



**February 25, 2010  
Portland, Maine**

**Presenter:  
Karen Williams**

# **The Adolescent Brain:**

**Contemporary Research**

**in Development**

**and the**

**Exploration of Implications**

**and Applications**



## **“Brain-friendly” Corrections:**

- **Work in concert with the way the brain functions & develops;**
- **Are based on an understanding of behavior chemistry and adults’ roles in the development process;**
- **Prepare youth for life on the outside rather than just controlling their behavior while in residence; and**
- **Use proven development & “habilitation” strategies.**

# Foundations of Brain-Friendly Corrections:

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**CHALLENGES:** Adolescence is challenging even if you are not in a corrections setting.

- The majority of youth in corrections have little experience with **Trust**, especially with adults - - and adults in authority. They have grown up with distrust as part of their reality. **Their brains have been "trained."**
- Their brain chemistry is "stuck" in the fight/flight or appease/freeze mode, which means they are unable to form rational thoughts and to learn from experience. Some can obey "inside", but fail outside.
- Adults are responsible for teaching youth how to "un-stick" and "shift" their brain chemistry. They cannot get un-stuck or shift on their own.
- The vast majority have no one to teach them the skills to "unstick" and "shift" their brain chemistry so they can change behaviors.
- Most require coaching and constant practice to learn new behavior skills.



# Foundations of Brain-Friendly Corrections:

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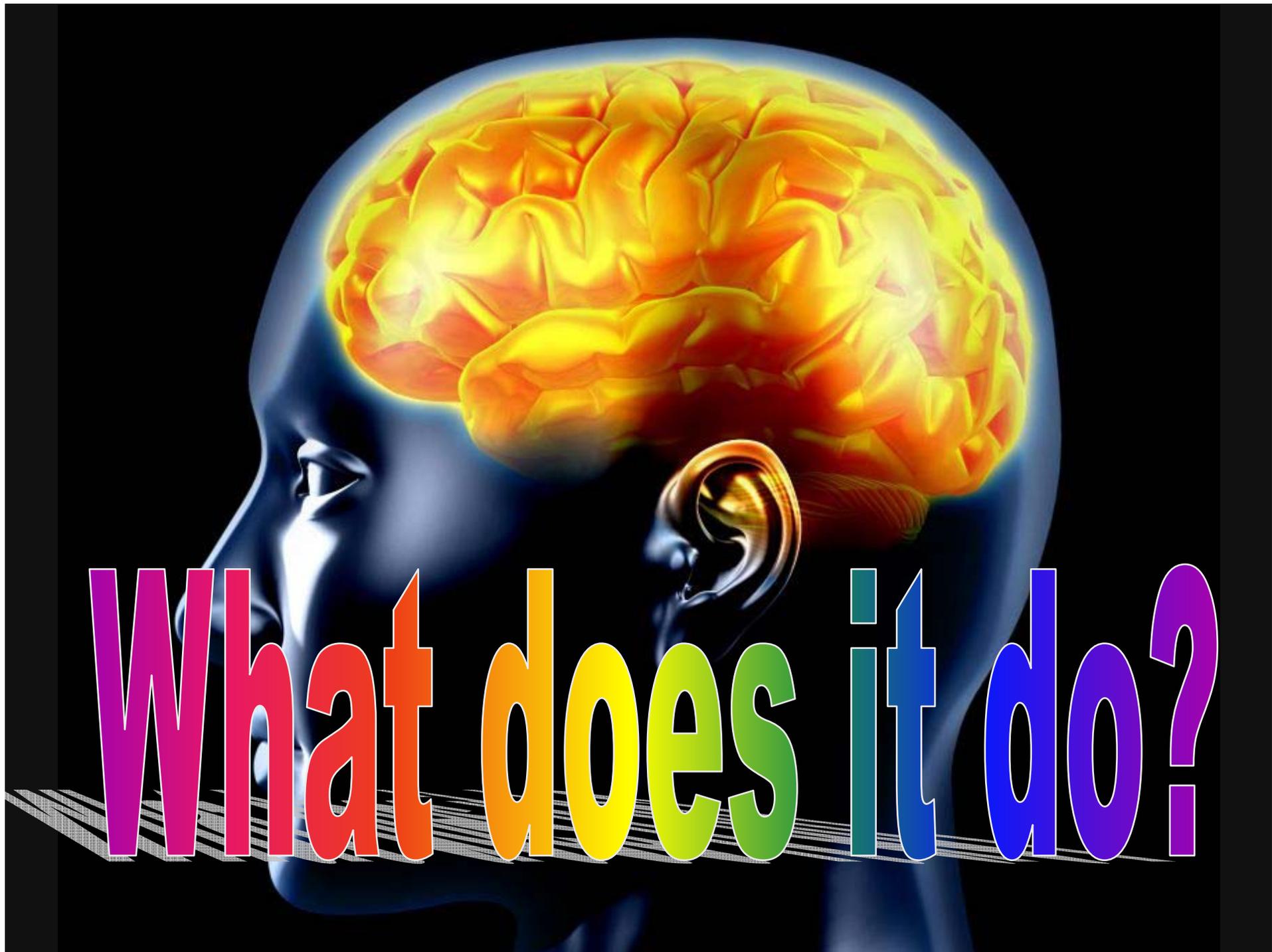
## GOOD NEWS!

*The “Development Door” is still open - - timing is on our side! The teen brain experiences a major peak of neural plasticity - - allowing neurons to be reshaped (literally) & neural connections to be rewired.*

**Note: Development = Learning!** If they can learn to use a cell phone, they can learn to use self-control & will power!

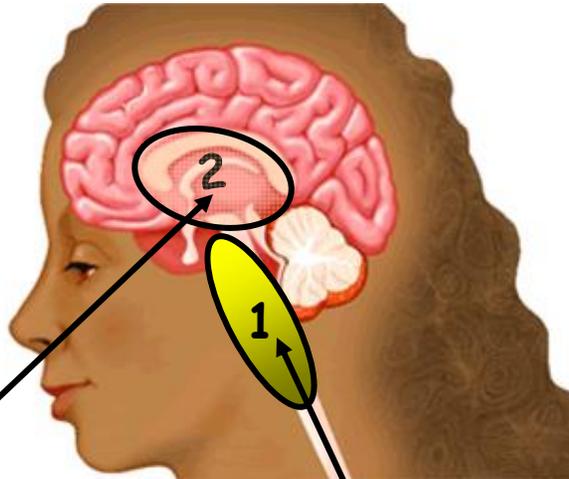


*A combination of trust, coaching, practice & support un-sticks & shifts brain chemistry and makes learning & positive youth development possible!*



What does it do?

# 5 Key Functions



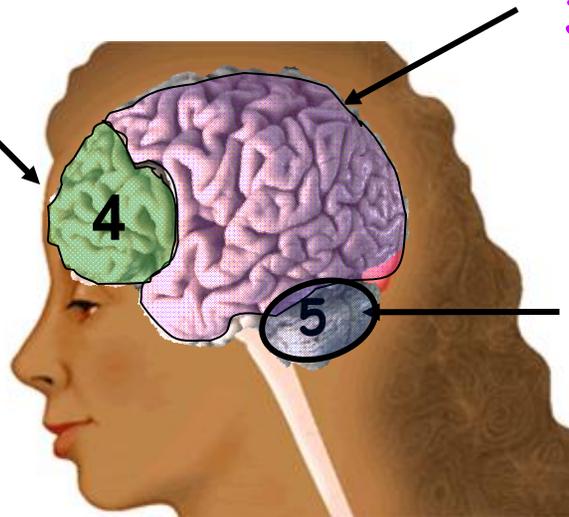
2. Survival

1. Life

# 5 Key Functions

4. Thinking & Controlling

3. Doing



5. Coordinating

Being Alive; Staying Alive; Knowing You're Alive; Doing Things -  
and - it's all happening at the same time!

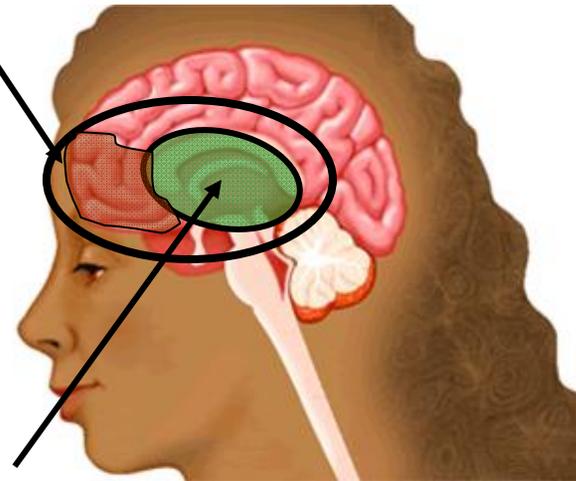


Where is Behavior located?

# 2 "Behavior" Centers

## Thinking & Controlling

(Paying Attention, Controlling Emotions,  
Working Memory, "Manual Override")



## Survival

(Getting Attention, Feeling Emotions, Long Term  
Memory, Motivation, Drives, Instincts,  
Immune System, Hormones & Other Regulators)

# Conscious

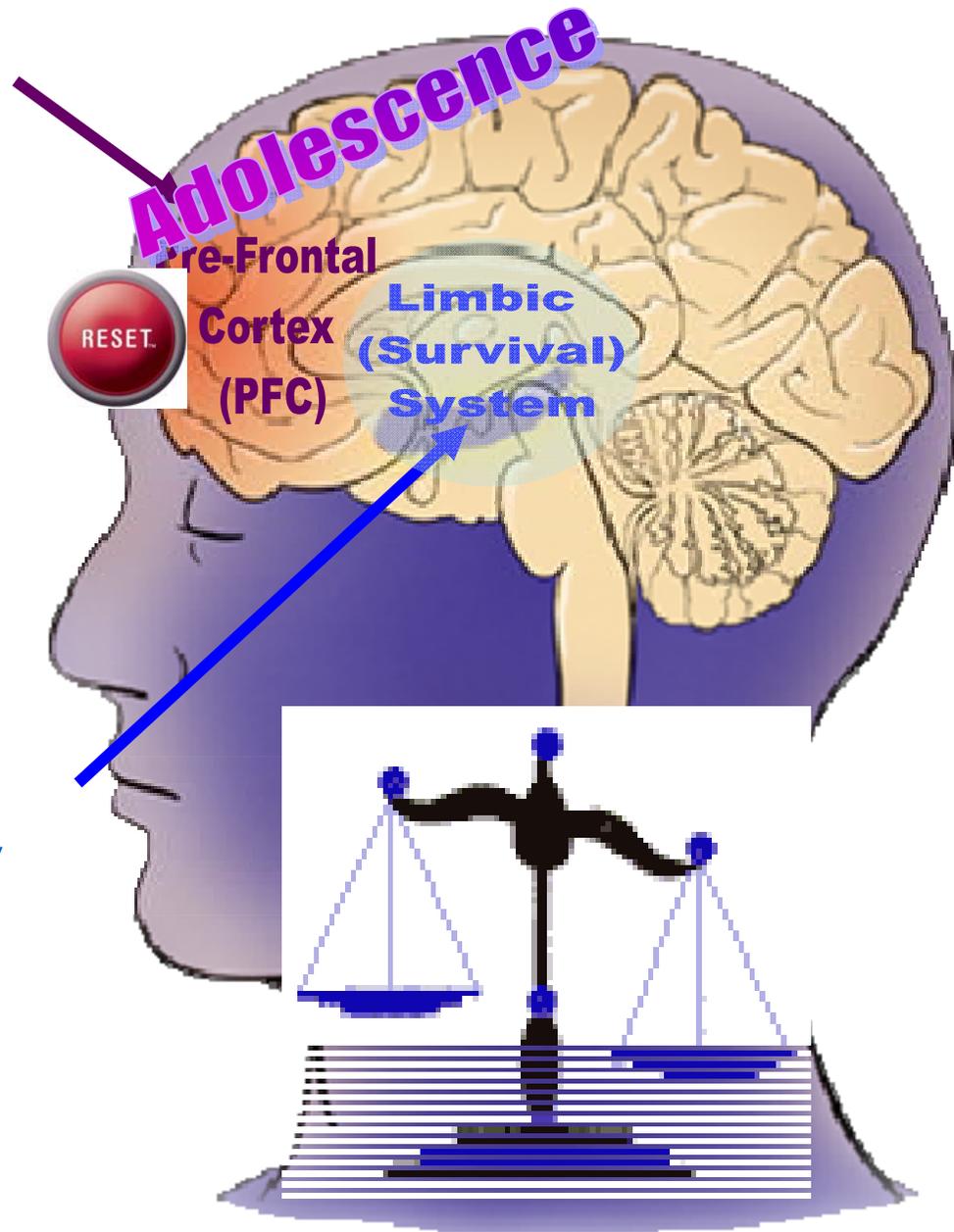
Working Selectively  
(Thinking, Reasoning &  
Self-Control)

Rational Responses  
"Executive Functions"

# Subconscious

Working Continuously  
(Emotions,  
Instincts & Drives)

Automatic Responses



**Guide, Slow, Stop**  
**Steering Wheel**

**& Brake**

**Thinking & Controlling**

**GO!**

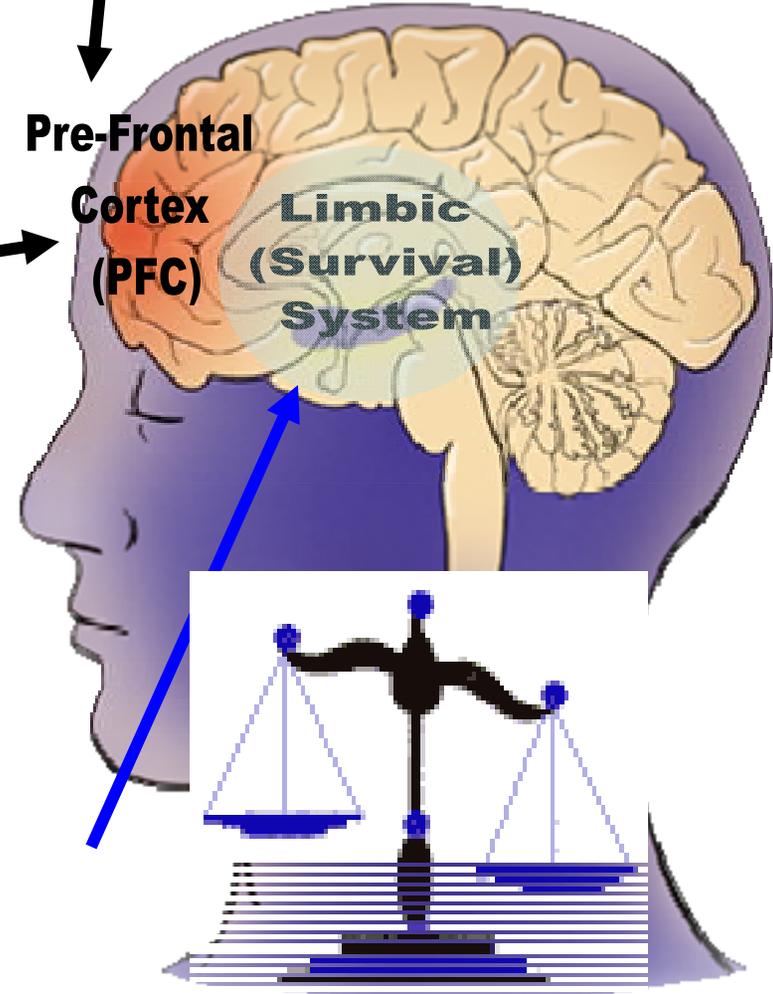
**Gas Pedal**  
**& Transmission**

**Survival**



**Pre-Frontal  
Cortex  
(PFC)**

**Limbic  
(Survival)  
System**



By the way...

✓ **Learning**

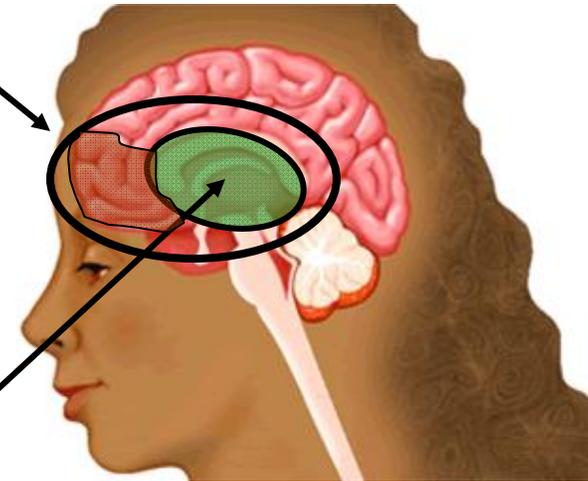
✓ **Development**

✓ **Mental Health**

✓ **BEHAVIOR**

**Behavioral Health**

Thinking & Controlling

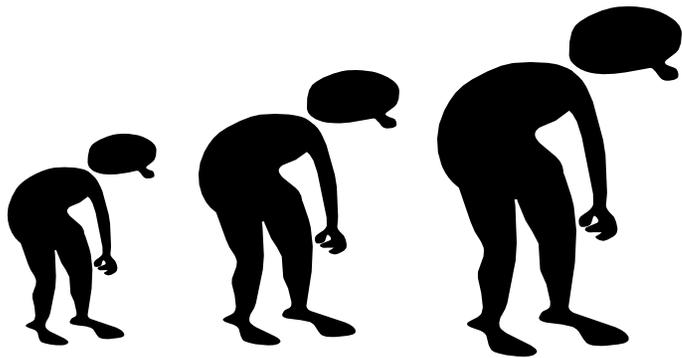


Survival



How does it Develop?

**Growth** is change in  
physical size and weight.



Can you get **BIGGER**  
without getting Better?

Getting **BIGGER**

**Development** is change in  
capacities and abilities!



Can you get **BETTER**  
without getting Bigger?

**LEARNING**

**NEW!!!**

Getting Better!!!

- 30% of people learn/develop by observation & feedback - - & most of these learn/develop without a lot of additional coaching/support.



- **70% require coaching & support**

- 25% have parents who coach/reinforce

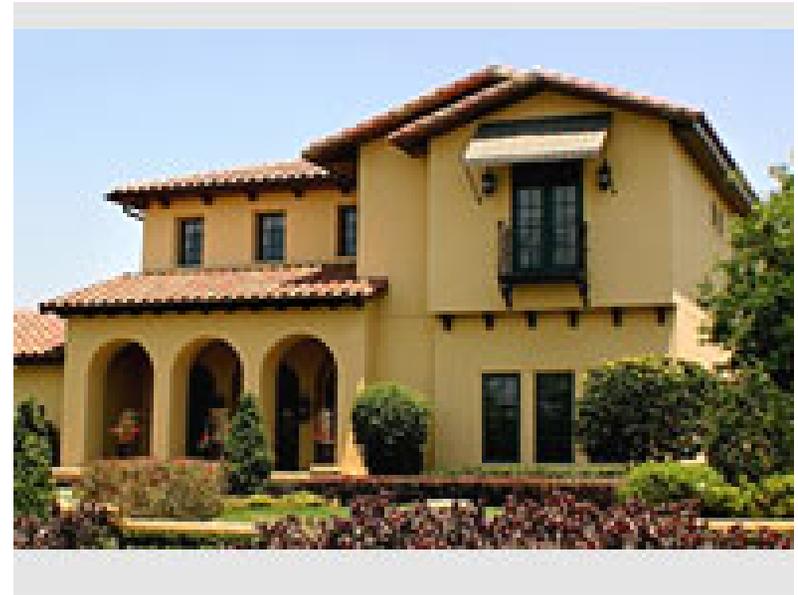
- 25% have "others" who coach/reinforce

- **50% have "no one"**

"Development" is the BUILDING period.



It is FAR EASIER  
to BUILD IT RIGHT  
in  
the 1st place  
than to have to  
repair it later on.



Once you have built it,  
you can maintain it,  
improve it,  
remodel it.

# Human Development =

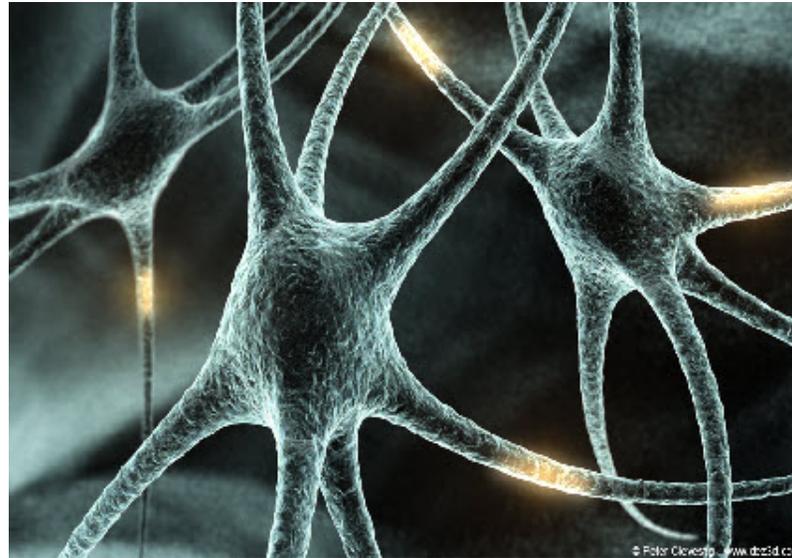
DNA

+ Neurons

+ Experience



Architect  
& Contractor



Materials/Equipment

- Environment
- Conditions
- Interactions
- Security
- Protection
- Trust



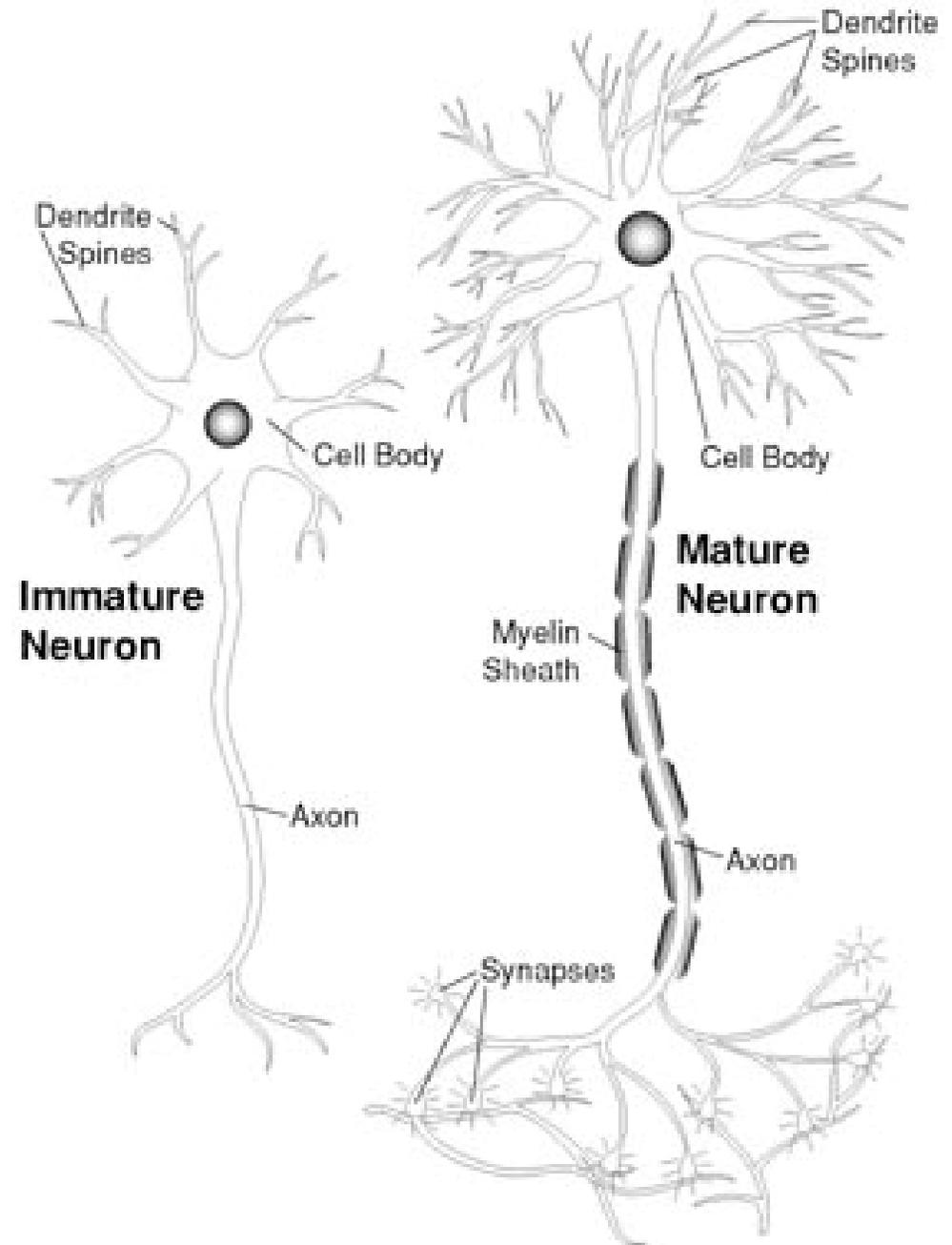
Builder

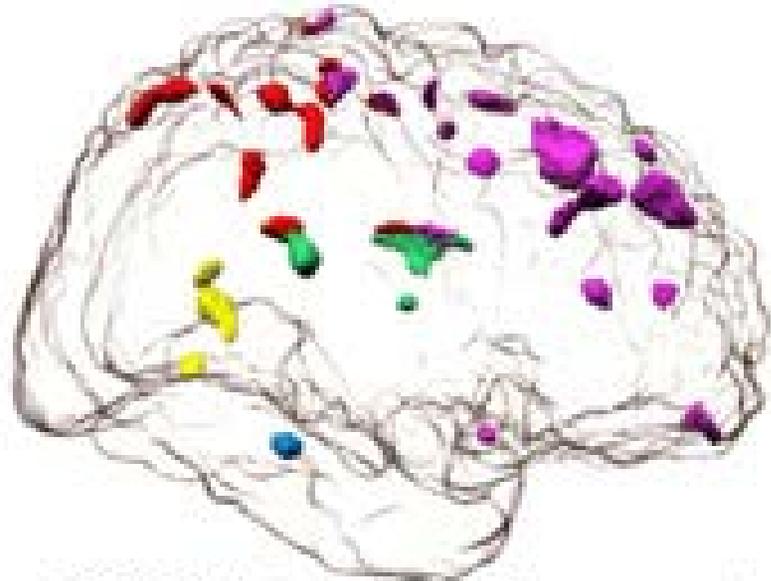


# Building a Person

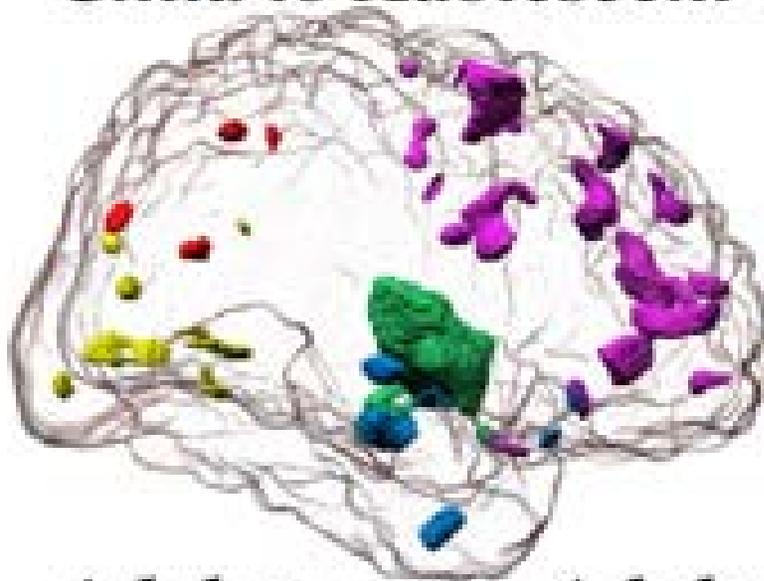


Experience  
"encodes", "wires",  
"programs", "changes the  
structure of"  
our neurons!





*Child to Adolescent*



*Adolescent to Adult*

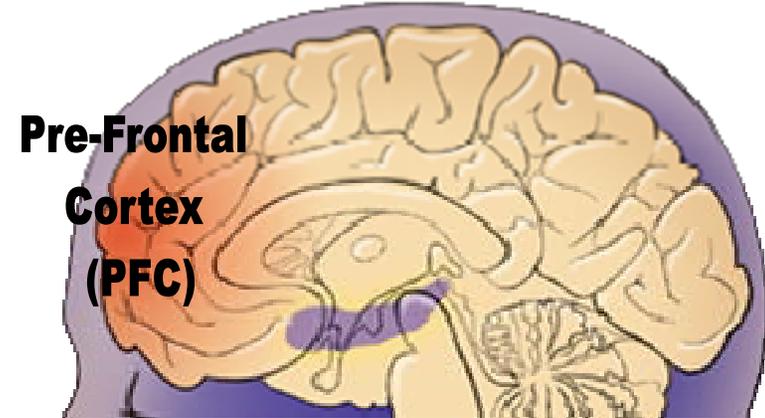
Different parts  
are built



programmed  
different times

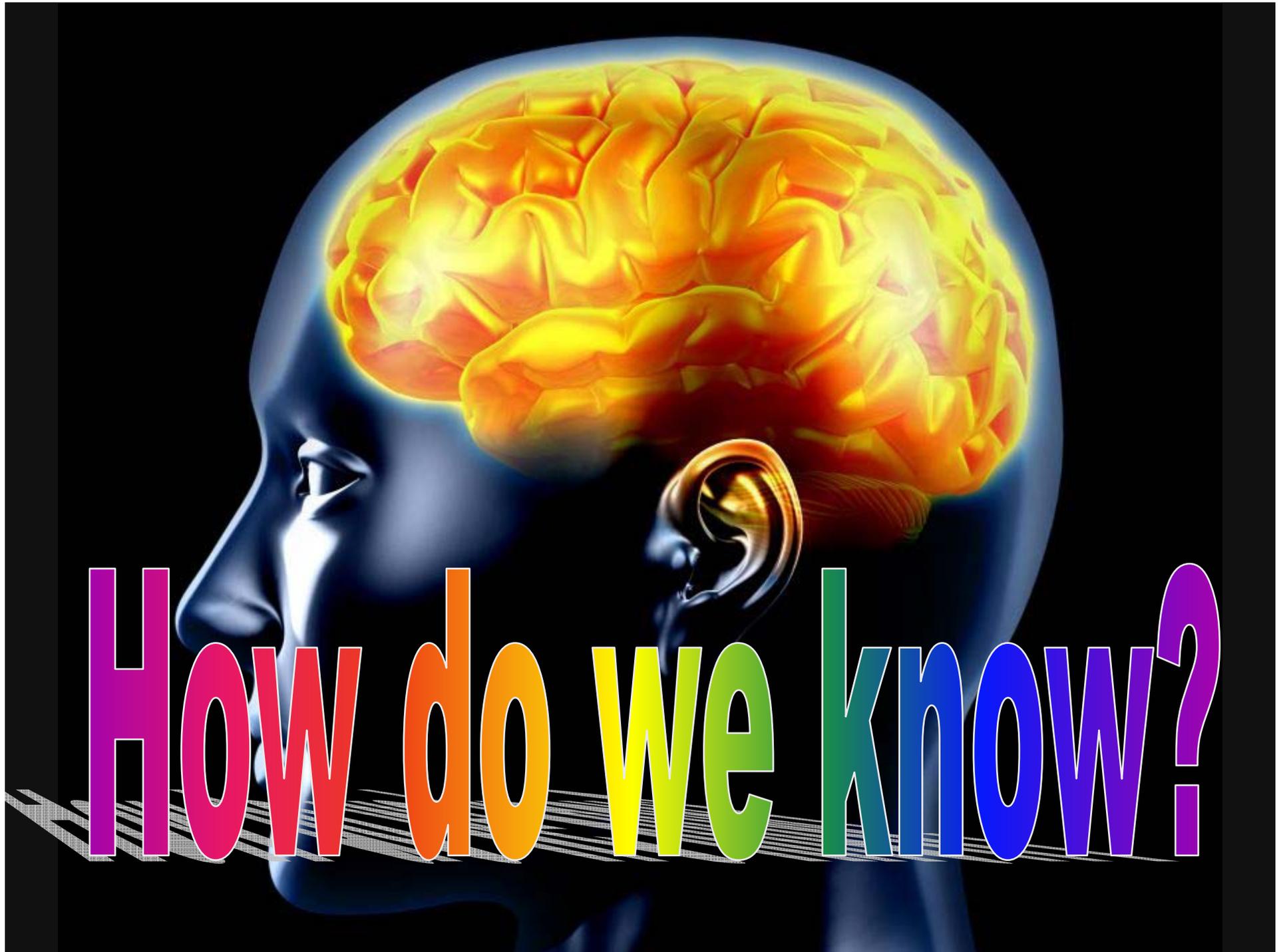
## Adolescents are **SUPPOSED** to add "Executive Functions" to:

- Use Will Power
- Control Emotions
- Control Behavior
- Delay Gratification
- Predict Consequences
- Learn from experience
- Protect Friends & Loved Ones
- Assume responsibilities as "Own Parent"
- "Switch" from Limbic to PFC on their own



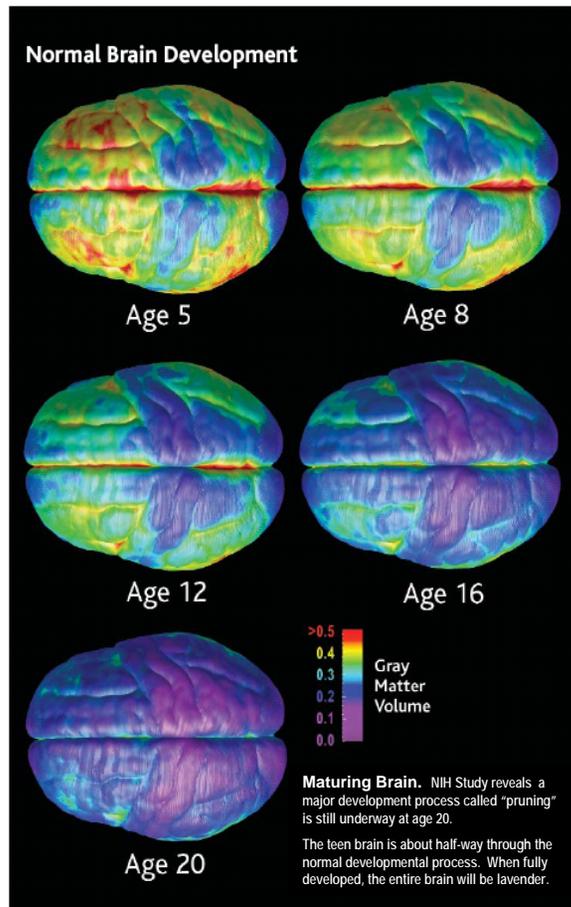
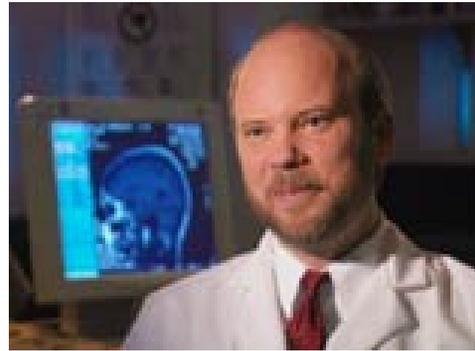
**All of these require the PRE-FRONTAL CORTEX to be active; none are automatic; all are learned.**

**NOTE: MATURITY is doing these things WITHOUT US!**



How do we know?

# 2004

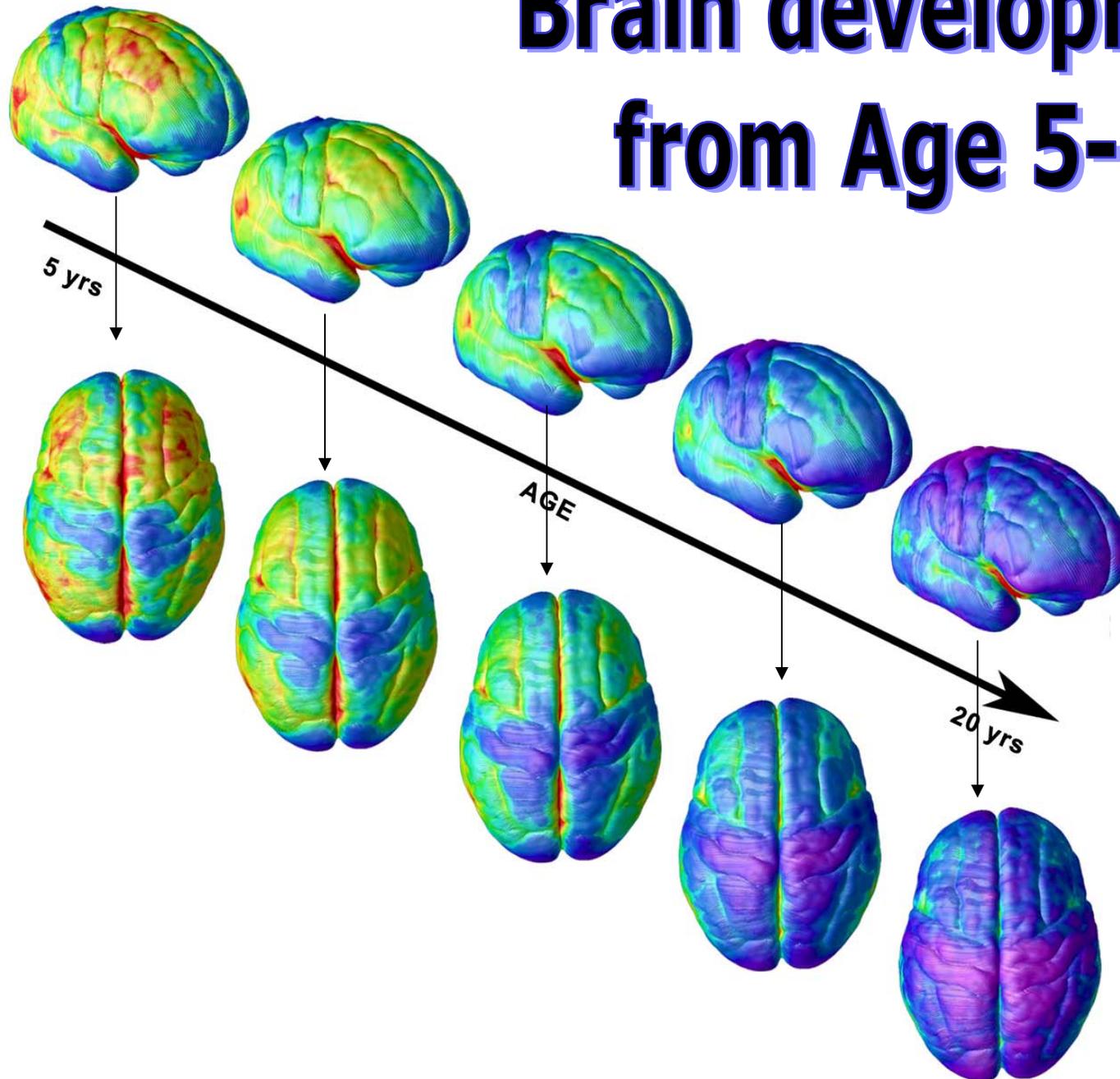


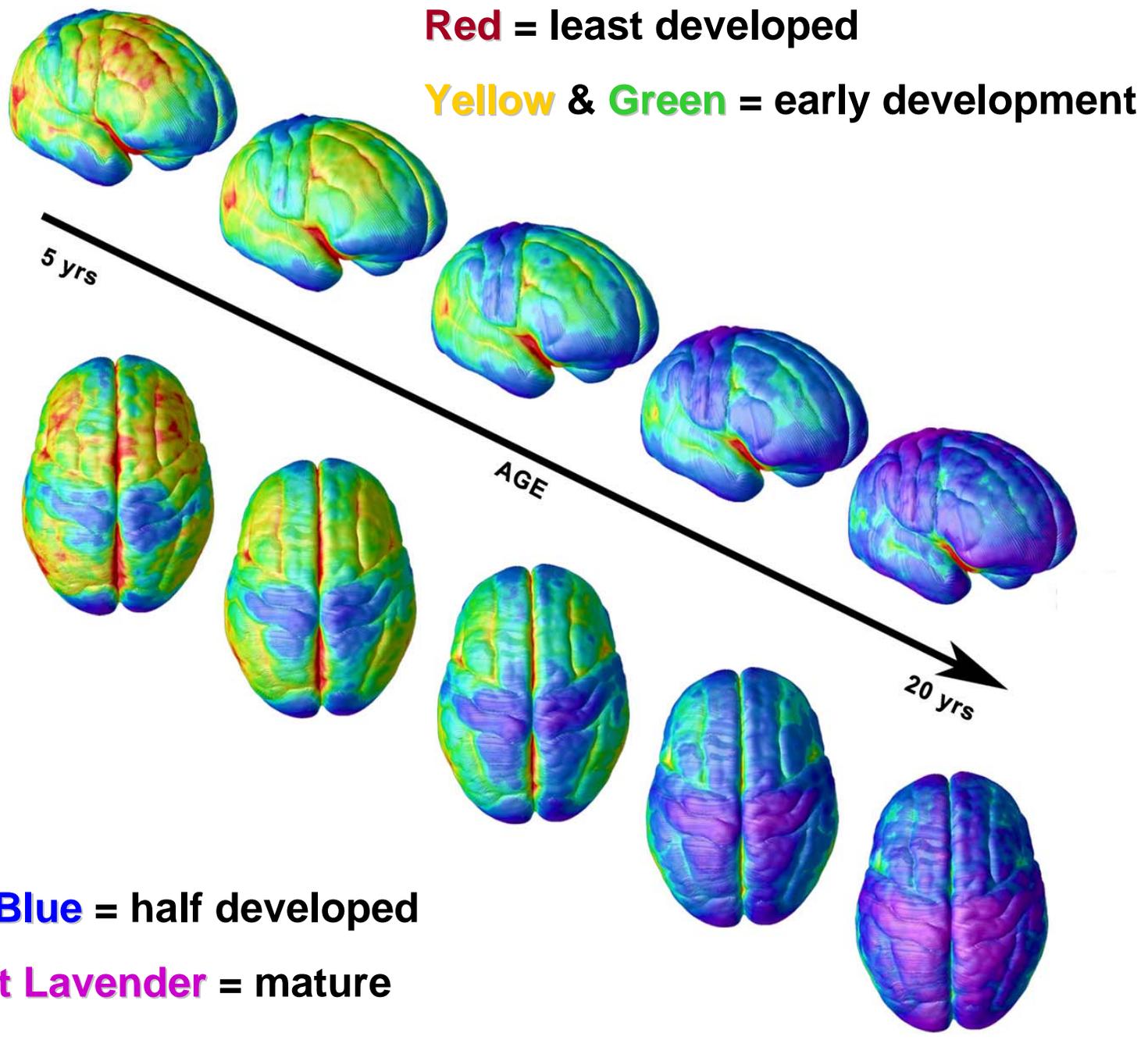
1st composite scans  
of the healthy human brain  
as it develops  
from Age 5 to 20

# Brain development from Age 5-20

Side View

Top View





**Red** = least developed

**Yellow & Green** = early development

5 yrs

AGE

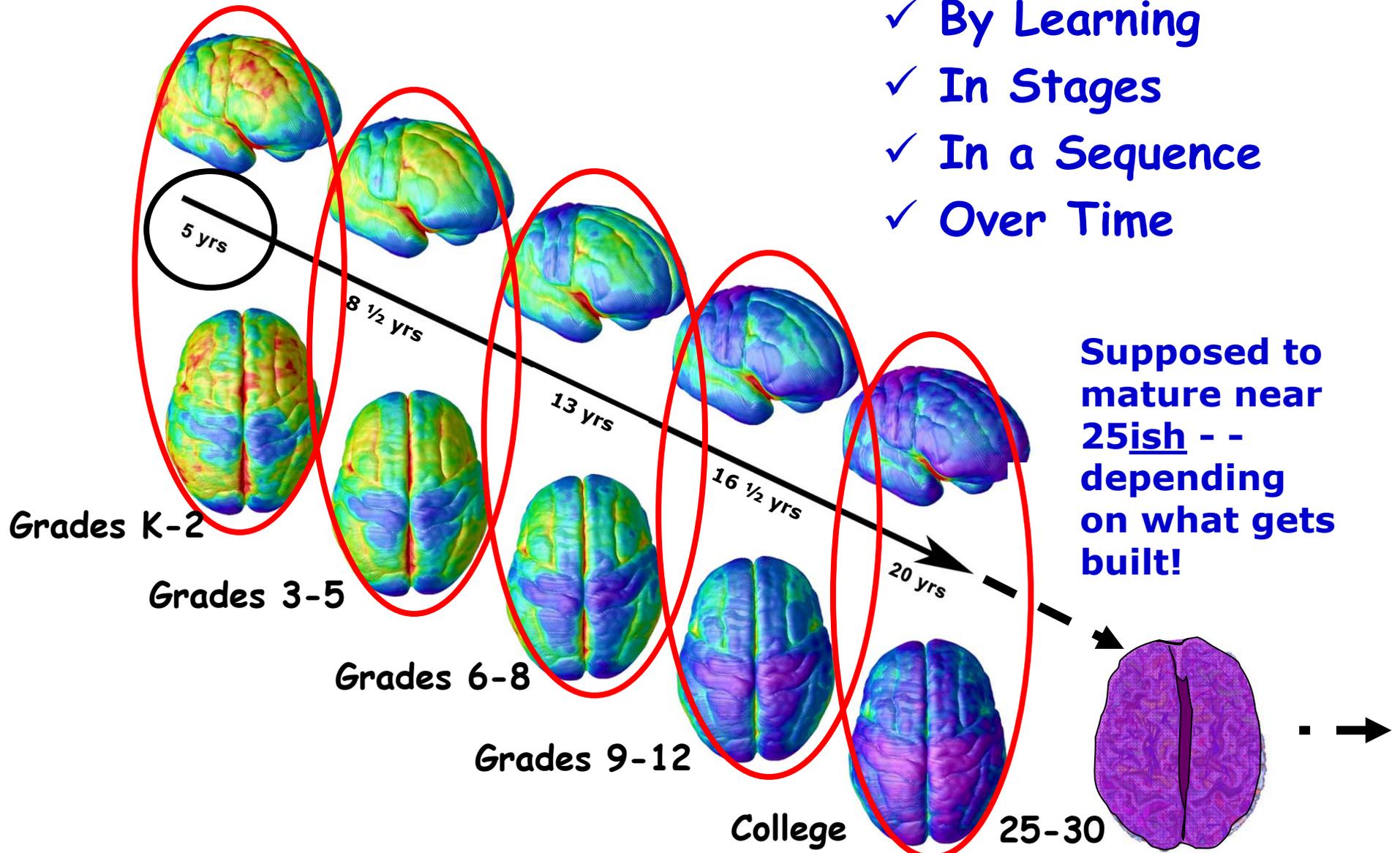
20 yrs

**Dark Blue** = half developed

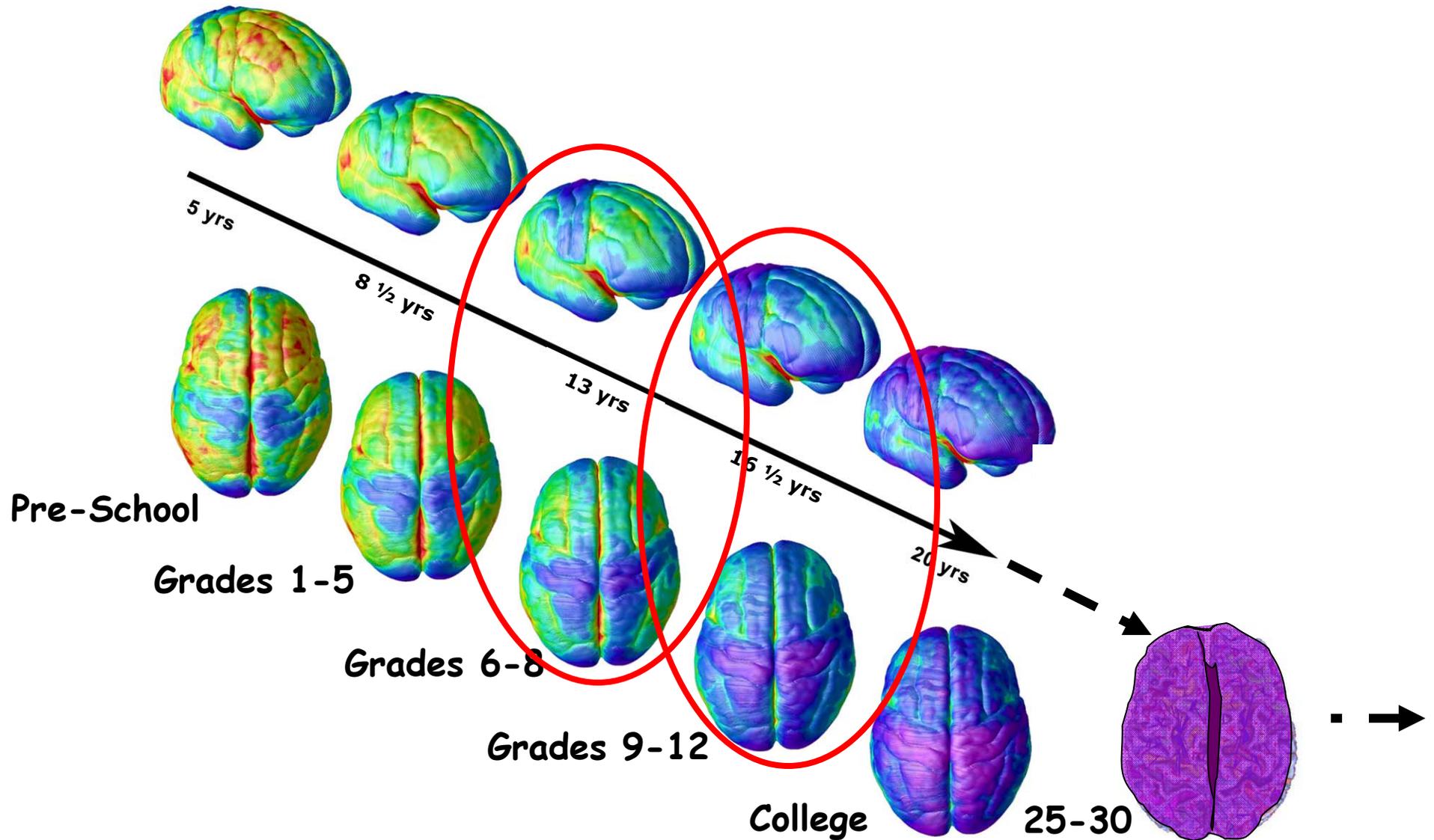
**Bright Lavender** = mature

# Our Brain Develops:

- ✓ By Learning
- ✓ In Stages
- ✓ In a Sequence
- ✓ Over Time



# How far along are they?





## Pre-Occupied With:

- Here & Now
- Appearance
- Acceptance

## Taken Over By:

- Sex Drives
- Risk Drives
- Freedom Drives
- Exploration Drives
- Privacy (Autonomy) Drives



# It's NOT Just Hormones

## Starting Out

Learning to Control Body & Behavior

2-3 Yrs

Peak of birth to 6



14-15 yrs

Peak of 12 to 18



## Starting Over

"Learning to Control Urges & Surges"

**IMPATIENT =** only 3 years until they have to be *on their own all day with strangers in SCHOOL.*

- Rebellious
- Willful
- Self-Centered
- Mood Swings
- Can't delay gratification

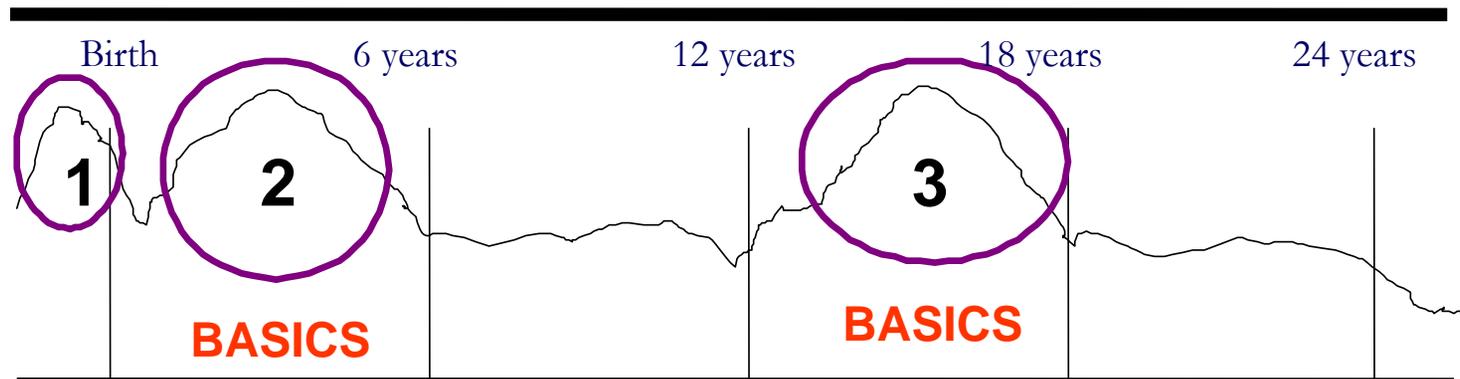
- Rebellious
- Willful
- Self-Centered
- Mood Swings
- Can't delay gratification

**IMPATIENT =** only 3 years until teens have to *be on their own legally and are responsible for all their own actions.*

## The 3 Critical

# Peaks Of Risk

*Periods when the brain has no internal protection!*



Adolescents are still

add "Executive Functions" to:

Forethought



- Use Willpower
- Control Emotions
- Control Behavior
- Delay Gratification
- Predict Consequences
- Learn from Experience
- Protect Family & Loved Ones
- Assume responsibilities as "Own Person"
- "Switch" from Social to Independent on their own

of these require the  
FRONTAL CORTEX  
Executive; more  
rational; more  
planning; more  
anticipatory

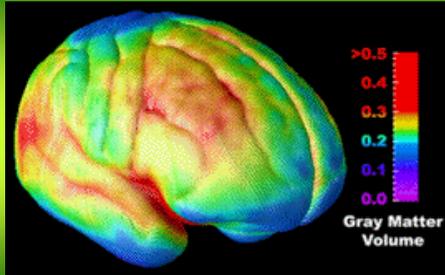
They have trouble...



*Cause &  
Effect?*

*They are  
starting  
over!*

...putting the pieces together!



# The BUSIER the Brain - The HIGHER the Risk

Group 1

Really Fast



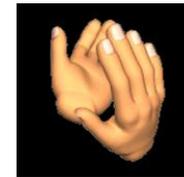
Group 2

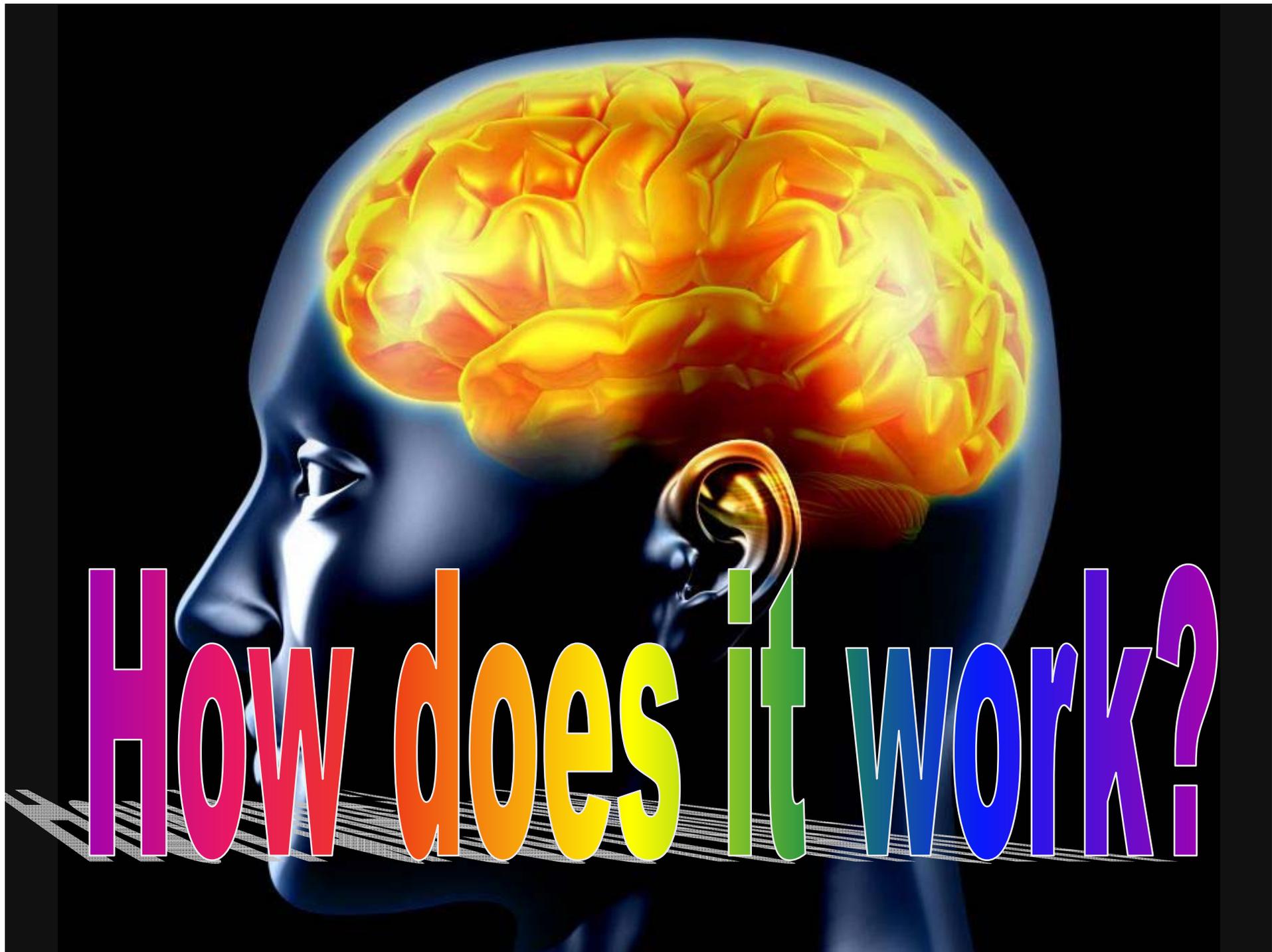
In Surges



Group 3

Slowly

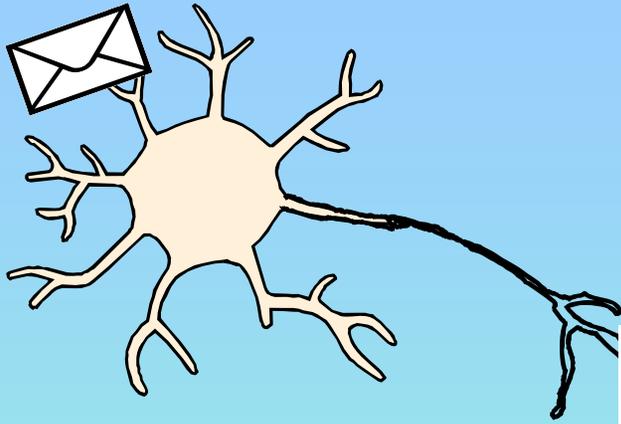




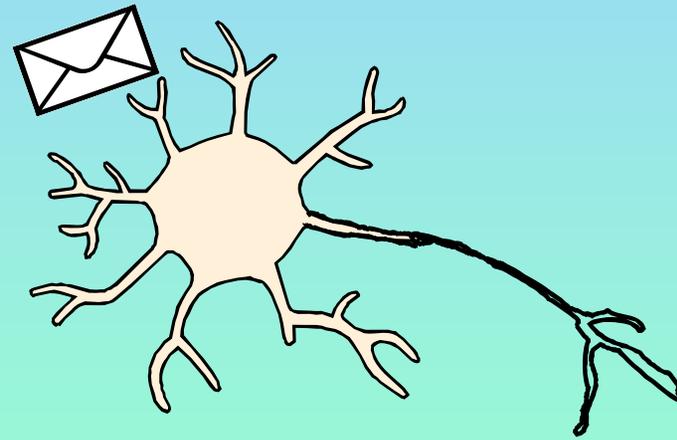
How does it work?

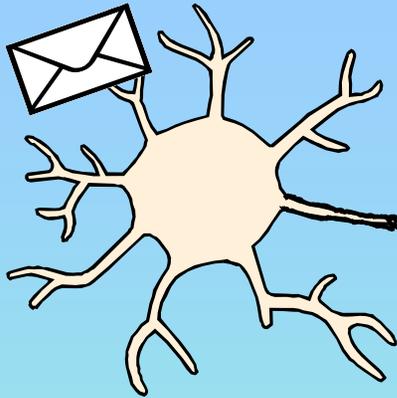
Neuro-transmitters

are "chemical message carriers."

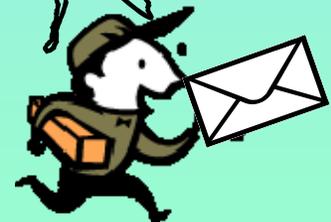
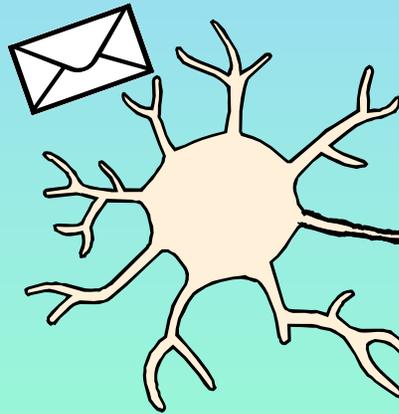


Synapse





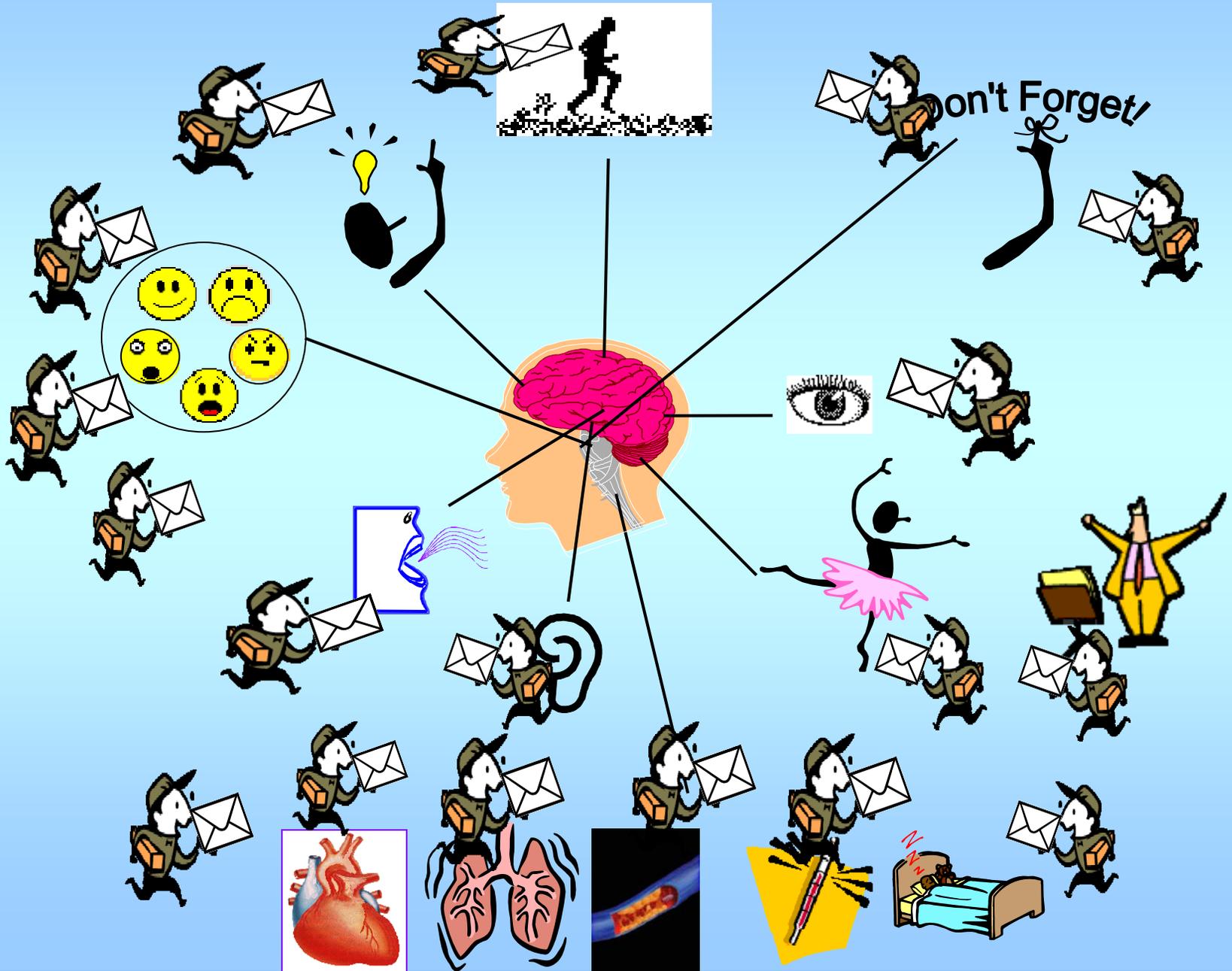
**Gap = Synapse**

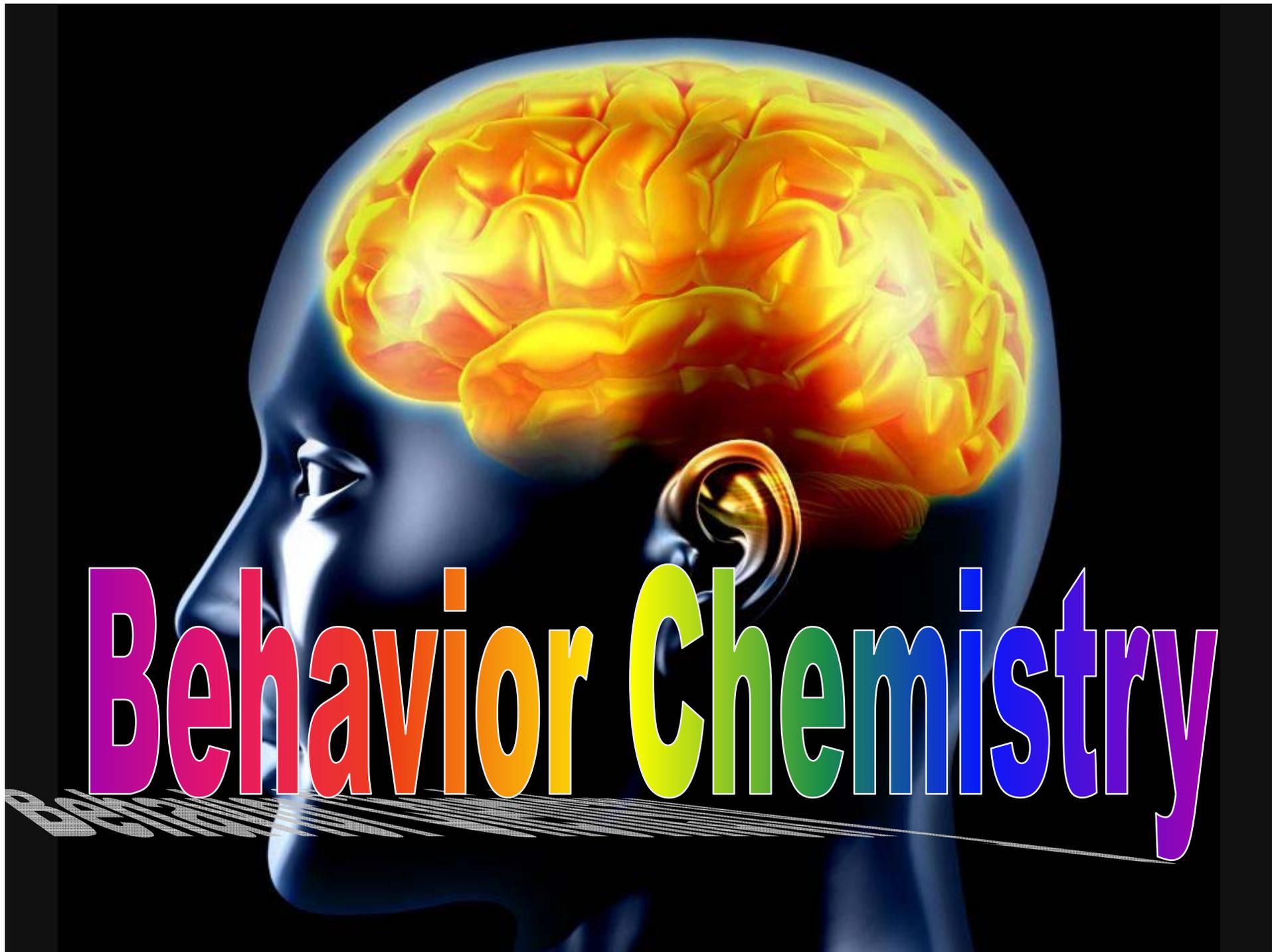


Messages must be

**ON TIME & in PERFECT CONDITION!**

# Neurotransmitters do all the work!



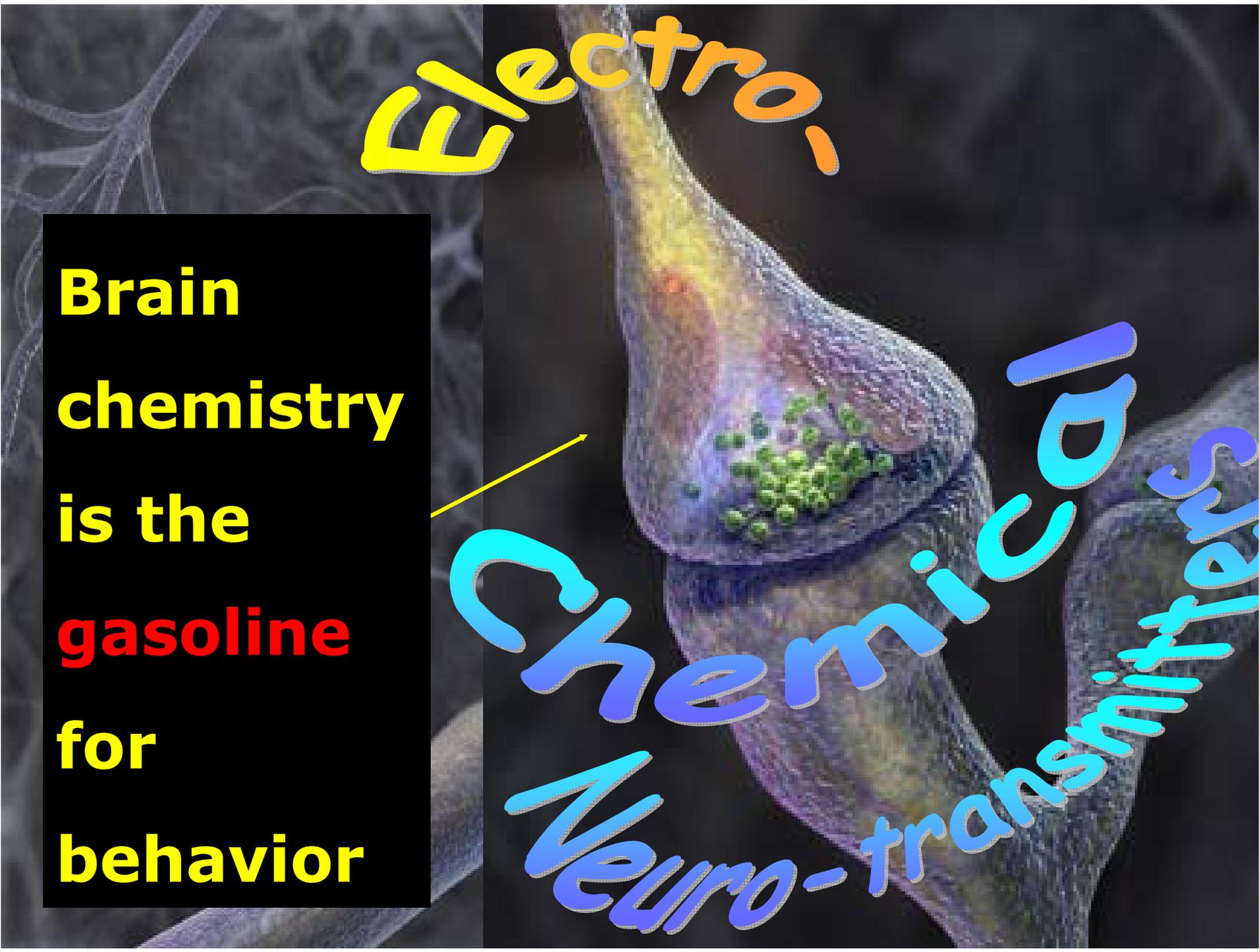


# Behavior Chemistry

Electro,

**Brain  
chemistry  
is the  
gasoline  
for  
behavior**

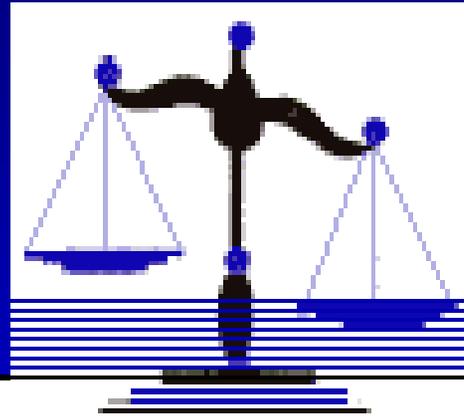
Chemical  
Neuro-transmitters



# Our "Learning, Development & Behavior Chemistry"

Neuro-transmitters

## Sara



### Dopamine

### Serotonin

Restful Alertness

"Rest & Digest"

Thinking, learning  
judgment, etc.

Proper amounts  
feel calming; too  
little feels  
depressed

"Pain/Pleasure"

"Cements"

learning/creates  
motivation. Feels  
good; attracted  
to *anything* that  
increases  
dopamine

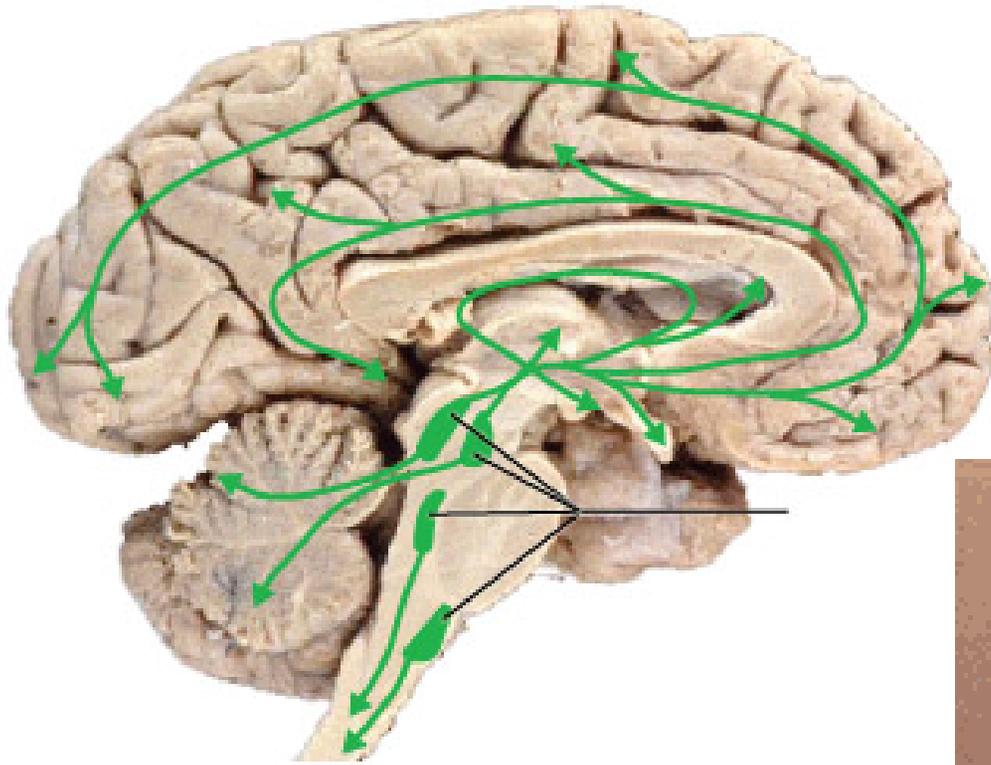
## Nora

### Norepinephrine

"Fight/Flight"

Attention!

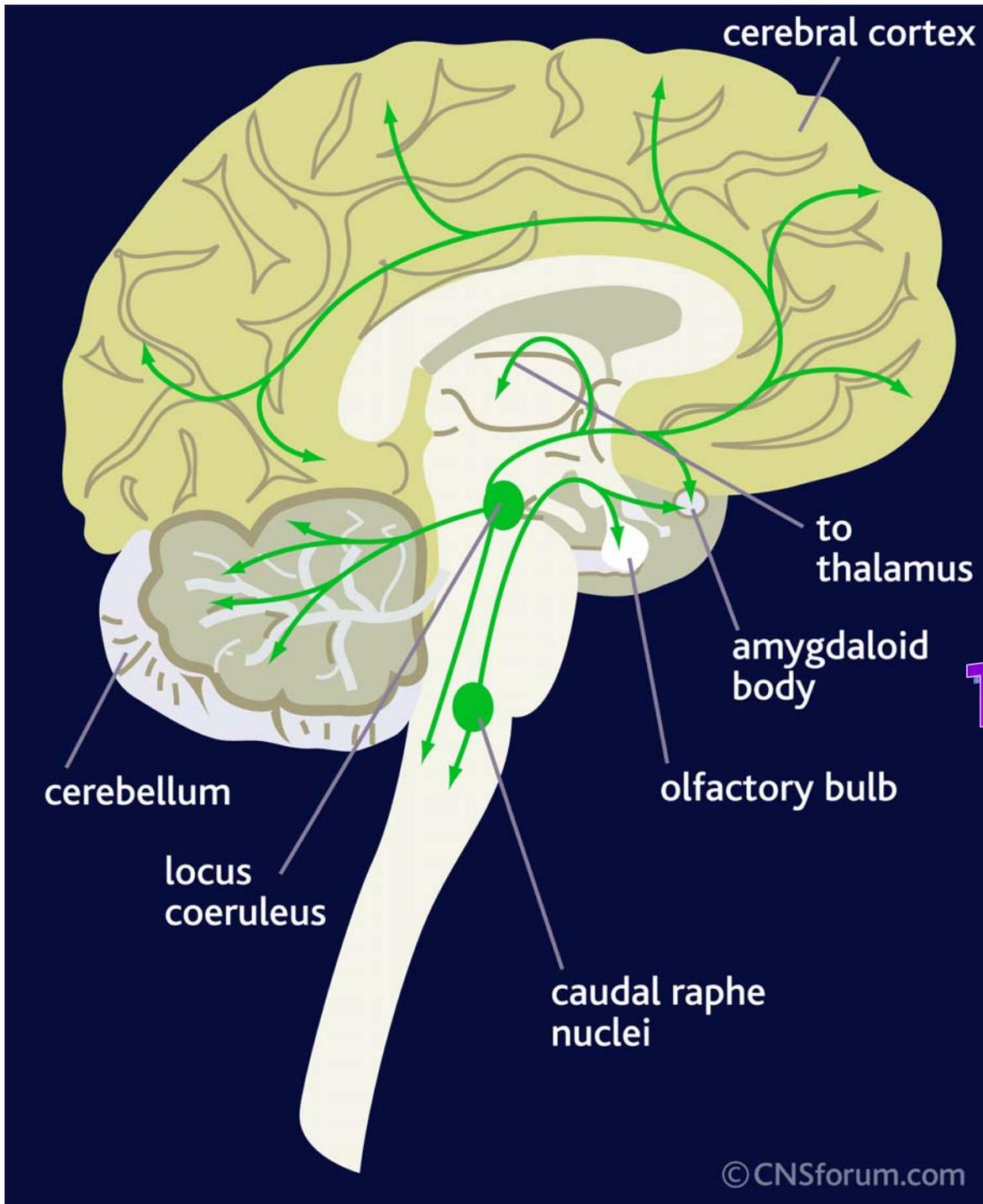
An energizer;  
too much creates  
anxiety,  
aggression/mania



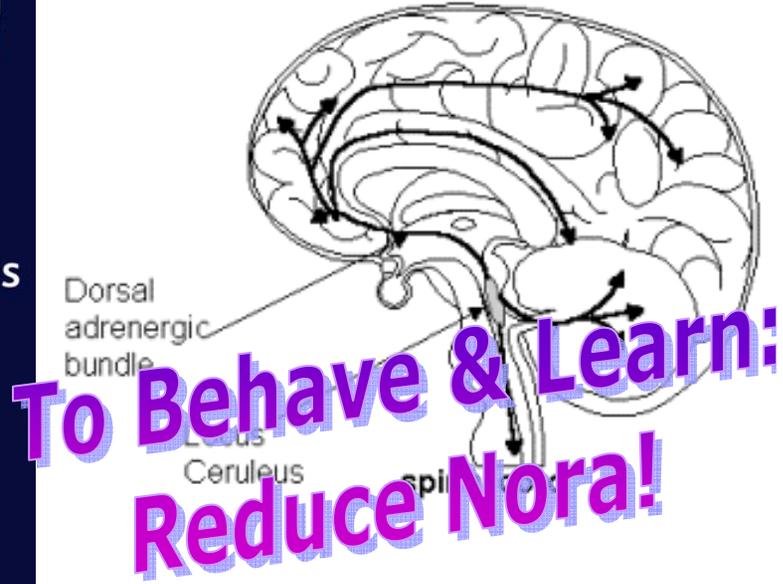
**Sara**  
**Pathways**  
**in the Brain**

Sara is our  
"Learning Chemical"  
**To Behave & Learn:**  
**Increase Sara!**

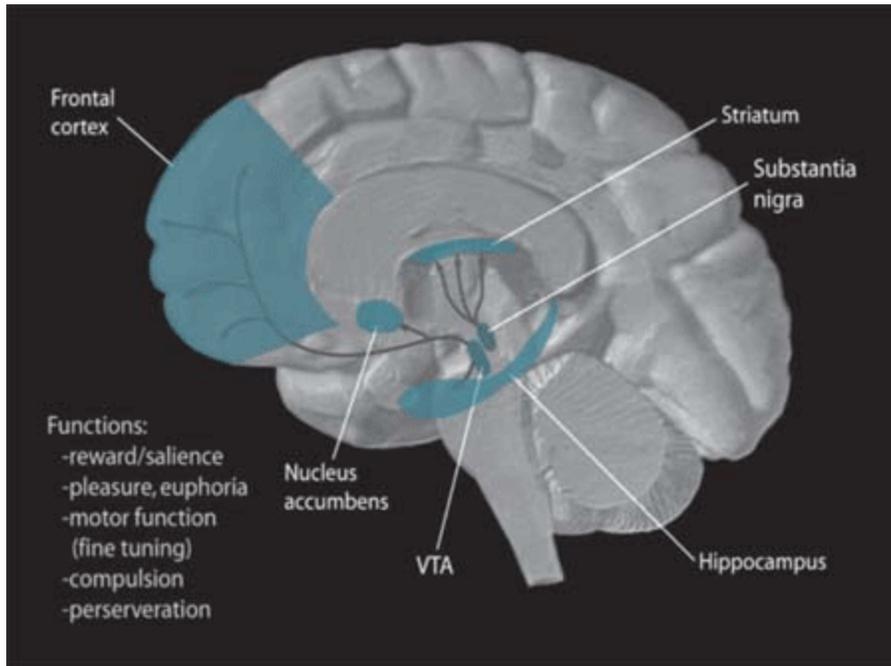




**Nora  
Pathways  
in the Brain**



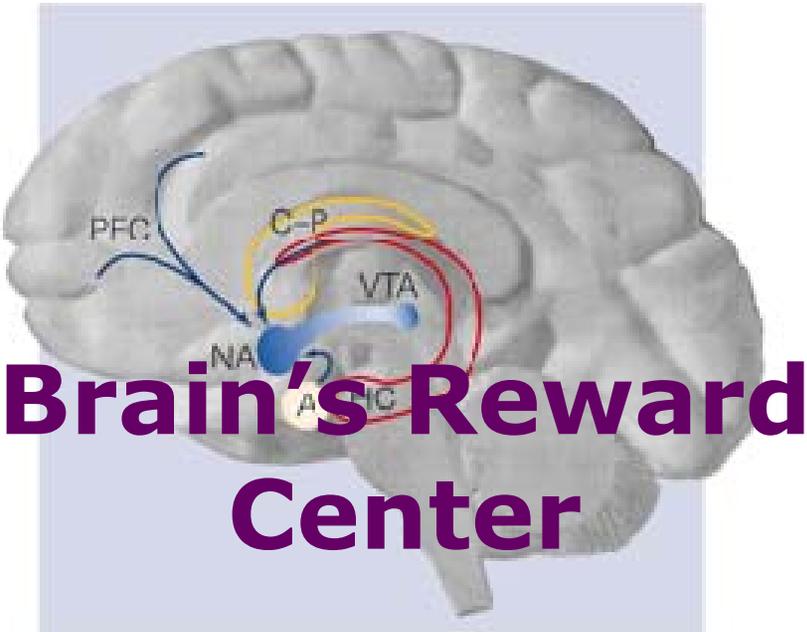
**Nora is our  
Fight/Flight Chemical**



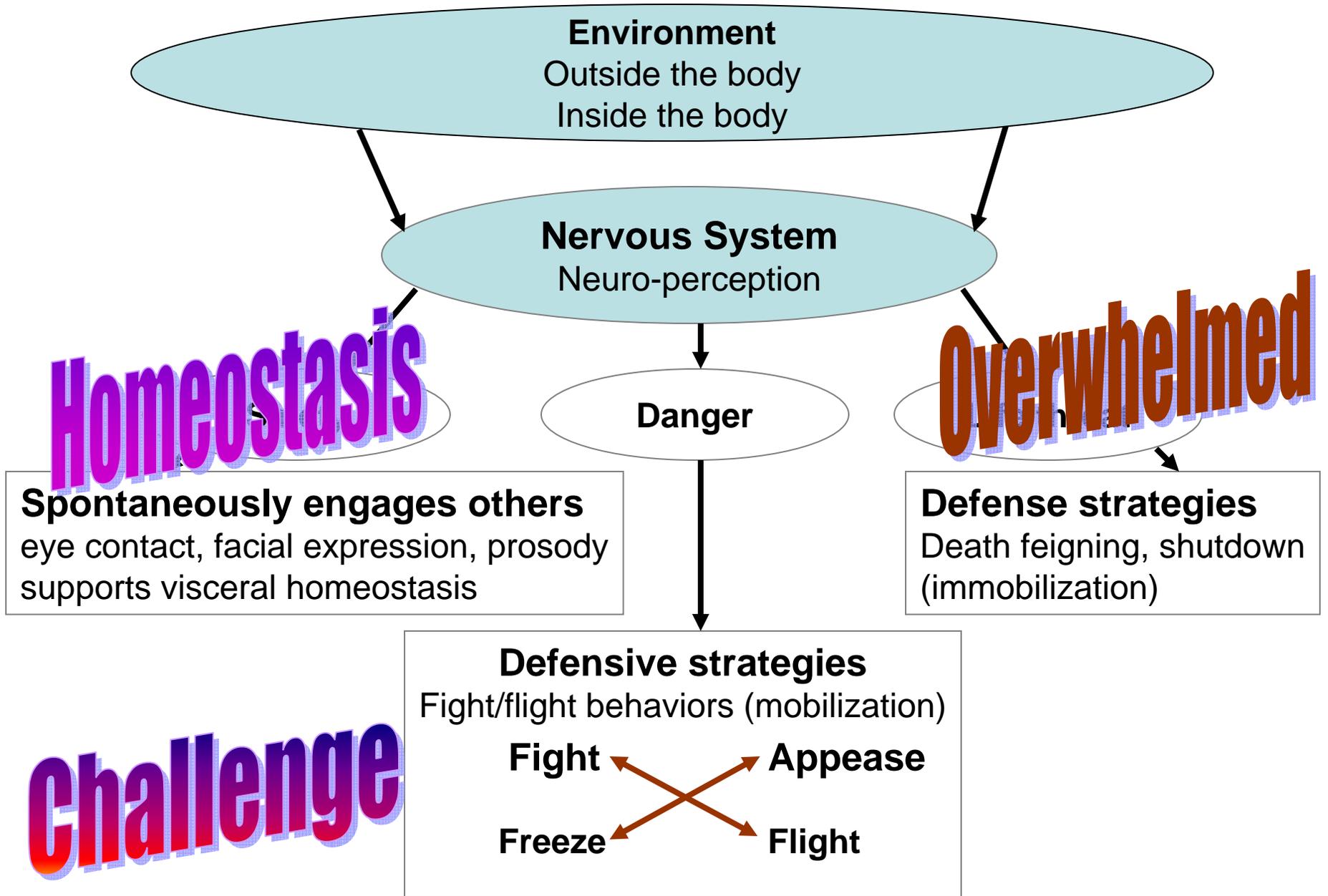
# Dopamine Pathways in the Brain



**The brain SEEKS dopamine – it “lives for dopamine!”**



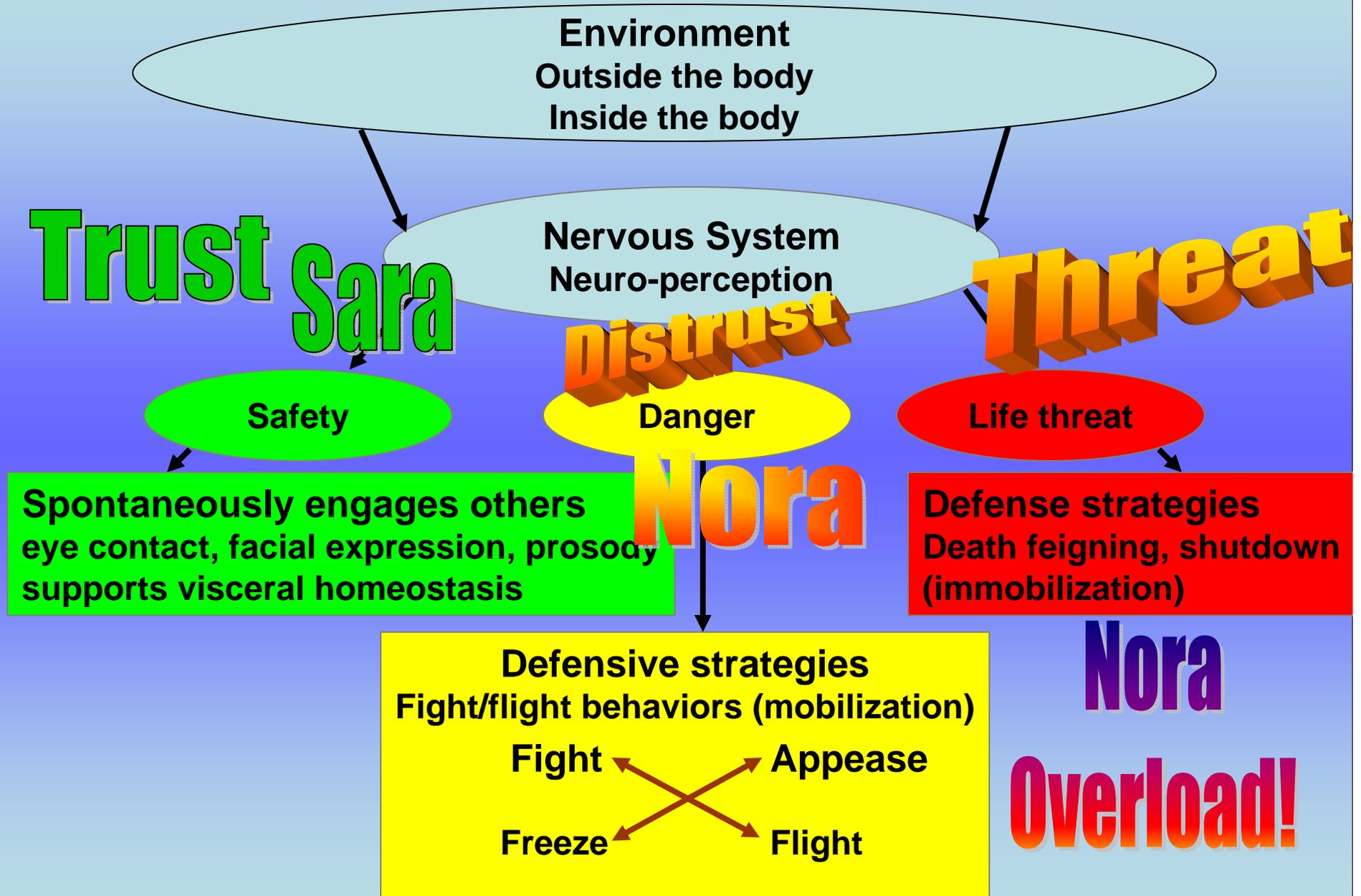
# A basic principle of our nervous system



From: Stephen W. Porges, 2007

sporges@utc.edu

# A basic principle of our nervous system

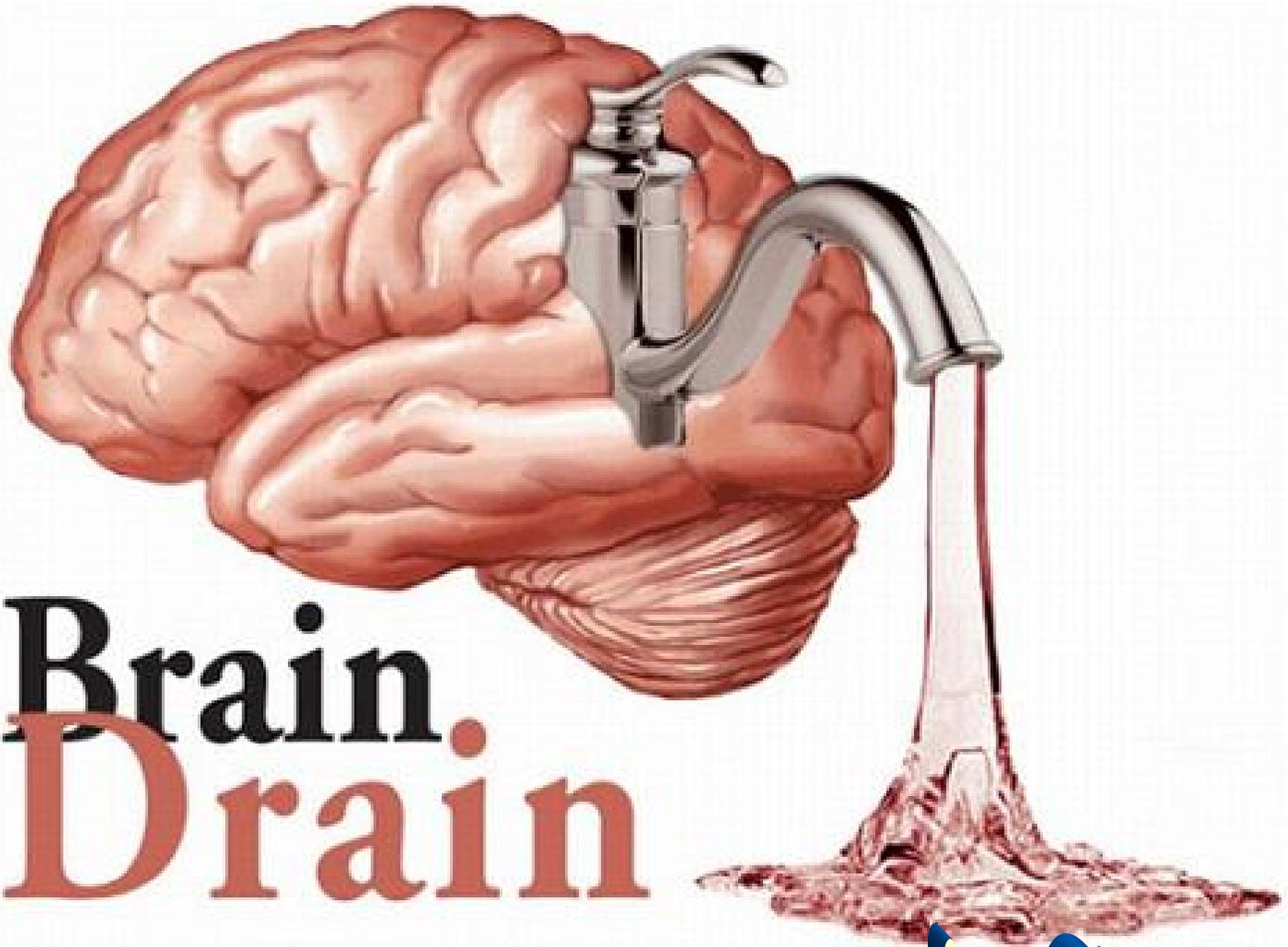


# What's his history with "trust"?

## **Spent young life:**

- **Tired? Sleepy? Hungry?**
- **Nearly Homeless?**
- **Lonely? Being harassed or bullied?**
- **Dyslexic? Embarrassed? Feeling stupid?**
- **Worried? Humiliated? Depressed?**
- **Saw mom/sibling beaten last night?**
- **Multiple foster care placements?**
- **Got a parent or sibling in jail?**
- **Parents separated; getting a divorce?**
- **Moving several times a year?**
- **A parent or sibling in Iraq?**





**Brain.**  
**Drain**

**Sara is Gone!**

**Distress! Nora!**

**Isolation...**

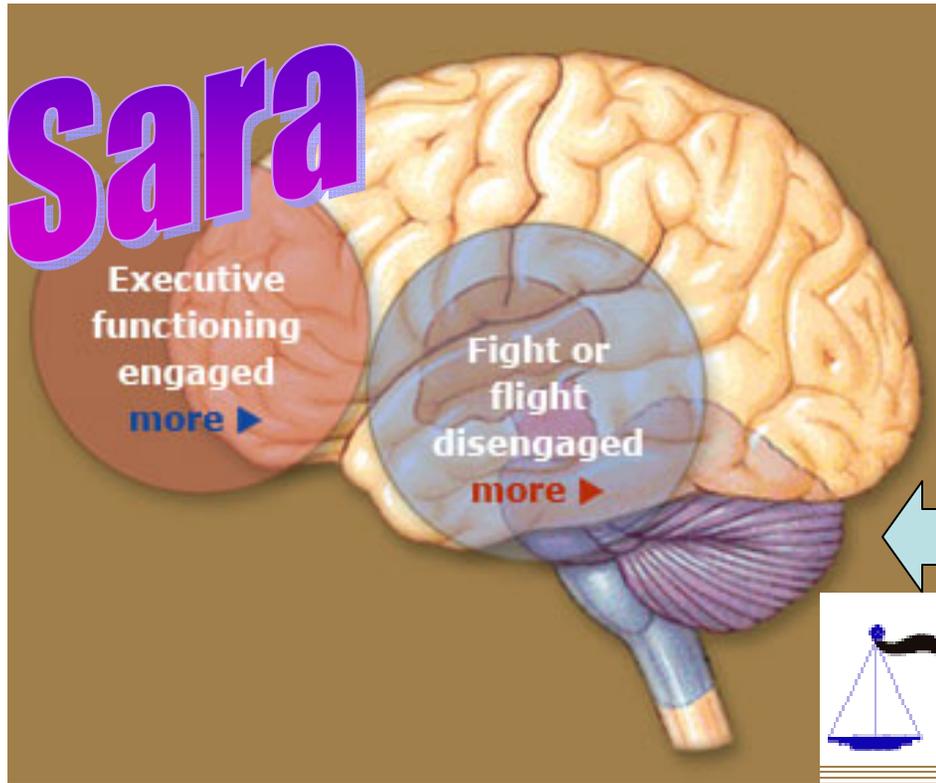
**Nora Overload!**



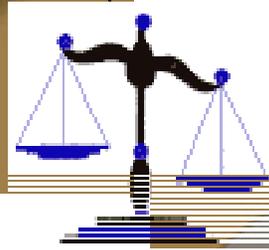
# Sara

Executive functioning engaged more ▶

Fight or flight disengaged more ▶



**RESTFUL ALERTNESS:** Over time, this response leads to increased intelligence, improved academic performance, improved decision making and higher moral reasoning, and reduced stress-related disorders.

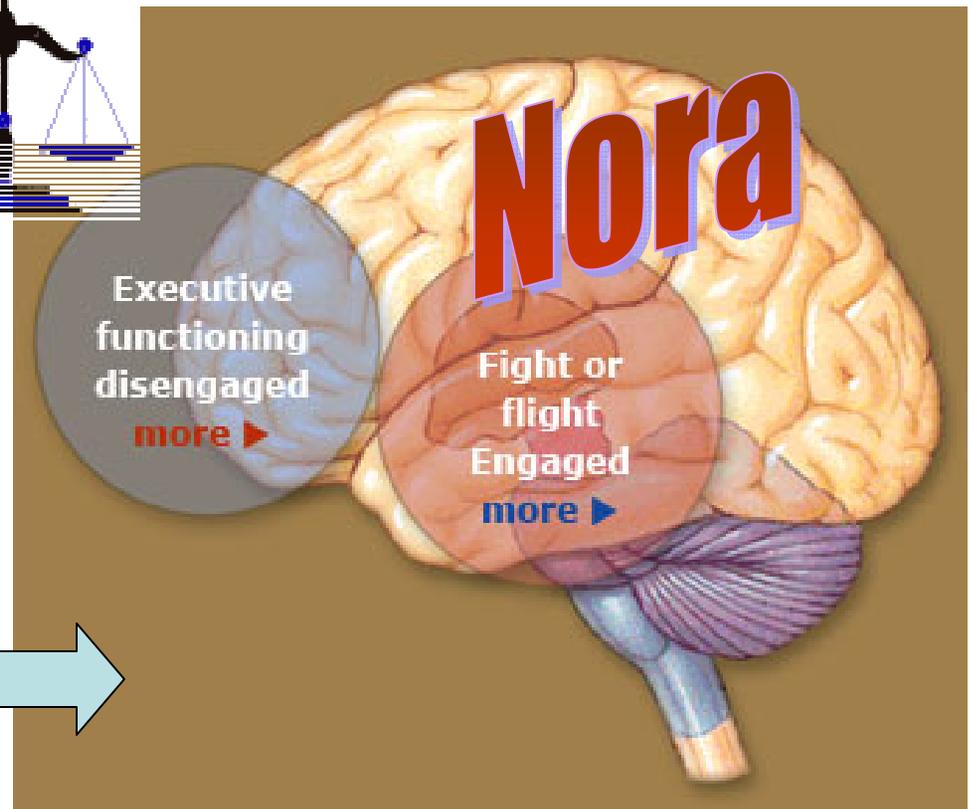


**FIGHT or FLIGHT:** Over time, this response can lead to impulsive, short-sighted, even violent behavior; increased anxiety, depression, alcohol and drug abuse, learning disorders, and increased stress-related diseases.

# Nora

Executive functioning disengaged more ▶

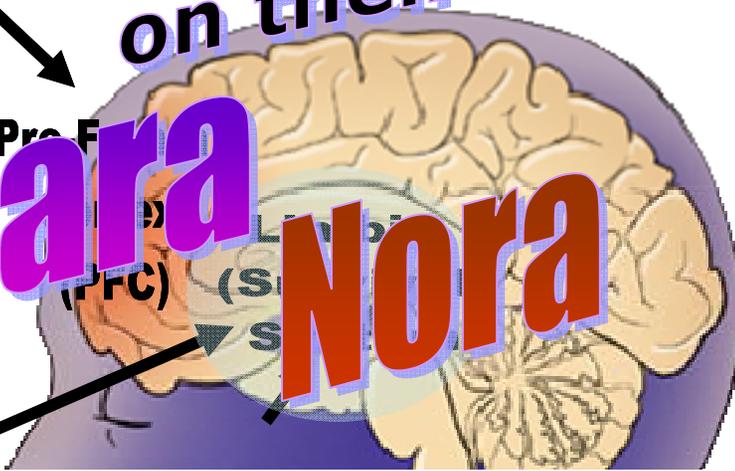
Fight or flight Engaged more ▶



## Rational Responses

- Thinks before acting
- Considers consequences
- Learns from mistakes
- Anticipates problems
- **USES WILL POWER**

**They CANNOT SWITCH on their own!**



The diagram shows a cross-section of a human brain. The name 'Sara' is written in purple over the frontal lobe, and 'Nora' is written in orange over the temporal and parietal lobes. Labels for 'Pre Frontal Cortex (PFC)' and '(S...)' are visible near the respective names. An arrow points from the 'Rational Responses' list to the 'Sara' label, and another arrow points from the 'Automatic Responses' list to the 'Nora' label.

**Sara**  
**Nora**

## Automatic Responses

- Impulsive
- Wiley - Manipulative
- Does NOT learn from mistakes
- Self-Defeating Behaviors/Choices
- Appears to have NO Will Power!

It's easy to recognize where a youth is by his/her behavior.

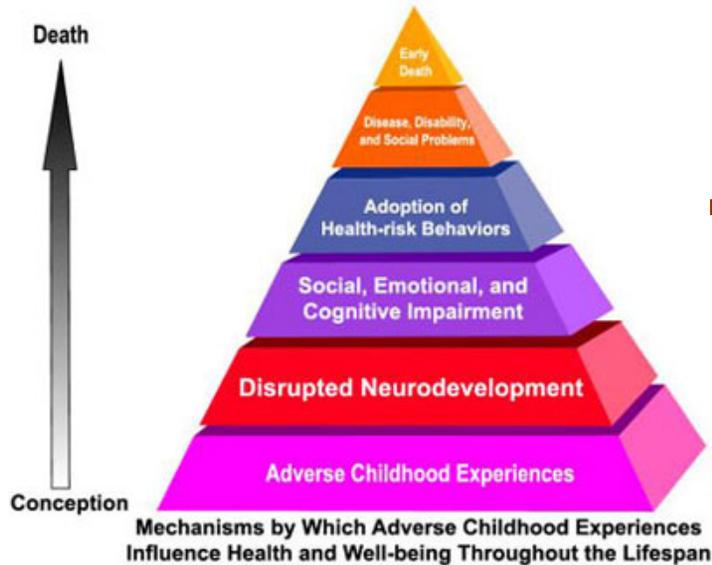




# Behavioral Health

# Adverse Childhood Experiences (ACE Study)

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- **Public/Private Partnership**
- **Started in 1985 – Ongoing**
- **1995 CDC Partnership - Ongoing**
- **Largest of kind – 17,000**

*Changed Nation's Views on Children's Behavioral Health*

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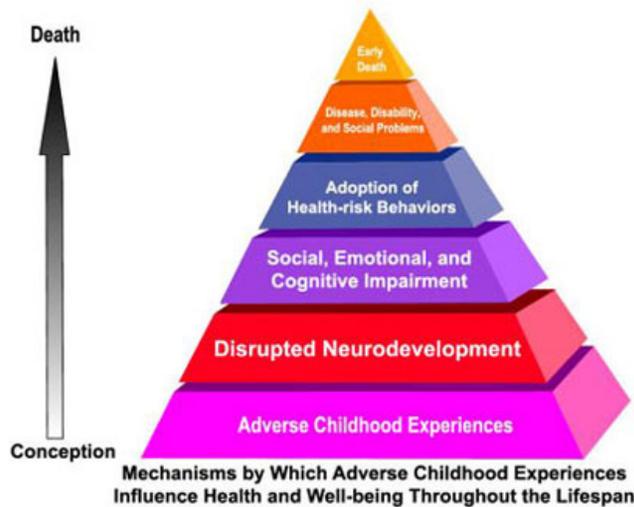
Dr. Vincent J. Felitti, MD  
Internist, Kaiser Permanente



Dr. Robert F. Anda MD (plus MS in Epidemiology)  
Centers for Disease Control (CDC) & Prevention

# Adverse Childhood Experiences (ACE Study)

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## *Major Contributions to Mental/Behavioral Health:*

- Was the impetus for the field of “**child traumatic stress**”
- Showed the link between **stressful or traumatic childhood experiences** and **SOCIAL, EMOTIONAL & COGNITIVE IMPAIRMENTS** (using neuroscience)
- & the link to **UNHEALTHY BEHAVIORS**
- & the link to **BEHAVIORAL HEALTH DISORDERS & DISEASES**
- & the link to **PHYSICAL HEALTH DISORDERS & DISEASES**, including diabetes, heart disease, COPD, some cancers and more.

Overwhelms a child's ability to COPE.



**Child Traumatic Stress  
(CTS)**

**=**

**Preamble to Behavioral Health Problems**

# Traumatic Events

"External"

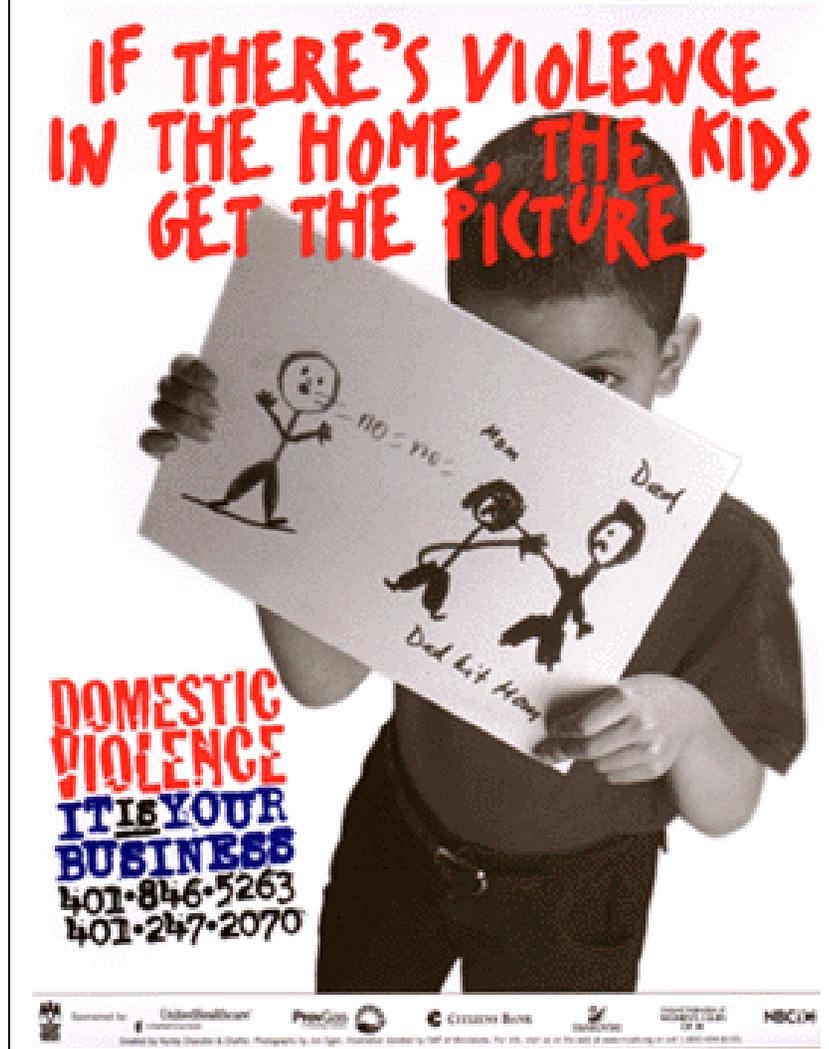
- Disasters
  - **Fires, floods, mudslides**
  - **Earthquakes/Volcanoes**
  - **Hurricanes/Tornadoes**
  - **Major transportation, industrial, technological**
- Wars/Conflicts
- Torture/Genocide
- Terrorists' Attacks



# Traumatic Situations

"Close"

- Home
  - Substance-abusing Caregiver
  - Domestic Violence
  - Neglect (benign & intentional)
  - Abuse (verbal, emotional)
  - Abuse (physical, sexual)
  - Traumatic grief (loss)
  - Loss of contact w/parents/family (Prison – foster care – divorce)
  - Loss of personal dwelling
- Community Violence/Crime
- Medical Trauma
- Personal/Family Accidents



## Undermine TRUST!

# Symptoms of Traumatic Stress

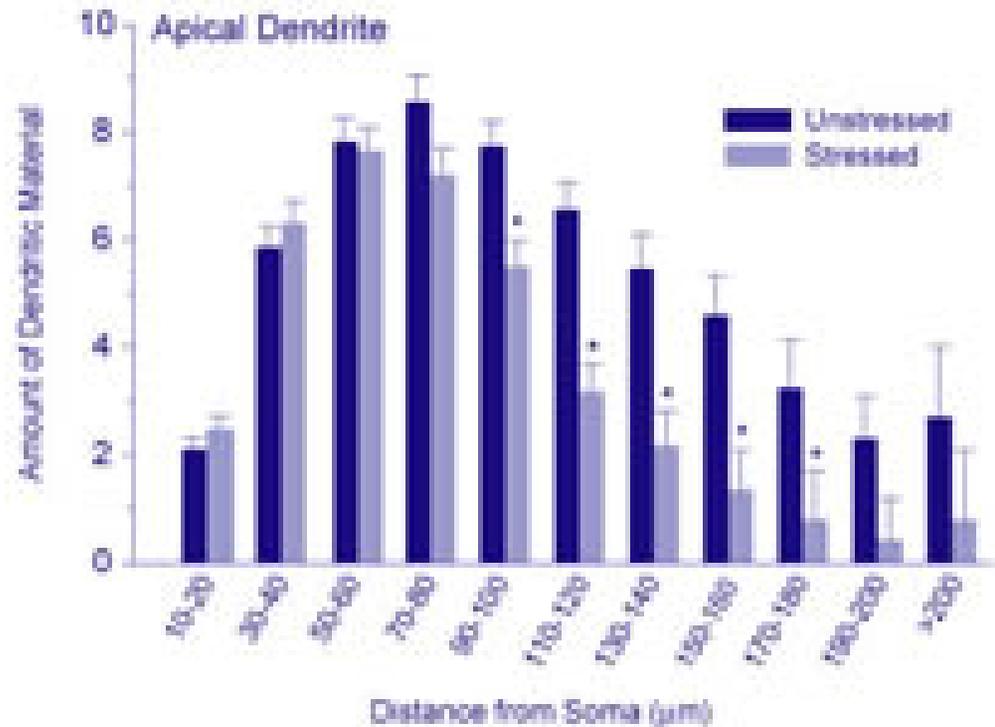
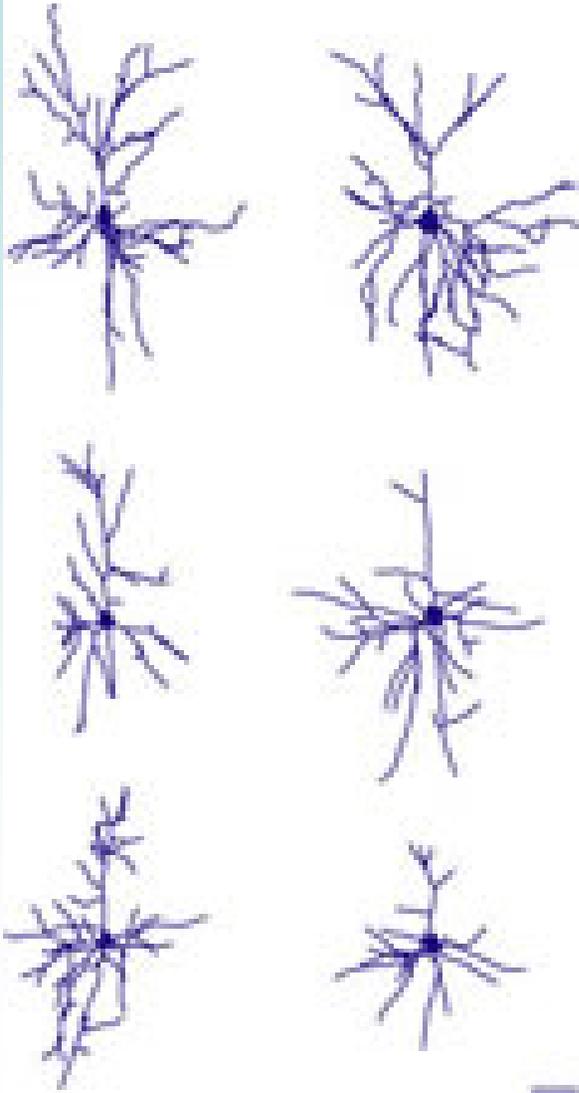
- Is more fearful and worried than other children
- Is not talking or expressing needs routinely
- Has trouble forming relationships
- Is unusually quiet, shy, or withdrawn
- Is unable to play
- Has trouble with self-control; disruptive; attention-seeking
- Is controlling – questions everything – rejects authority
- Is unsure all or most of the time; resistant; afraid to try/fail
- Is hard to soothe or comfort – is moody routinely
- Tends to have frequent headaches or stomach aches
- Sleeping or eating problems; younger: toilet control problems
- Displays behavior like hitting, screaming, or fighting
- Treats other children, animals, or objects cruelly/destructively
- Bullying – aggression
- Defiance without purpose
- Hostility without purpose
- Indecisive routinely
- Blaming routinely
- Sleepy routinely
- Argumentative routinely
- Forgetful – distracted routinely
- Anxious – fretful routinely



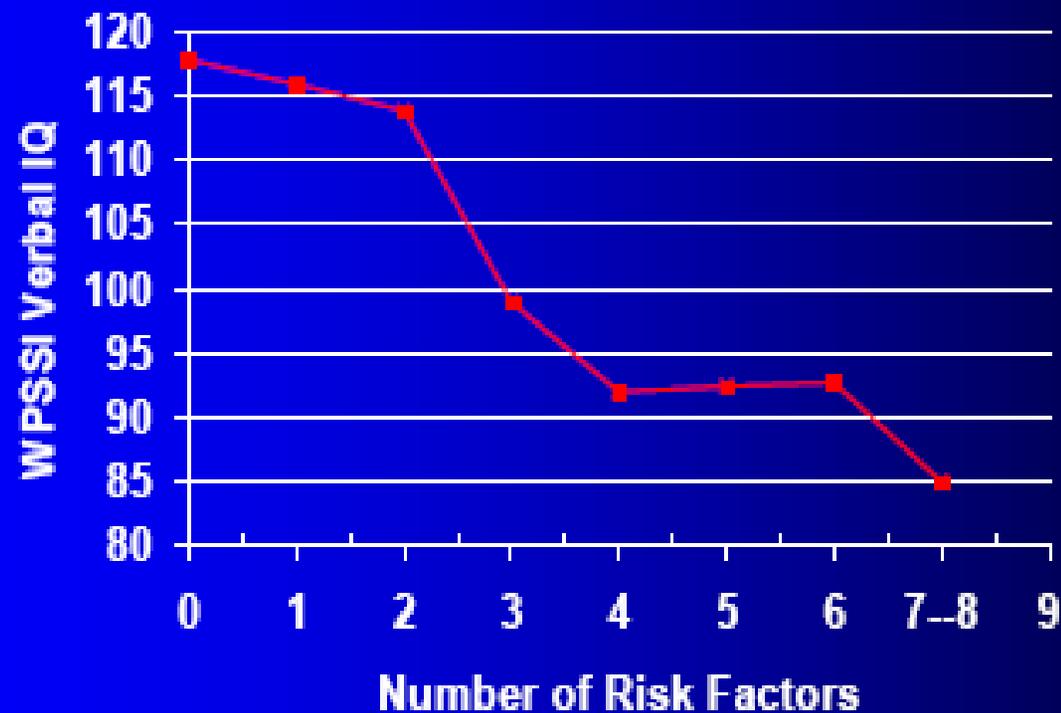
# Traumatic Stress = Restructuring/Loss of Dendrites

Unstressed

Stressed



# Effects of Multiple Risks on Preschool Intelligence



**Symptoms you can see...**

**Delayed Damage**

An iceberg floating in the ocean. The tip of the iceberg is visible above the water surface, while the much larger, submerged part is visible below. The text 'Delayed Damage' is written across the submerged portion of the iceberg. The background is a dark blue ocean under a light blue sky.

Damage doesn't show up right away.

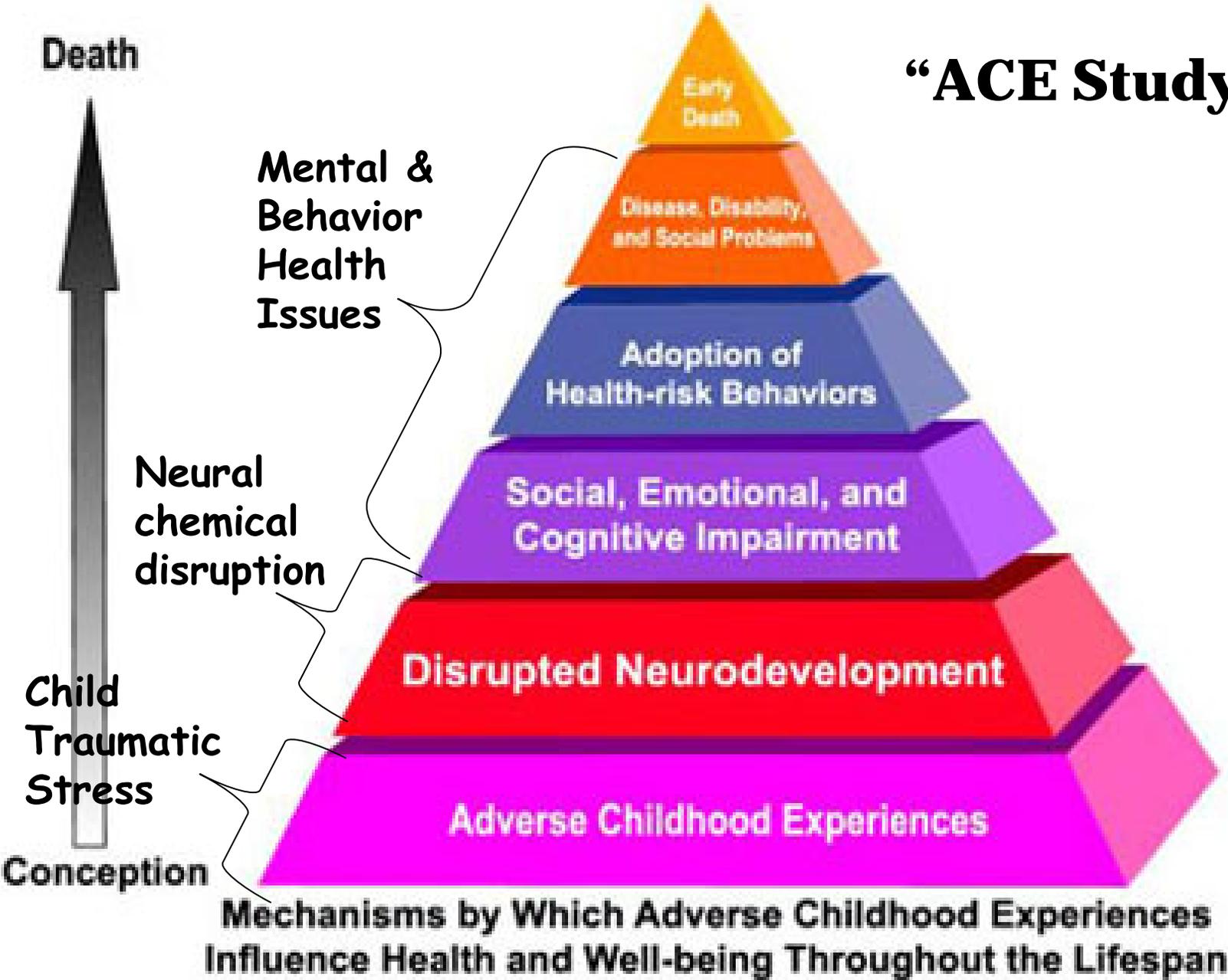
Damage

Immediate effects

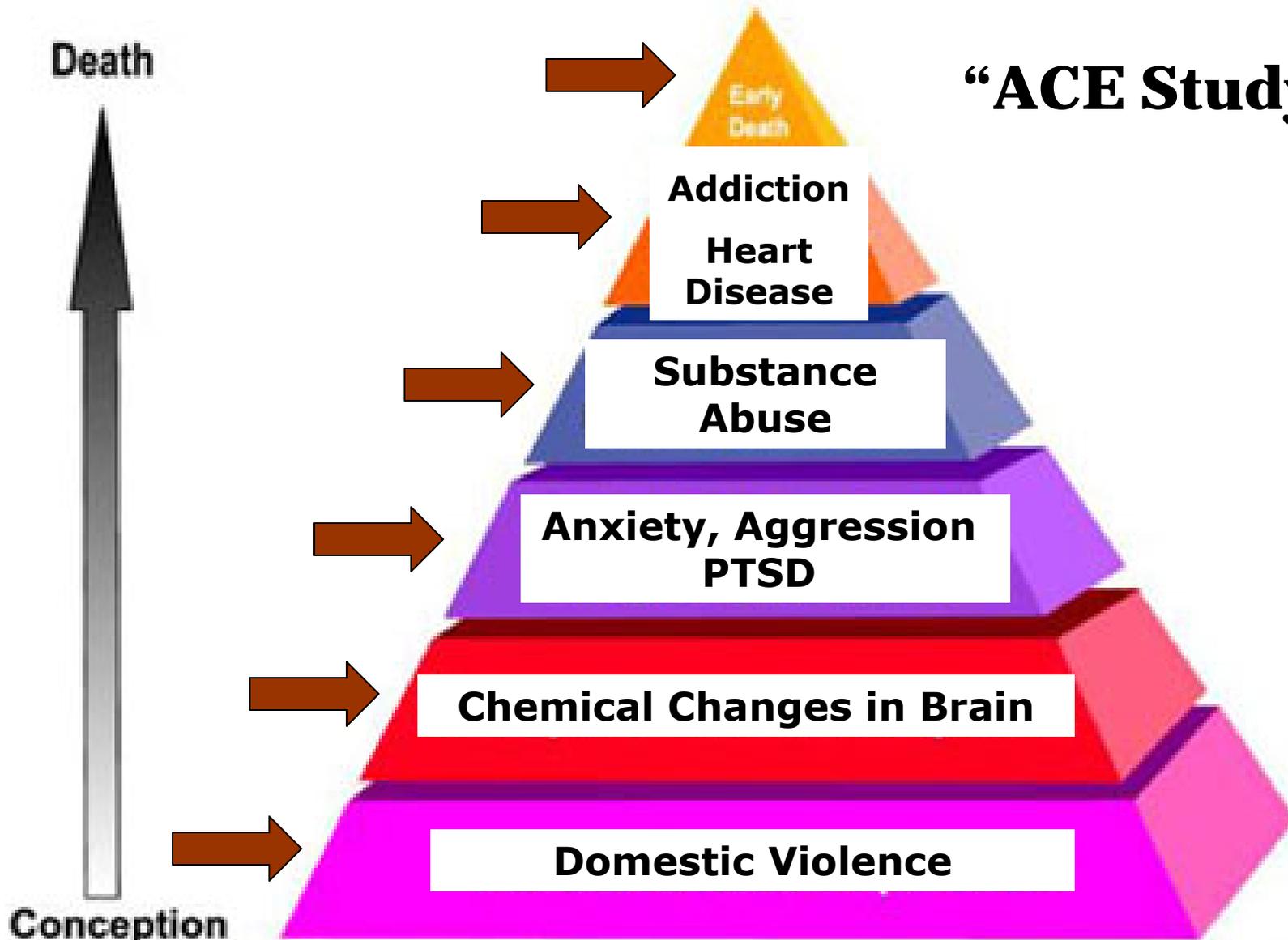
ACEs



# “ACE Study”

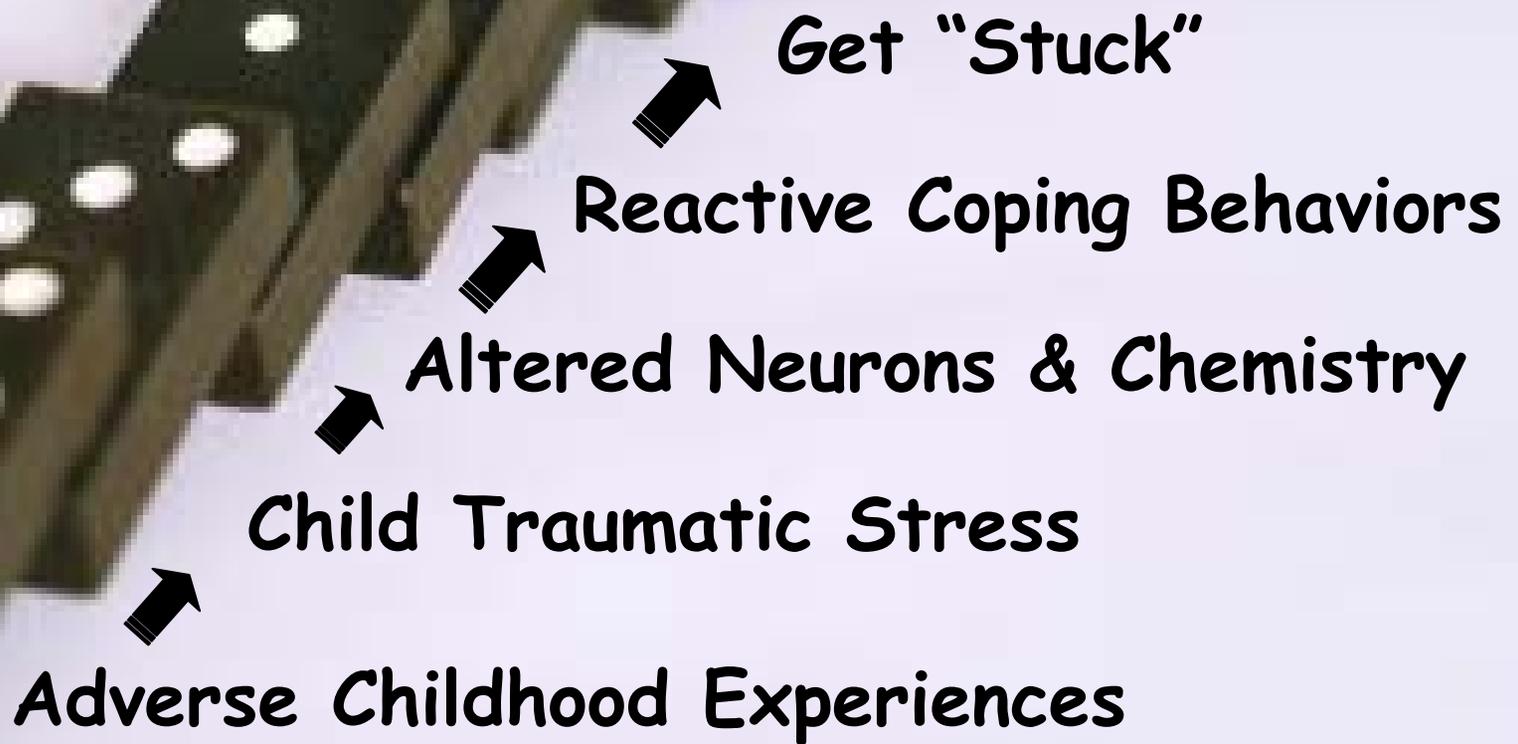


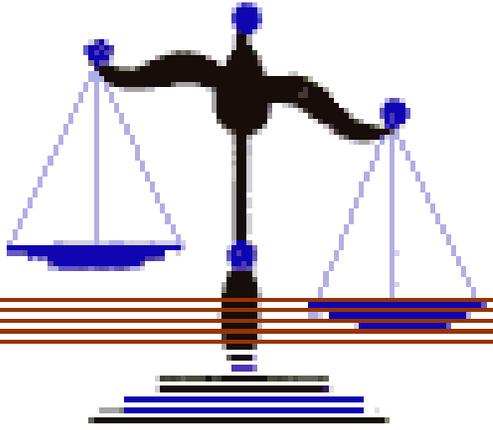
# “ACE Study”



**Mechanisms by Which Adverse Childhood Experiences  
Influence Health and Well-being Throughout the Lifespan**

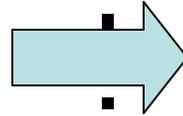
# *Survival Mode*





# Behavioral Health

Trauma-  
induced  
behavioral  
health  
concerns

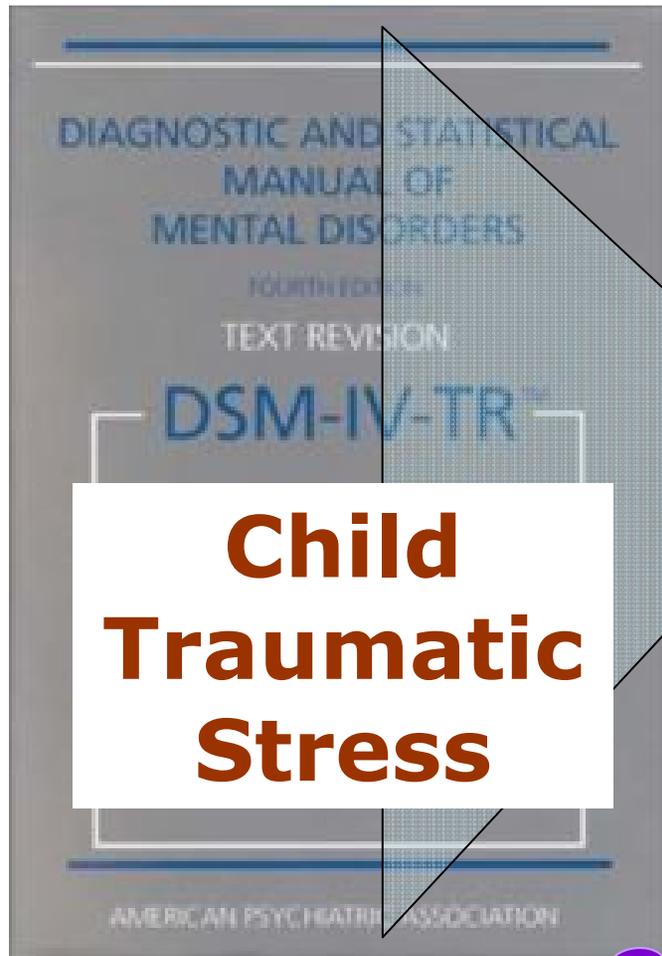


**Diagnosable  
Disorder**

**The symptoms are the same; it's the intensity  
and duration that push youth over the line!**

# CTS –Induced Behavioral Health Disorders

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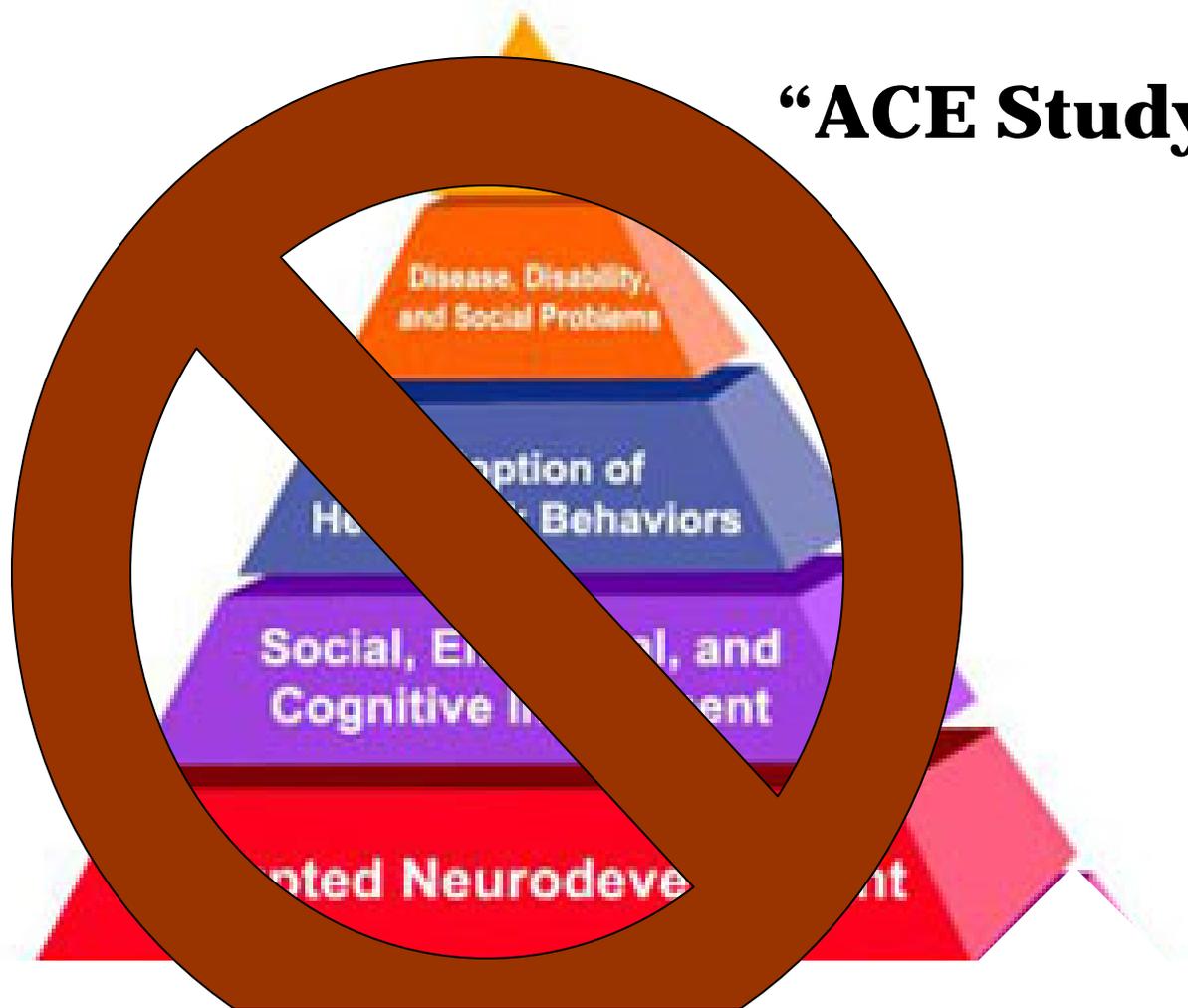


- **PTSD**
- **Anxiety Disorders**
- **Depression/Mood Disorders**
- **Conduct Disorders**
- **Oppositional Defiance**
- **Eating Disorders**
- **Substance Use Disorders**
- **Gambling, Sex, Spending Addictions & Risk-junkies**

**CTS = Precursor**

Death

**“ACE Study”**

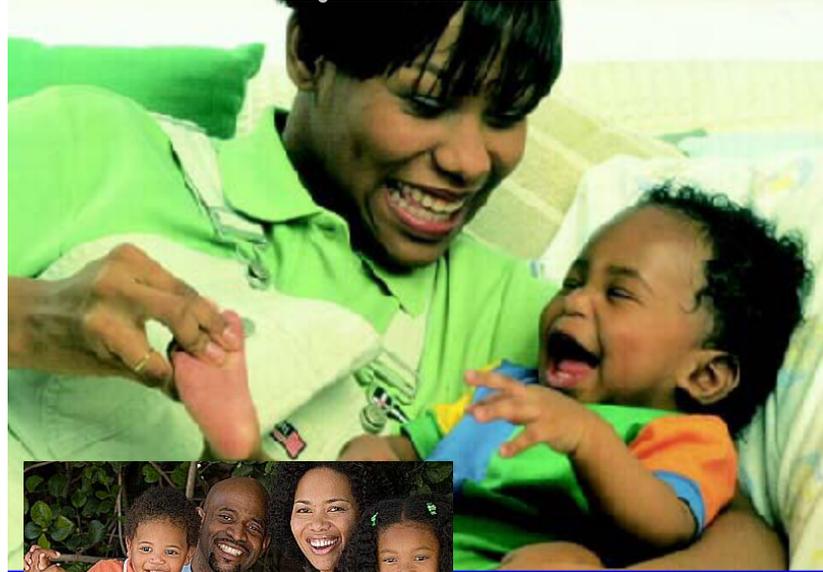


Concept

**ENDING ADVERSE CHILDHOOD EXPERIENCES WOULD SAVE OUR NATION BILLIONS IN HEALTH CARE COSTS!!**

<http://www.cdc.gov/nccdphp/ace/>

Experience is our **BUILDER**.  
What we experience determines



**how we are constructed!**

# Making the shift from Surviving → Striving → Thriving!

➡ Youth with people and places to TRUST

➡ Youth with opportunities to get healthy  
“jollies & their dose of Dopa”

➡ Youth with COPING SKILLS

➡ Youth who learn how to shift from Nora  
to Sara and to reward themselves

➡ **Can Resist, Persist, Withstand,  
Overcome, Recover & Rebound!!!**



**Trust**

**Joyful**

**Distrust**

**Afraid**

**Angry**

**Rebellious**

**Disruptive**

**Taunting**

**Defiant**

**Loner**

**Insecure**

**Manipulative**

**Passive**

*Which column would  
you put these in?*

**Trust**

**Joy**  
**Abuse**

**Distrust**

**Abandonment**

**Consistency**

**Neglect**

**Fairness**

**Loneliness**

**Respect**

**Opportunity**

**Isolation**

**Insecurity**

**Ridicule**

**Bullying**

*Which column would  
you put these in?*

# Questions:

- 1. Do our correctional settings work in concert with the way the brain functions & develops? Who's trained?**
- 2. Are the interventions based on an understanding of behavior chemistry and adults' roles in the development process? Are the adults serving as models of what we want youth to be?**
- 3. Do the approaches used prepare youth for life on the outside rather than just controlling their behavior while in residence?**
- 4. Do our institutions provide an environment that engenders trust?**
- 5. Are we using proven development & "habilitation" strategies – teaching youth how to shift from survival to thinking and controlling – Self-regulating behavior?**

# The purpose of CORRECTION...



*is to IMPROVE the outcome.*

Because it is still **DEVELOPING!**



The brain needs more  
**PROTECTION!**



Development DOES NOT just happen!

You get OPPORTUNITIES + Doorways!

Missed opportunities  
make everything HARDER.

**They develop  
on OUR TIME  
TOO!**



**Protect Their DEVELOPMENT!  
Protect Their FUTURE!**

**WE**

**are their**

**LIFE**

**COACHES!**