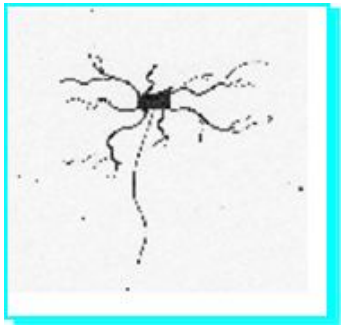


Adolescent Brain Development

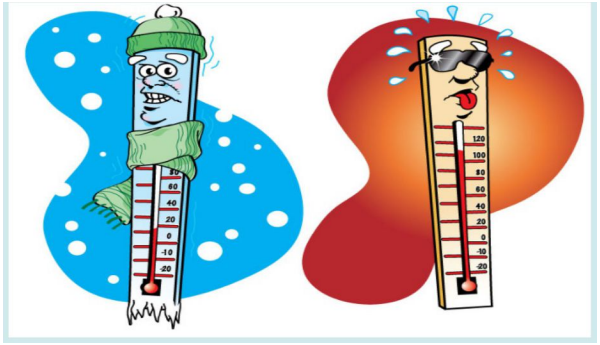
RHMS PTA Meeting December 8, 2020

Illustrated Note-Taking

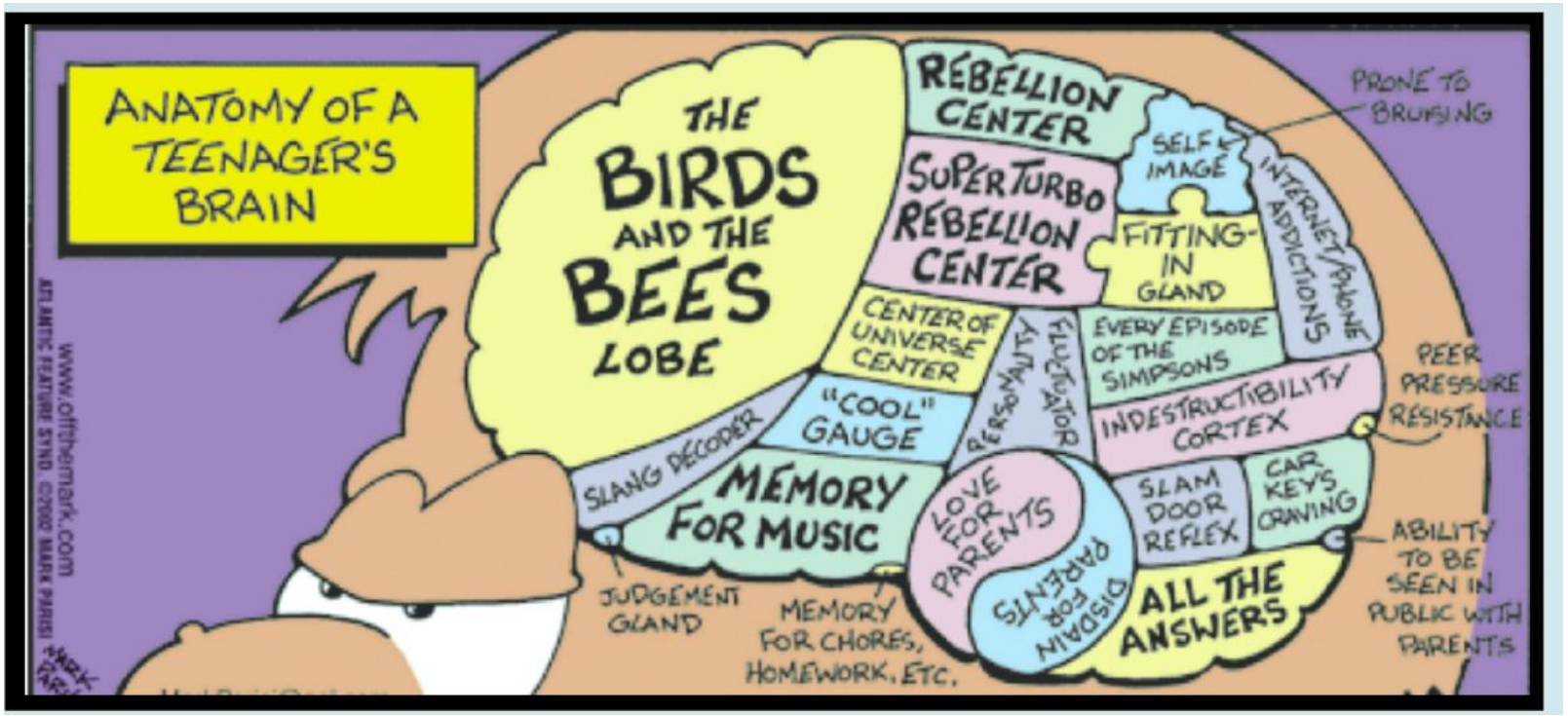
Effective Strategy for Adolescent Brains

"Adolescent Brain Development"

associate an image with new learning



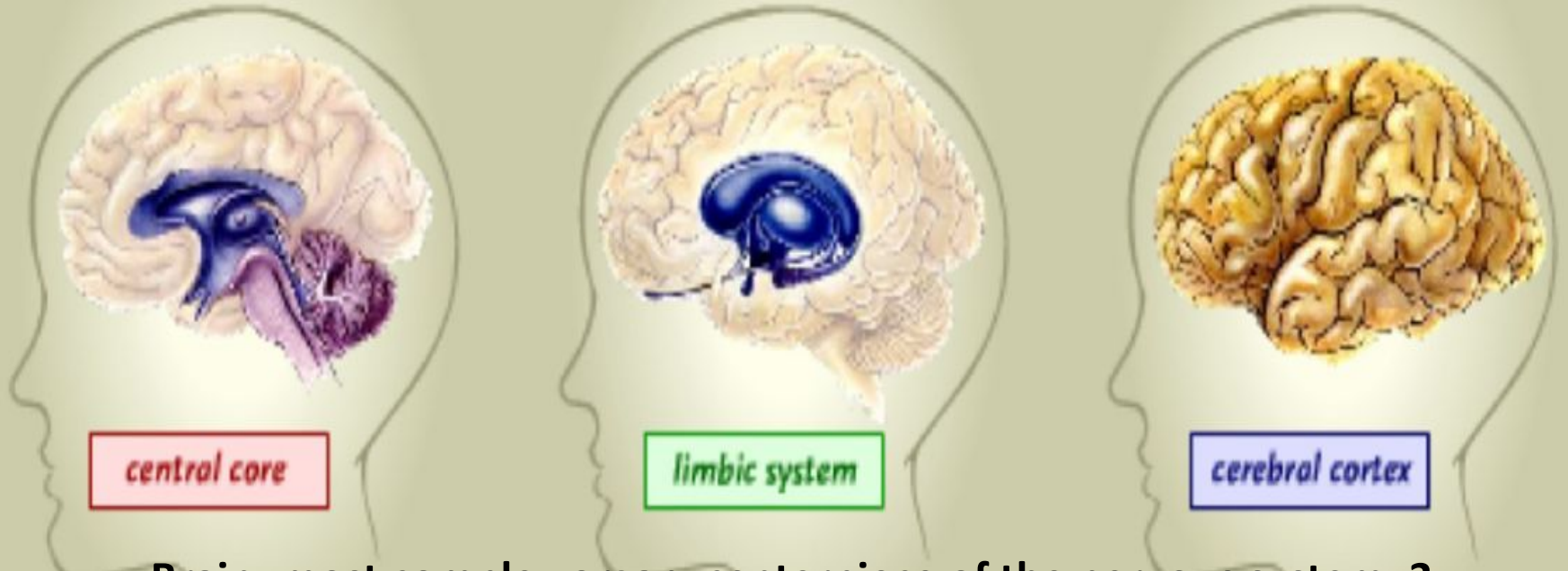
What do you think you know about the adolescent brain?



Brain Development

As parents of middle school students, what are some basics about brain development that are helpful to know?

Introduction | Central Core | Limbic System | Cerebral Cortex



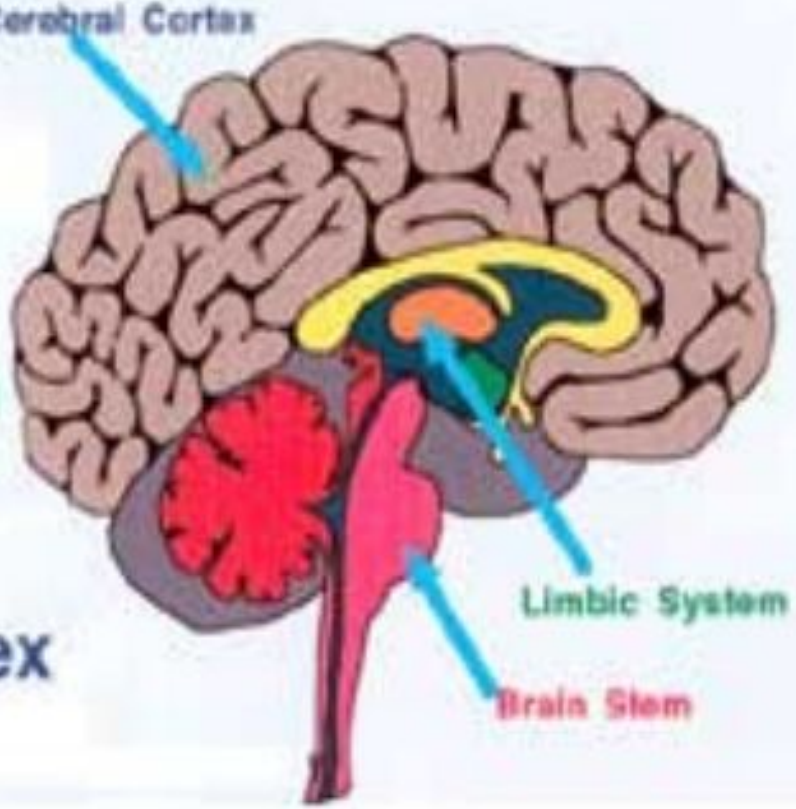
Brain -most complex organ, centerpiece of the nervous system, 3 interconnected layers: central core, limbic system, and cerebral cortex - which have distinct roles and all work together.

The Large Scale Structure of the Brain

Brain Stem

Limbic System

Cerebral Cortex



The Central Core

- Controls automatic functions
- Primary purpose to keep us alive
- RAS - reticular activating system - altertness/attention
- Cerebellum controls voluntary movement - has a role in memory

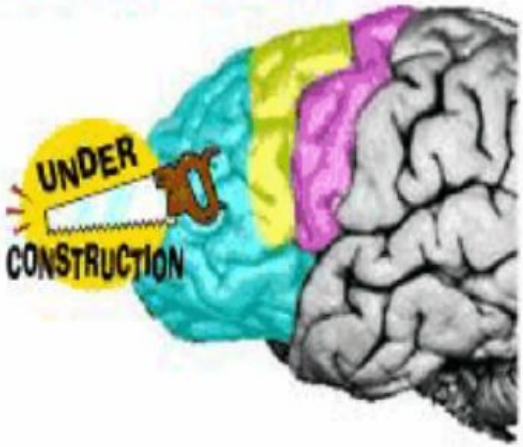
Limbic Area

- ✓ Emotional center
- ✓ Controls perceptions
- ✓ Processes social information
- ✓ Completely **developed** by early adolescence

The Limbic System - Emotional Brain
Key Structures

- **Thalamus** - controls sensory input
- **Hypothalamus -** controls pituitary gland
- **Hippocampus** - short term memory (5-20 sec) and working memory (up to 20 min)
- **Amygdala** - processes emotions - fear, anger, pleasure - quickly responds to threats by sending adrenaline and cortisol to brain causing **fight, flight, freeze, or appease** response.

Prefrontal Cortex



Conductor of the Orchestra

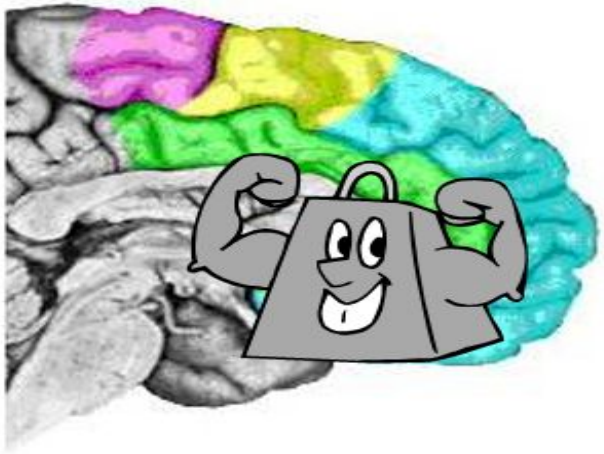
- Planning
- Organization
- Decision-making
- Judgment
- Impulse control

Makes us uniquely human

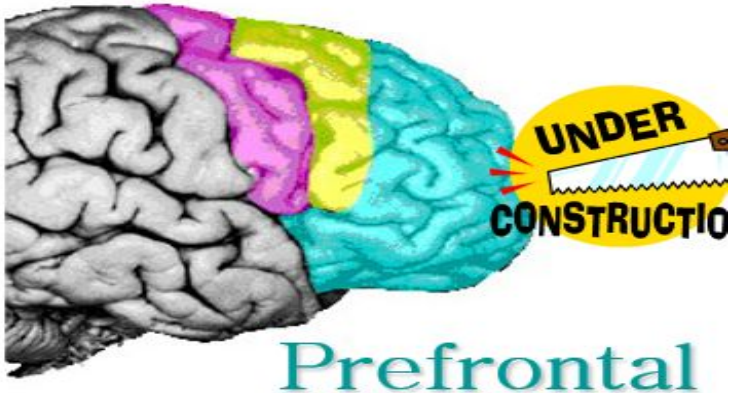
- Mood modulation
- Abstract thinking
- Reason
- Self-Discipline

The Cortex & Prefrontal Cortex

- Newest part of the brain - last part to fully mature
- Has a strong capacity to rewire itself, create new pathways and prune unused connections
- Controls - executive functions:
  - Planning
  - Abstract thinking
  - Organization
  - Decision making
  - Self-regulation
  - Imagination



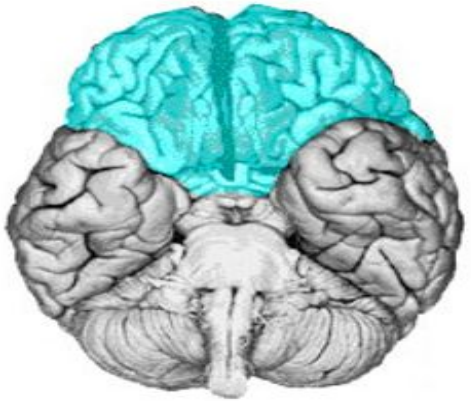
Limbic Area



Prefrontal Cortex

Motor
Premotor
Prefrontal
Limbic

Frontal Lobe



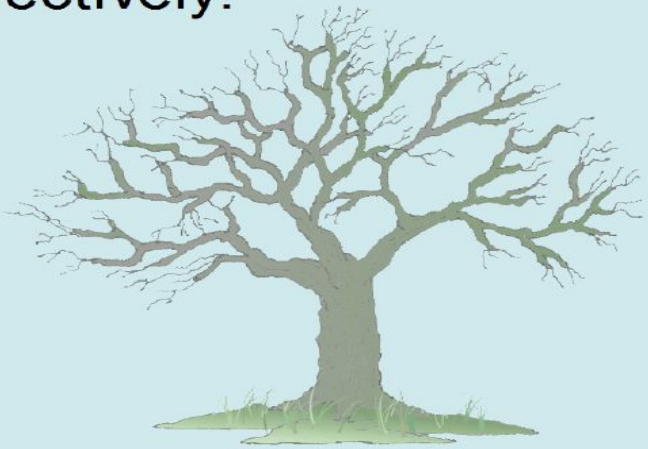
The Brain & Learning

Use it or lose it

The brain grows by **expanding** and **pruning** the connections between cells, keeping the connections that are used the most and getting rid of the unused ones. This allows the strongest and most efficient connections to function more effectively.

"0 to 3"

Neurons that fire together, wire together!



The Adolescent Brain & Learning

- Just before puberty the brain “blooms”
- Between 12-14 the brain pruning occurs

Highway

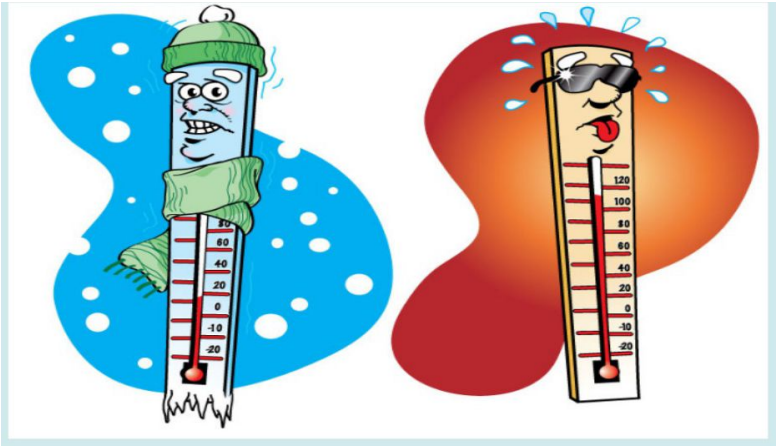
What gets used …

Dirt Road

If not used …

Adolescent Decision-Making

By age 15, adolescents are able to reason and make decisions just as well as adults in ***hypothetical situations***.



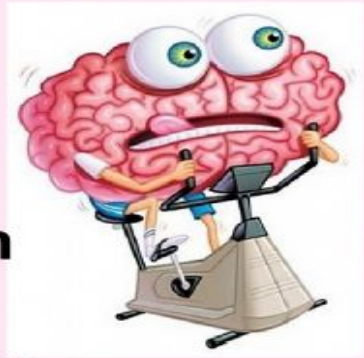
The reward teens most want it is the respect of their peers.

Adolescents are particularly susceptible to being negatively influenced by social exclusion.

Cyberball study (Blakemore & Sebastion)
All participants young adolescents, mid-adolescents, and adults showed added anxiety when being excluded. But adolescents reported much stronger effects.

Summary

- Adolescents process information more often, more easily, and more quickly through their limbic system. The connections to the prefrontal cortex (planning, decision making, understanding consequences, managing emotion) are still developing.
- Learning is the development of dense, interconnected neural networks which are created through repetition and use.
- Adolescence is a peak time for creating strong neural networks. - Use it or Lose it!



Key Ideas to Remember

Questions?