The Adolescent Brain: Implications for Educators and Schools

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The inter-relationship of mental health states: address needs to improve outcomes
The “Evolution” of the Adolescent
Quite Some Time Ago

“I see no hope for the future of our people if they are dependent on the frivolous youth of today, for certainly all youth are reckless beyond words.

When I was a boy we were taught to be discrete and respectful of elders but the present youth are exceedingly wise and impatient of restraint.”

Attributed to Hesiod; 8\textsuperscript{th} Century B.C
And the great philosopher says...

“What is happening to our young people? They disrespect their elders, they disobey their parents. They ignore the law. They riot in the streets inflamed with wild notions. Their morals are decaying. What is to become of them?”

attributed to Plato
Sturm und Drang: the Romantic View

- The Sorrows of Young Werther (Goethe, 1774)
- Chatterton, Shelly, Wordsworth, Coleridge, Keats
- Wagner – Seigfreid the “classic” adolescent
- Rimbaud, Verlaine, Wilde
- The “prototypic” adolescent was full of storm and stress – became the foundation for western arts, culture and even mental health
Adolescence – what do we mean by that?

“Adolescence” – extending over a period of ten years from twelve to fourteen to twenty-one or twenty-five (George Stanley Hall)

“The teens are emotionally unstable and pathic. It is the age of natural inebriation without the need of intoxicants, which made Plato define youth as spiritual drunkenness. It is a natural impulse to experience hot and perfervid psychic states, and is characterized by emotionalism.” (George Stanley Hall)

To be normal in adolescence is itself abnormal (Anna Freud)
National Post: “Ferris the redeemer”
Steve Almond (April 30, 2007)

“Ferris is ... what every teenage guy dreams of being: a raging, narcissistic id who gets away with it all. Cameron is an actual teenager: alienated from his parents. painfully insecure, angry, depressed.”
Canada’s Youth
“The Emerging Millennials”

Project Teen Canada - National Youth Survey

Reginald Bibby

- Values
- Attitudes
- Beliefs
- Behaviour
- Expectations
10 Things we all need to know about Today's Teens

1. They’re decent People
2. They love their friends and music
3. Their tech toys are new means to old ends
4. They’ve said goodbye to the monoculture
5. Their ties with parents are the best in decades
10 Things we all need to know about Today's Teens

6. They enjoy school – strain and all
7. Their quality of life is a solid upgrade
8. They’re into relationships more then sex
9. They’re morally flexible, but some things are no-no’s
10. They’re post-religious and pre-spiritual
Canadian Central Truths

#1 Value = Personal Freedom

#1 Worry = Time

Canadian teens view Canada as a place to have:
A good home
Lasting marriage
Better life than their parents
Values

Most important values
➤ > 80% teens say honesty and trust

Greatest Influence
➤ 8/10 said fathers, 9/10 said mothers
➤ 90% by the way they were brought up

Parent-child relationship
➤ >70% teens get enjoyment from parents
The Net Generation

Faster more demanding society where being over-extended is trendy – MORE TIME!

Prefer Interactive media vs. broadcast media

Multi-tasking media

Connected, engaged and engaging
The Human Brain: A Brief Tour

- Brain activity controls everything from heart rate and sexual function to complex cognitive activities that we believe are quintessentially human (thinking, speaking, and creating works of art). Organ of adaptation, exploration, procreation and civilization.

- Contains an estimated 100 billion nerve cells - more cells than there are stars in the milky way galaxy

- Contains 10 to 50 times as many glial cells (nourishment, mechanical support, myelination, blood-brain barrier etc...)

- Contains > 100 trillion synapses

- 7% of our genome is dedicated to the working of our synapses
The Human Brain: understanding thru study

Capability to understand limited historically by technology

Non-science; pseudo-science; science

Carry our myths with us – in our brain: eg: phrenology; ethical reasoning; etc.

The brain is the only entity that is engaged in understanding itself!
The Human Brain: A Brief Tour

Modular organ with regional specializations: combined functionalities

Protracted development (fundamental importance of the “adolescent years”)

Genetically programmed but sculpted by the environment: PLASTICITY (thru life)

We are what our Brain is: individually and collectively
“The mind is what the brain does”
Adolescent brain development can be considered in three intersecting processes:

- **Proliferation** (rapid growth of brain matter and the formation of new connections within the brain)

- **Pruning** (cutting away of unused or unimportant connections)

- **Myelination** (insulating of brain pathways to make them faster and more stable)

(Sowell et al., 1999; Sowell et al., 2001)
OUTCOME

Through these three processes (genetically determined AND sculpted by the environment, past and present) the teen brain becomes:

• More ADAPTIVE
• More EXPLORATORY
• PROCREATION READY (dopamine systems)
• READY FOR CIVILIZATION TO DEVELOP
Neurodevelopment and Adolescence

Brain changes peri-puberty lead to enhanced emotional instability, sleep/wake/arousal regulation changes, appetite changes, increased risk/novelty taking and sensation seeking.

Brain frontal lobe development takes time:

"TURBO CHARGED CAR WITH AN INEXPERIENCED DRIVER"
Normal Teen Brain Development:

Lenroot & Giedd (2006)
Sleep is very important during periods of brain maturation!

- Phase shift – lark to owl
- Increased sleep need
- Increased daytime sleepiness
- Less total sleep time

While many teenagers get less sleep than younger children, there is actually an increase in sleep needs during the teenage years! – (about 9+ hours/night) sleep debt
This can be problematic, because adequate sleep is **essential for learning and memory development.**
Is it the weekend yet?!

During the **summer**, teens tend to get the **same** amount of sleep on weekends and weekdays.

But during the **school year**, teens get **much less** sleep on school days, and they compensate for this on weekends!

Hansen et al. (2005)
The JET-LAGGED teen?!

On average, teenagers sleep about 2 hours more per night on weekends than on weekdays.

This is equivalent to TWO time zones! AND... they do this every week!
Studies show that...

The reaction times of adolescents are much better in the **afternoon** than they are in the **morning** (lower means better)!

And that students perform **better** in the afternoon than in the morning.

Hansen et al. (2005)
In one survey of Canadian high school students:

- 70% reported getting less than 8.5 hrs of sleep per night.
- 58-68% reported being “really sleepy” between 8 and 10 a.m.
So, scheduling all of the important tests first thing in the morning doesn’t make much sense!
Teenagers need more sleep than adults, so many teenagers are chronically sleep deprived.
No wonder they are late for school, sleepy at school, reluctant to be involved in extracurricular activities and **cranky**!
Teenagers show *dramatically* elevated levels of daytime sleepiness (compared to adults).

In many cases, the level of sleepiness in adolescents are near the threshold seen in *sleep disorders* like narcolepsy and sleep apnea!

Sleep deprivation has *negative effects* on the control of behavior, emotion and attention, and is a significant impediment to learning, attainment of social competence and quality of life - ? Risk factor for onset of mood disorders?

*(Dahl et al., 2002)*
And wait, there’s more!

*Sleep Loss Increases Afternoon Cortisol Levels*

So what can we do?

There are a few first steps, which include:

- Increasing teenagers sleep hours by decreasing the amount of stimulating activities late at night (TV, cell phone, computer blue).
- Creating a broader **awareness** of the problem among parents, teachers, teens and health providers.

(Dahl et al., 2002; Hansen et al., 2005)
So what can we do?

Unfortunately, many of the things that might help correct the problem involve **BIG** social policy changes:

- **Changing** school curriculum and policy (does an agrarian/industrial educational model fit KB society?)

- **Stopping** early start times in high schools (some school districts have already done this! – all studies show substantive POSITIVE results: less lateness; fewer discipline referrals; better academics; fewer traffic accidents; etc.)
Understanding How Adolescents Learn

• Differences in evaluation of risk (decreased awareness of probability of negative outcomes)

• Differences in nature and timing of “reinforcement”: motivation – what it is and when it occurs

• Increased capacity for exploration and an increased drive for novelty seeking
Adolescent Brain and Risk

• Two different but connected brain systems: one for calculating the value of rewards and one for assessing the risks involved in them
• Ventral striatum (highly dopamine sensitive): early teen development and highly active = bigger responses to immediate rewards
• Inferior frontal gyrus: late development (mid – 20ties) helps us evaluate conflicting impulses (holds back short term reward for more important long term rewards)
• Teen Brain: ascendancy of the ventral striatum over the inferior frontal gyrus (heart over head – but both are in the brain)
One study looked at the differences in motivation between adults and teenagers. The researchers compared the brain activation of adults and teenagers while they were performing the same task for a reward.

Compared to **adults**, **teenagers** **under-use** the brain circuits that adults involve in motivation!

Bjork et al. (2004)
This under-use of the “adult” motivational system might be the reason why teenagers need more extreme rewards to achieve the same level of brain activity as adults.

AND... the difference in brain activity between teenagers and adults can be even LARGER when the reward is not instant.
Most teenagers are more likely to do their homework for a $5 reward **TONIGHT** than for a $50 reward next week!

What does this mean for me??
There also appear to be differences in the relative effects of reward and punishment in youth compared to adults on modification of behaviors

**AND...** it seems that punishment may have less of a behavioral impact than rewards for teens ...

**AND...** it seems that peer rewards may be more motivating for teens

**NOW ...** what does that mean for educators interactions with teens?
Opportunities for Educators

• How can schools or academic requirements be structured to take cognizance of the different type of reward systems at work in the adolescent brain?

• How can schools or academic requirements be structured to take cognizance of the different type of motivational systems at work in the adolescent brain?

• Are there ways that these systems can be more effectively morphed into “adult” pathways? (should they?)
How Adolescents Learn

• Increased processing of information in brain centers more specialized to address emotions than cognition.

• Greater risk of “inaccurate” reading of emotional states of others – especially seeing anger instead of fear

• Less capacity for “holistic” evaluation of emotional states of others” : nuances in facial expression; prosody; eye contact; body posture
Opportunities for Educators

• How can schools be structured to enhance development of capacities for “emotional intelligence”?

• What kind of school based activities or curricula could be used to improve adolescents’ abilities to experience, identify, process, understand and evaluate emotional clues (in themselves and others): role of the arts?
Brains on technology: environment

• The “Gutenberg Revolution” of our century.

• Brain develops by interacting with our environment – plasticity, plasticity, plasticity

• New digital environment changes the way the brains of youth develop – digital natives not digital immigrants
The Age of Distraction

The Conversation
The Art of Listening, Learning, and Sharing

Brought to you by:
Brian Solis and JESS3
The social brain

• Changing social environment
  (twitter, facebook, myspace, text messaging, MSN, etc)

• Extended “friend” base but similar sized circles of closeness

• Decrease face-to-face interaction or an increase in the ratio of face to face and non face to face interaction?

• Will current brain circuits for face-to-face socializing weaken?
  (social awkwardness, inability to interpret nonverbal communication, physical isolation)

• Will we develop new social areas of the brain?
Opportunities for Educators

• How can new technologies be integrated into schools to promote learning as exploration?
• How can teachers better help the critical thinking capacity of the teen brain develop?
• How can the emotional stimuli that drive learning be harnessed to enhance cognitive engagement?
• How can school structures be modified to reflect the realities of the KB economy rather than the agrarian/industrial economy?
Healthy Brain and Healthy Body

• Brain development influenced by: nutrition (protein, vitamins, minerals, omega 3) and exercise (150 min. physical activity/week)

• Integration of education about and environmental richness in positive nutrition and exercise may be expected to help promote neurodevelopment

• Protect your brain: sports, helmets, seat-belts, drugs.
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www.teenmentalhealth.org
Opportunities: Healthy Brain and Healthy Body

• What innovative ways can positive nutrition be integrated into schools and youth environments?
• What innovative ways can vigorous physical activity be integrated into schools and youth environments?
• What innovative ways can our understanding of how the brain functions and how adolescents develop be integrated into schools and youth environments?
Opportunities for Educators

• Importance of understanding how the adolescent brain works
• Take advantage of its strengths and help it develop to overcome its weaknesses
• Develop systems and educational frameworks that encourage exploration, innovation and critical cognitive development (civilization)
• Provide guidance and support – fundamental role of the teacher as a coach, advisor and mentor
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