

THE ADOLESCENT BRAIN

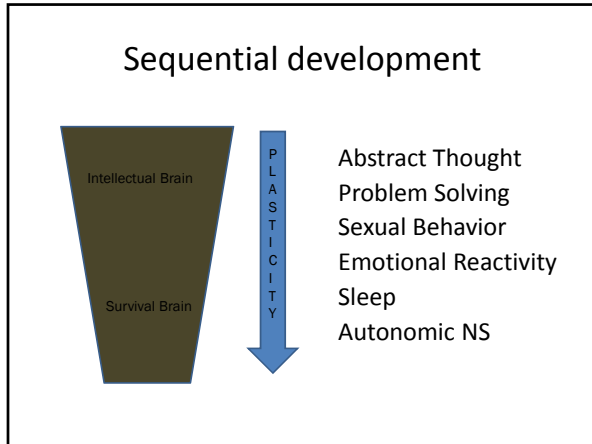
Impact on Functioning and
Implications for Strategies and
Interventions

Research and sources

- Linda Chamberlain, Ph.D. MPH
 - Alaska Family Violence Prevention Project
 - Safe from the Start (CA Initiative)
 - Family Violence Prevention Fund
 - Family Violence Prevention and Health Practice (ed.)

The adolescent brain

- 90% developed by age 5
- Weight of cabbage packed into a grapefruit
- Consistency of jelly
- 100 billion neurons
- 100 trillion connections
- A work in progress/neural plasticity



Brain structures

STRUCTURE	FUNCTION	DEVELOPMENT
Parietal Lobe	Integrate information from other areas of the brain (senses)	Matures throughout midteens
Temporal Lobe	Hearing, language, perception, memory	Grey matter peaks around 16 y/o
Occipital Lobe	Visual memory	Increases linearly during teens
Cerebellum	Muscle coordination, balance, complex cognitive processes	Early 20's
<small>L Chamberlain, 2007</small>		

Components of the brain

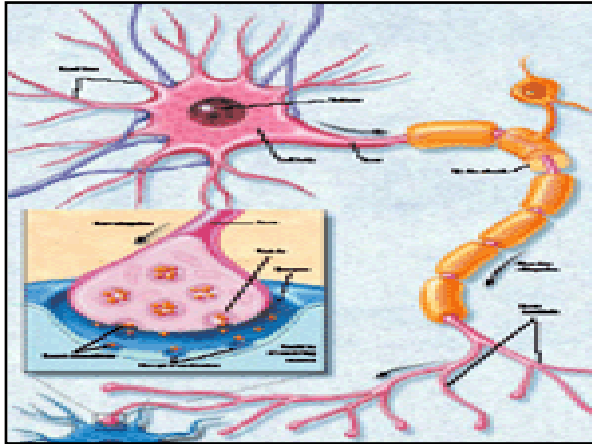
Prefrontal Cortex – CEO of the brain, last to develop, judgment, impulse control, foresight and setting goals

Gray matter – outer layer of cortex, dense with cell bodies

White matter – many myelinated axons (nerves)

Synapses – Connections

Myelin – fatty tissue that insulates nerves and increases speed of nerve conduction



Brain development

- ✘ Cortex gets thicker with age then goes through a pruning process
 - ✘ Pruning = “use it or lose it”
- ✘ Adolescence – brain becoming more efficient, myelination of nerves, increase speed of chemical and electrical conduction
- ✘ Depending on region of brain will not be fully developed until late teens to early 20’s
 - + Prefrontal cortex – growth spurt around 9-10 y/o, pruning begins around 12 y/o, last to be myelinated

Brain chemistry

- Serotonin (brain’s brake for impulse control) temporarily declines in most adolescents
- Dopamine – (brain’s reward system) fluctuating in adolescent brain
 - Plays a role in motivation
 - Excessive risk taking increases dopamine level
 - Stress decreases dopamine levels
 - Drugs increase dopamine level (why they seek the high)

Adolescent brain basics

- Teen brains have to work harder than adults
- Easily overloaded by stress
- Need more sleep (9.5 hours)
- Use more primitive part of brain to process emotions (limbic system v. adult/cortex)
 - React first, think later
 - Inaccurate at interpreting others emotions (more often perceive as anger)

Impact of different rates of development

Reward Center activated	Prefrontal Cortex not fully developed >>judgment
Wants new and exciting Drugs appear exciting	Drug use prior to 16 impairs attention, decreases brain volume and grey matter
Earlier Onset of puberty	Brain development not complete until mid-20's, leaves teens vulnerable due to increase risk-taking and underdeveloped decision-making

Starting the engines without a skilled driver – several years with a sexually mature body and sexually activated brain circuits yet with relatively immature neurobehavioral systems necessary for self-control and affect regulation – R. Dahl, MD University of Pittsburgh

Behavioral impact

Lack of “common sense”

Thinking seems rigid

Decisions seem irrational

More emotional

Disorganized

Gender differences

- Male brain is 10% bigger
- Female have more gray matter (dense with cell bodies), males have more white matter (rich with myelinated axons)
 - Males can transfer information across sections of brain better leading to better spatial and mathematic skills
 - Females more efficient in processing information and have better verbal skills and can juggle several activities

Gender differences

- Limbic system (emotional brain)
 - Hippocampus – transfer new information to long term memory, is sensitive to estrogen so grows faster for females>>stronger social skills, better at emotional support and complex relationships
 - Amygdala and hypothalamus –sensitive to male hormones so grows larger, increase response to fear/danger (fight v. flight), contact sports, sexual desires and aggression

Strategies for healthy adolescent development

- Modes of learning
 - 11-14 years learn by example, need role models, education and open communication
 - 15-17 years Encourage teens to discuss choices/decisions, application of knowledge and past experiences to current decisions
 - 17 & older Reflect on previous experience
 - MORE TIME WITH ADULTS WITH A MATURE PREFRONTAL CORTEX

strategies

- Diversity in activities, limit time with TV and video games
- Create opportunities for quality time engaging with adults
- One task at a time, help identify priorities
- Promote gender specific enrichment activities tailored to youth's interest

strategies

- Respond calmly and limit your emotions
- Clearly state feelings and concerns, one at a time (don't communicate through facial expressions)
- Encourage teens to talk about feelings with open-ended questions in a safe and supportive environment
- Help find healthy ways to deal with stress (exercise, journaling, support groups)

Strategies

- Help teens create and keep schedules that allow more time for sleep
- Avoid stimulating activities and stimulants (cola) in the evening before bed
- Emotionally charged discussions should not occur at night
- Opportunities for structured risk-taking
- Learn best outside of cortex, by doing

Children and youth exposed to trauma

- Cortisol – stress hormone
 - If brain has been chronically flooded, can act as a toxin (hippocampus), impacts synaptic connections
 - Theory behind EMDR is that it is stimulating neurons on both sides of brain so can deal with trauma
 - Relationship between exposure to violence and alcohol use

Children and youth exposed to trauma

- Integrated services to address violence, substance use and mental health (shared protective and risk factors)
- Always assess for trauma

Alcohol and drug abuse

- Use increases dopamine levels which is the reward center
- Alcohol – more likely to black out than pass out, and less likely to succumb to sedative effects
- Hippocampus (memory) smaller in heavy drinking teens
- Young drinkers have more long-term memory impairments
- “Just say no” is not enough
