

NOBTS Christian Counseling Conference  
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The Adolescent Brain  
Why They Do What They Do!

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# The Adolescent Brain: Why They Do What They Do!

Participants will investigate current adolescent brain research to:

- broaden understanding of how the developmental level of the adolescent brain impacts moodiness, impulsivity, and poor decision-making ability

# The Adolescent Brain: Why They Do What They Do!

Participants will explore how the findings of adolescent brain research relate to the selection of therapy models for use with adolescents and their families.

# The Adolescent Brain: Why They Do What They Do!

Participants will identify and discuss how the findings of adolescent brain research could fit into the therapy models they currently use.



**Why are adolescents moody, impulsive, and why do they make unwise decisions?**

# Physical Changes

- Rapid growth
- Hormonal balance
- Peer Comparisons

# Cognitive Development

- Hypothetic-Deductive Thought
- Egocentrism
- Imaginary Audience
- Social Cognition

# Self-Image and Identity

- Who am I?--Moratorium Period
- Self-Esteem
- Parent's response
- Peer's response



# Family and Peers

- Task of Separation from Parents
- New Boundaries Necessary for Parents
- New Interests/Commitments
- Peers Provide Acceptance/Companionship

# The Adolescent Brain: A Second Window of Opportunity



The Adolescent Brain: A second window of opportunity



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**FACT:** A person's learning capacity will never be greater than it is during adolescence.



A decision your teen makes now can affect him **FOR LIFE.**

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## The Adolescent Brain:

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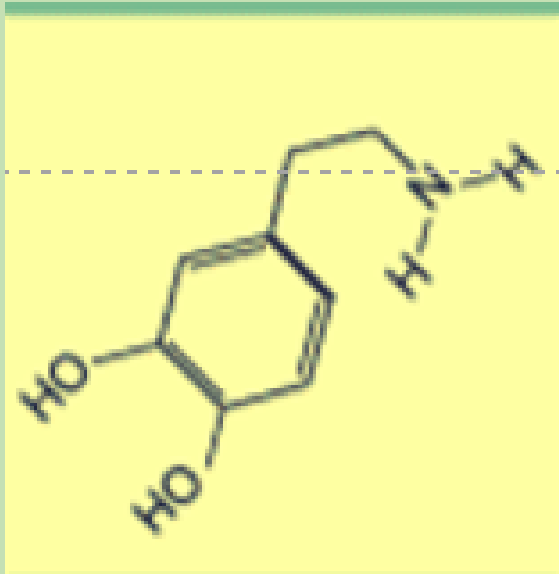


It takes about **25 YEARS** for a brain to fully develop



Although the brain reaches **90%** of its adult size by age 6, the brain undergoes **MAJOR, DYNAMIC CHANGES** throughout adolescence.

# 4 Ways the Adolescent Brain Differs from the Adult Brain



- **Dopamine Levels:**
- More dopamine activity in the brain's reward center in early adolescence than at any other point in their life.
- Teens go out of their way to seek rewarding experiences, such as experimenting with new drugs.

# 4 Ways the Adolescent Brain Differs from the Adult Brain



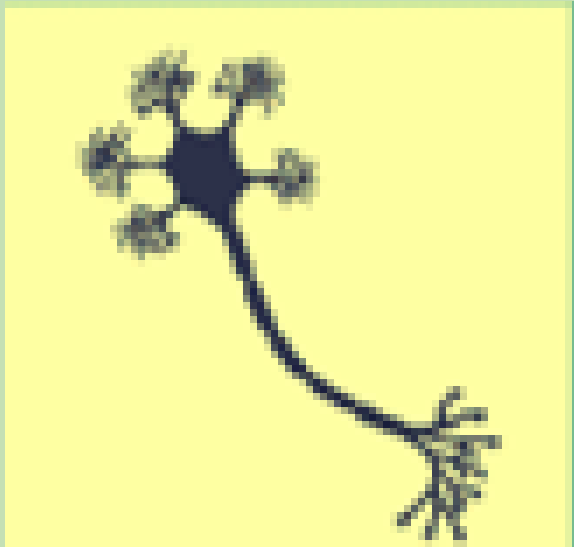
- **Hyper-Rational Thinking**
- The part of the brain that is in charge of decision making is not fully developed in adolescence. Teens focus on the thrill or the positive aspects of an experience, such as drug using, without weighing its negative consequences.

# 4 Ways the Adolescent Brain Differs from the Adult Brain



- **Pruning**
- The pruning stage of development can also be thought of as conditioning. Choices teens make now can affect their brains for life. If a teen does not read during adolescence, his reading “synapses” will be eliminated.

# 4 Ways the Adolescent Brain Differs from the Adult Brain

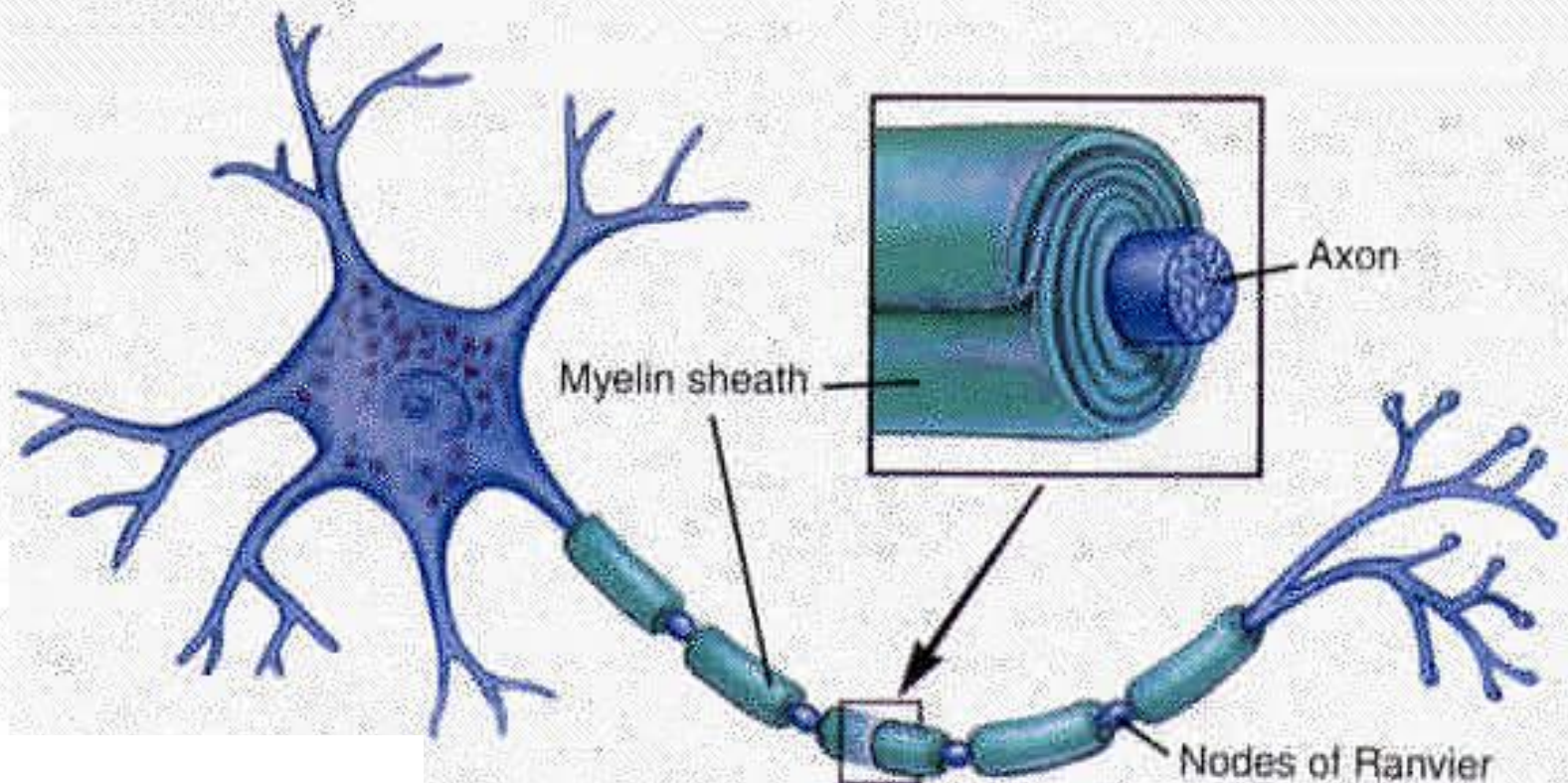


- **Myelination**
- The brain's "white matter," called myelin, enables nerve signals to quickly communicate with different parts of the brain.
- This process begins in utero. There is a rapid increase in the formation of myelin in the first 2 years of life and again in adolescence.
- Main contributor to neuroplasticity

# Myelination

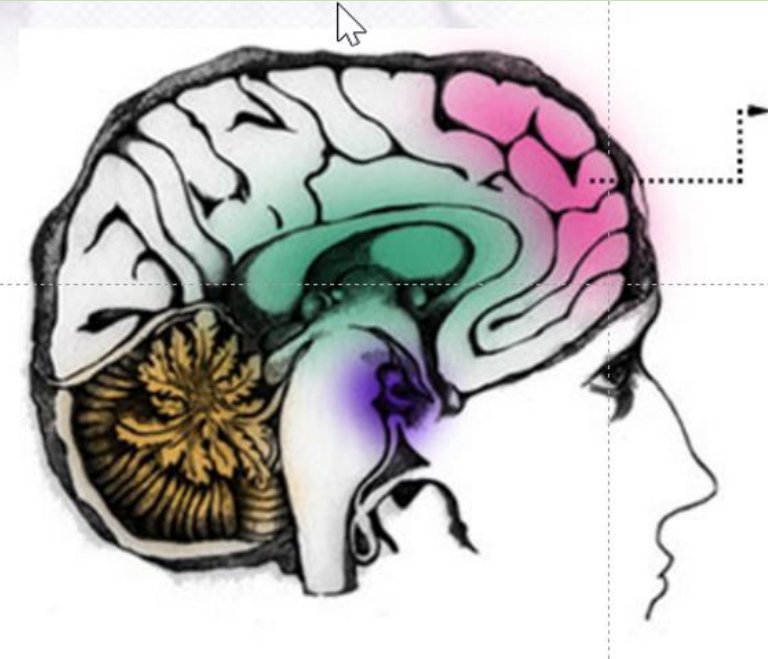
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## Myelin Sheath





# 5 Areas of Major Change in the Brain During Adolescence



## Frontal Cortex

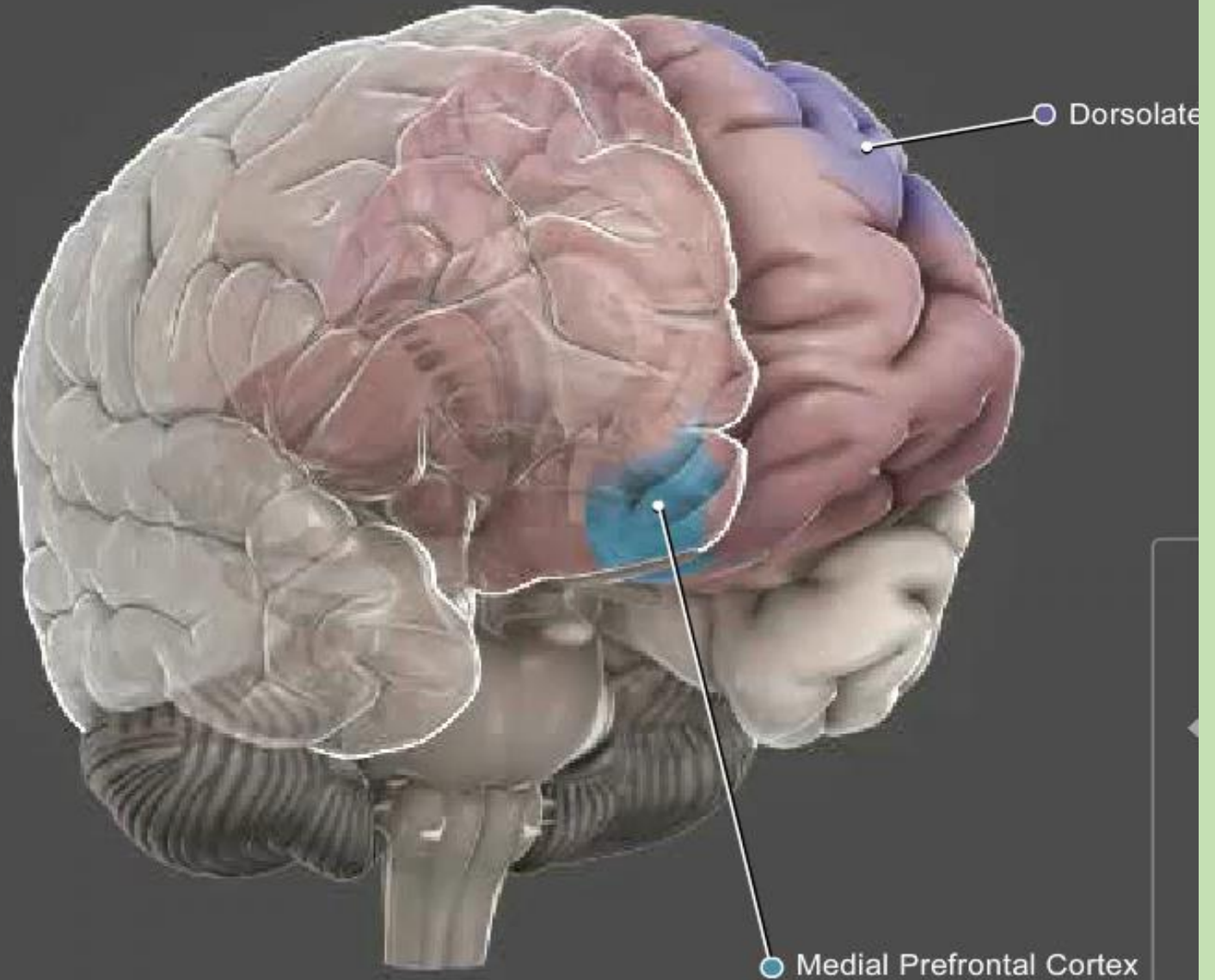
--the CEO of the brain

--responsible for planning, strategizing, and judgment

--major growth starts around ages of 11-12

--followed by a period of pruning and organizing of the new neural connections during the teen years.

# Prefrontal Cortex



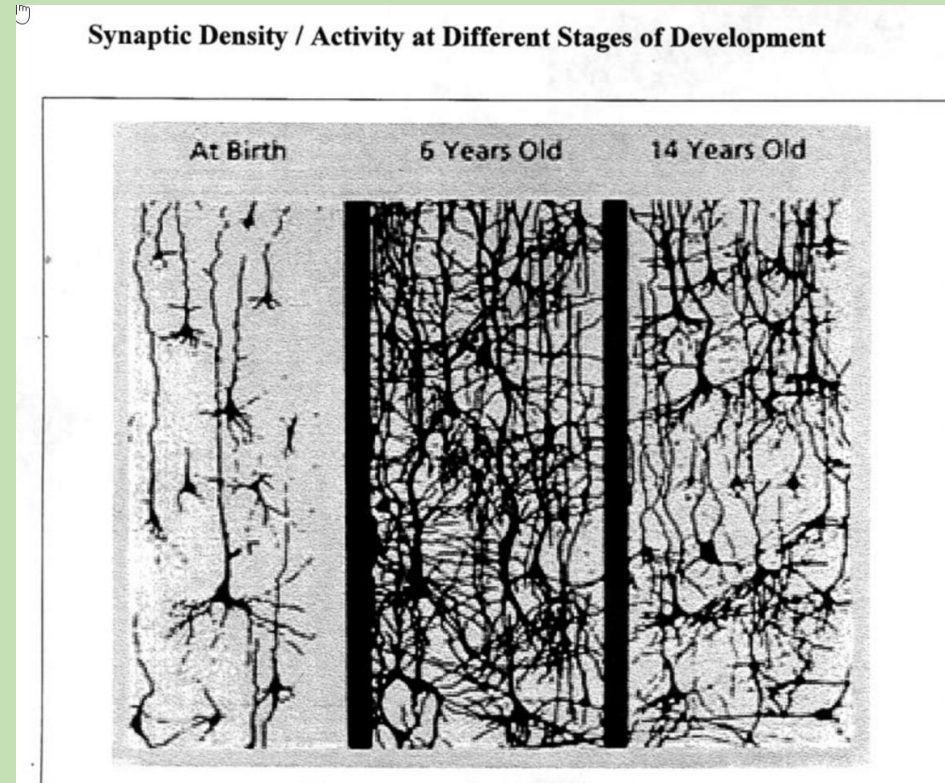
# Synaptic Density/Pruning

- **Brains of pre-pubescent children and adolescents have differences in synaptic density in the prefrontal cortex.**
- **Adult brain has about 100 billion neurons; at birth the brain has only slightly fewer neurons**

# Synaptic Density/Pruning

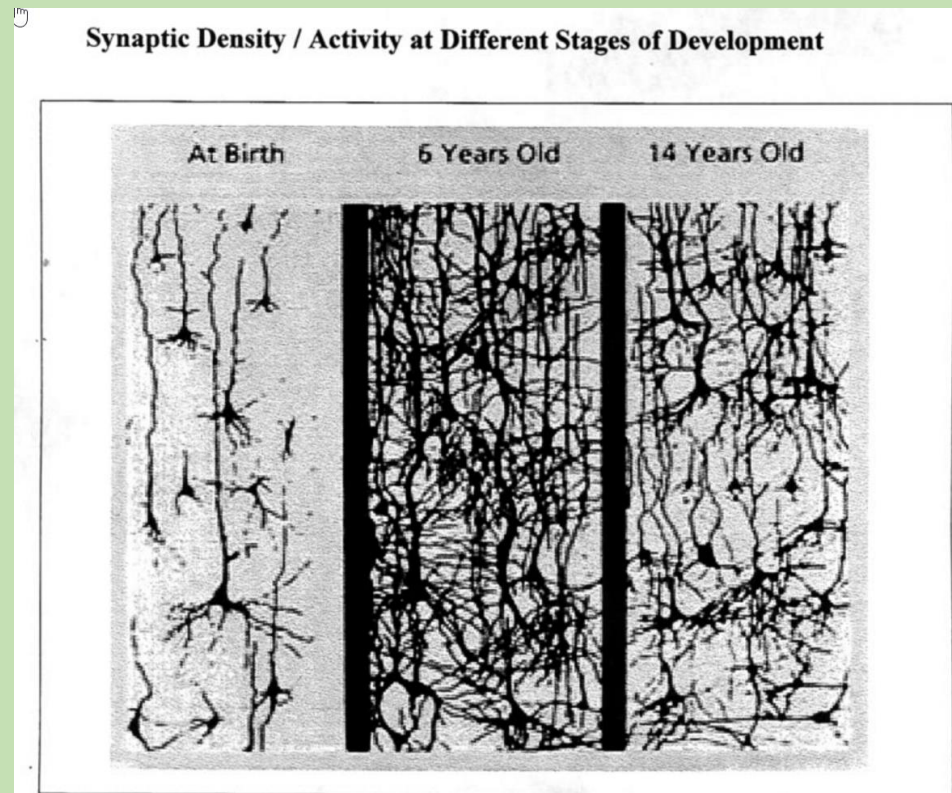
- The intricate network of connections – or synapses – between neurons, sees the most significant change.

Early in postnatal development the brain begins to form new synapses, so that the synaptic density greatly exceeds adult's levels.



# Brain Development

- Myelination and synaptogenesis
- Synaptic pruning
- Enriched environment impacts growth
  - increases dendrite connections
  - Increases activity of key chemicals in brain



# Social Cognition

## Perspective Taking

Cognitive processes that depend on the prefrontal cortex might undergo a perturbation at puberty due to the synaptic reorganization that occurs at this time.

# Social Cognition: Perspective Taking

- Perspective taking is the ability to take on the viewpoint of another person.
- The ability to take another's perspective is crucial for successful social communication.

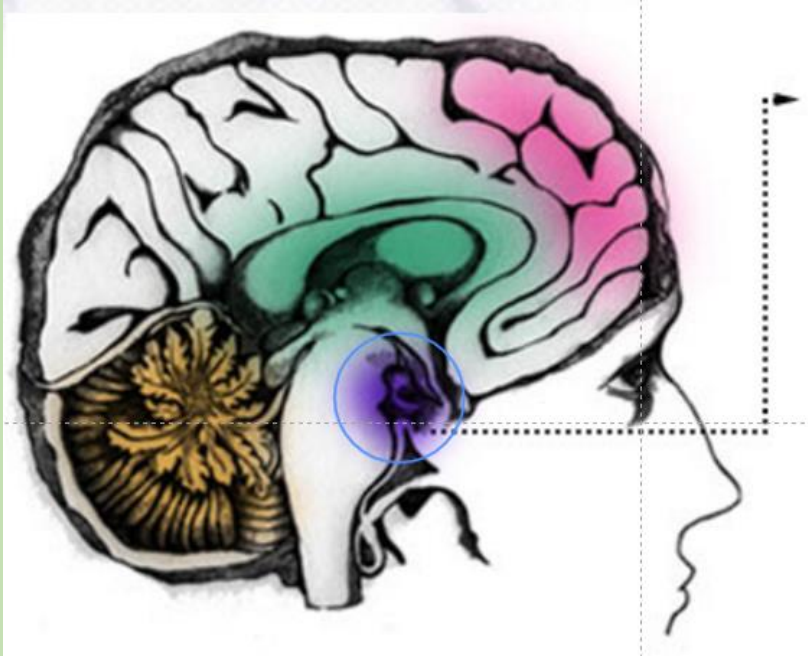
# Social Cognition

## Perspective Taking

Proposed that 'mirror neurons' fire when an agent both performs an action or observes another person performing the action-- provides a basis for integrating perceptual, motor and social functions.

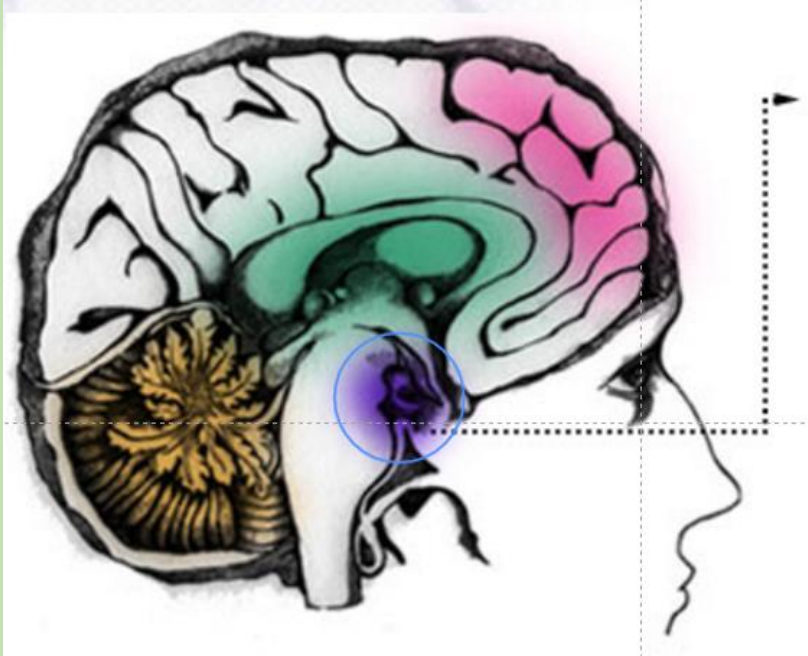


# Amygdala



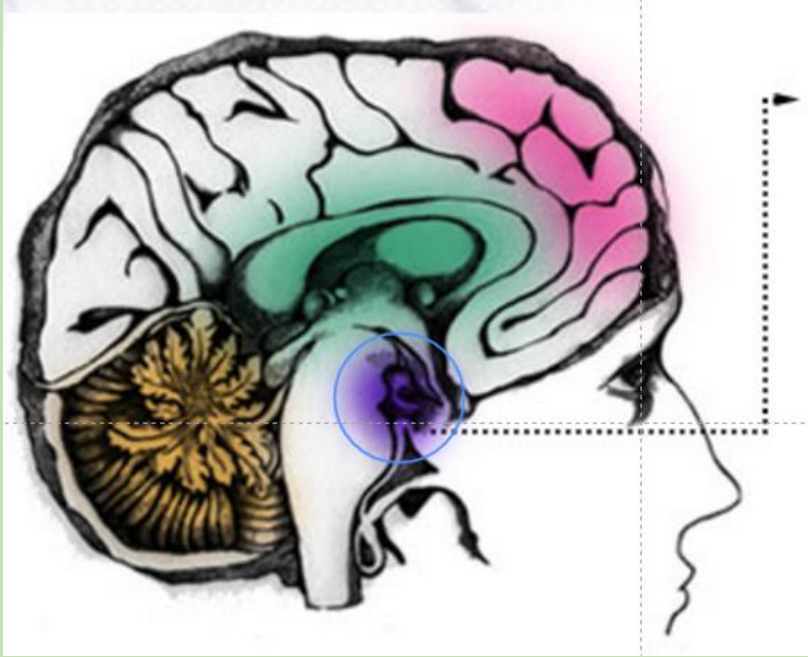
--Associated with emotional and gut responses.

# Amygdala



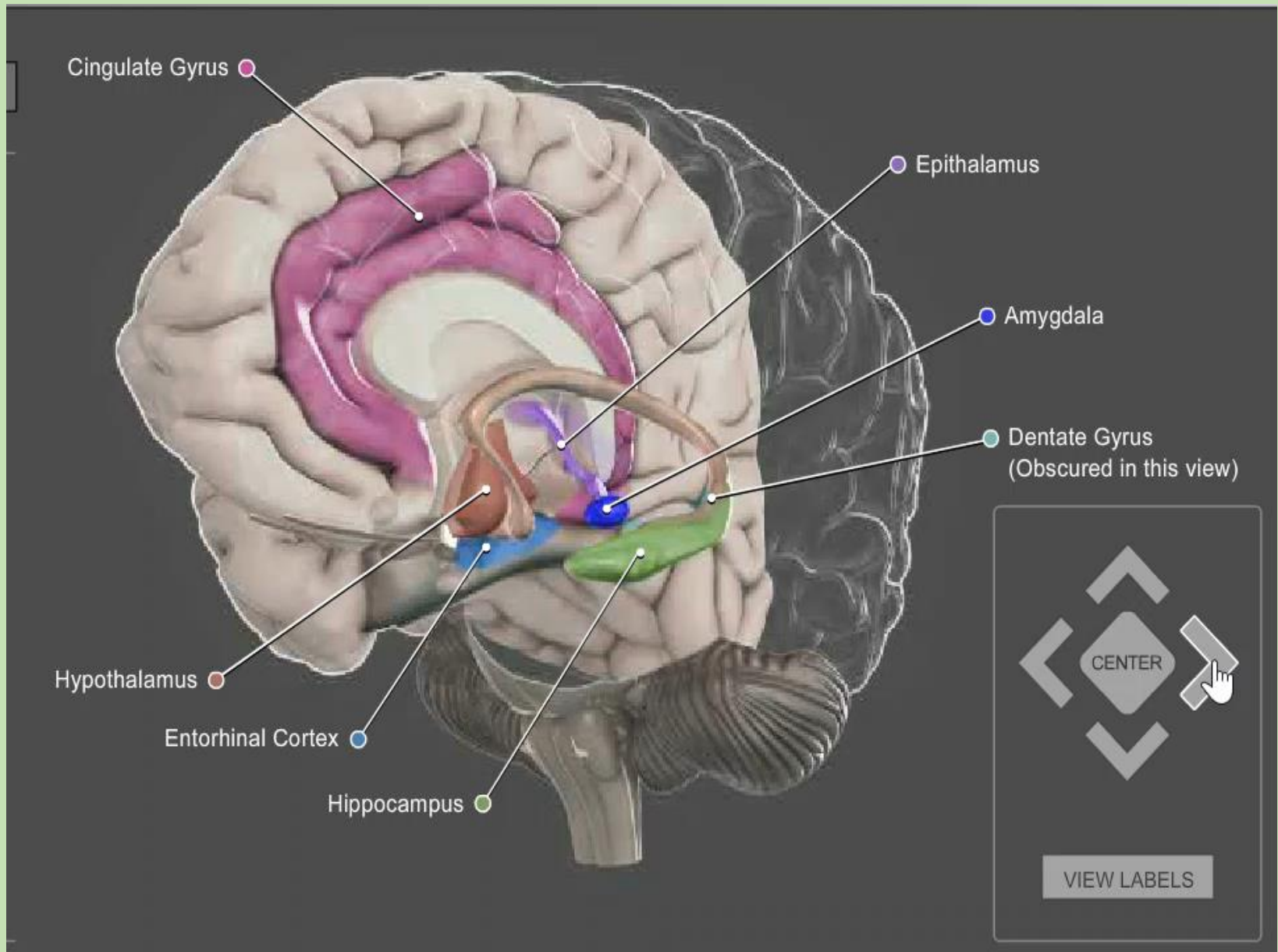
Teens, when interpreting emotional information, use this reactive part of the brain, rather than the more “thinking” region, the frontal cortex

# Amygdala



Adults rely more heavily on the frontal cortex. This may be why teens have trouble modulating their emotional responses.

# Amygdala



# Moodiness

- Witelson--emotions in teen brain at least twice as intensely as adults, with frequency up to 28 times a day.
- Amygdala swells with testosterone--intensifies irritability and aggressiveness--as well as emotions like love and sexual desire.

# Moodiness

- Yurgelun-Todd--In adolescent brain amygdala much more active instead of prefrontal cortex.
- Adolescents unable to correctly identify emotion. See anger instead of fright.
- May be misunderstanding or misperceiving feelings of teachers and parents.

**TEENS ALSO USE LESS OF THE PREFRONTAL CORTEX WHEN READING EMOTION.**

In a study designed to map the differences between the adult and teenage brain, participants were asked to label the expressions of a series of faces. When it came to labeling fear...

**100% OF ADULTS WERE CORRECT**

Fear

Fear

**50% OF TEENS WERE CORRECT**

Surprised?

Fear?



# Moodiness and the Amygdala

- Teens are shown a neutral face in photo
- A major area of the limbic region (amygdala) becomes activated.
- In adults, same photo activates the reasoning prefrontal cortex.





ADULT BRAIN



TEEN BRAIN

Teens used less of the **prefrontal region** than adults when reading emotions

# Moodiness and the Amygdala

- More active in adolescents than in children or adults.
- Emotions can arise rapidly and intensely without the calming influences of the prefrontal cortex.

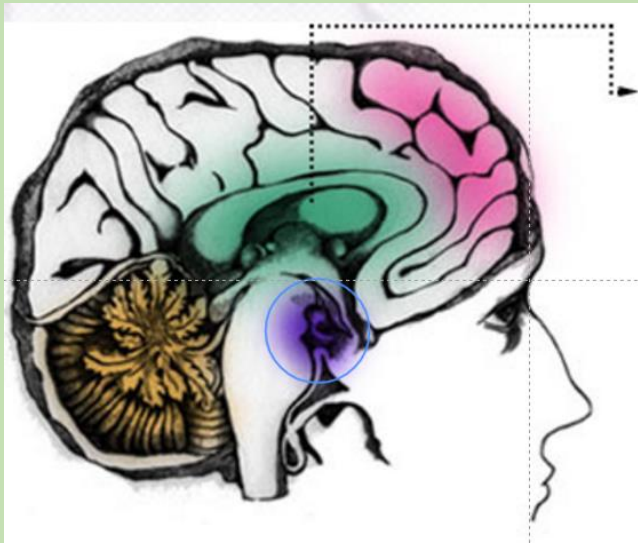
# Moodiness and the Amygdala

- Teens may have inner sense of conviction that the other person's neural response is filled with hostility, and he cannot be trusted.
- A blank expression or bump in hallway can be interpreted as intentional.
- They often experience a parent's neutral statements as aggressive.

# Moodiness

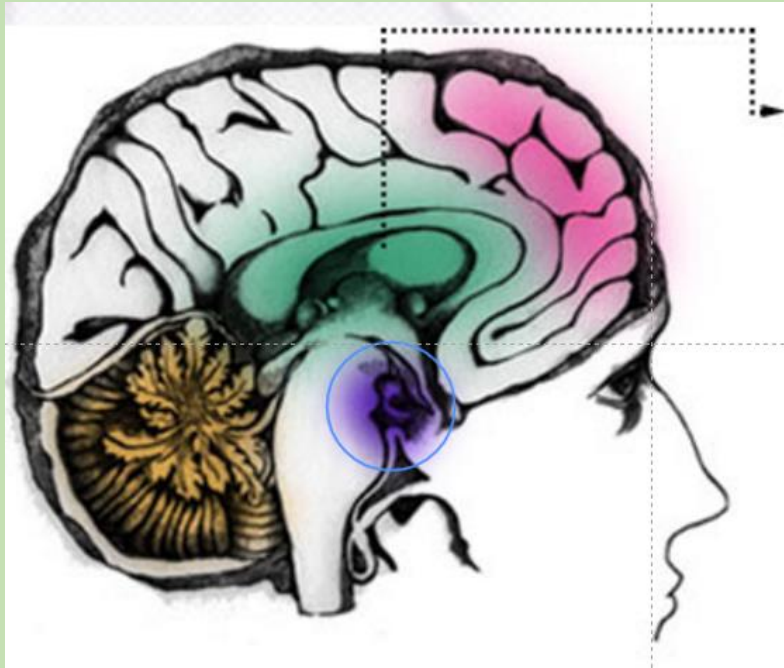
- Girls more accurate than boys in identifying emotions.
- Girls' emotional response not as strong--myelination?

# Corpus Callosum



Cable of nerves that connects the two hemispheres of the brain.

# Corpus Callosum

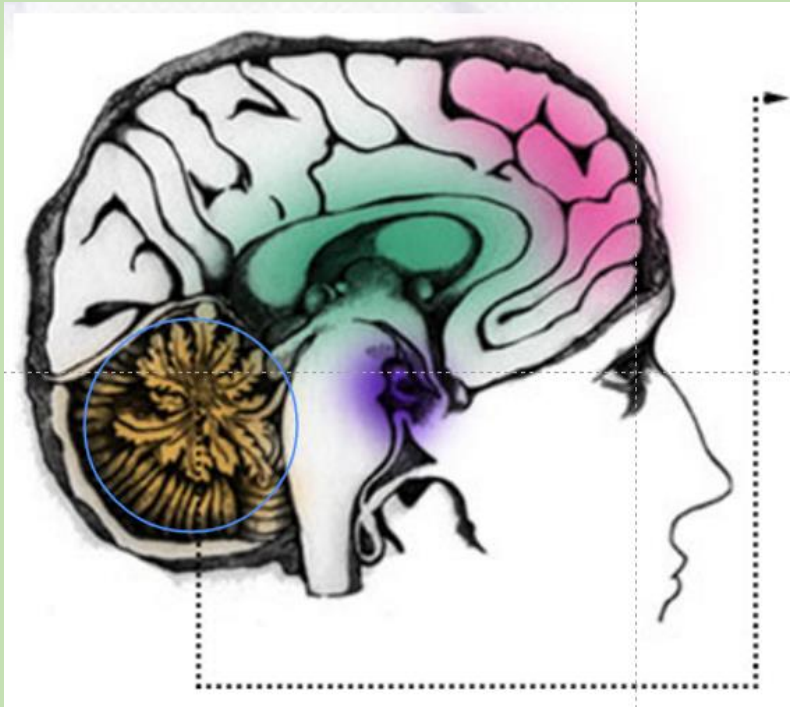


Believed to be involved in creativity and problem solving. Appears to change and grow significantly through adolescence.

# Corpus Callosum



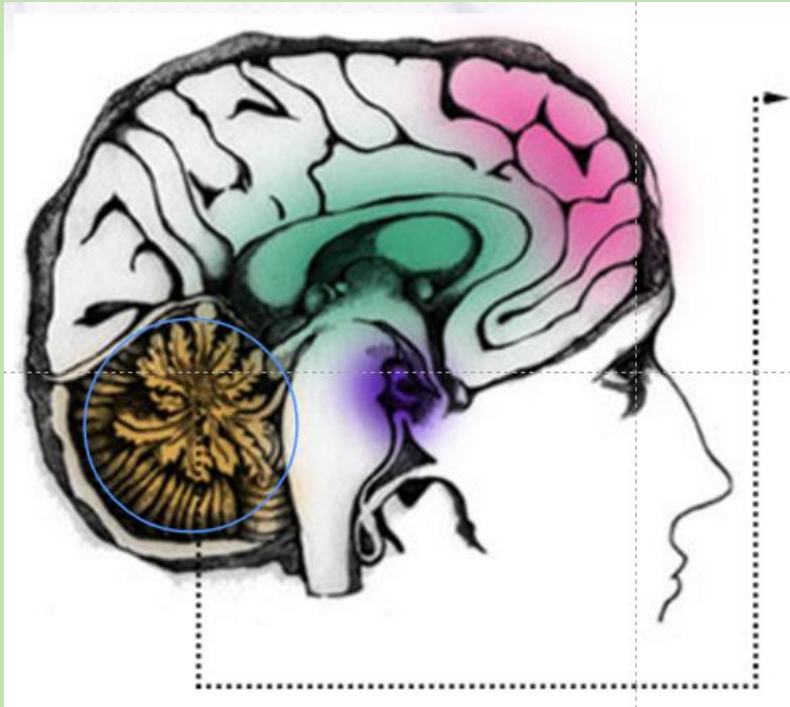
# Cerebellum



Thought to be involved with the coordination of muscles and physical movement.

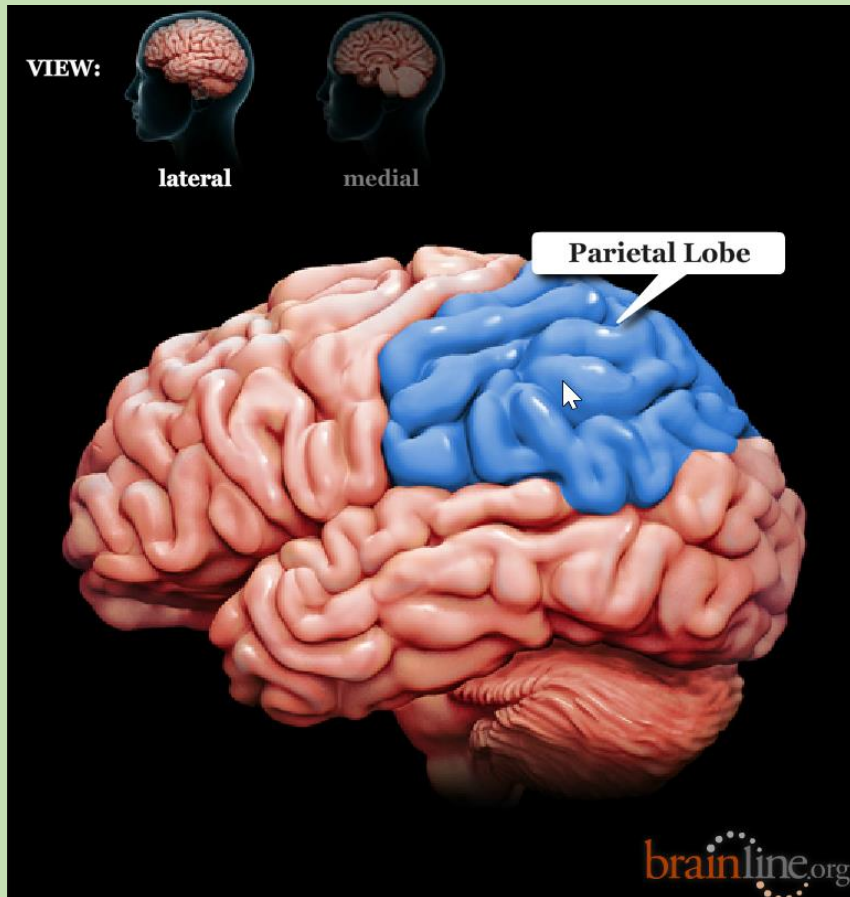


# Cerebellum



Also involved in the coordination of thinking processes. Undergoes dynamic growth and change during the teenage years.

# Parietal Lobe



Area of brain  
where sensory  
information is  
processed...

Hot

Cold

Touch

Pain

Etc.



# Neurotransmitters

- **dopamine**--controls movement, psychiatric symptoms, regulates hormonal responses
- **norepinephrine**--role in learning and memory
- **serotonin**--controls emotional states such as mood, depression, anxiety, sleep states
- **glutamate**--long-term memory formation

# Other Chemicals

- Hormones
  - Estrogens
  - progestins,
  - androgens--testosterone
- Glucocorticoids--cortisol



# Impulsivity

- Reproductive hormones shape not only sex-related growth and behavior, but overall social behavior.
- Hormone systems involved in the brain's response to stress are also changing during the teens. As with reproductive hormones, stress hormones can have complex effects on the brain, and as a result, behavior.

# Impulsivity

- No ability to think through consequences of action
- Risk-taking stimulates dopamine system, while serotonin decreased in teen brain
- Enormous hormonal changes take place during adolescence.



**THE PREFRONTAL CORTEX** IS ALSO UNDERDEVELOPED, AND IMPROPERLY BALANCED WITH THE REST OF THE EMOTIONAL PART OF THE BRAIN.

**THIS IS WHY TEENS ARE MORE SENSITIVE TO...**

Risky and impulsive behavior

Peer pressure



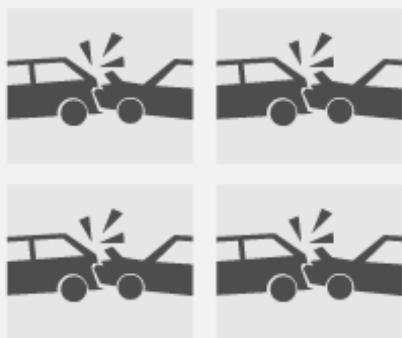


# Decision Making

- No pathway from limbic system to prefrontal cortex
- No ability to think through consequences of action

PARENTS NEED TO UNDERSTAND THAT NO MATTER HOW MATURE THEIR TEEN MAY SEEM, THEY **DO NOT HAVE** THE SAME UNDERSTANDING OF RISKS AND CONSEQUENCES AS AN ADULT.

## THIS IS WHY...



Teens are **FOUR times** more likely to get in a car crash than adults.



Nearly **TWO-THIRDS** of teens believe giving in to peer pressure will help raise their social status.



**NINE** out of **TEN** of teens who witness cyberbullying won't report it.



# Decision Making

- Under settings with increased emotion or in the presence of peers, reasoning can become skewed.
- The integrative role of balancing emotions, planning for the future, having insight and empathy are more easily thrown off-line with intense emotions and peer influence.

# Factors that Impact Teen Brain Development

- **Physical/Sexual/Verbal Abuse**
- Verbal abuse releases cortisol
- Destroys dendritic connections
- Cerebellum sensitive to elevated levels of cortisol.

# Factors that Impact Teen Brain Development

- **Alcohol/Drug Abuse**
- No sedative effects in teens
- Judgment/decision making impacted.
- Faster dependency rate with binge drinking
- Hippocampus/prefrontal cortex susceptible to damage (memory) and deficits in problem solving.

# Alcohol/Drug Abuse

- Stops the prefrontal region from coordinating and balancing streams of information from within the body and outside world.
- If we “flip our lids” the prefrontal integrative fibers of our brain stop coordinating our whole system.

# Alcohol/Drug Abuse

- Even if adults haven't slept well/eaten, are under pressure/feel some underlying emotional agitation,  
...the prefrontal cortex's calming influences may not work so well and we flip our lids.

# Alcohol/Drug Abuse

- Teens can cultivate the growth of the integrative fibers of the prefrontal cortex.



Positive interactions with others and self-reflection are two ways to increase prefrontal integration.



# Factors that Impact Teen Brain Development

- **Nicotine**
- Receptors for nicotine increase twice as rapidly in adolescents than adults
- 90% regular smokers addicted

# Factors that Impact Teen Brain Development

- **Stress**—brings high levels of cortisol and adrenaline.
- High levels of dopamine and norepinephrine impair working memory

# Genetic Components

- During high school/college, major psychiatric disorders, such as
- depression,
- bipolar disorder,
- schizophrenia,
- can express themselves for the first time, even in well-functioning individuals.

# Genetic Components

- If mood or thought becomes dysfunctional, and
- Brain is filled with rigidity or chaos that disrupts adaptive functioning for long periods of time,
- Possible that a teen is experiencing not simply the unavoidable intense emotions of adolescence but something more.

# Genetic Components

- Bipolar disorder : A Theory
- Inhibitory fibers coming out from prefrontal cortex to the amygdala
- 8 years old, have 900 fibers going to the amygdala to calm it down, 600 needed to make it work well: with 900 you are fine.

# Genetic Components

- Adolescence pruning: half of them will be pruned. Started with 900, prune to 450, left with 450, need 600 to do well
- Now below the minimum you need--mood swings start.

# Genetic Components

- If not vulnerable to bipolar disorder, start with 1600.
- Adolescence pruning--go from 1600 to 800--still fine above the limit.
- Adolescence is a vulnerable period--it's not just hormones.
- This reconstructing called pruning (intentional destruction, stress-increased but probably genetically induced) restructures the brain

# Epigenetic Changes

- Epigenetic changes — Regulatory molecules that control gene expression can actually be changed by stress.
- May be actual alterations in genes involved in the stress response, or axis called the HPA (hypothalamic pituitary adrenal axis), which controls stress hormone release.
- Parents who have not resolved personal trauma may induce more stress in their child.



# Attachment Model of Parents

- Parent = anxious attachment  
Making sense of their lives can...
- ...create a new form of neural integration,
- ...link the prefrontal cortex with an overactive hyper-vigilant amygdala

# Attachment Model of Parents

- ...sooth the limbic firing reactivity
- ...enabling a secure attachment with their own children.
- Siegel believes process of therapy facilitates integration
- possible growth of GABA fibers in soothing and containing the emotional centers.

# Name-It-Tame-It (See Tool #1)

- As the prefrontal cortex matures, it grows glutamate fibers down to the amygdala,
- which release GABA [gamma-aminobutyric acid] which inhibits and regulates automatic responses — literally soothing the amygdala, and enabling greater response flexibility.
- Research suggests the ability to name a painful feeling actually alleviates the experience of it, and could be an example of what helps inhibitory fibers grow.

# Two Routes to Amygdala

- Slow route:
- Higher cortex sifts through information, reasons, reflects, then informs amygdala in a calm and rational way
- The slow route is used more in adults.

# Two Routes to Amygdala

- Fast Route:
- Bypasses the cortex
- Simply sends incoming streams of perception directly to the amygdala.
- Studies of teens—even in calm conditions, the fast route to amygdala activations occurs more readily in teens than in adults

# Two Routes to Amygdala

- Why it is said adolescence is a period of more emotional intensity, more emotional spark.
- When intense emotions erupt in our minds, we need to learn to feel them and deal with them.

# Tool #1: Name It To Tame It

- Learning to deal with emotions means being aware of them and modifying them inside of us so that we can think clearly.
- If we say the name of an emotion inside our own mind, it can help.
- This naming process activates the prefrontal cortex and calms the limbic amygdala!

## Tool #2: Time In

- Take time to reflect inwardly.
- Grows important fibers of the brain.
- Teaching brain to focus attention in very practical ways. Taking time-in on a regular basis is helpful because it exercises the mindsight circuits that can integrate our brains.



## Tool #2: Time In

- Develop awareness—developing the ability to be present
- with what is happening in the moment
- let go of judgments
- focus instead on accepting life as it is rather than on how we expect it to be.

## Tool #2: Time In

- The more present we are in life
- the higher the level of the enzyme telomerase in our bodies
- which maintains and repairs the life-preserving ends of our chromosomes, called telomere caps.

## Tool #2: Time In

- With stress, and aging
- ...chromosome caps are slowly whittled down.
- ...Building up more telomerase helps us to be healthier and live longer.
- ...The ability to be present is increased, immune system functions better, level of telomerase increases.

## Tool #2: Time In

- With presence, the ability to be aware of your emotions and make them work for you instead of against you will be improved.
- The practice of meditation is like focusing your attention.

## Tool #2: Time In

- You can mindfully wash the dishes.
- Let internal sensations of the experience fill your awareness.
- When your mind starts to wander, begin to think about the sensations of the water or dish soap or the dish in your hands.
- Intentionally focus on some aspect of our inner world.

## Tool #2: Time In

- Breathing: focus on the sensation of the breath.
- When the mind gets distracted, take note of that and redirect attention to the sensation of the breath.
- Research shows key to long-term benefits is regular, daily practice. For adults, minimum of 12 minutes daily.

# Tool #3: Reflective Thinking and Conversations

- Time for reflective thinking
- Time for conversations with friends/family helps develop/ cultivate self-awareness.
- Time of new experiences of learning and experiencing the ability of knowing about knowing
- Knowing that we know starts in adolescence.

# Tool #3: Reflective Thinking and Conversations

- Creative/conscious explorations of conceptual thinking and abstract reasoning enable the brain to approach old problems in new ways.
- The reconstruction of the cortex enables conceptual thinking and creative explorations to emerge and blossom.



## Tool #4: Parent trauma processing

- Mirror neurons allow you to see an intentional act in someone else and then create that act in you, so your perception is mirrored also by your action.
- Allows you to simulate internally what you see someone else feeling

# Tool #4: Parent trauma processing/Parent Attachment Style

- If teenager comes home and their parents are in a bad mood, they could soak that up and you get an interactive cycle

# Why is knowledge about prefrontal cortex important in therapy?

- Siegel's discoveries led to him identifying **nine functions** of the middle areas of the prefrontal cortex:
  - 1. bodily regulation — regulating the sympathetic and parasympathetic nervous systems
  - 2. attuned communication — 'feeling felt' and resonating with another
  - 3. emotional balance

Why is knowledge about prefrontal cortex important in therapy?

- 4. response flexibility — ability to pause before responding
- 5. fear modulation — inhibiting the fear response
- 6. empathy — to understand the internal state of another

# Why is knowledge about prefrontal cortex important in therapy?

- 7. insight — ability to perceive our own mind
- 8. moral awareness — behaviors for the social good
- 9. intuition — the wisdom of the body.

# Nonverbal Aspects to Contingent Communication

- (1) eye contact,
- (2) facial expression,
- (3) tone of voice,
- (4) posture,
- (5) gestures, and
- (6) timing and intensity of response.
- These are all dependent on the Parent Attachment Style.

# Parent Attachment Style

- If **parent** has **avoidant attachment**, there is a possible **underdevelopment of the right hemisphere of the brain**.
- The right hemisphere **stores autobiographical memory** and **holds our raw emotional needs and feelings**.
- The avoidant style **enables us to not feel our needs**, and we also **don't recall our lived experiences of family life**.

# Parent Attachment Style

- We **ignore the non-verbal communication from others**, signals that are both sent and received by the right side of the brain.
- \*Even **gut reactions and heartfelt sensations**, signals arising from the intestines and the neural circuitry around the heart, arise and **end up primarily on the right side** of the brain, as it is the right prefrontal cortex that receives such bodily input.



# Parent Attachment Style

- **Raw forms of implicit memories feel as if they are happening in the present.**
- These are each the **outcomes of overwhelming experiences that may be unresolved in our lives.**
- This non-integrated state happens when the narrative focuses on loss or trauma.

# Parent Attachment Style

- **When attachment is not secure, the brain is not integrated.**
- **A person can move from non-secure to secure models of attachment.**

# Parent Attachment Style

- **Secure Attachment:** Life feels full.
- A positive sense of love and caring emerges between us, and within us.
- **Feeling felt is the fundamental experience of a secure relationship,**
- Connecting with others = “reflective conversations” or “reflective dialogue.”

# Parent Attachment Style

- When adults ignore a teen's inner life— (don't show interest or kindness for what one is going through)—it is very painful and may induce a feeling of shame.

# Parent Attachment Style

- Work on **reflective conversations**—
- Each person should **share what they are feeling, thinking, remembering, hoping, dreaming, believing, or perceiving.**
- These conversations **connect us to one another so that we can feel felt and seen**—so that we can feel authentic and real.
- With kindness we honor and support one another's vulnerabilities, creating a safe space where we can open up in an authentic way.

# Parent Attachment Style

- **Present, attune, resonate, and create trust.**
- This PART will help create the most balanced mental life for ourselves and the others with whom we are connecting.

# Tool #5: Regulate Sleep

- Sleep Time: **Most teens need 8.5 to 9.25 hours**, adults need 7-9 hours of sleep.
- This is for **optimal brain growth**,
- optimal memory consolidation of the day's learning,
- optimal insulin function and food metabolism to keep fit,

# Tool #5: Regulate Sleep

- **optimal immune function** to fight off disease,
- **optimal response to stress** to deal with life's hassles,
- **optimal mental functioning** with effective abilities for focusing attention, thinking, remembering, problem solving, handling your emotions, and connecting with others in relationships.



## Tool #5: Regulate Sleep

- **Specialized fluid system that helps to rid it of toxins** that build up during the day, including beta-amyloid plaques thought to be involved in Alzheimer's disease.
- Limit Use of Video Games
- The mind is stunted by playing hours and hours of video games.
- While playing video games the prefrontal cortex is not stimulated.

# • Tool #5: Regulate Sleep

- High-school students reported an average 6.5 hrs of sleep per school night, with 20 % obtaining 5 hrs, and only 3 % reporting the recommended 9 hrs/night.
- Just 1 hr less of weekday sleep was associated with significantly greater odds of
  - feeling hopeless,
  - seriously considering suicide,
  - suicide attempts,
  - substance use

# Tool #5: Regulate Sleep

- The outcome of inadequate sleep:
- Brain doesn't grow well,
- memory is not consolidated
- don't remember what you learned,
- insulin doesn't work right
- becoming overweight is more likely,

# Tool #5: Regulate Sleep

- stress hormones rise and make you feel lousy,
- immune functions don't work well, so you can get sick more easily,
- the mind won't be as sharp for paying attention, thinking, and problem solving.
- You may have less energy, feel bad, become irritable more easily, and get frustrated with others more frequently.

# Tool #5: Regulate Sleep

- Daily sleep habits:
- Turn off digital objects one hour before bed
- If trouble falling asleep, turn down lights a bit in half hour before going to bed.
- Do not do work or homework in bed. Bed should be for restful activities, not associated with working.

# Tool #5: Regulate Sleep

- Caffeine in soda, coffee, or tea may keep you up.
- Some are helped by a warm bath before bed, a glass of milk.
- Some like to write out the day's event so they won't worry about things when they fall asleep.
- 8-9 hours are what to aim for.

# Tool #6: Focus Time

- Focus intently on one thing.
- Multitasking disrupts the neuroplastic conditions necessary to make studies turn into synaptic change in the brain.
- Help your teen evaluate if they have time to focus.
- If they do not have time, they may need to consider reducing the number of activities they are involved in.

# Tool #7: Downtime

- Downtime is when you have no plans, nothing we are trying to accomplish, nothing that needs to be done.
- Individuals who are more introverted need more downtime to recharge.
- Individuals who are more extroverted need to be with others to recharge.



# Tool #8: Playtime

- Play in engaging, pleasurable, non-judgmental ways. It should be fun for everyone.
- Laughing, having fun.
- Evaluate your family time—when is the last time you made playing together and having fun the focus?

# Tool #9: Physical Time

- Physical time: aerobic movement.
- Heart rate up for over 30 minutes, 5 times a week.
- Family members can help each other be consistent in this practice.

# Tool #10: Connecting time

- Present, attune, resonate, and create trust.
- This PART will help create the most balanced mental life for ourselves and the others with whom we are connecting.

# Additional Recommendations

- Enrichment of Environment—
  - Give opportunities to read emotional cues—arts, drama, music, celebrations
- Teach Teens to Deal with Stress—
  - outlets for emotional expression—discussion, singing, writing, music, drawing, journaling.
  - Teach peer acceptance and social behaviors explicitly—guide in safe groups.

# Recommendations

- Sufficient Exercise
  - Walking, swimming, stretching, playing games releases epinephrine and dopamine, impacts positive feelings for teens.
  - More dendrites connections in rats who exercise

# The Adolescent Brain: Why They Do What They Do!

Participants will identify and discuss how the findings of adolescent brain research could fit into the therapy models they currently use.

# Evidenced-Based Therapy Models for Adolescents

- Applied Behavior Analysis
- Behavior therapy
- Cognitive behavioral therapy
- Cognitive therapy
- Family therapy
- Dialectical behavioral therapy
- Motivational Interviewing
- Organizational Skills Training (especially helpful for teens with ADHD)

# Evidenced-Based Counseling Models for Adolescents

- Narrative Therapy
- Acceptance and Commitment Therapy
- Active Parenting of Teens: Families in Action
- Adolescent Coping with Depression (CWD-A)
- Aggression Replacement Therapy (ART)
- Child-Parent Psychotherapy (CPP)
- Eye Movement Desensitization and Reprocessing (EMDR)
- Functional Family Therapy (FFT)



# Evidenced-Based Counseling Models for Adolescents

- Multidimensional Family Therapy (MDFT)
- Multisystemic Therapy (MST)
- Seeking Safety
  
- <https://manuals-sp-chfs.ky.gov/Resources/Related%20Resources%20Library/Evidence%20Based%20Practices-Quick%20Reference.pdf>