



Pacific Southwest (HHS Region 9)

PTTTC

Prevention Technology Transfer Center Network

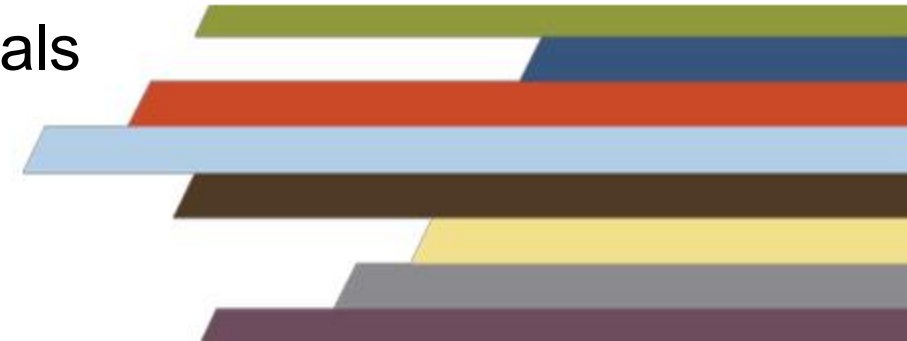
Funded by Substance Abuse and Mental Health Services Administration



The Growing Brain

A Multi-Media Presentation for Prevention Professionals

Roneet Lev, MD, FACEP



Disclaimer

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This webinar is being recorded and archived, and will be available for viewing after the webinar. Please contact the webinar facilitator if you have any concerns or questions.

Developed under SAMHSA Cooperative Agreement
#H79SP081015-01

Purpose of the PTTC

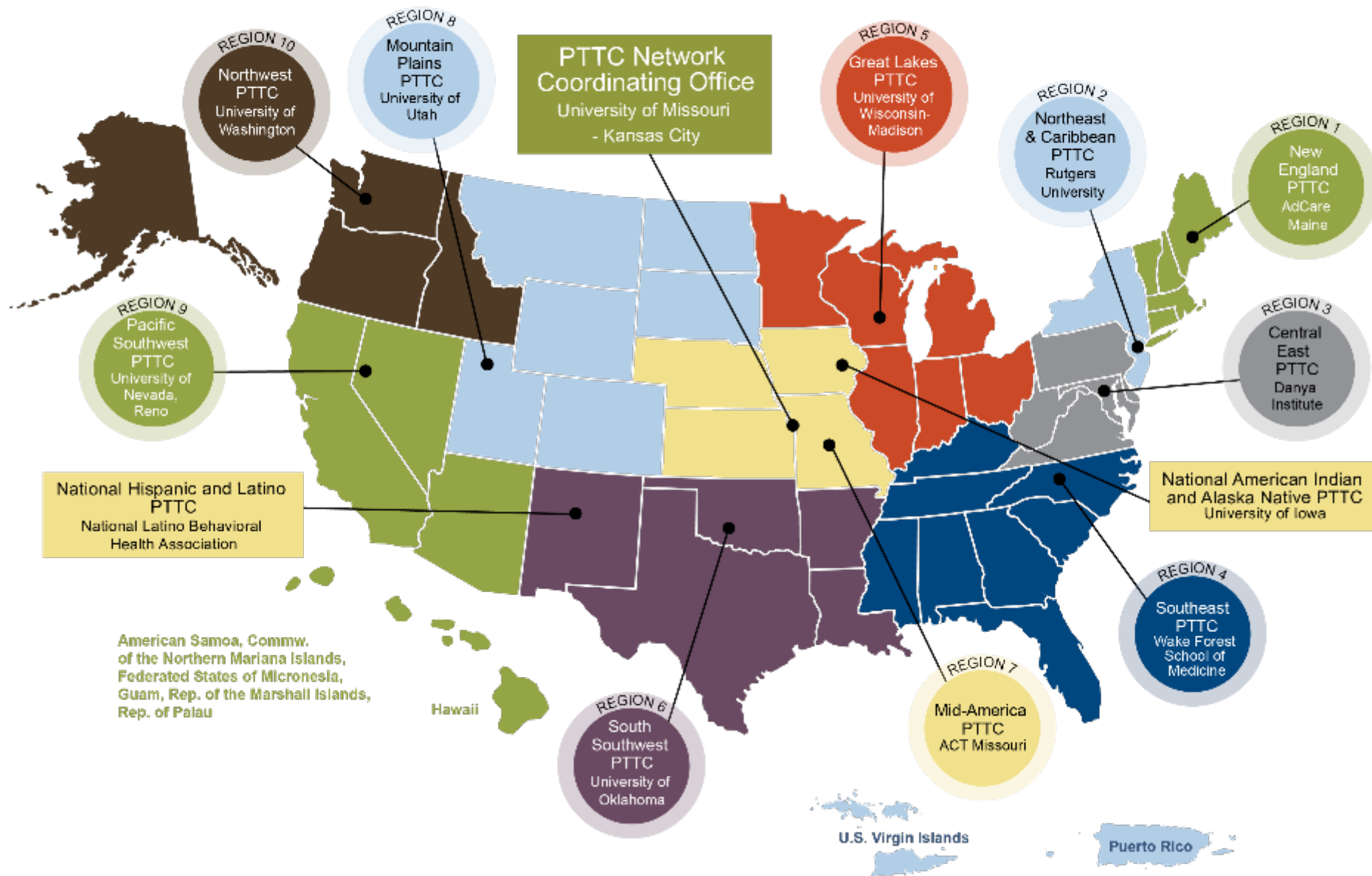
- Develop and disseminate tools and strategies needed to improve the quality of substance abuse prevention efforts
- Provide training and learning resources to prevention professionals
- Develop tools and resources to engage the next generation of prevention professionals



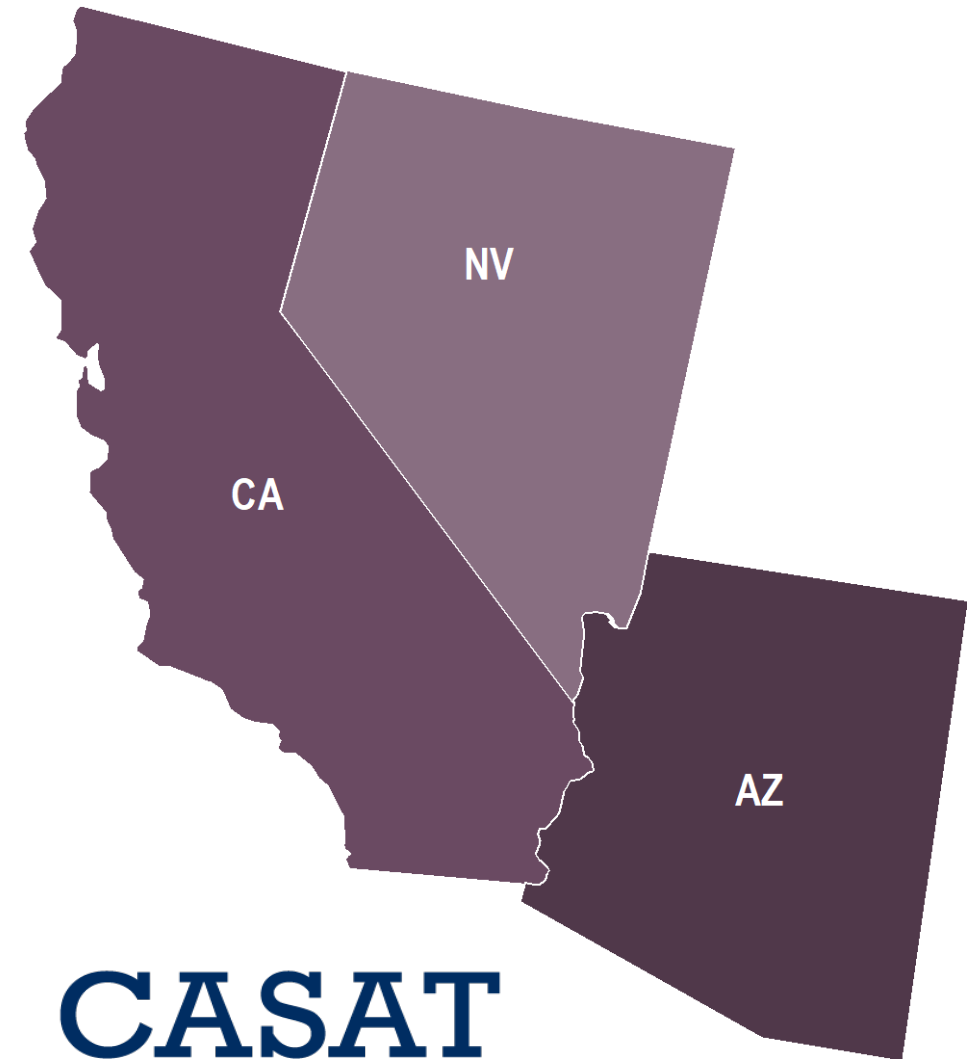
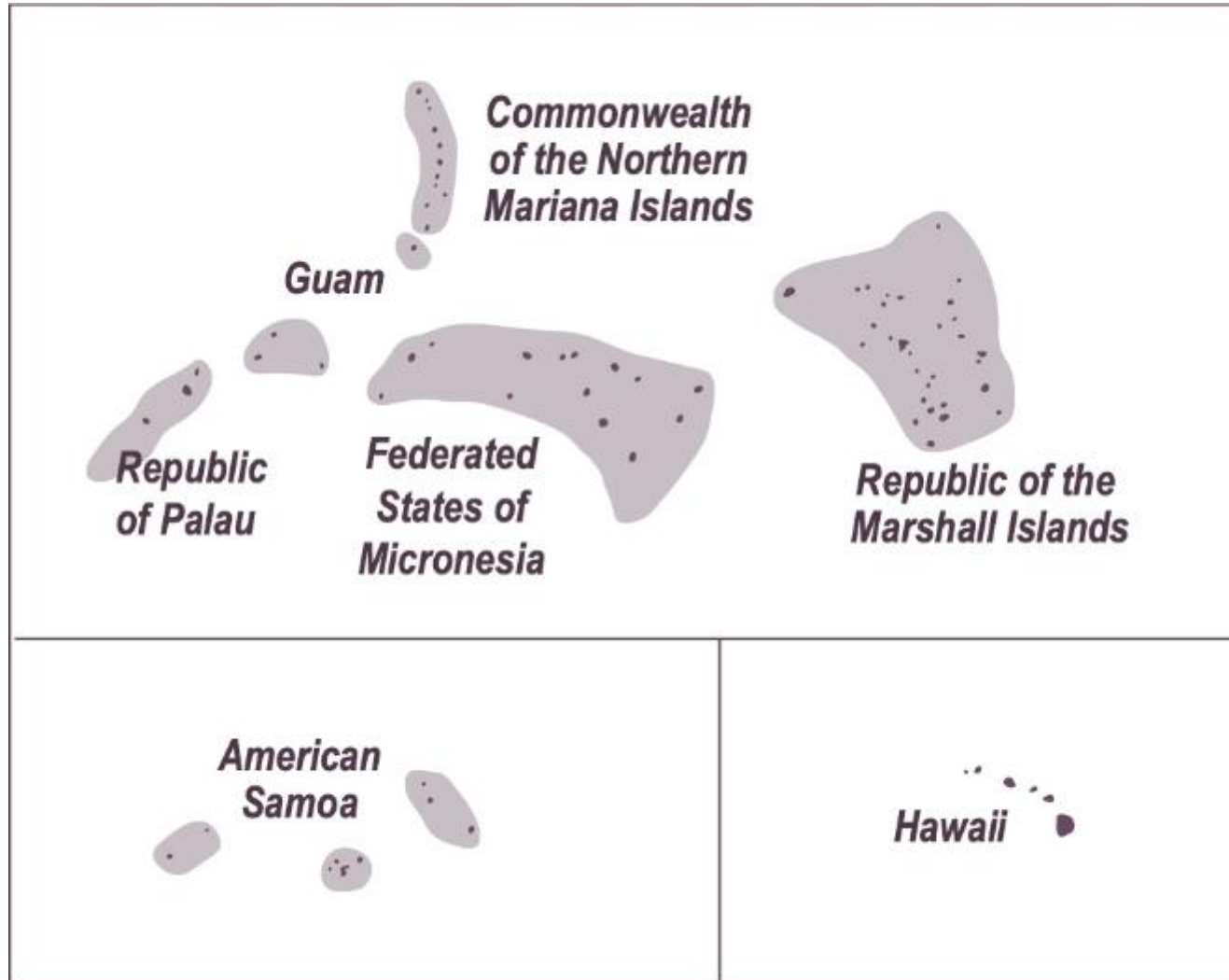
PTTC

Prevention Technology Transfer Center Network
Funded by Substance Abuse and Mental Health Services Administration

PTTC Network



Pacific Southwest



Mark Your Calendars!

Adverse Childhood Experiences and Chronic Stress: Building Resilience During and After COVID-19

August 4, 2020*

Case Studies in Marijuana: From Pharmacology to the Emergency Department

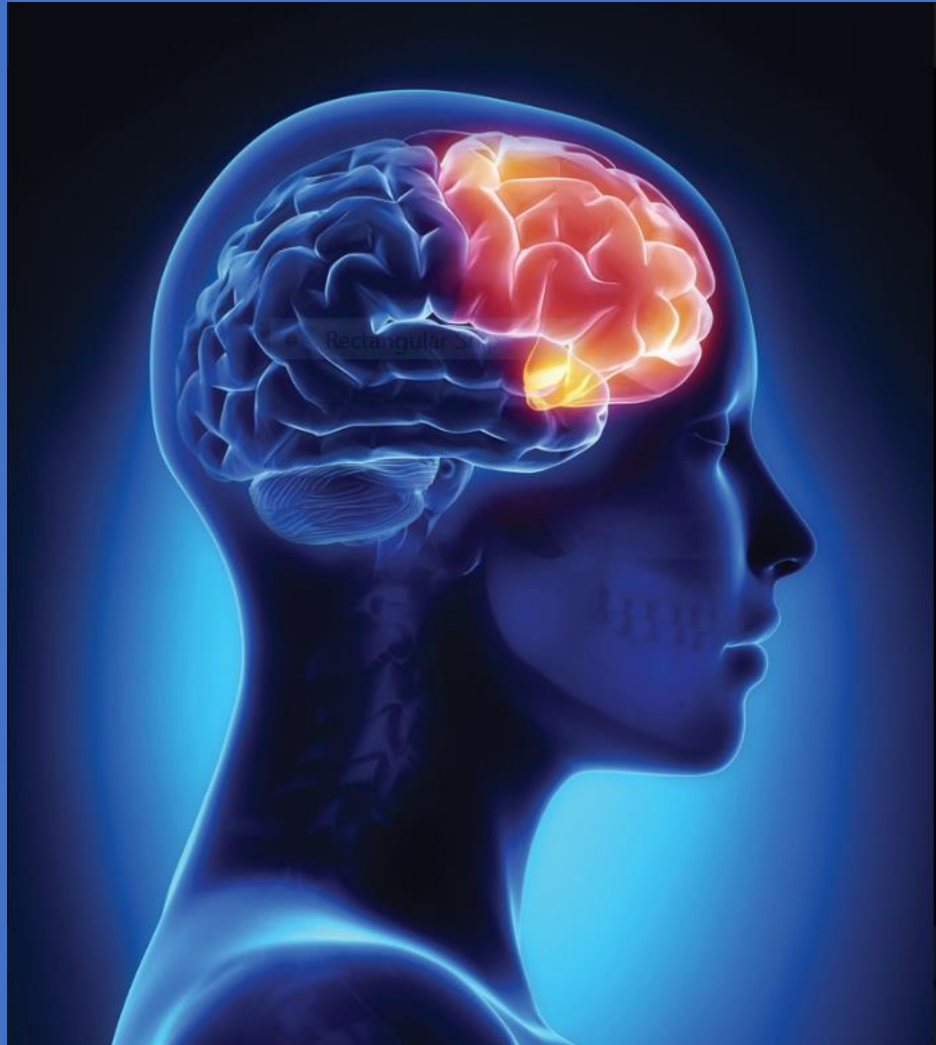
September 3, 2020

*all times 3:00 PM Pacific

Presenter



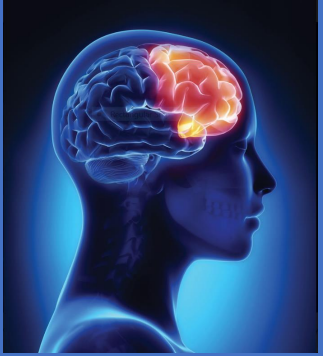
Roneet Lev, MD, FACEP, was the first Chief Medical Officer of the White House Office of National Drug Control Policy, ONDCP. She is a nationally acclaimed medical expert and speaker who continues to treat patients in the emergency department. As a mother of four, she relates to families who struggle. Dr. Lev is dually board certified in emergency and addiction medicine, bringing over 25 years of experience treating the frontline cases of addiction. She came to the White House as chief of the emergency department at Scripps Mercy Hospital in San Diego.



The Growing Brain

Roneet Lev, MD
Emergency and Addiction Physician

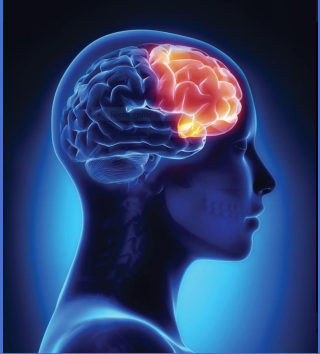




Quiz

At what point in someone's life is the brain finished growing?

- a. Childhood
- b. Adolescence
- c. Mid to Late 20s
- d. The brain is always maturing



Objectives

Structures of the Brain

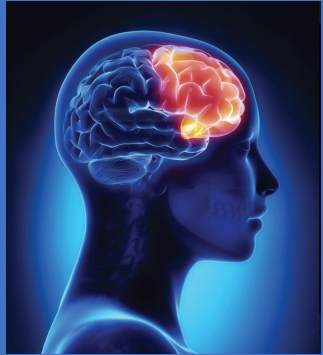
- ⑩1. Parts of the Brain
- ⑩2. The Brain Cell – Neurons
- ⑩3. Neurotransmitters

Brain Growth

- ⑩1. Pruning – Use it or Lose It
- ⑩2. Myelination – Speed
- ⑩3. Neuroplasticity – Flexibility

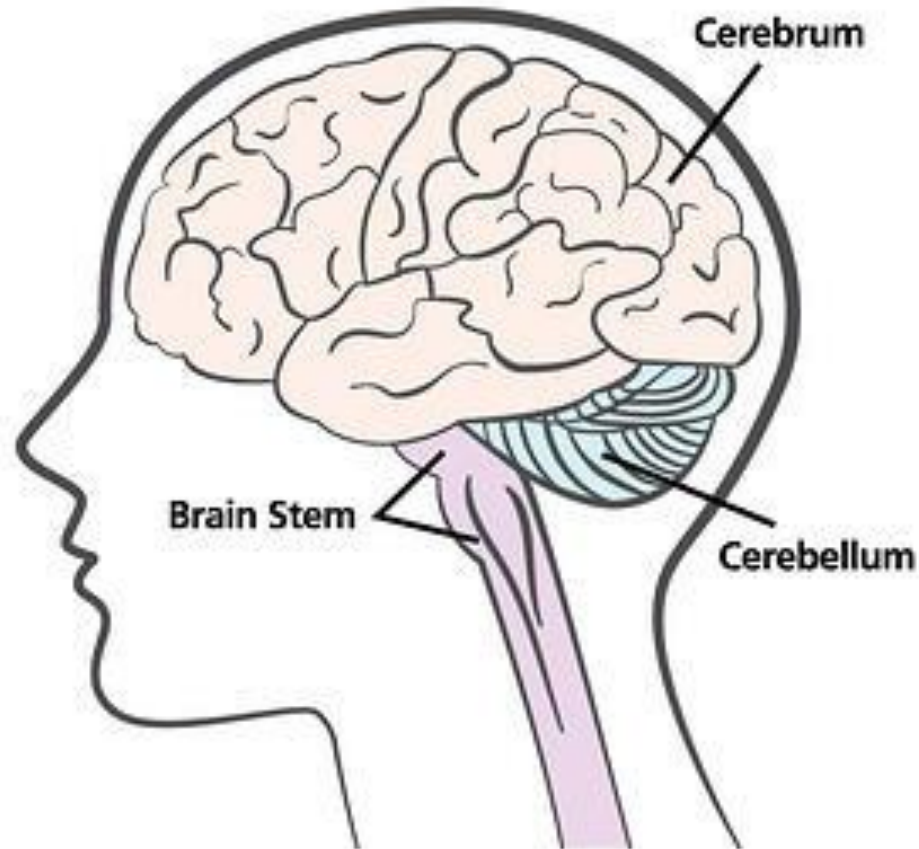
Chemistry of Addiction

- ⑩1. Stages of Addiction
- ⑩2. Dopamine Hijacking
- ⑩3. Stunting Brain Growth



Structures of the Brain

1. Parts of the Brain



Brain Stem

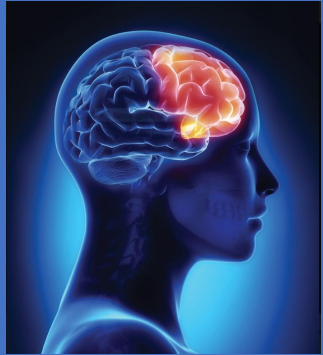
- Automatic
- Midbrain, Pons, Medulla oblongata

Cerebellum

- Balance

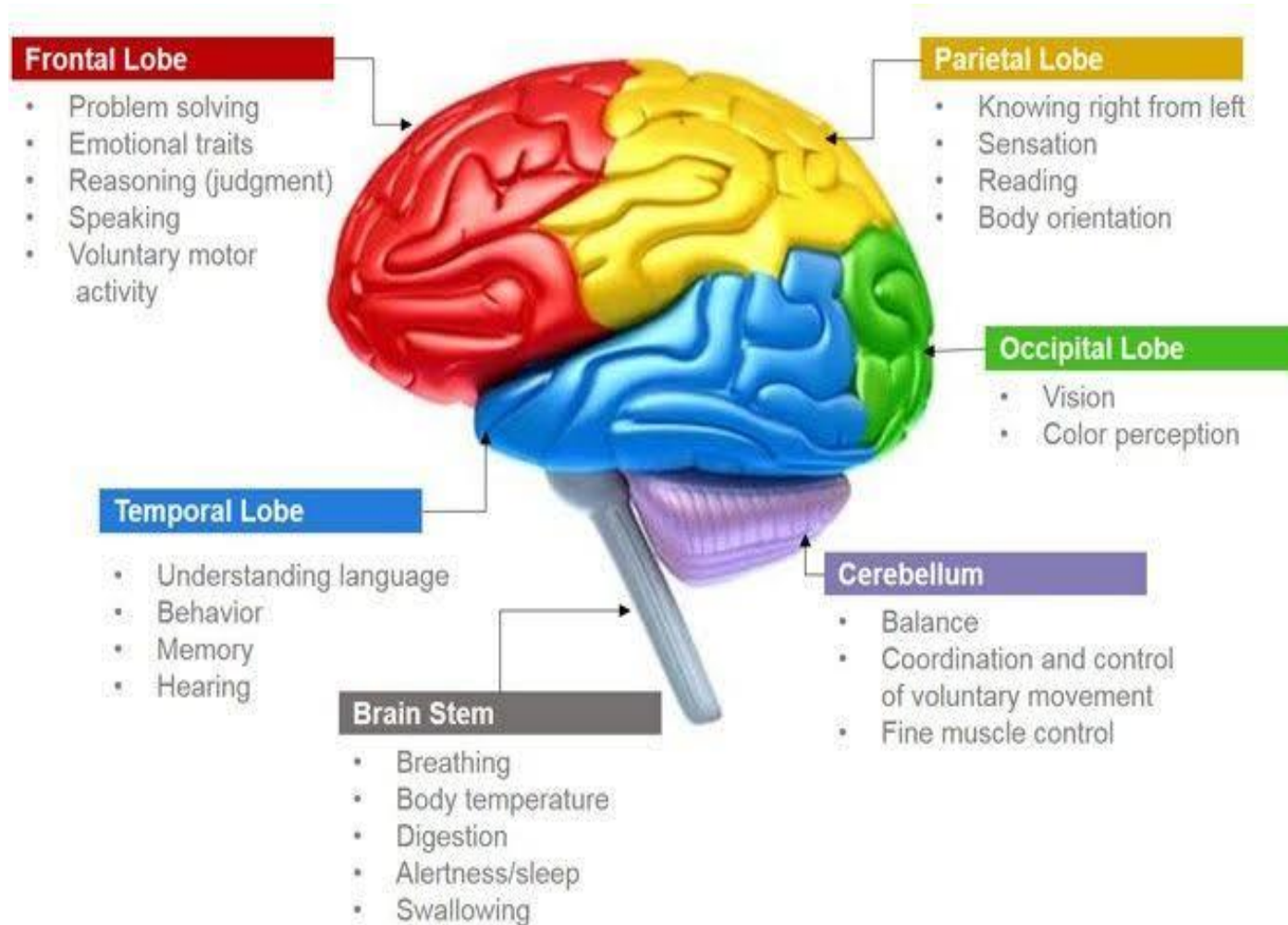
Cerebrum – 85%

- Memory, thinking, emotion, speech, touch
- 2 Hemispheres
- 4 Lobes

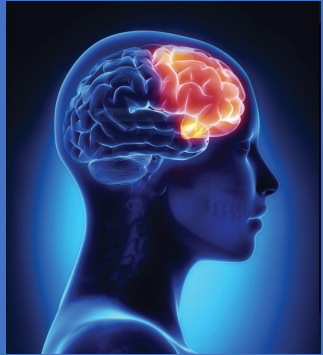


Structures of the Brain

1. Parts of the Brain



Pre Frontal Cortex
The CEO
Executive Function
Decision Making
Good/ Bad
Consequences
Goals
Social control

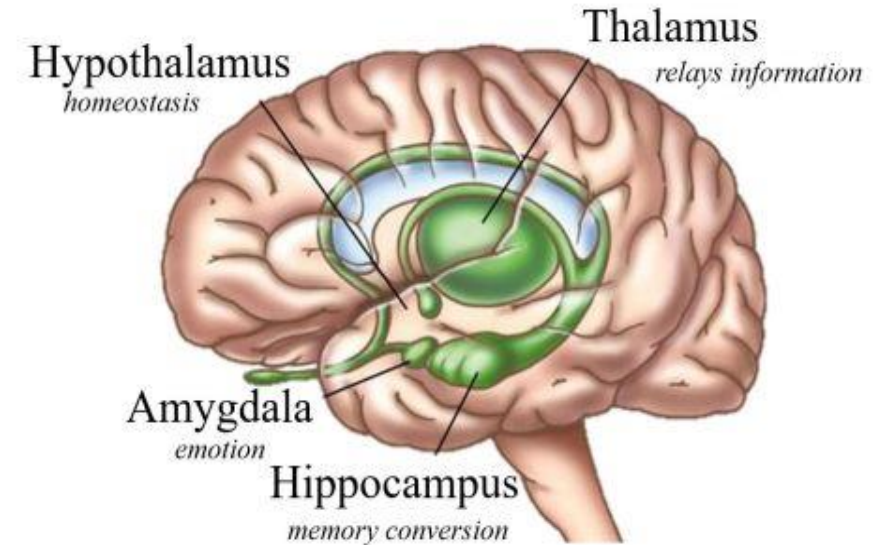


Structures of the Brain

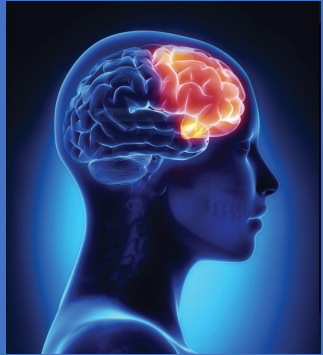
1. Parts of the Brain



The Limbic System



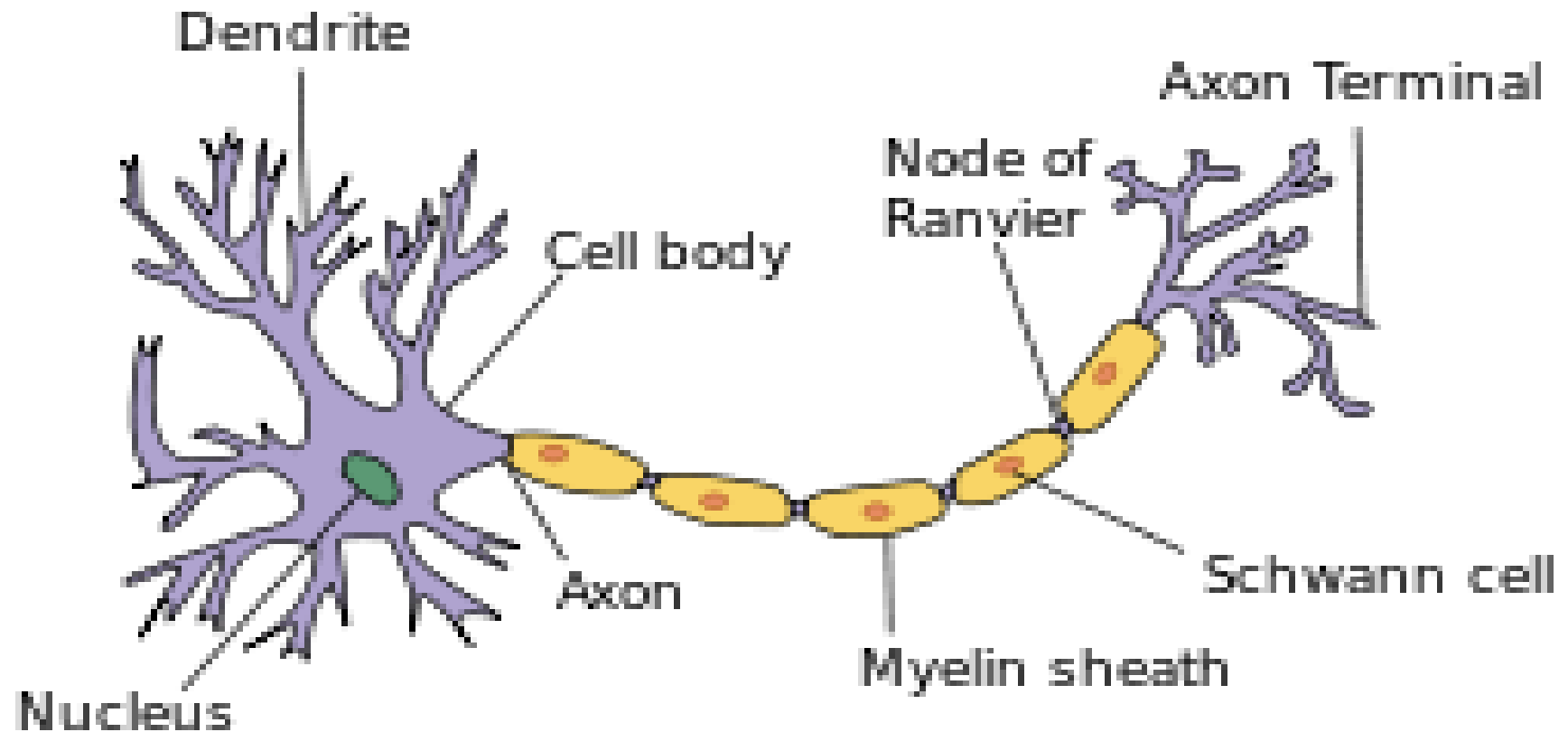
Frontal Lobe – Executive
Limbic System – Emotional
Brain Stem - Survival

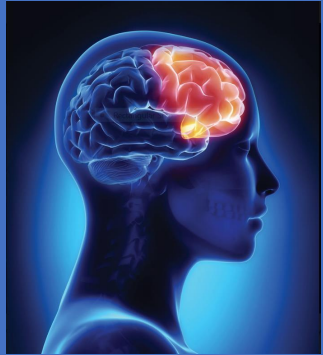


Structures of the Brain

2. The Brain Cell – Neuron

Neuron Anatomy



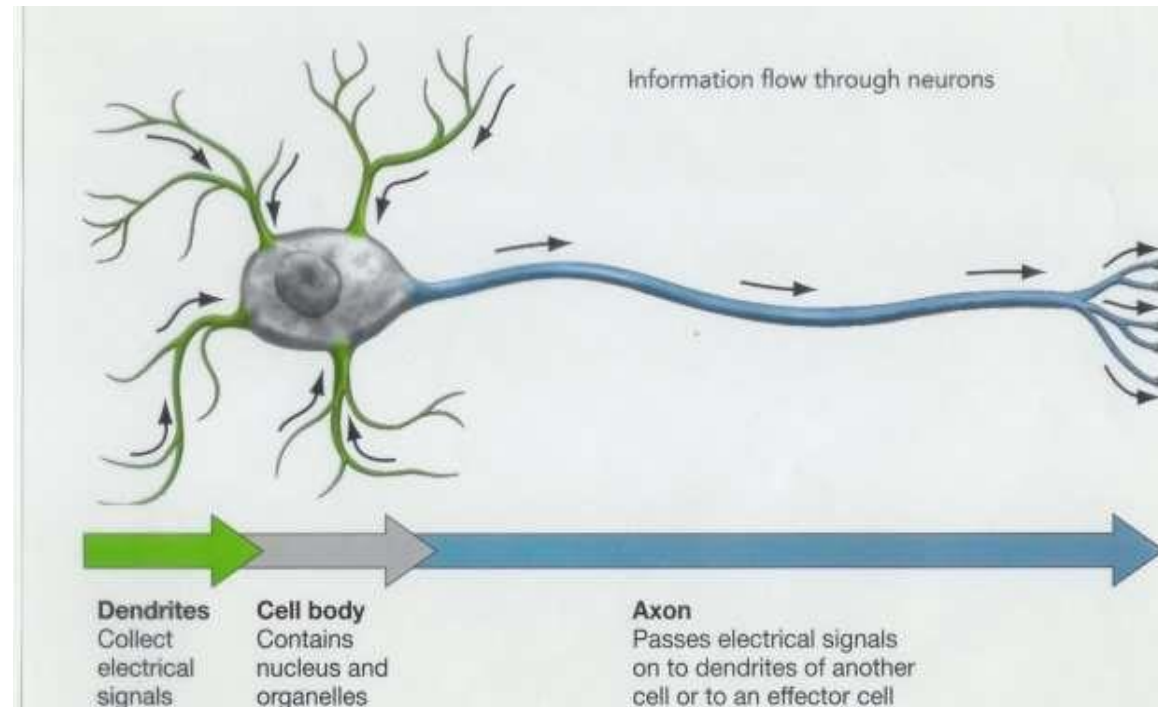


Structures of the Brain

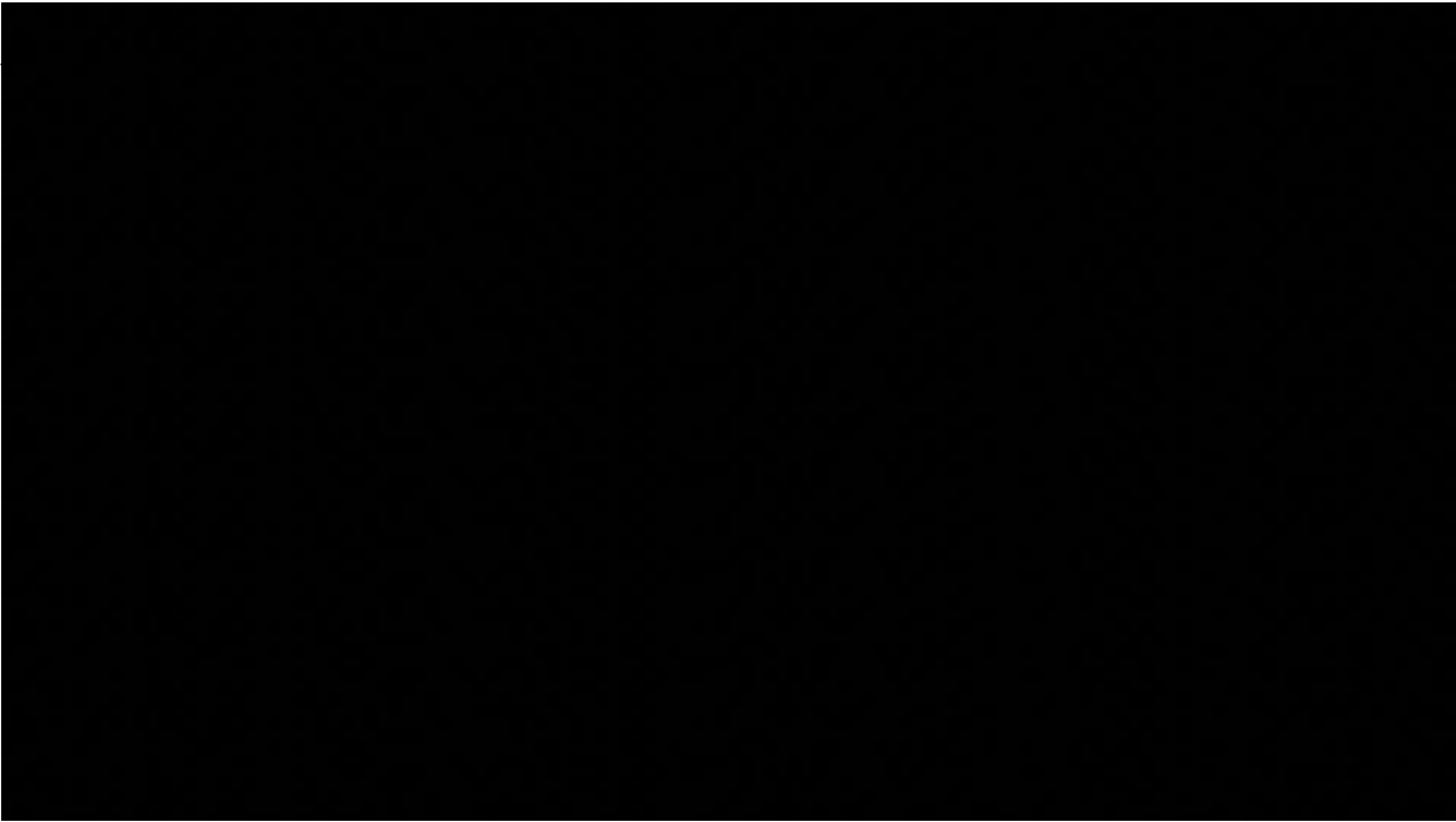
2. The Brain Cell – Neuron

Action Potential = Nerve Impulse

**Dendrites
collect
electric
signals**

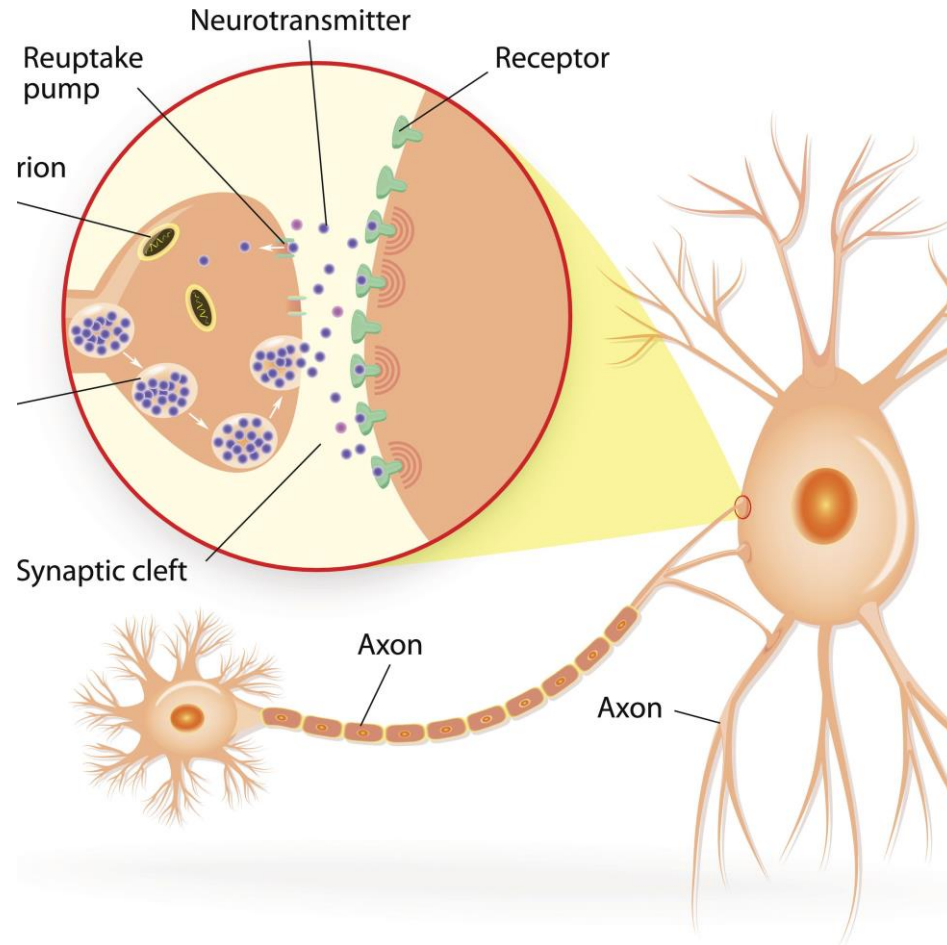
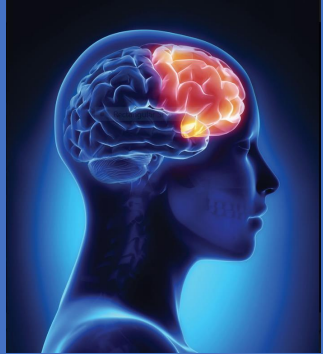


**Axons pass
electric
signals onto
dendrites of
another cell**



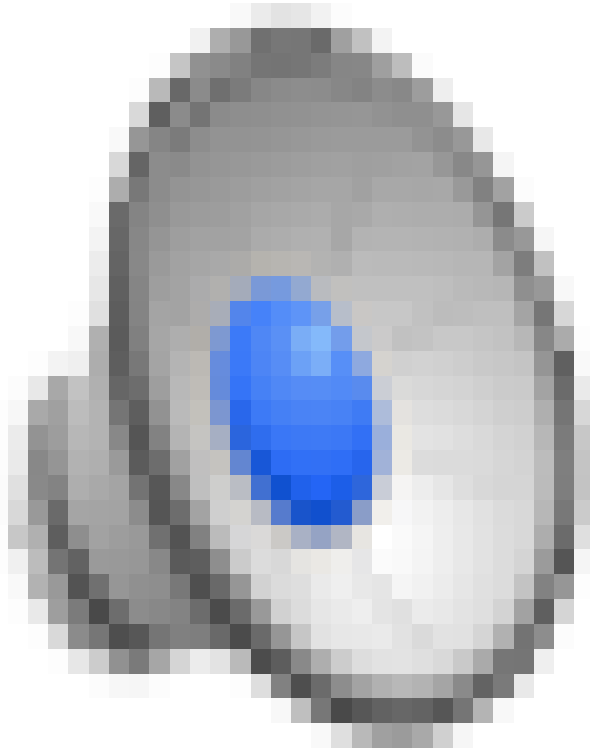
Structures of the Brain

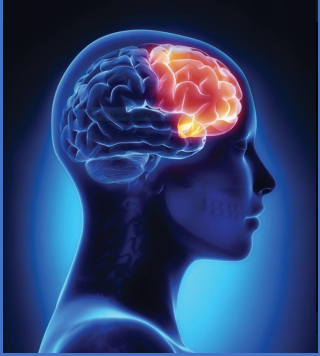
3. Neurotransmitters



Neurotransmitters are chemicals that are released by the end of a neuron by the arrival of an action potential

How Neurons Communicate





Objectives

Structures of the Brain

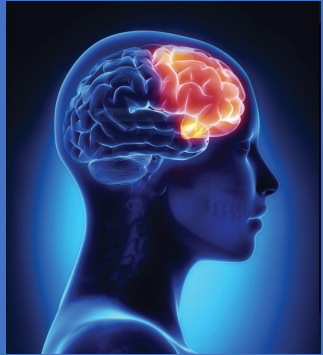
- ⑩1. Parts of the Brain
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Brain Growth

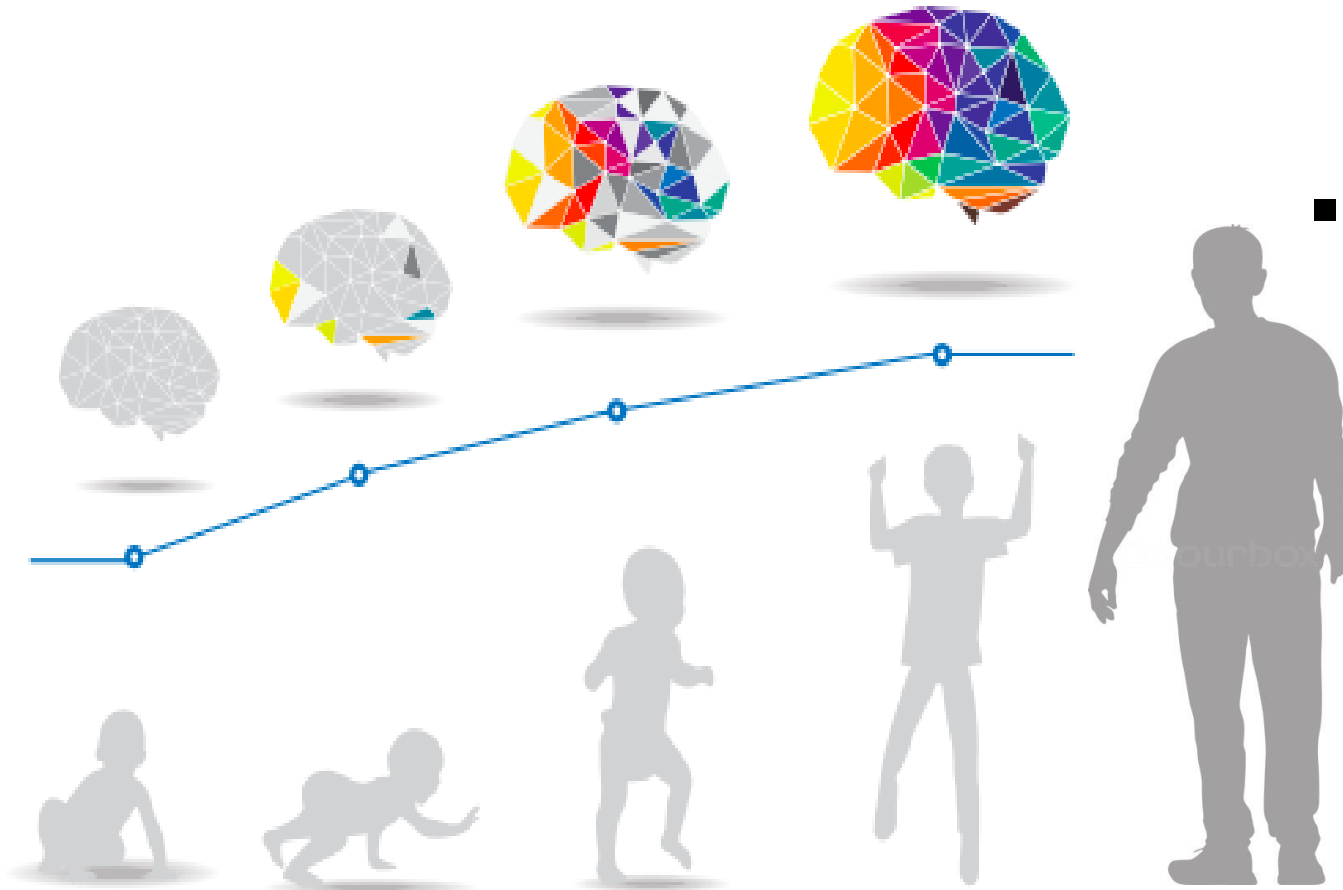
- ⑩1. Pruning – Use it or Lose It
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Chemistry of Addiction

- ⑩1. Stages of Addiction
- ⑩2. Dopamine Hijacking
- ⑩3. Stunting Brain Growth



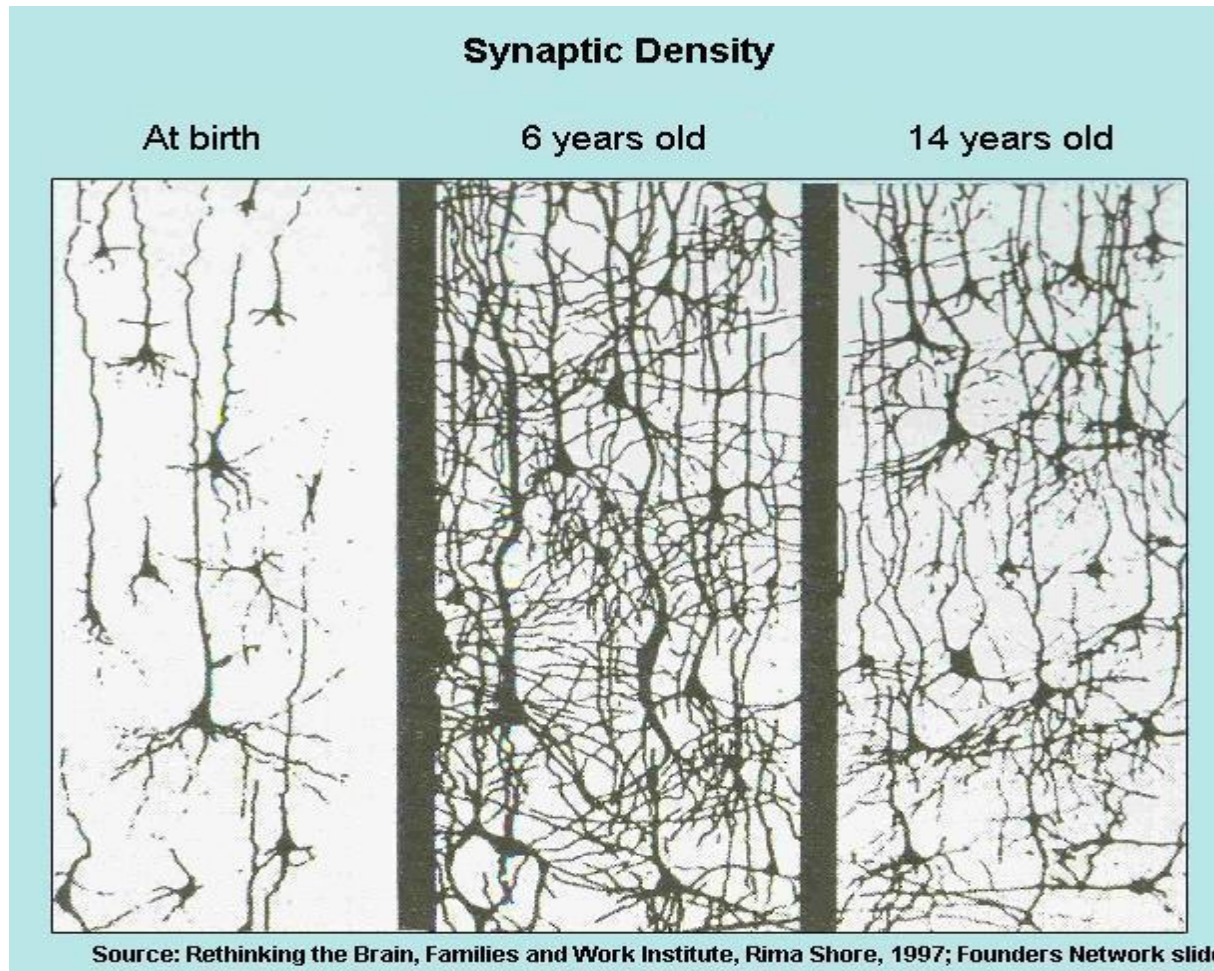
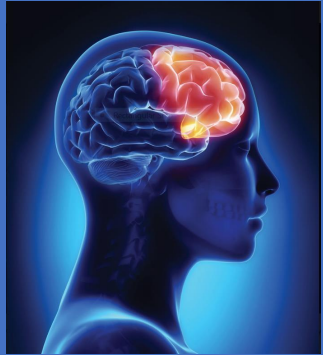
The Growing Brain



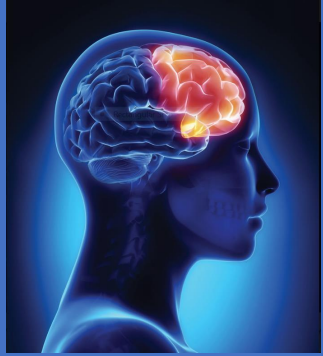
- Brain Maximal Physical Size
Boys 11 years
Girls 14 years
- Brain Inner Development
25-27 years old
- Finite number of Neurons, Can't grown more

Brain Growth

1. Pruning

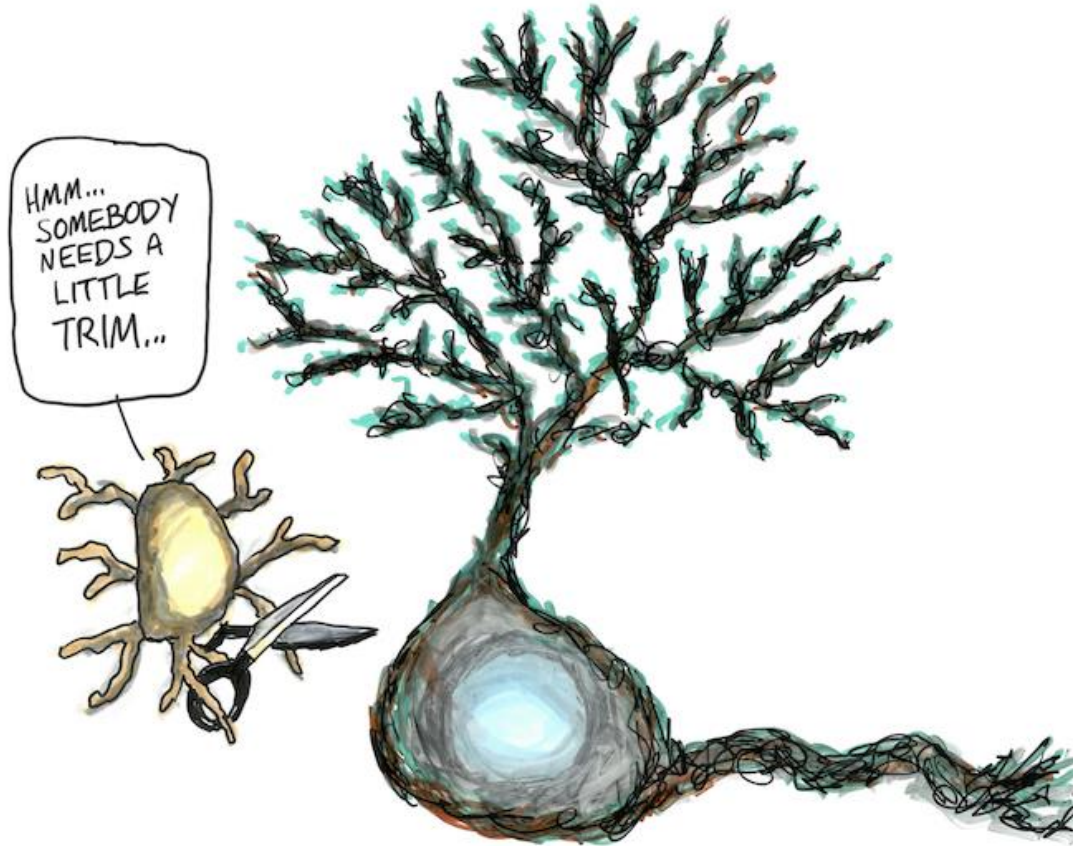


Synaptic pruning is a natural process where the brain eliminates extra synapses, or neuron connections.

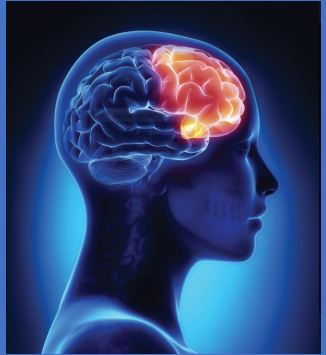


Brain Growth

Pruning

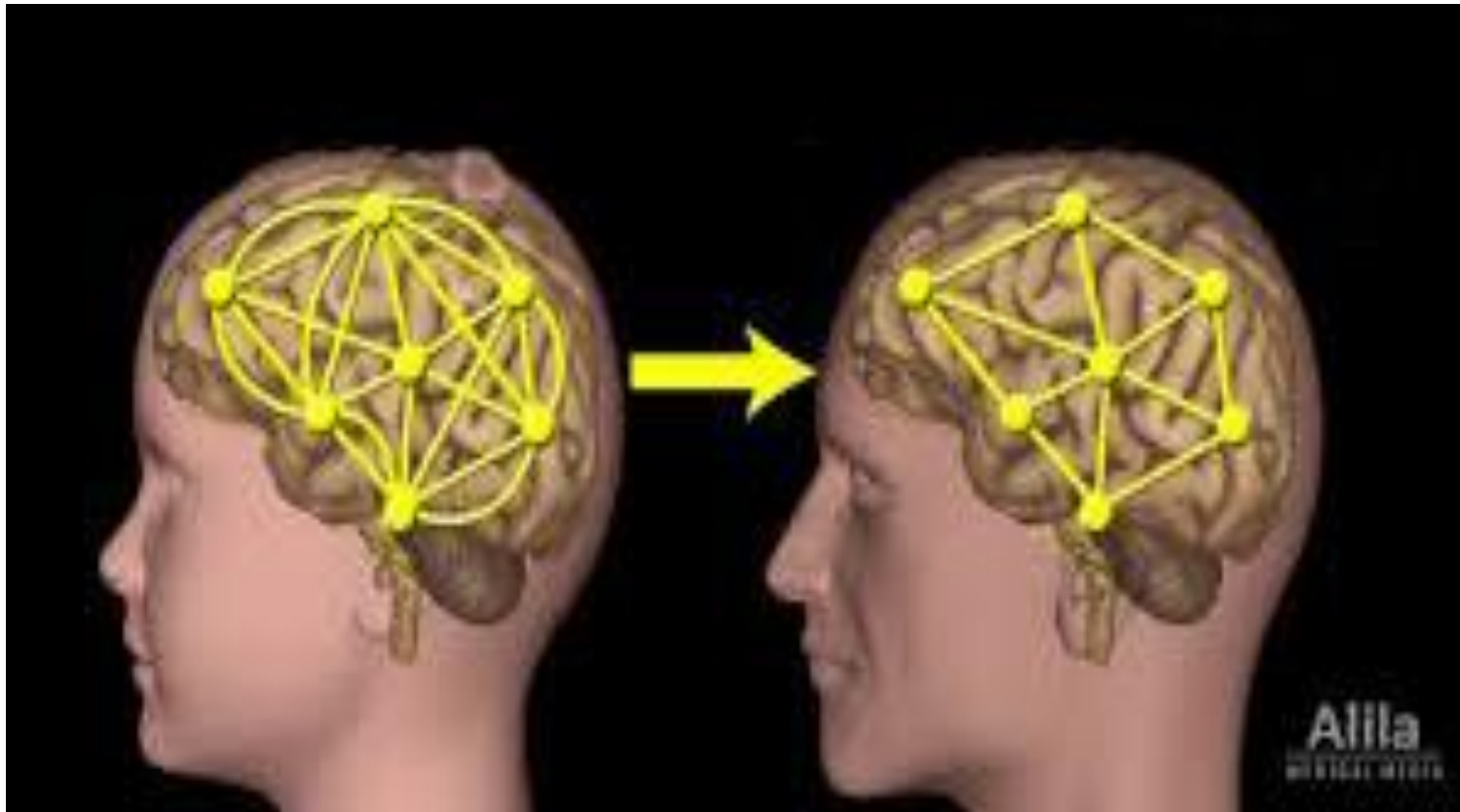


- **Use It or Lose It**
- Used, well traveled connection and strengthened,
- Less used neurons are eliminated



Brain Growth

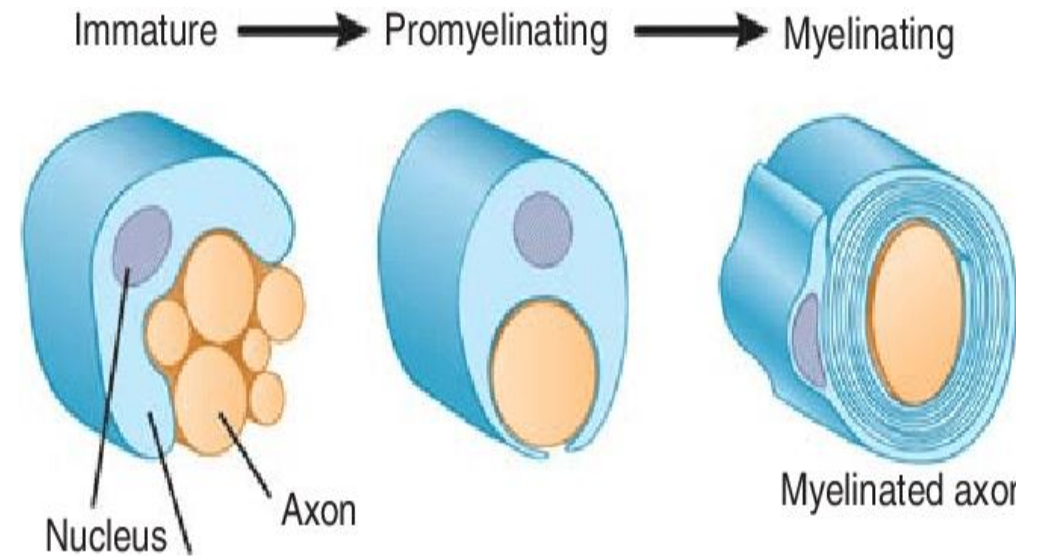
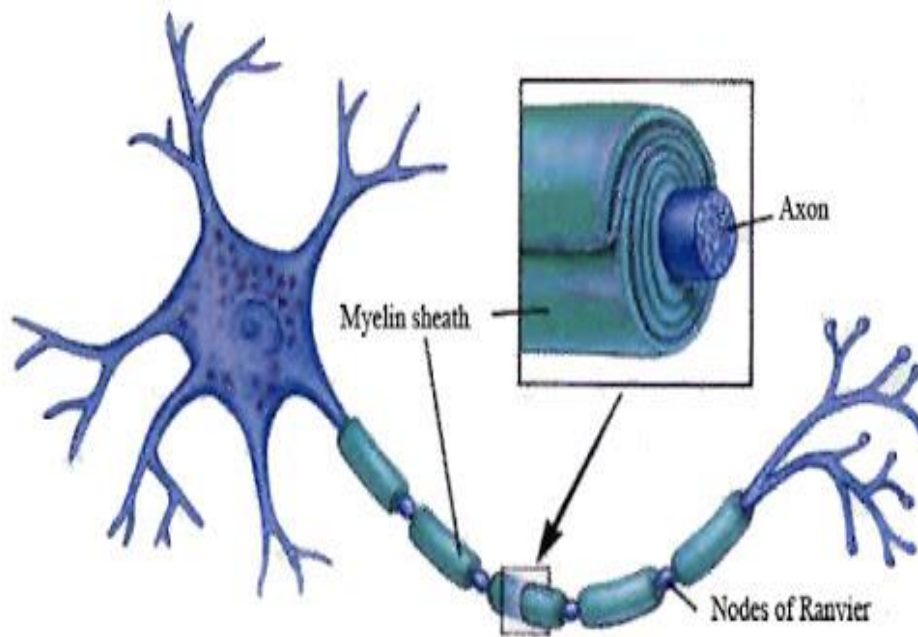
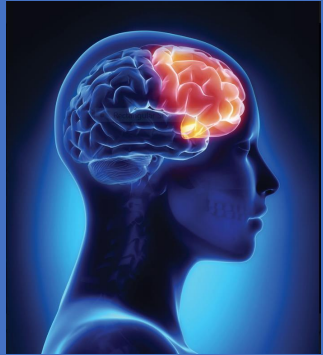
Pruning



- Too much pruning – **Schizophrenia**
- Too little pruning – **autism, seizures**

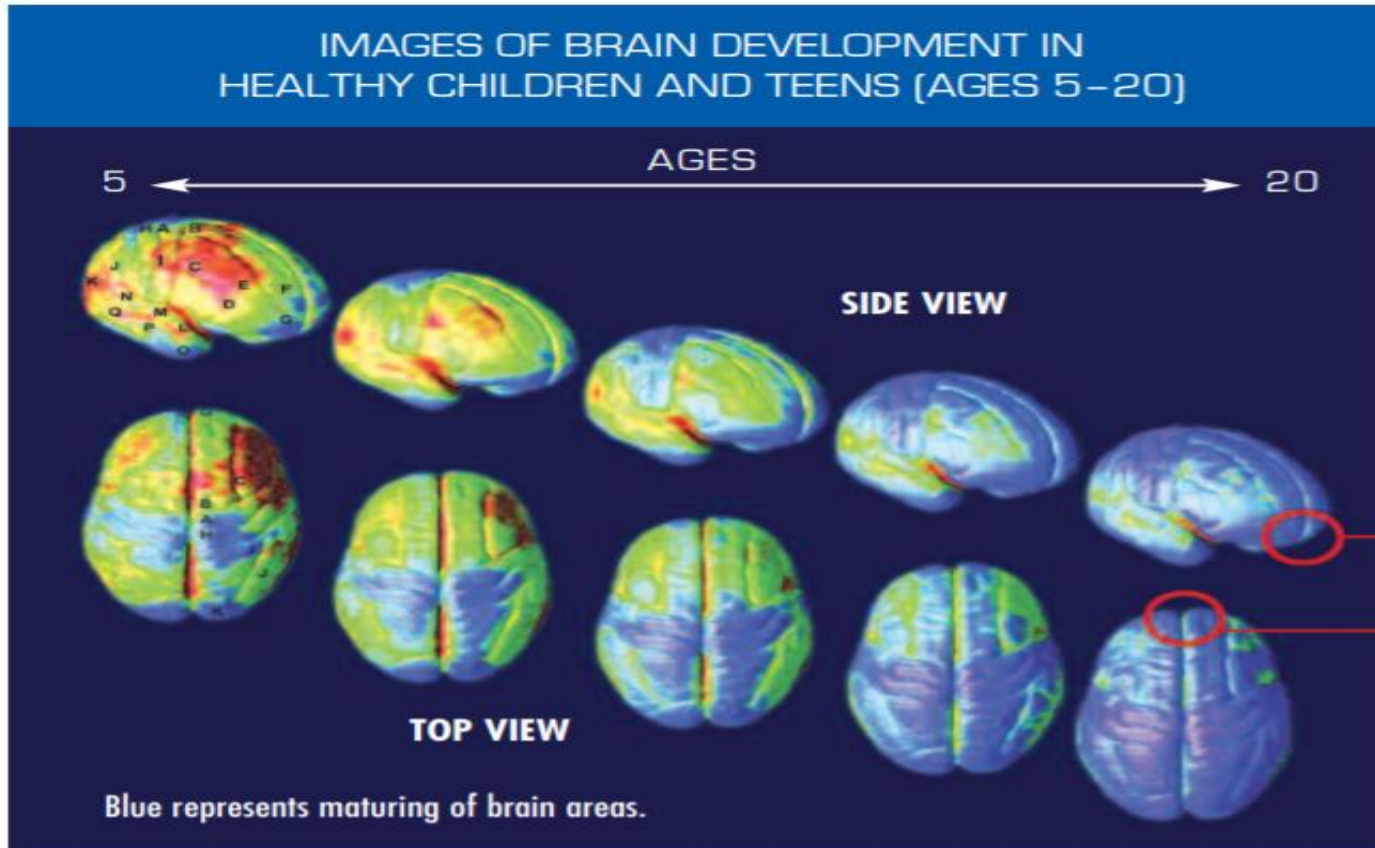
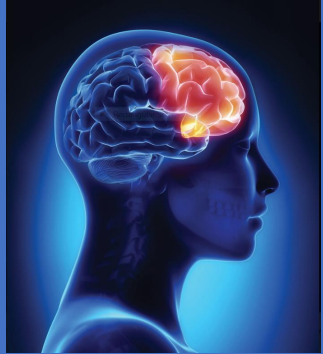
Brain Growth

2. Myelination



Brain Growth

Myelination



Source: PNAS 101:8174–8179, 2004.

Last part of the brain to mature, to grow myelin, is the prefrontal cortex, the executive function of the brain

PUBLISHERS

1990-1991

1992-1993

1994-1995

1996-1997

1998-1999

2000-2001

2002-2003

2004-2005

2006-2007

2008-2009

2010-2011

2012-2013

2014-2015

2016-2017

2018-2019

2020-2021

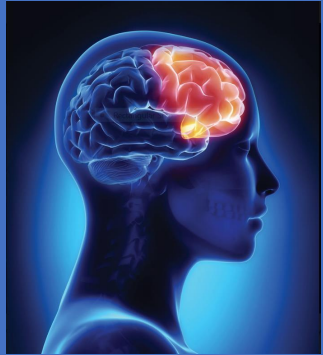
2022-2023

2024-2025

2026-2027

2028-2029

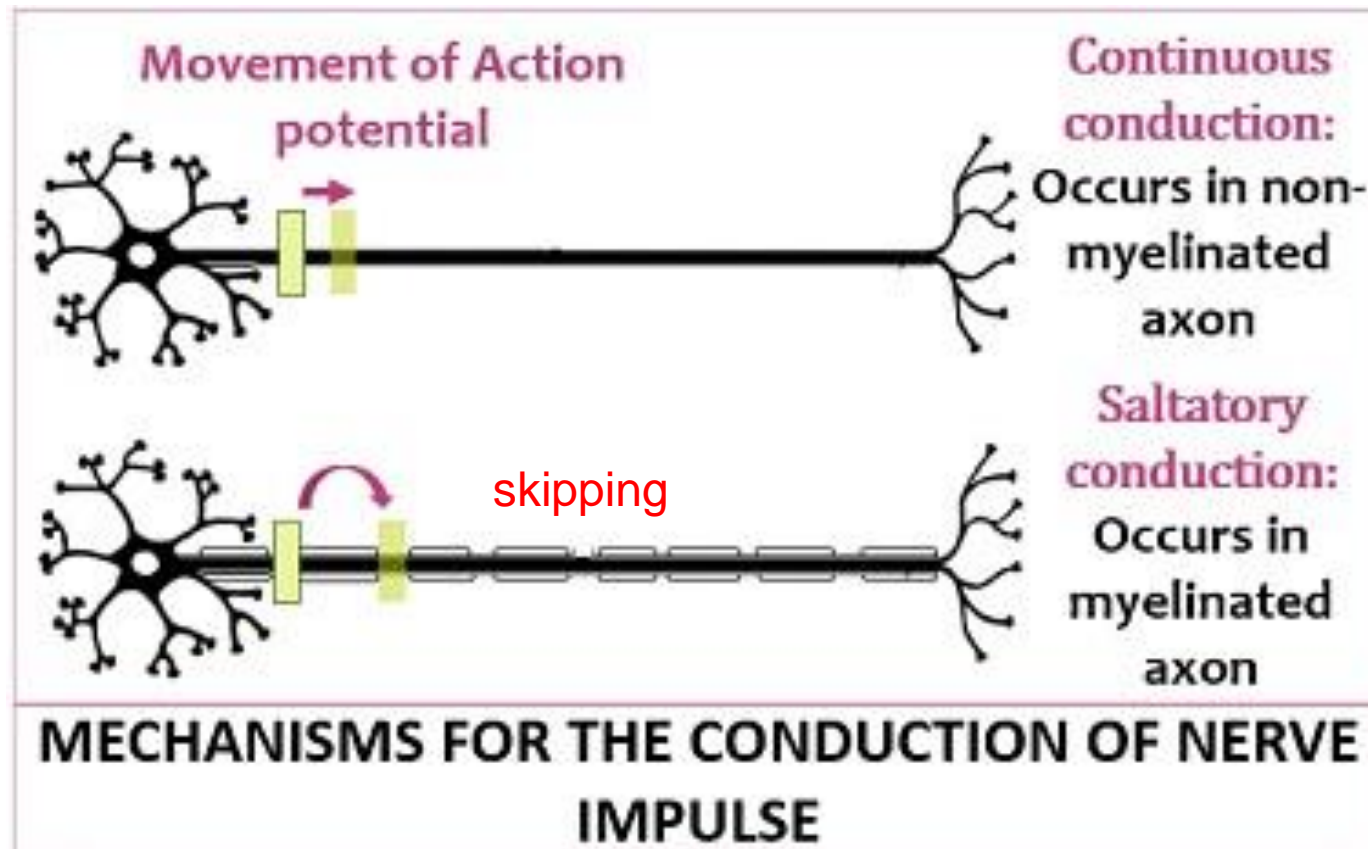
2030-2031



Brain Growth

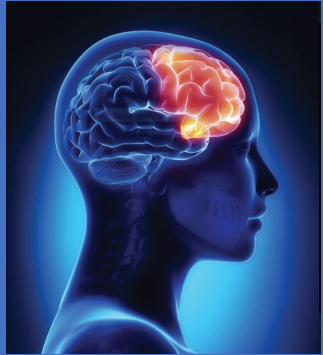
Myelination

Saltatory vs Continuous conduction



Continuous
= Slow

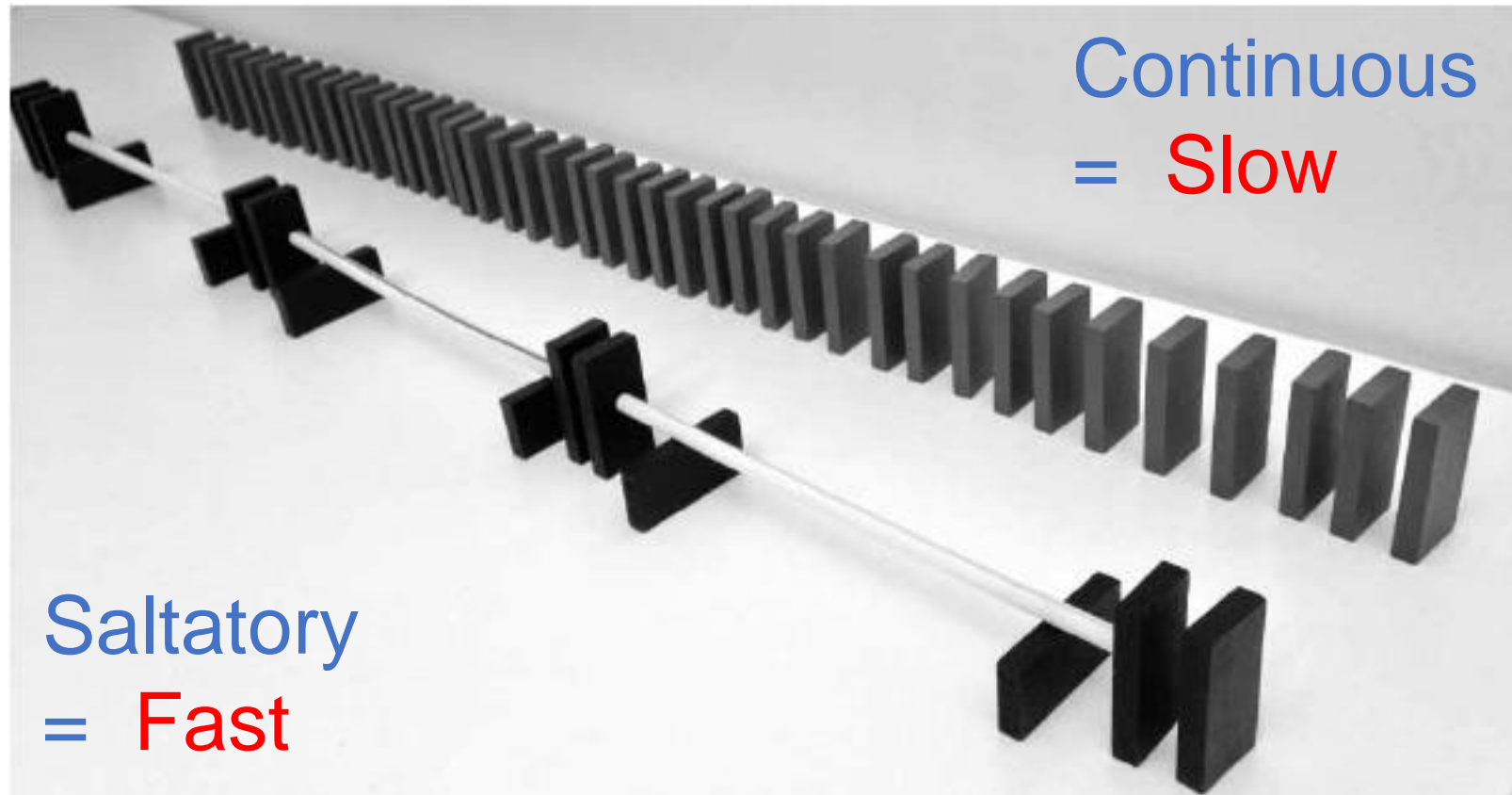
Saltatory
= Fast

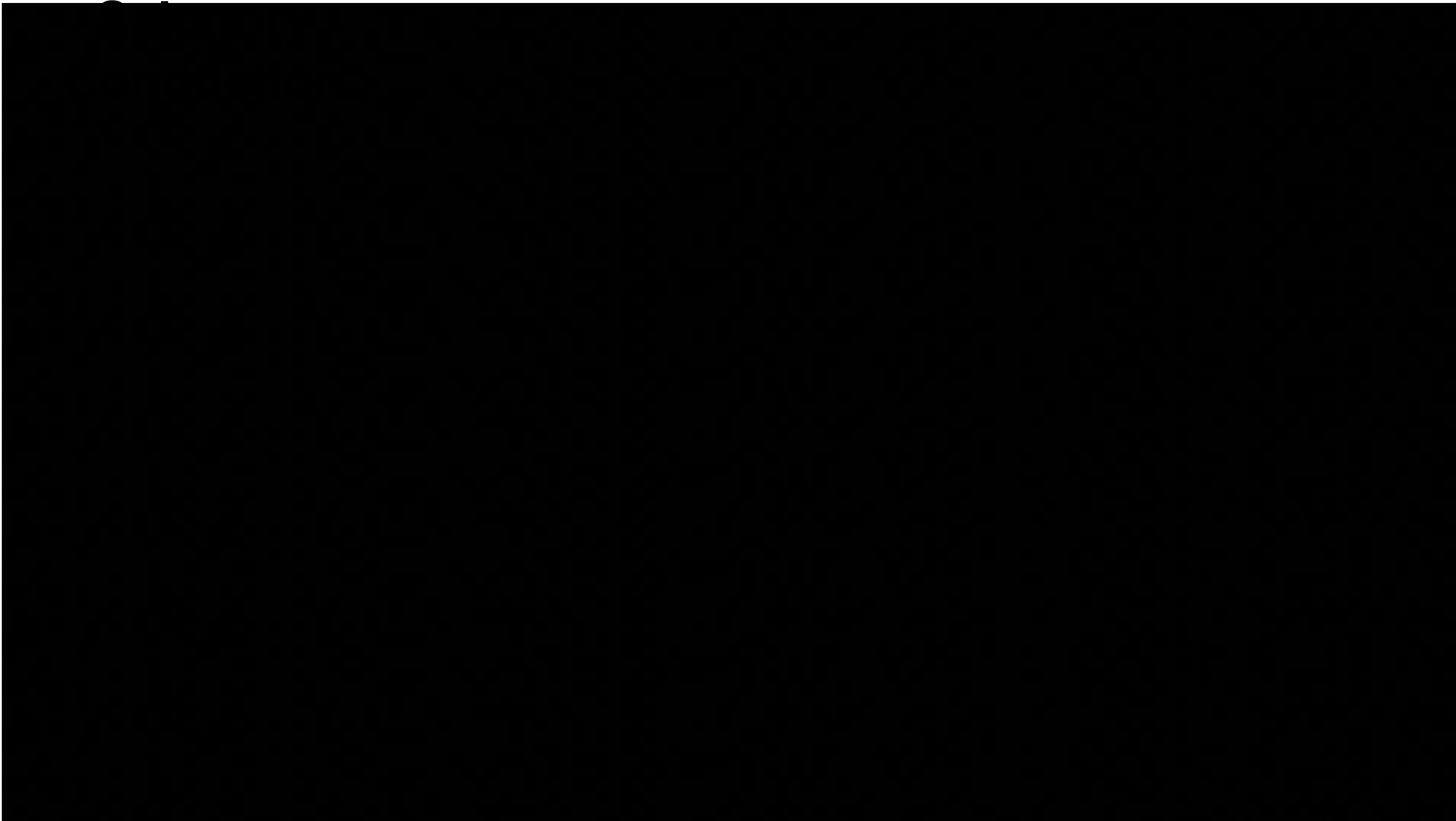


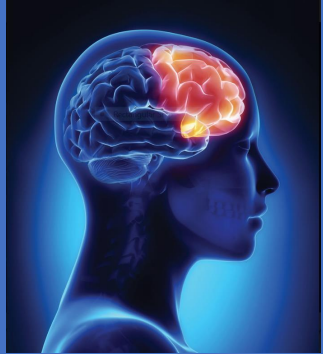
Brain Growth

Myelination

Myelination speeds up conduction

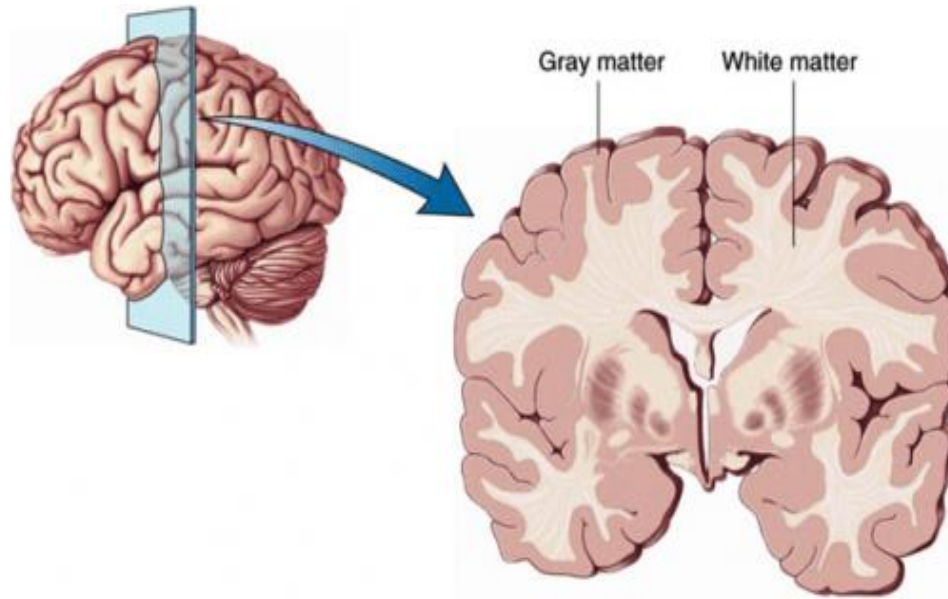






Brain Growth

Gray and White Matter



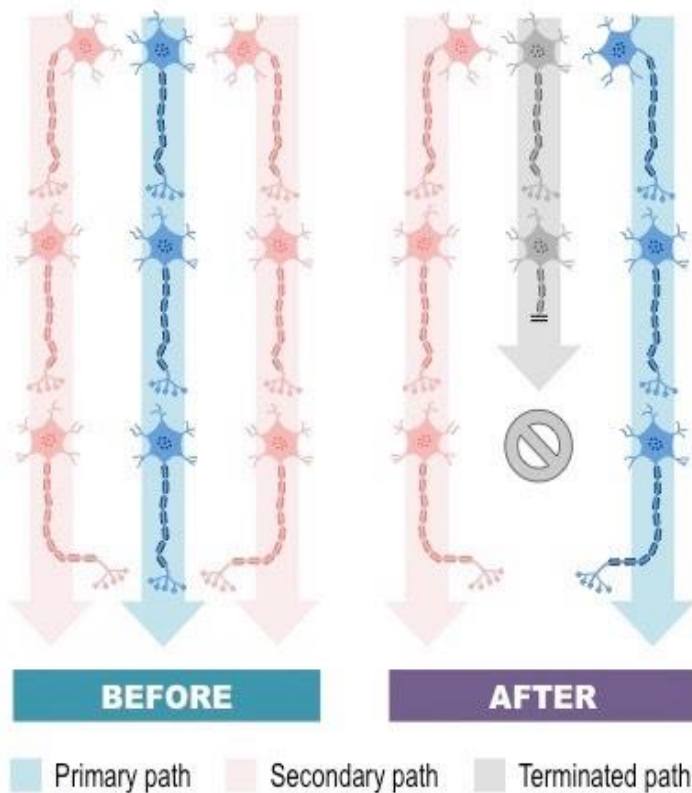
Brain Growth

- **White Matter (Myelin)**
Increases – Myelination
- **Gray Matter (Cell body)**
Decreases – Pruning

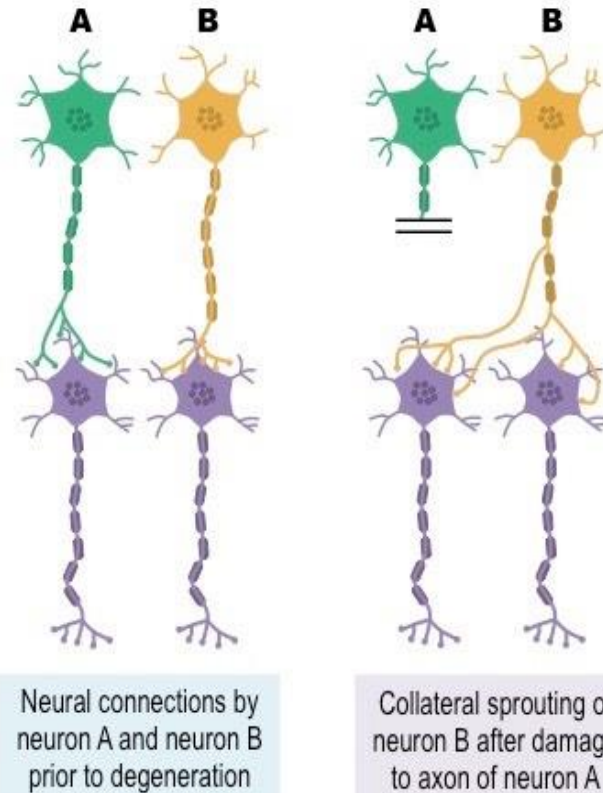
Brain Growth

3. Neuroplasticity

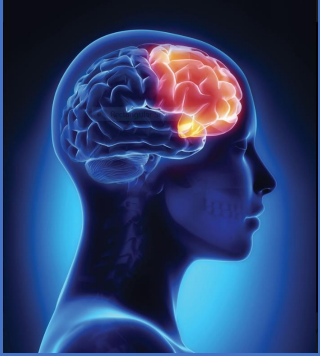
Rerouting: New connections are made between active neurons to create alternate neural pathways



Sprouting: New axon and dendrite extensions allow existing neurons to form new connections



Neuroplasticity is the brain's ability to reorganize itself by forming new neuronal connections throughout life.



Objectives

Structures of the Brain

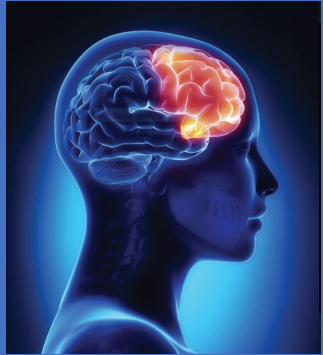
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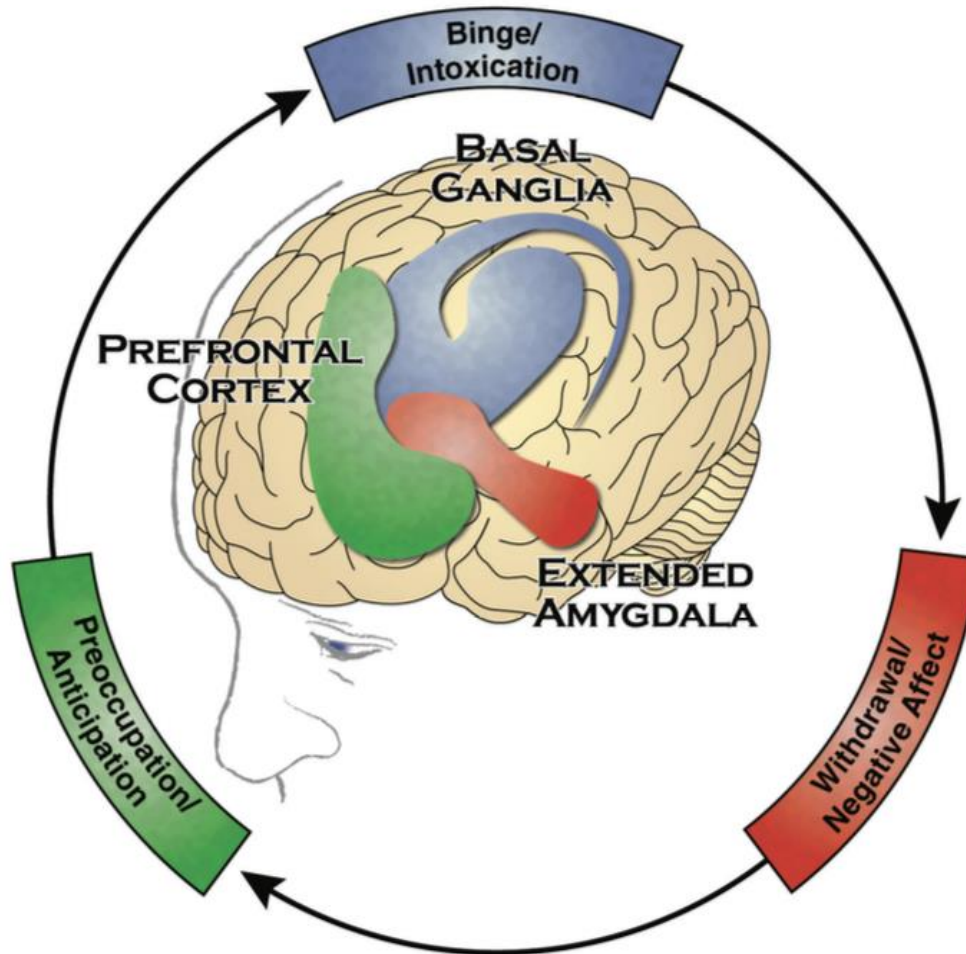
Chemistry of Addiction

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Chemistry of Addiction

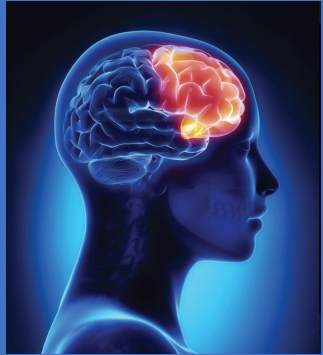
1. Stages of Addiction



3 Stages of Addiction

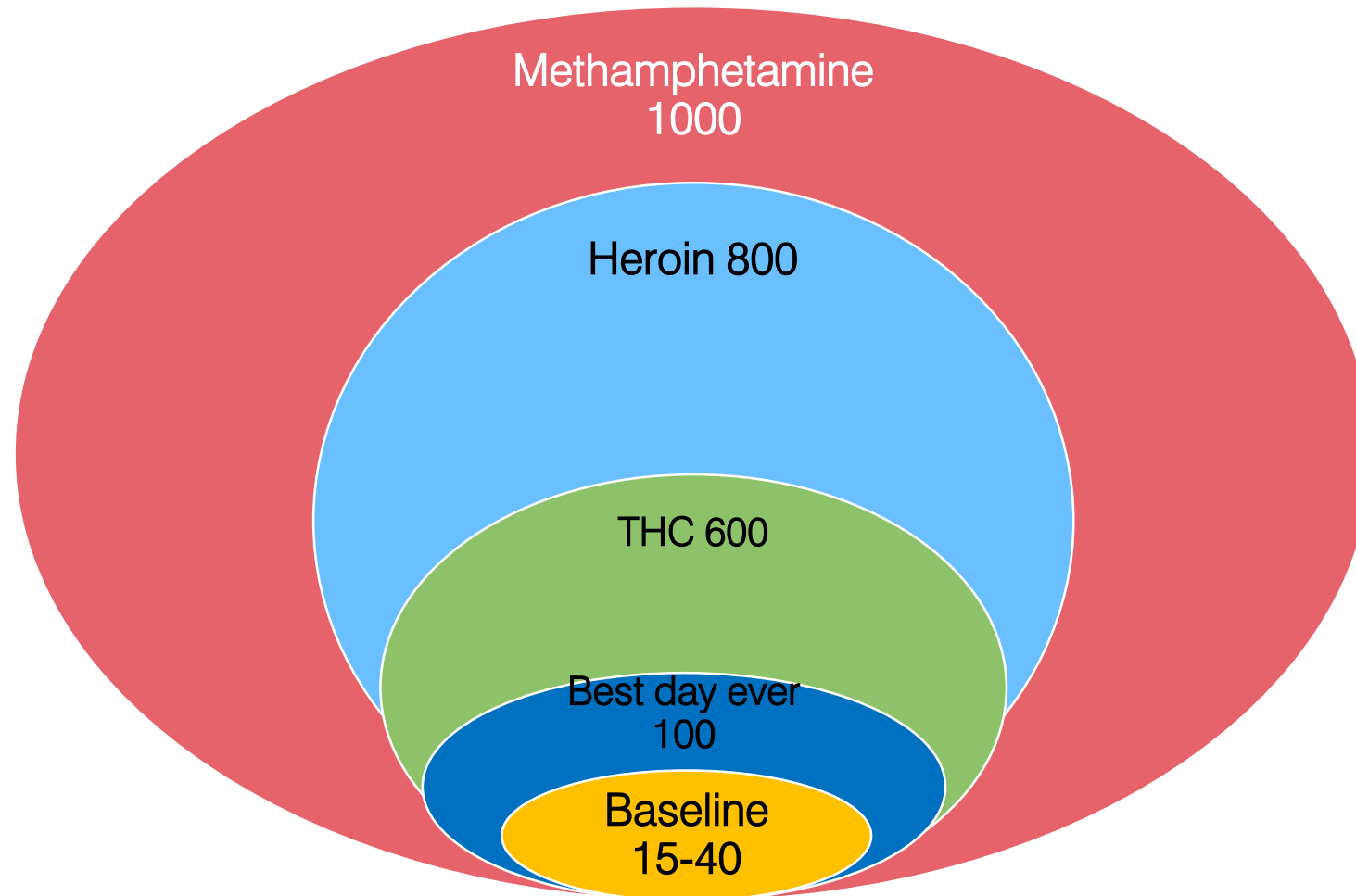
Addiction is a developmental disorder

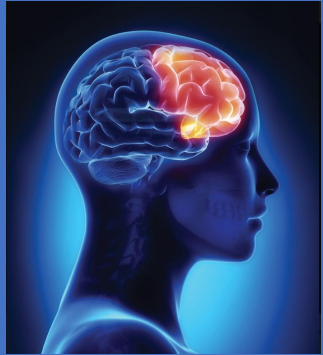
- I. Binge/ Intoxication – Basal Ganglion – Dopamine
- II. Withdrawal, Negative Reward, Stress – Amygdala
- III. Craving/Impulse, Loss of Control – Prefrontal Cortex



Chemistry of Addiction

2. Addiction Hijacks Dopamine



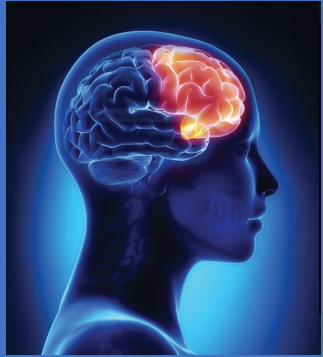


Chemistry of Addiction

3. Stunting Brain Development

- **Less Myelination** – slower neuron connections
- **More Synaptic Pruning** – drug use enforced while other skills are pruned or eliminated
- **Limbic System decides over the PreFrontal Cortex** – decision are more emotional rather than future oriented

Keep 'em
Alive 2
'Till 5



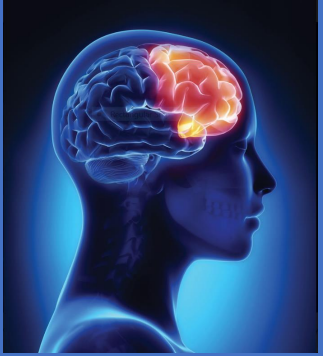
Drugs Effects on the Brain

Stunting Brain Development

Increased likelihood to develop addiction

4x to 7x



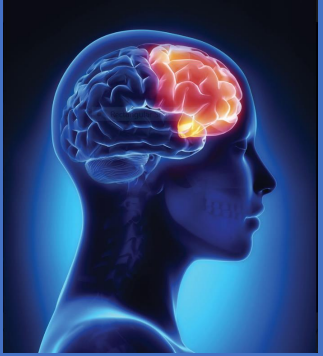


Quiz

At what point in someone's life is the brain finished growing?

- a. Childhood
- b. Adolescence
- c. **Mid to Late 20s**
- d. The brain is always maturing

The Growing Brain



roneetlev@gmail.com