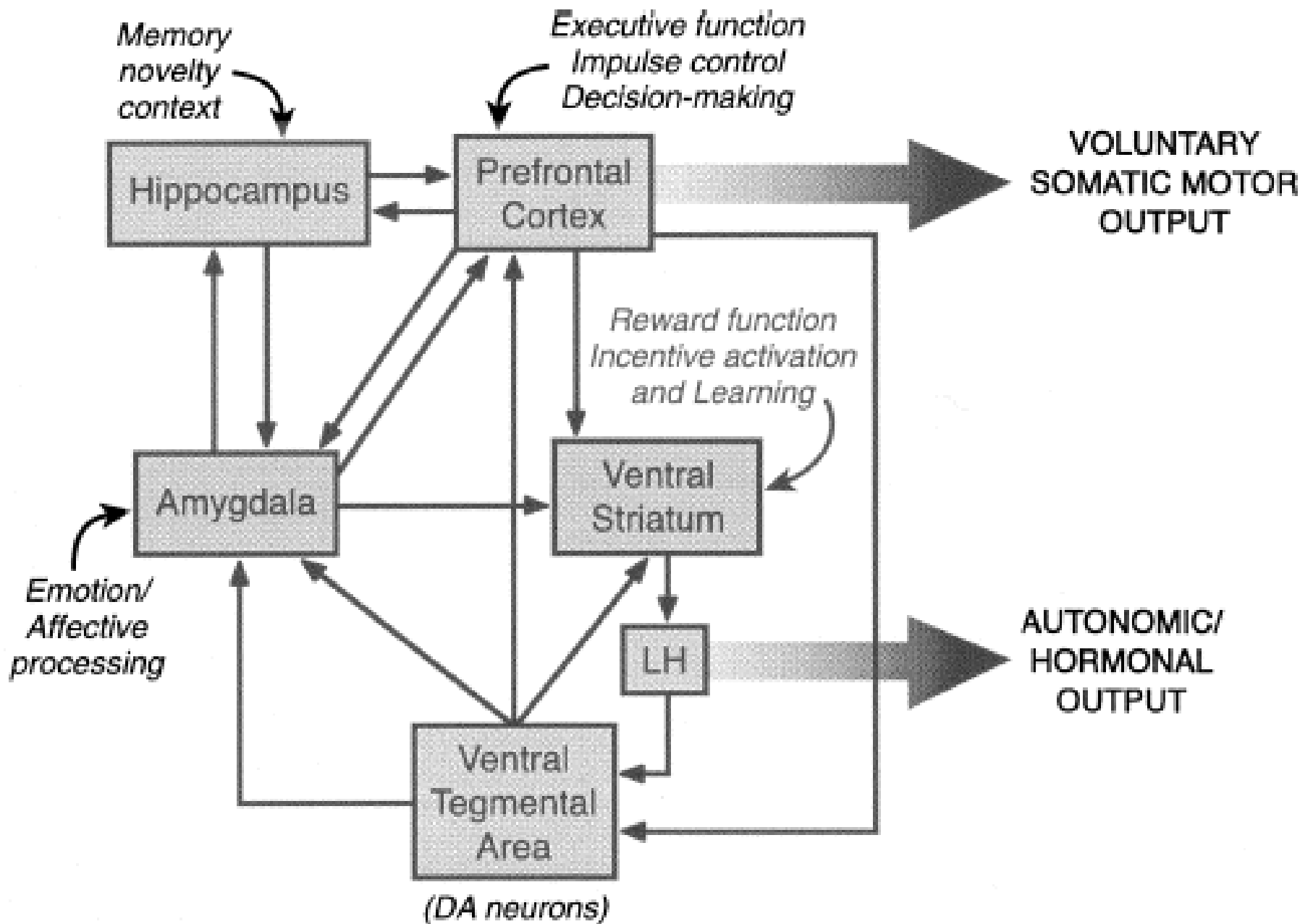
Developmental course of human brain development



TRENDS in Cognitive Sciences

fMRI findings during adolescence

- Visual-spatial working memory tasks showed age-related increases in BOLD signal in the prefrontal and parietal cortex
- Response inhibition tasks showed similar regional age-related changes in BOLD signal
- Social cognition tasks such as recognising facial expressions show age related changes in BOLD signal in the amygdala with adolescents relatively poorer at recognising sad faces



Brain development in adolescence

Growing evidence that brain development continues through adolescence

Particularly regions of the brain that are key to regulation of behaviour and emotion and to the perception and evaluation of risk and reward

Specific developments in the prefrontal cortex

- continued myelination of nerve fibers with increased connectivity with other areas of the brain
- significant and localised pruning (especially frontal regions)

Brain processes

- Use it or lose it
- Plasticity
- Sensitive periods

Learning and memory

- Working memory
- Declarative memory
- Procedure learning
- Conditioned learning

→ interaction with emotion

Eg. ADHD, anxiety

Attachment

- Animal studies have demonstrated the sensitive periods ie imprinting
- Disruption in early attachment can exert lifelong effects on social competence and mental health

Eg. Borderline personality disorders

Social relatedness

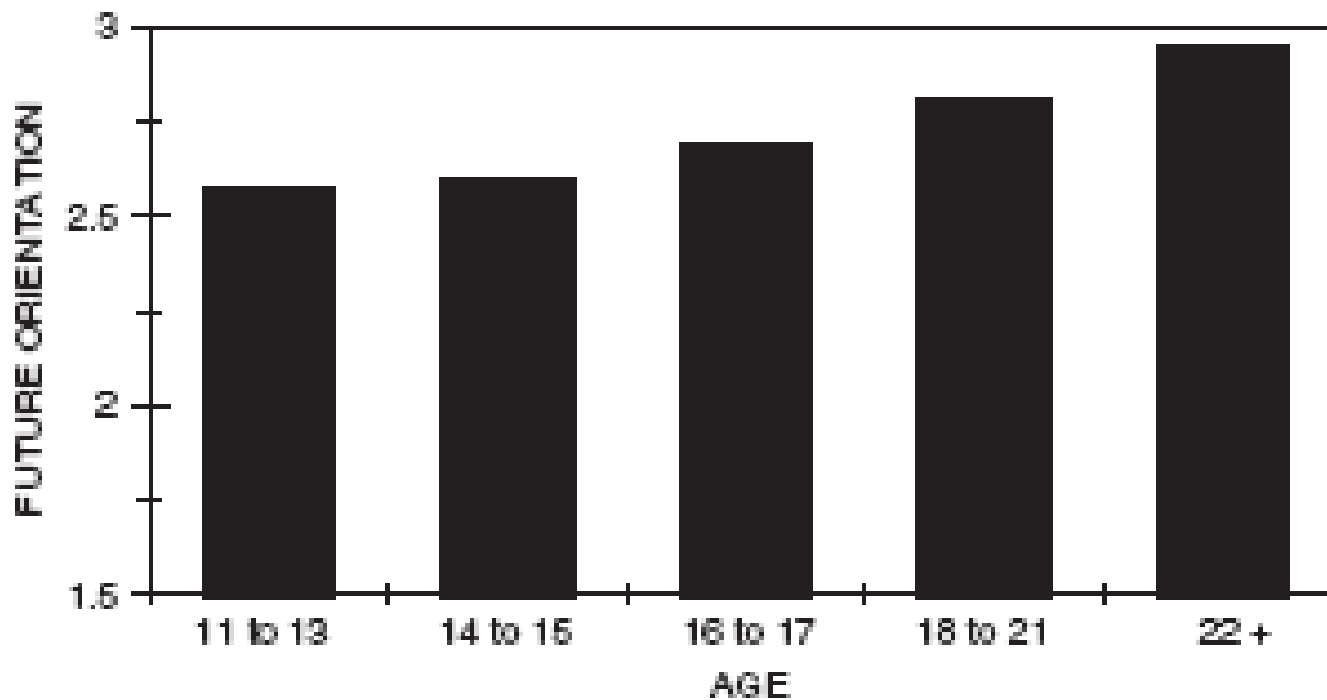
Includes – processing of social stimuli, imitation and perspective taking, emotions induced by social interactions and awareness of self and others

- Processing social stimuli and understanding one's own and others' intentional states –> “theory of mind”
- Social relations are an essential component of mental health

- Self-regulatory control

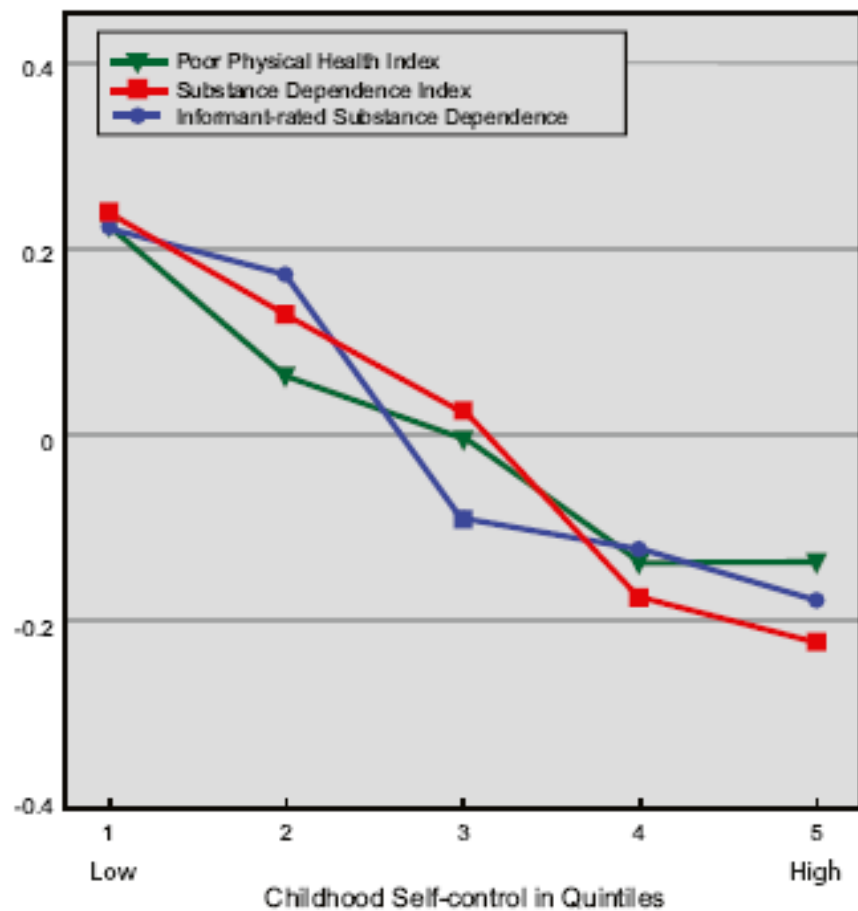
- The capacity to weigh prospects for short-term gain against long-term outcomes
- Includes skills such as cognitive reappraisal
- Regions of the brain: widespread regions of the cortex and subcortex
- Ability increases with age

I would rather save my money for a rainy day than
spend it now on something fun

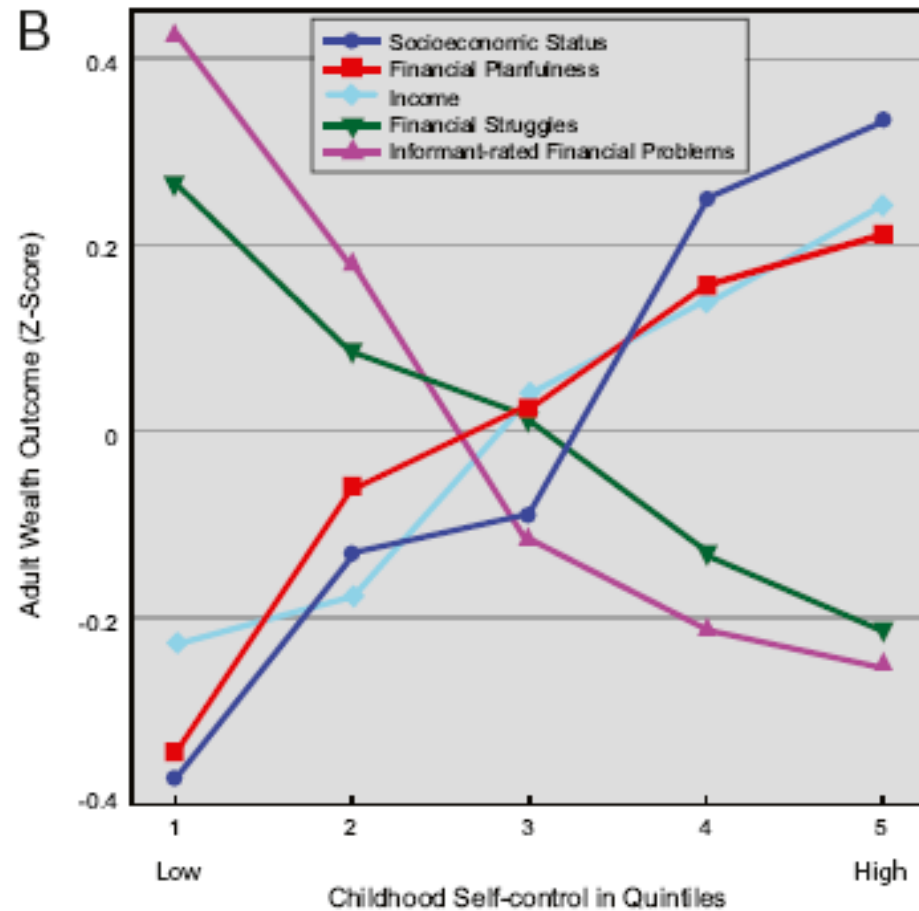


Grisso 2003 in Reyna and Farley

A

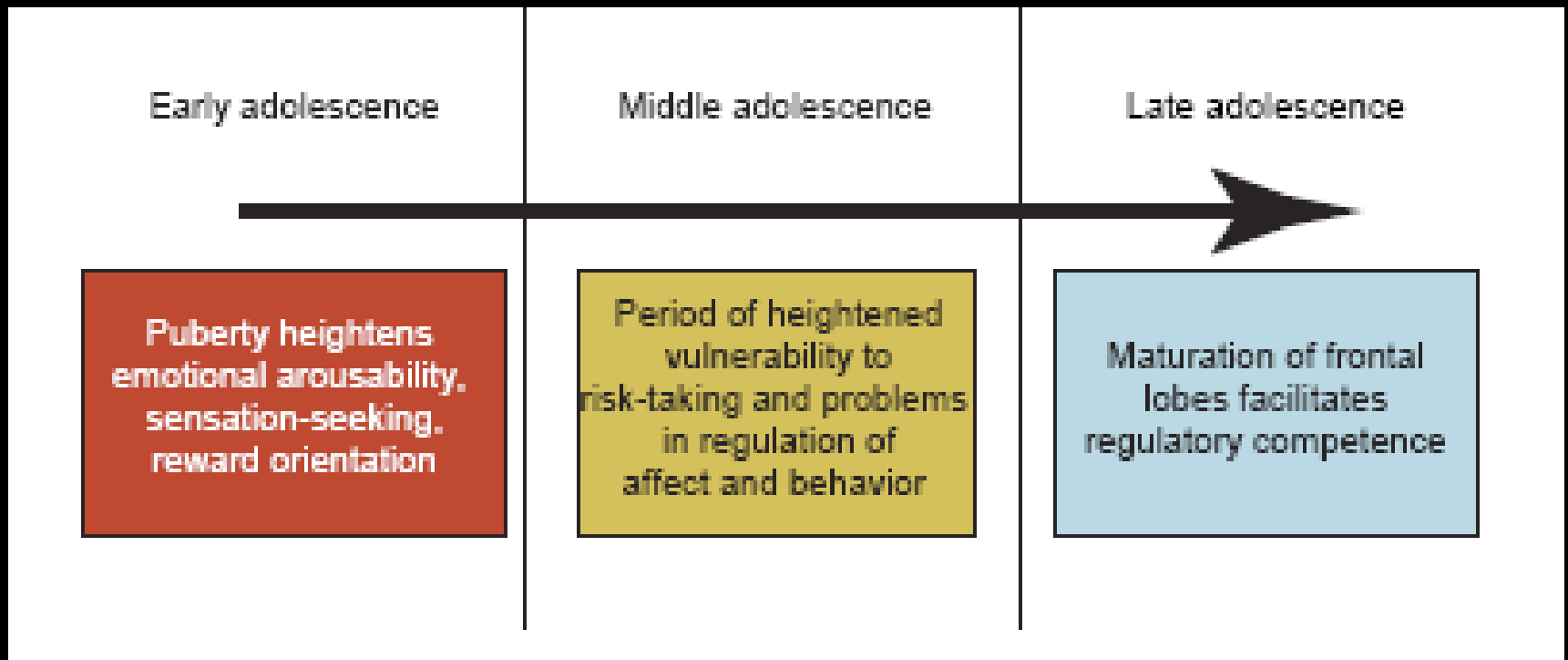


B



Moffitt 2011

Brain development in adolescence



Concrete → Formal Operational Thought

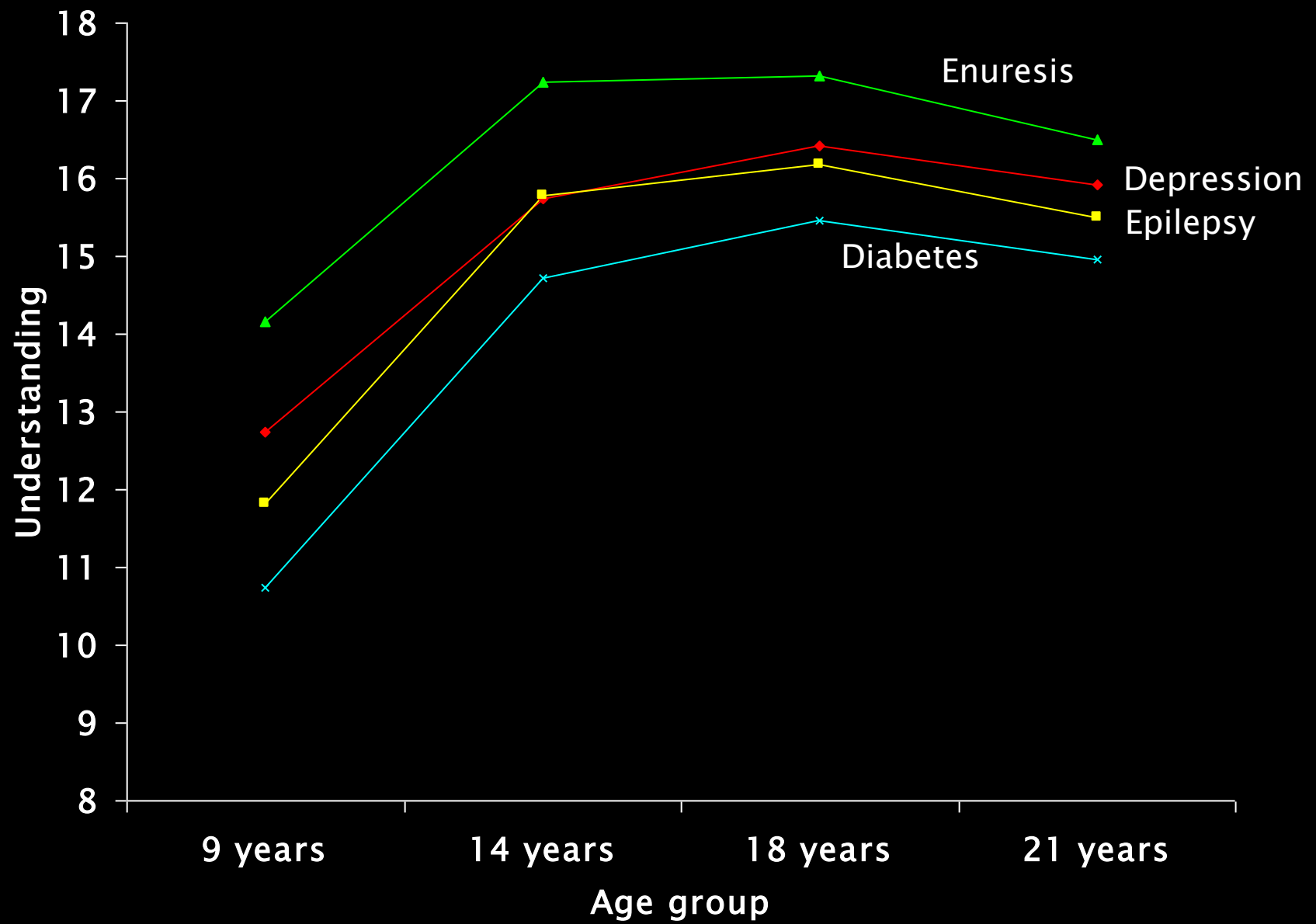
The ability to reason hypothetically

The ability to think about thinking

The ability to plan ahead

The ability to think beyond conventional limits

Cole and Cole 1993



Weithorn 1982

Cognitive development

Cognitive development = attainment of a more fully conscious, self-directed and self regulating mind

Achieved through the assembly of an advanced 'executive suite' of capabilities

→→ This represents a major shift away from 'core mechanisms' towards an integrated account

This has been supported by major advances in the neurosciences, including comparative neuroanatomy

Affect and cognition

There is evidence that pubertal development directly influences the developmental changes of arousal, motivation and emotion

Increases in sensation seeking are influenced by puberty not chronological age (Martin et al, 2002)

Increased sensitivity to social status is linked to increased levels of reproductive hormones

Pubertal development directly influences the development of romantic interest and sexual motivation (Neeman 1995)

Do adolescents make rational decisions?

- What does it mean to make rational decisions?
 - Coherent vs correspondence (internally consistent vs external/ outcome)
- Short term vs long term goals
- Are adolescents able to make coherent decisions?
- Current theories emphasize dual processes:
 - Fast, associative and intuitive
 - Slow, deliberate and analytical

Do adolescents make rational decisions?

Rational models

- Behavioural
- Health–belief
- Protection–motivation
- Theory of planned behaviour
- Problem–solving

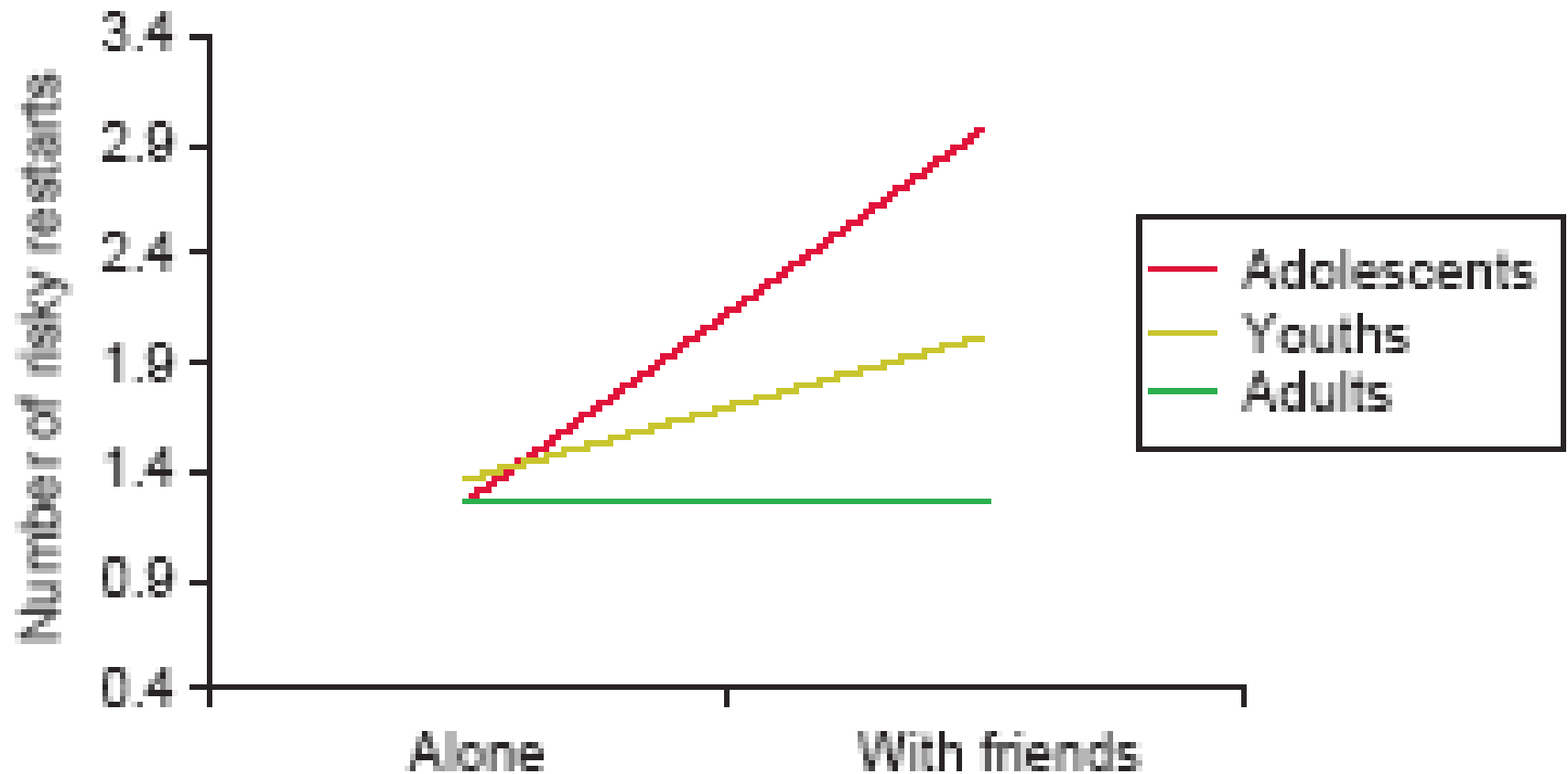
Intuitive and reactive models

- Prototype/willingness
- Fuzzy–trace

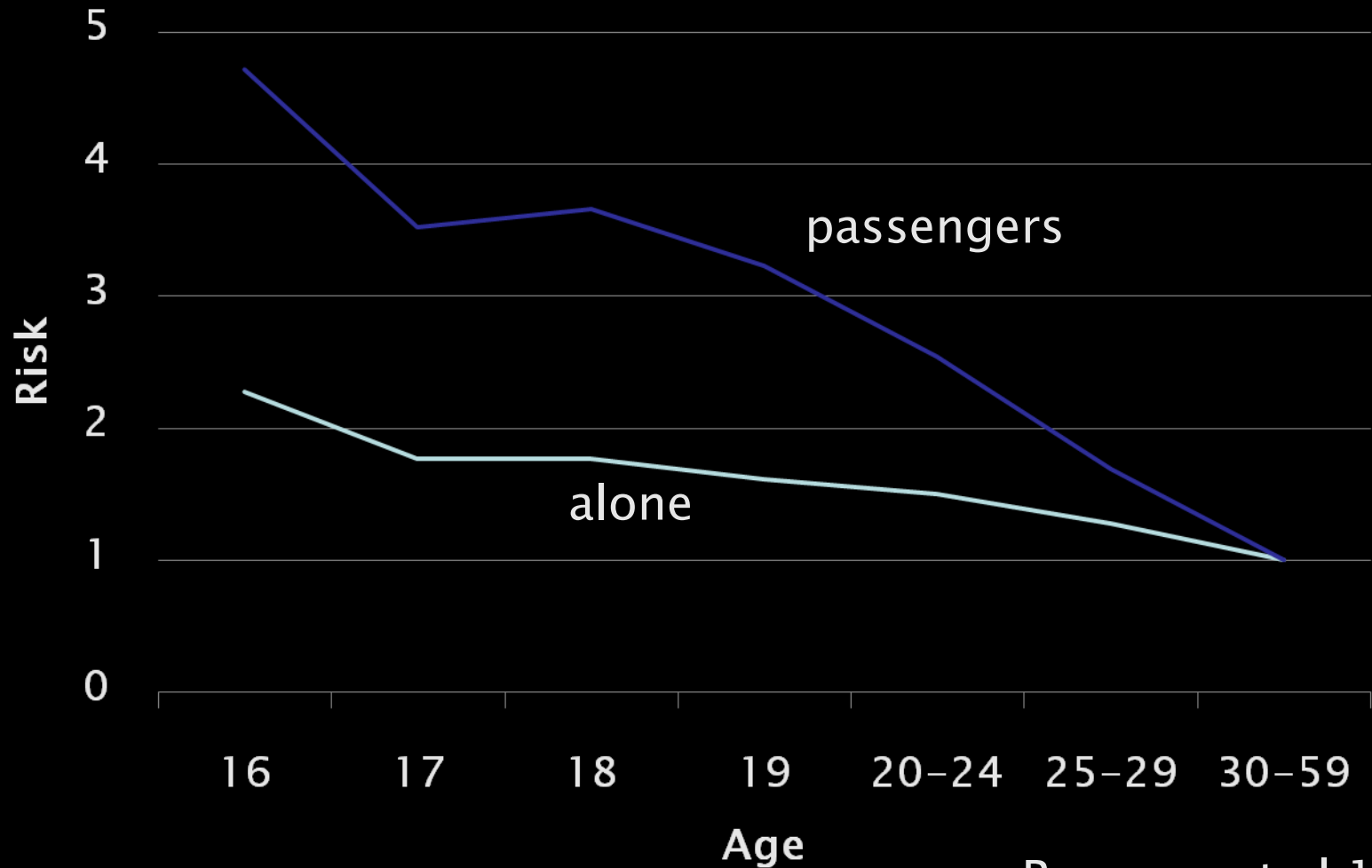
Fuzzy-trace models

- Behaviour is governed by ‘fuzzy’ gist representations of experiences
 - Including people, object and events
 - multiple mental representations of experiences
 - Covers a range of representations from verbatim to other ‘gist’ with higher order values, meaning and culture
- Explain and behaviours that are intuitive and ‘expert’
- Increases with age, experience and expertise
- With increasing ‘gist’ based decision making the tendency to take risks decreases

Cognitive development in context

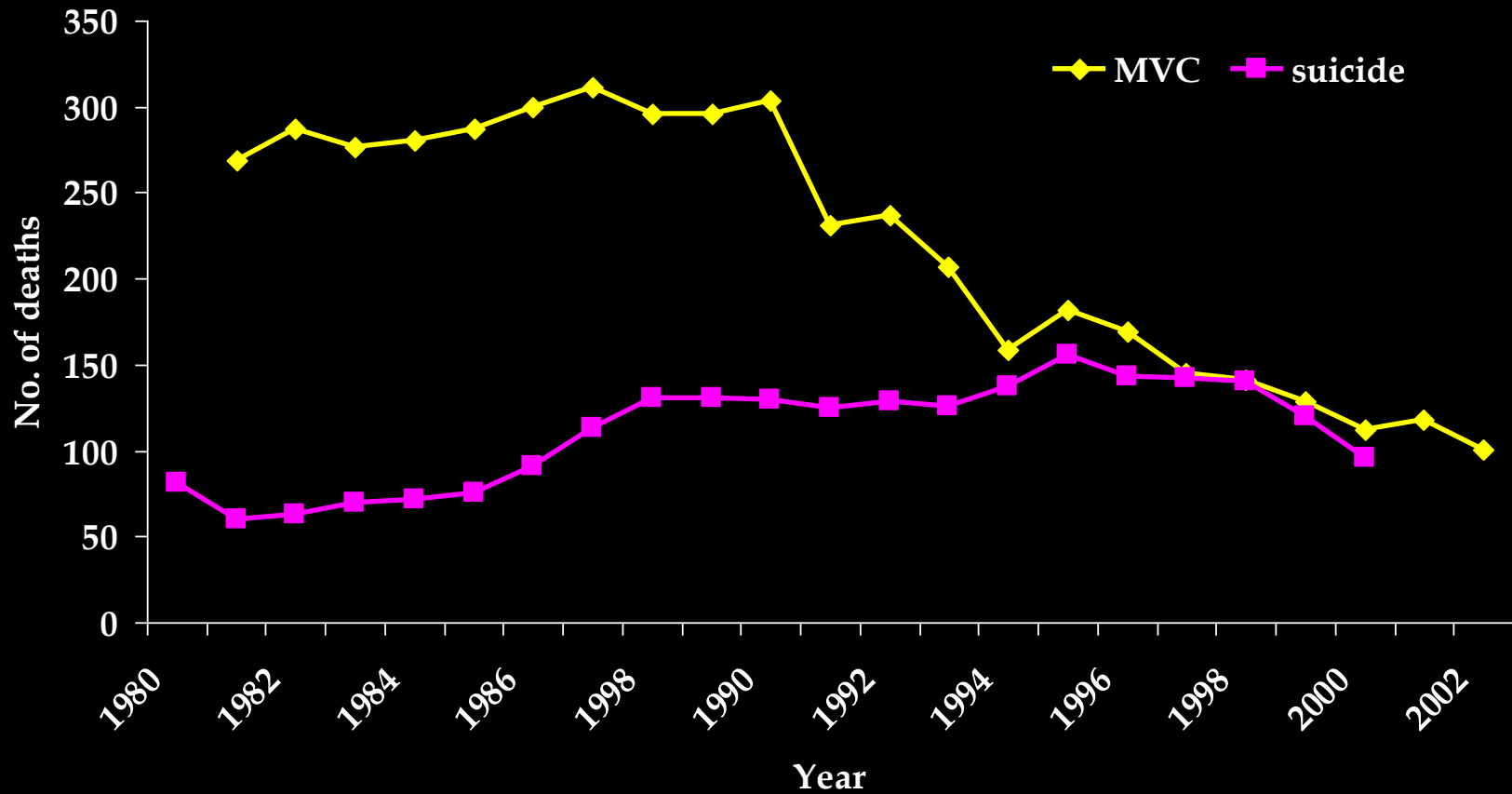


Crash Risk by driving age



Preusser et al 1998

Suicide and MVC youth deaths 1980-2000



Implications

Adolescents engage in risky behaviours despite knowing the risks



Knowledge alone is not sufficient

Cognitive development involves a range of capabilities, skills and development



Efforts to enhance adolescent development should be strengths based and teach competencies

Risk behaviours are expressed within a social and environment context



Interventions need to be ecological

Cognitive decision making involves affective processes or 'gut feelings'



Peers, families and communities are protective when they are prosocial and connected to the adolescent

Implications for clinicians

- Two-prong approaches
 - Information and well through reasons for reducing risky behaviours
 - Reducing opportunities and availability of 'risks'
- Monitoring and supervision of younger adolescents
- Encourage positive self-representations or 'gists'
- Develop an intuitive understanding of risky behaviours and their consequences
- Provide frequent reminders
- practice at recognising environmental cues that signal danger

