



Youth, addiction, and the brain

**The Collaborative
For research and training in youth health and
development**

Lecture Series 2009

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- ◆ *“Why are youth prone to becoming addicted?”*
- ◆ *First a definition of youth will be outlined, followed by a discussion merging three strands:*
 - 1. information about brain function in the aetiology of addiction;*
 - 2. neurodevelopmental knowledge in the transition from childhood to adulthood; and*
 - 3. the influence of common comorbid problems, particularly major depression and conduct disorder.*

What is a 'young person'?

‘Young person’

- ◆ A euphemistic term for “adolescent”
- ◆ The developmental stage between childhood and adulthood
- ◆ Biological initiation - puberty
- ◆ Social termination - psychosocial independence
- ◆ Or so I thought 10 years ago!

Youth Specialty Service survey (1994)

Q: “What would you prefer to be called? - adolescent, teenager, young person or youth”

A: youth > teenager > adolescent > young person

How old is a 'young person'?

11 - 17 years - Multisystemic Therapy

13 - 18 years - Youth Specialty Service

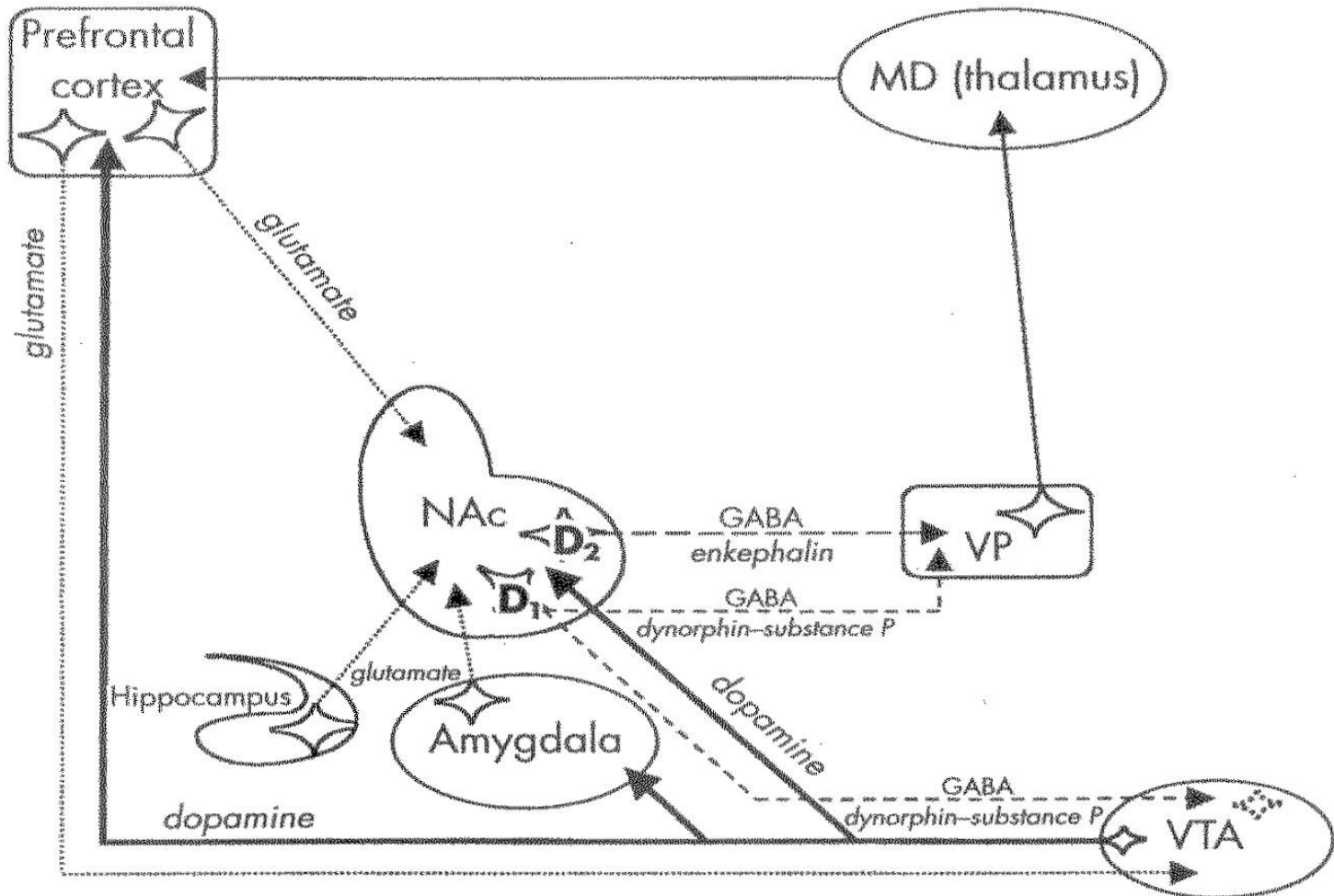
14 - 18 years - Odyssey Youth Service

10 - 25 years - Youth Health Centre

*Is some knowledge about
the brain useful?*

Neural circuitry of addiction

(Hammer 2002)



A Professor has an epiphany

Harlene Hayne (2008)

Professor of Developmental Psychology

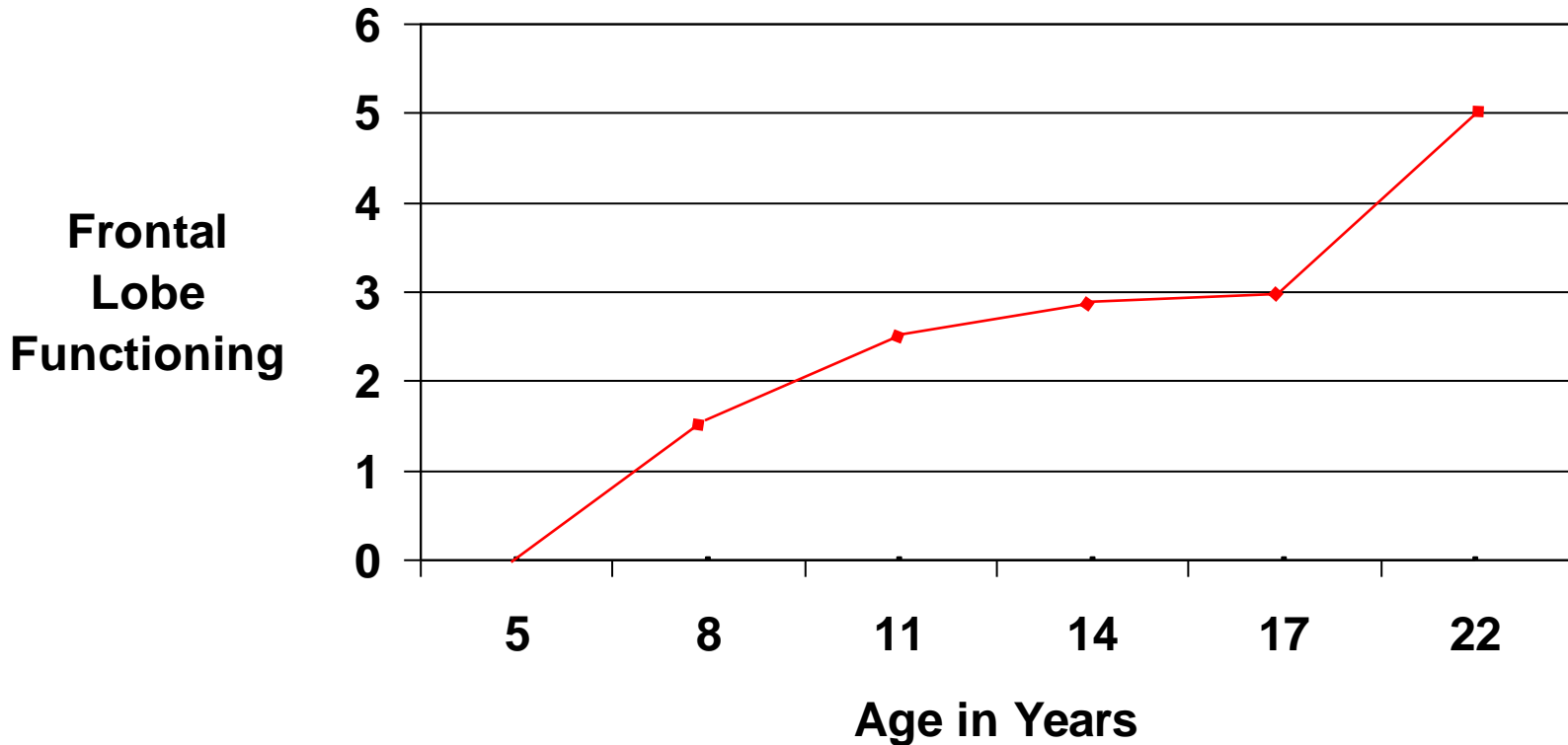
- ◆ “As a university teacher, the finding that the brain continues to mature during the period when many students attend university was a major epiphany... the reality is they are not adults...”
- ◆ “...between the ages 18 and 22 years, a large amount of brain development occurs in the prefrontal cortex. This is the part of the brain that helps to control attention span, perseverance, planning, judgement, impulsivity and self-monitoring – is this ringing any bells for parents? ”
- ◆ “We don’t even have a name for people in this age group.”

Adolescents think with a more primitive part of their brain to adults

(Yurgelun-Todd et al 2004)

- ◆ Group of normal adolescents aged 11-17 years were compared with a similar group of adults
- ◆ Cognitive tasks while being scanned by functional magnetic resonance imaging (fMRI)
- ◆ Shown pictures of people with fearful expressions and asked to say what emotion was being expressed
- ◆ Adults showed brain activity primarily in their frontal lobes while adolescents were primarily using amygdala and made more mistakes
- ◆ Older adolescents answered correctly more often and exhibited a progressive shift of brain activity from the amygdala to the frontal lobes

Planning ability in children and adolescents



(Romine & Reynolds 2005)

Prefrontal cortex size in youth with alcohol use disorders

- ◆ 42 youth aged 13 – 21 years
 - 14 alcohol use disorders
 - 28 healthy controls
- ◆ MRI scan to measure the size of the prefrontal cortex
- ◆ Those with alcohol use disorders had smaller prefrontal cortex compared with controls
- ◆ Was it pre-existent (to heavy binge drinking) or as a result of heavy binge drinking? Was the presence of co-morbid conditions a confounder?

Identity formation

“The world of leisure (friends and “time out”) is not a vehicle for displaying youthful identity, but is the cultural milieu in which young people actually create their personal and social identities”

(Hollands 1995)

Taking calculated risks is very different from being “at risk”

Illegal Leisure: The normalization of adolescent recreational drug use

(Parker, Aldridge and Measham 1998)

- ◆ Being “drugwise” is one of the extra responsibilities which modern adolescents face because they must grow up in a world in which drugs are an everyday reality
- ◆ Those adults who are unable to comprehend how much more complicated growing up has become are those who create the drama as moral panics
- ◆ Parents’ conceptions of risk and danger are to adolescents’ minds so misinformed and exaggerated that adolescents regard lying as an act of concern for their elders’ mental health



“Emerging Adulthood” (age 18-25 transition)

“Because marriage and parenthood are delayed until the mid-twenties or late twenties for most people, it is no longer normative for the late teens and early twenties to be a time of entering and settling into long-term adult roles.”

Jeffrey Jensen Arnett (2000)

Do you feel that you have reached adulthood?

(n=519)

	12-17 years	18-25 years	26-35 years
Yes	18%	39%	65%
No	37%	4%	2%
Yes and No	45%	57%	33%

(Arnett 2000)

Frontal lobe maturation in humans occurs by what age?

- a. 15 years - occasional
- b. 17 years - some
- c. 19 years - many
- d. 21 years - many more
- e. 23 years - most

Conclusion 1

“Adolescence” as a term may have served us well in the past to describes the transition from childhood to adulthood (puberty to about 18 years) but in the modern world there is an extension to that transition (18 – 25 years) perhaps best described as “emerging adulthood”

“Youth” is a useful term to describes the whole process

Youth = Adolescence + Emerging Adulthood

Conclusion 2

Neurobiological discovery over the past 10 years indicates that prefrontal cortex maturity

- control of attention span, perseverance, planning, judgement, impulsivity and self-monitoring -

does not end at about 18 years in humans but extends into the early 20s; if not 25 years, especially in young men.

Can you predict which 'young people' will become addicted and commit crime?

Four main vulnerability factors

- ◆ Family history of addiction
- ◆ Major enjoyment of the drug without experiencing a “hangover”
- ◆ Presence of conduct disorder
- ◆ Presence of other “comorbidity”

Generic risk factors for childhood conduct problems

Child Conduct Problems



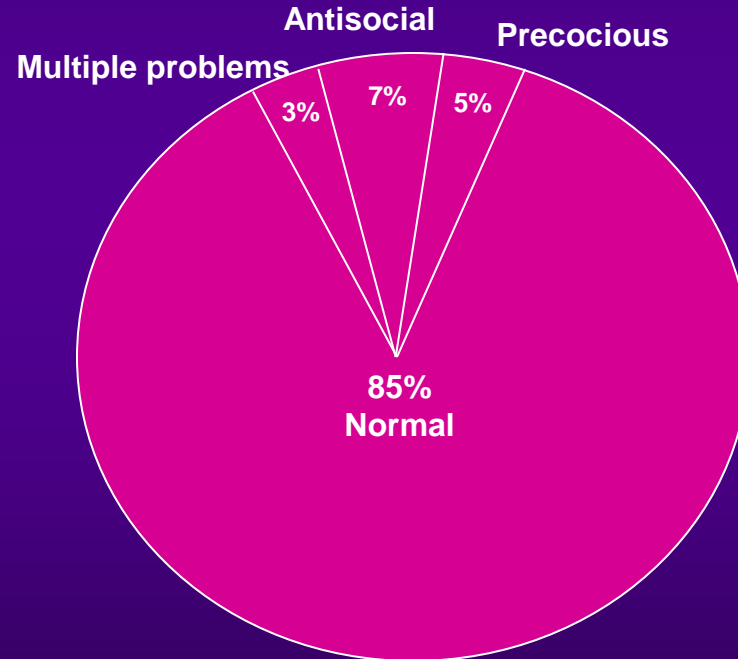
Source: Fergusson 2004

Common comorbid psychiatric disorders in patients presenting to NZ outpatient services (for adults and “emerging adults”)

	% with disorder
Any comorbid Axis I disorder	74
Social phobia	31
Post-traumatic stress disorder	31
Major depression	34
Antisocial personality disorder	27

(Adamson et al 2006)

Four major groupings of 15 year old adolescents



Based on latent class modelling of five key variables sexual activity, alcohol abuse, cannabis use, conduct disorder and police contact

(Fergusson et al 1994)

Prefrontal cortex dysfunction in antisocial adolescents

- ◆ 42 adolescents 10-17 years
 - 14 conduct disorder only
 - 14 ADHD only
 - 14 healthy controls
- ◆ fMRI during a psychological reversal test
- ◆ Those with conduct disorder showed abnormal responses within the ventromedial prefrontal cortex compared with ADHD and control subjects

Abnormalities in prefrontal cortex in major depression

- ◆ There are brain abnormalities (including in the prefrontal cortex) in a depressed person that go away with remission of symptoms
- ◆ There are also other brain abnormalities (medial and orbital prefrontal cortex) that are present even when the person is not depressed

Davey et al 2008 (Progress in Brain Research)

Why are 'young people' more likely to become addicted and offend?

1. Adolescents have relatively disconnected prefrontal cortical functioning. They naturally “think” with more immediate exuberance and optimism in contrast to a wider more constraining adult thinking pattern
2. Adolescents are therefore more vulnerable to ‘impulsive’ risky decision making eg drug taking
3. Those adolescents with conduct disorder and/or major depression are further compromised in their brain function, particularly prefrontal cortex (“higher power”)

4. However, adolescents with the constraints of good parents and/or caregivers (“external frontal lobes”) and relative poverty are protected against the temptations of the liberal hedonistic modern world
5. So, adolescents without good parenting are particularly vulnerable, especially if they have conduct disorder and/or major depression
6. Same with “emerging adults” without the constraint of marriage and children, but with the freedom of having independent income and time on their hands, especially if they have conduct disorder and/or major depression