

# ACES, TOXIC STRESS, AND THE DEVELOPING BRAIN

**IMPACT OF ACES ON LEARNING, BEHAVIOR, EMOTION,  
AND RELATIONSHIPS IN SCHOOL**

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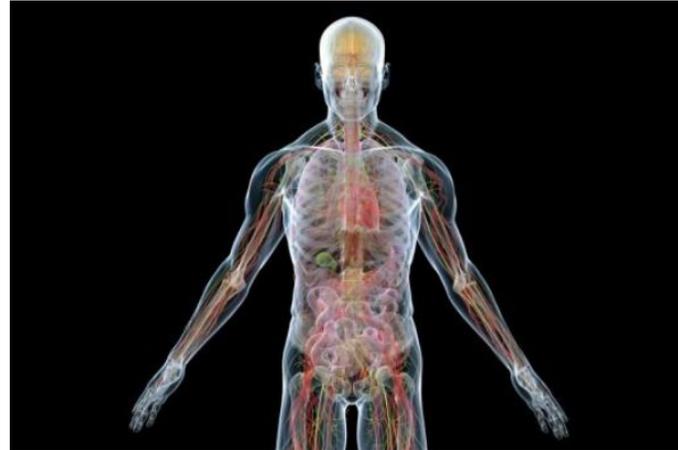
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# HERE ARE THE QUESTIONS I'VE BEEN ASKED

- **WHAT IS THE SCIENTIFIC EVIDENCE REGARDING THE IMPACT OF CHRONIC STRESS ON BRAIN DEVELOPMENT IN THE FIRST FIVE YEARS?**
- **WHAT IS THE DIFFERENCE BETWEEN SINGLE EVENT TRAUMA AND WHAT IS CALLED, VARIOUSLY, DEVELOPMENTAL TRAUMA, COMPLEX TRAUMA, CHRONIC TRAUMA, HIGH ACES I.E., GROWING UP WITH NEAR-CONSTANT STRESS**
- **WHAT IS THE LONG-TERM IMPACT ON HEALTH AND LEARNING ON THESE CHILDREN?**
- **HOW DO THESE CHILDREN SHOW UP IN THE CLASSROOM, AND WHAT IS THE ROLE OF SCHOOLS TO HELP?**

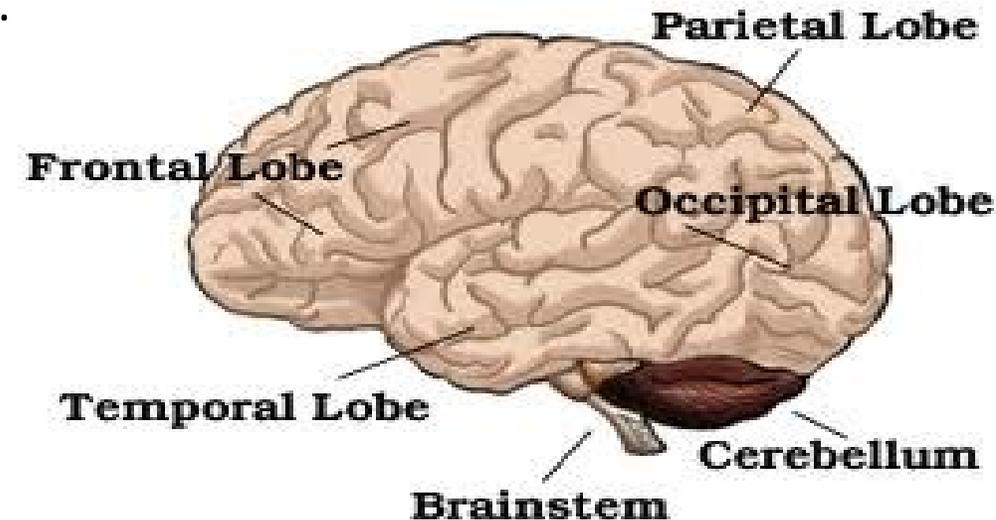
# 1. WHAT IS THE SCIENTIFIC EVIDENCE REGARDING THE IMPACT OF CHRONIC STRESS ON BRAIN DEVELOPMENT IN THE FIRST FIVE YEARS?



Scientific advances are driving a paradigm shift in understanding how adverse experiences in childhood affect development, learning, health, and disease across the lifespan

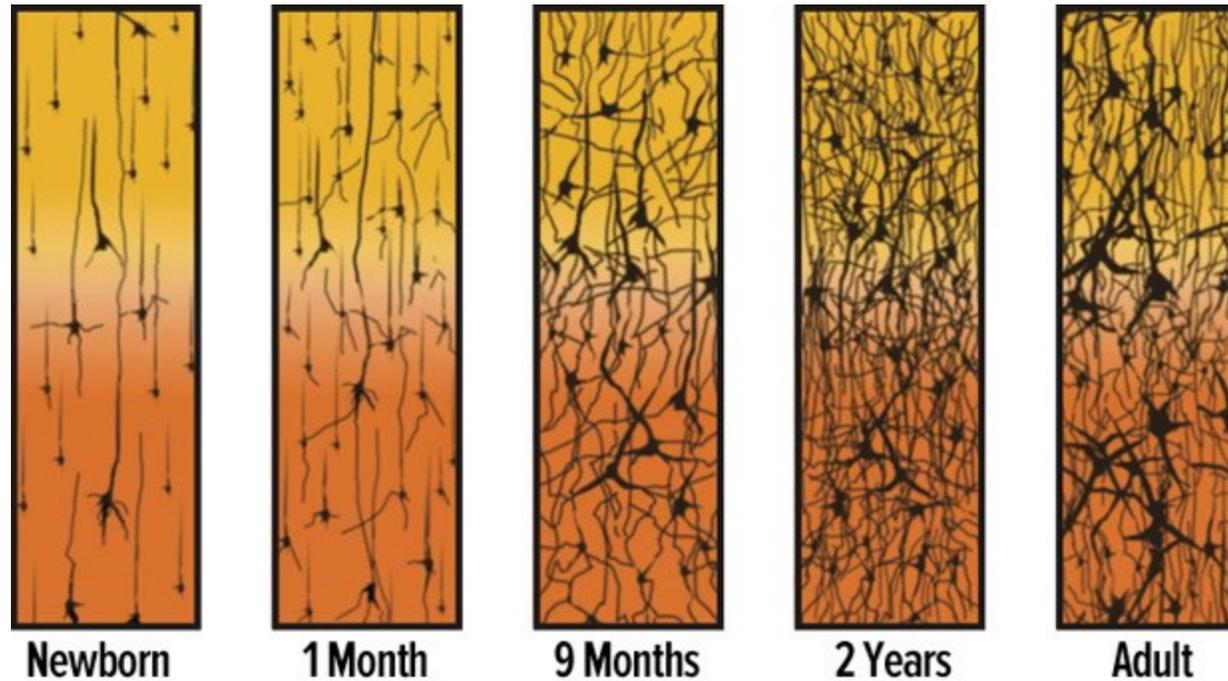
# Neurodevelopment

- Brain starts as single cell – develops into ten billion organized cells
  - Neurogenesis (nerve growth).
  - Migration (nerve movement).
  - Synaptogenesis (nerve connections).
  - Neurochemical differentiation (chemical connections).



- Generally proceeds from lower to higher structures—brainstem to cortex

# Neuron density over time



Source: Corel, JL. The postnatal development of the human cerebral cortex. Cambridge, MA: Harvard University Press; 1975.

The brain organizes in a “use dependent” fashion  
“use it or lose it”



The number and density of synaptic connections can change with activation or lack of activation

# Genes give us the range; what is expressed is due to environment

- The actual neural architecture of the brain—and the resulting functional capabilities—mirrors the nature, timing, and pattern of experience.

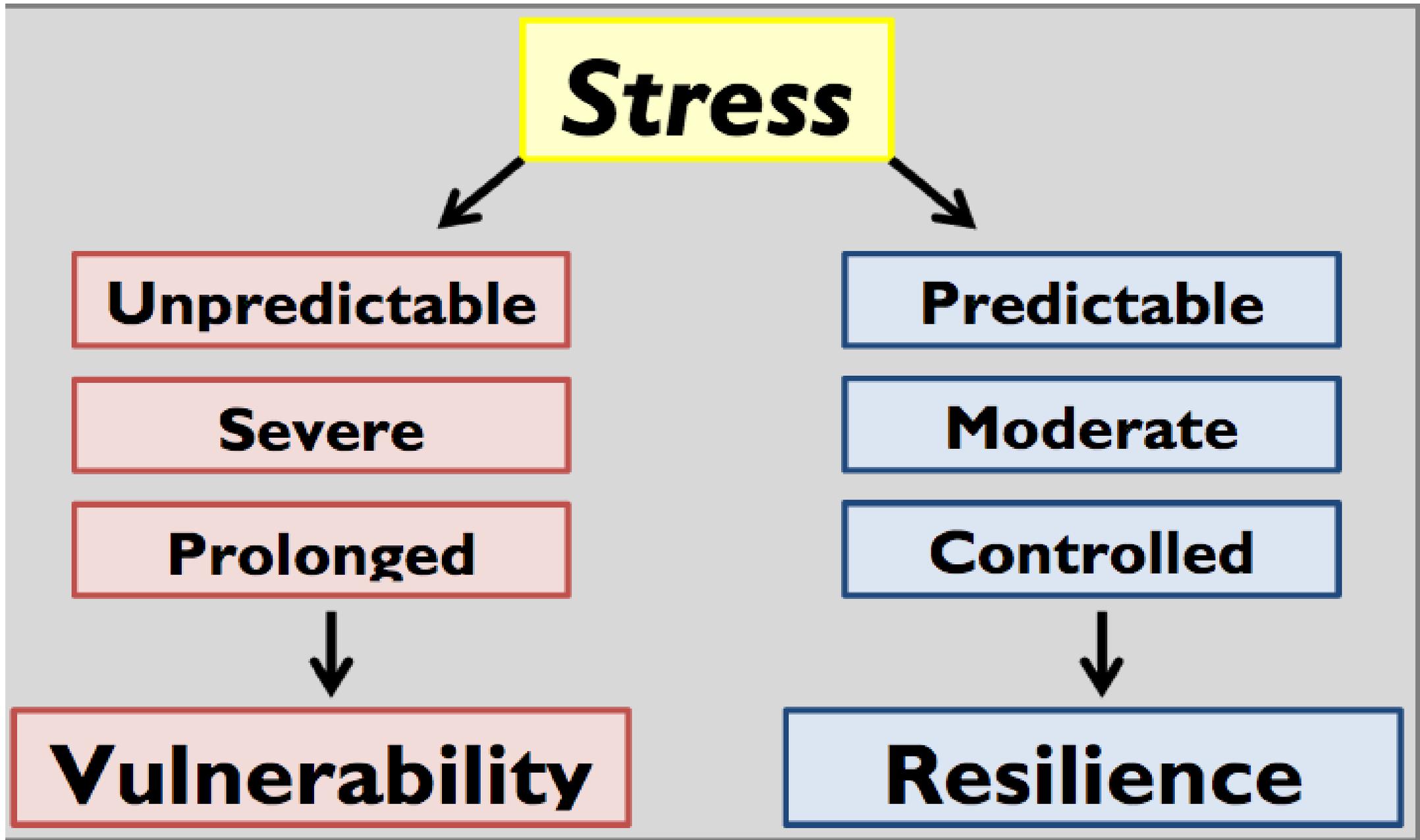


# There are windows of sensitivity and vulnerability



# True for nurturing environment and toxic stress





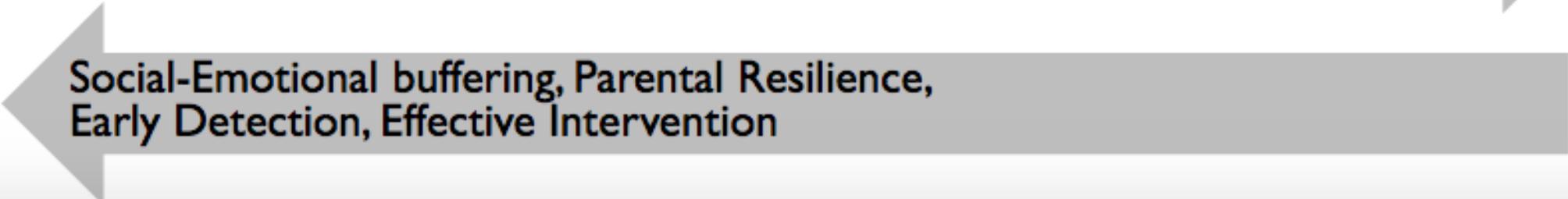
**Figure 5: The Pattern of Stress has a Role in Determining Risk or Resilience**

Positive Stress	Tolerable Stress	Toxic Stress
<ul style="list-style-type: none"> <li>• Normal and essential part of healthy development</li> <li>• Brief increases in heart rate and blood pressure</li> <li>• Mild elevations in hormonal levels</li> <li>• Example: tough test at school. Playoff game.</li> </ul>	<ul style="list-style-type: none"> <li>• Body's alert systems activated to a greater degree</li> <li>• Activation is time-limited and buffered by caring adult relationships</li> <li>• Brain and organs recover</li> <li>• Example: death of a loved one, divorce, natural disaster</li> </ul>	<ul style="list-style-type: none"> <li>• Occurs with strong, frequent or prolonged adversity.</li> <li>• Disrupts brain architecture and other organ systems.</li> <li>• Increased risk of stress-related disease and cognitive impairment.</li> <li>• Example: abuse, neglect, caregiver substance abuse</li> </ul>

Intense, prolong, repeated, unaddressed



Social-Emotional buffering, Parental Resilience, Early Detection, Effective Intervention



# Positive Stress Response

1

Brief increases in heart rate

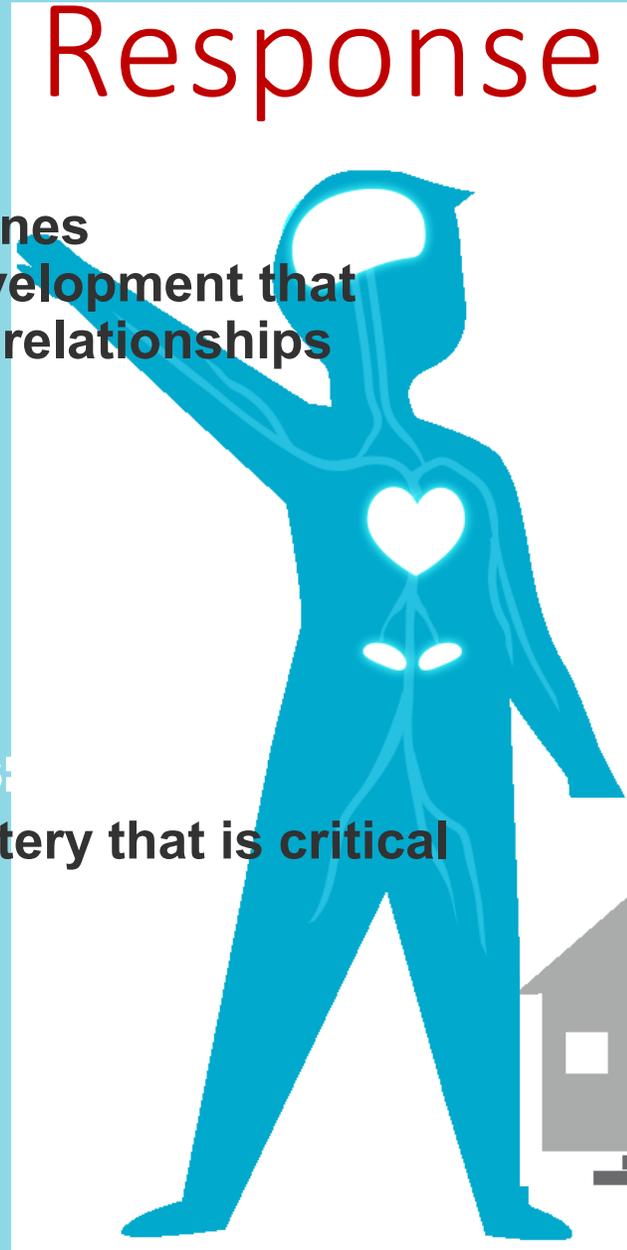
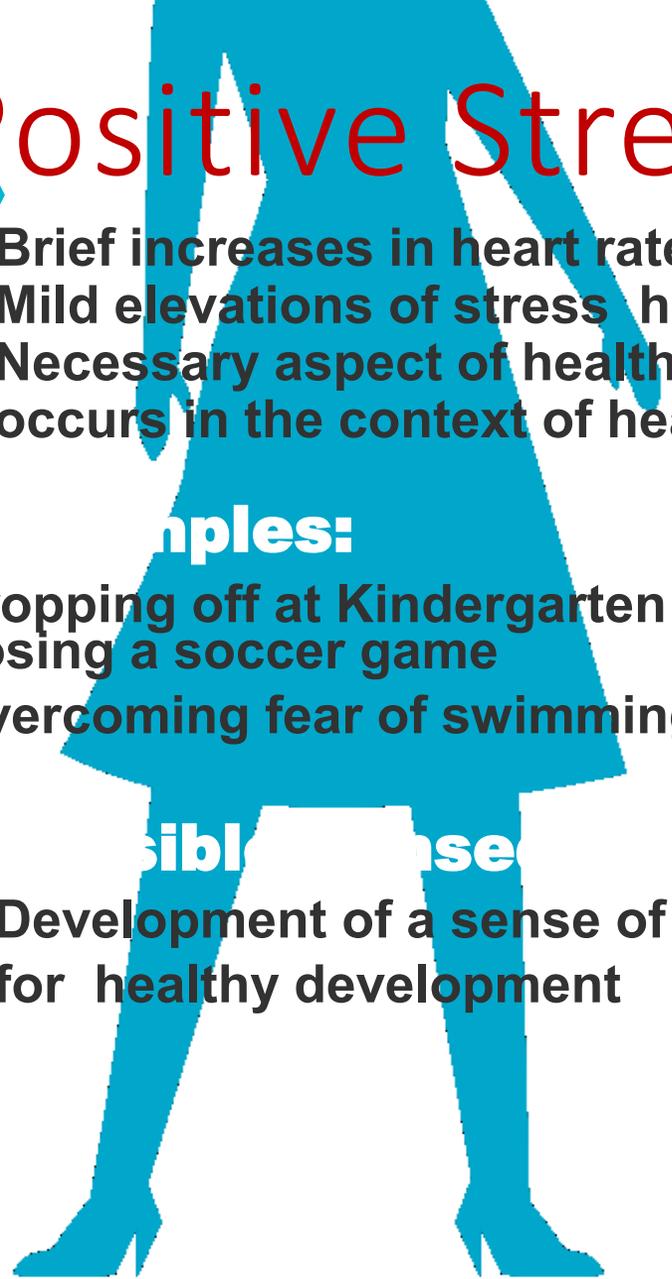
- Mild elevations of stress hormones
- Necessary aspect of healthy development that occurs in the context of healthy relationships

## Examples:

- Dropping off at Kindergarten
- Losing a soccer game
- Overcoming fear of swimming

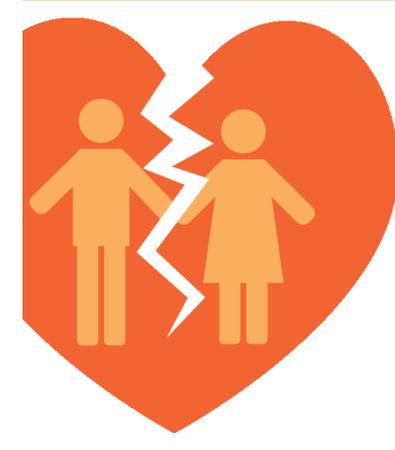
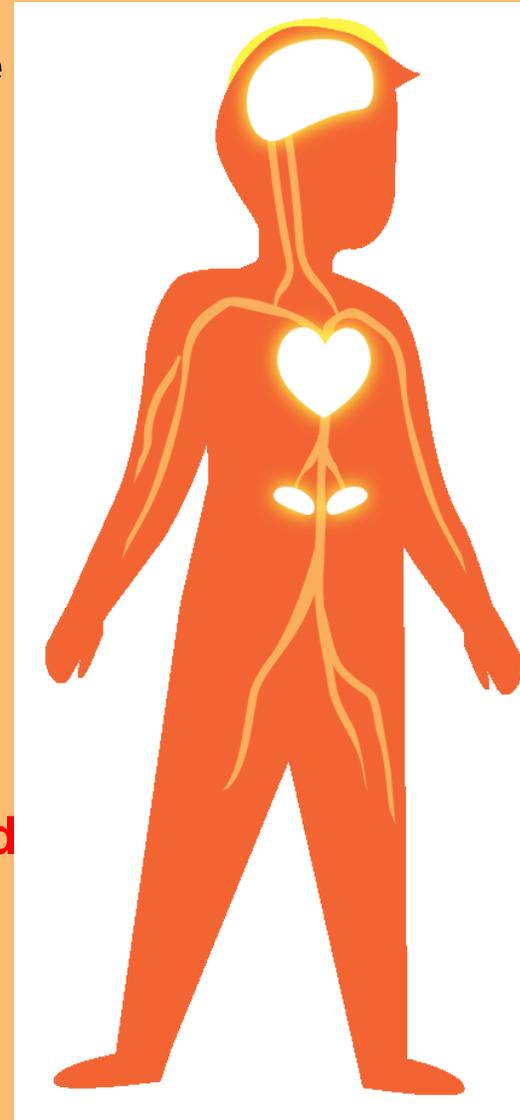
## Possible consequences:

- Development of a sense of mastery that is critical for healthy development



# Tolerable Stress Response

- More prolonged activation of the stress response system
- **Examples:**
  - Bullying
  - Death of a loved one
  - Frightening accident
- **Possible consequences:**
  - Range from positive to harmful depending on relationships, the environment, prior experiences, and innate factors
  - Stress responses *could* disrupt brain architecture, **but are buffered by supportive relationships**. Brain recovers.



3

# Toxic Stress Response

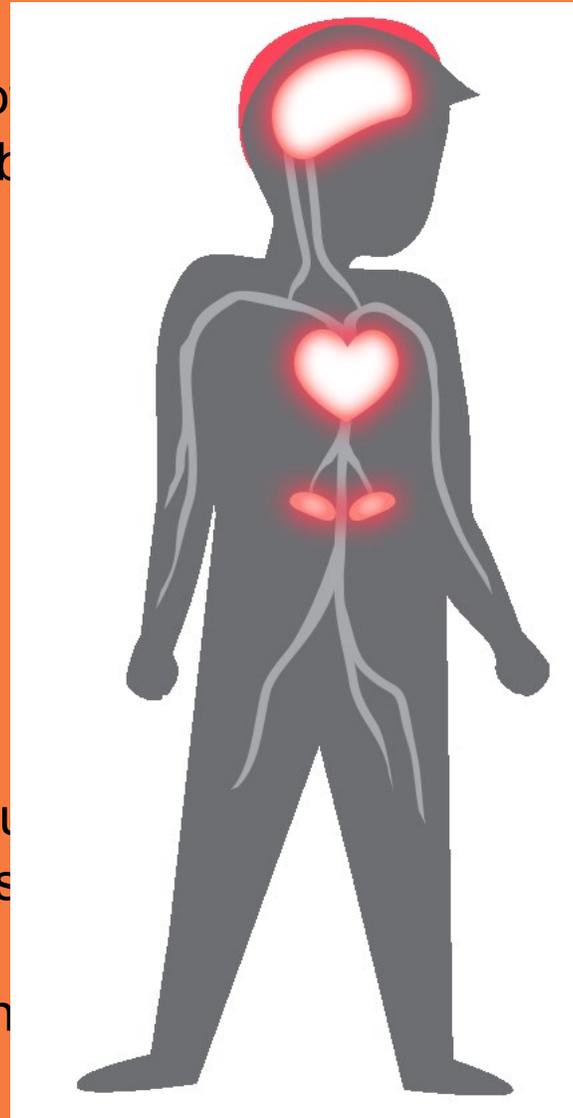
Prolonged activation of stress response systems in the absence of buffering protection afforded by stable responsive relationships

## **Examples: 3 or more ACEs**

- Physical or emotional abuse
- Chronic neglect
- Exposure to violence
- Extreme poverty

## **Possible consequences:**

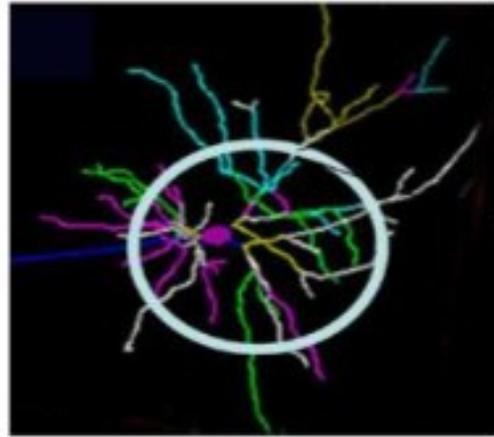
Lifelong impacts on brain architecture and other parts of the body's stress response system that increase the risk of stress-related physical and mental illness later in life





## Persistent Stress Changes Brain Architecture

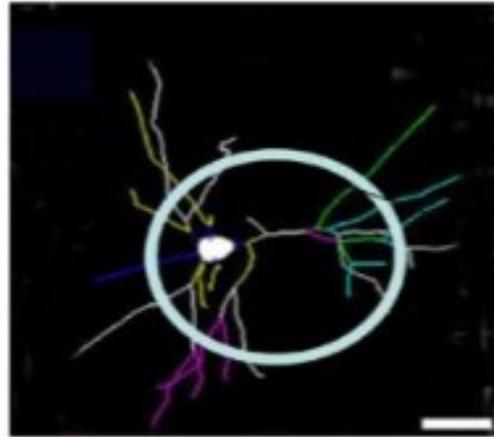
Normal



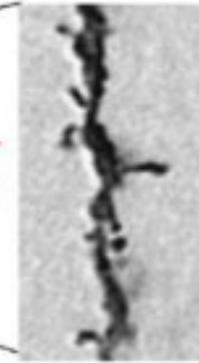
Typical neuron—  
many connections



Toxic  
stress



Damaged neuron—  
fewer connections



Prefrontal Cortex and  
Hippocampus

Sources: Radley et al. (2004)  
Bock et al. (2005)

# A LITTLE STRESS IS GOOD

- WE ARE SUPPOSED TO REACT WHEN A TIGER SHOWS UP
  - Bodies designed to respond to stress
  - Adrenalin and cortisol help us run from the tiger or hide
  - Threat of short duration, then get safe



BUT THE TIGER ISN'T SUPPOSED TO  
MOVE IN



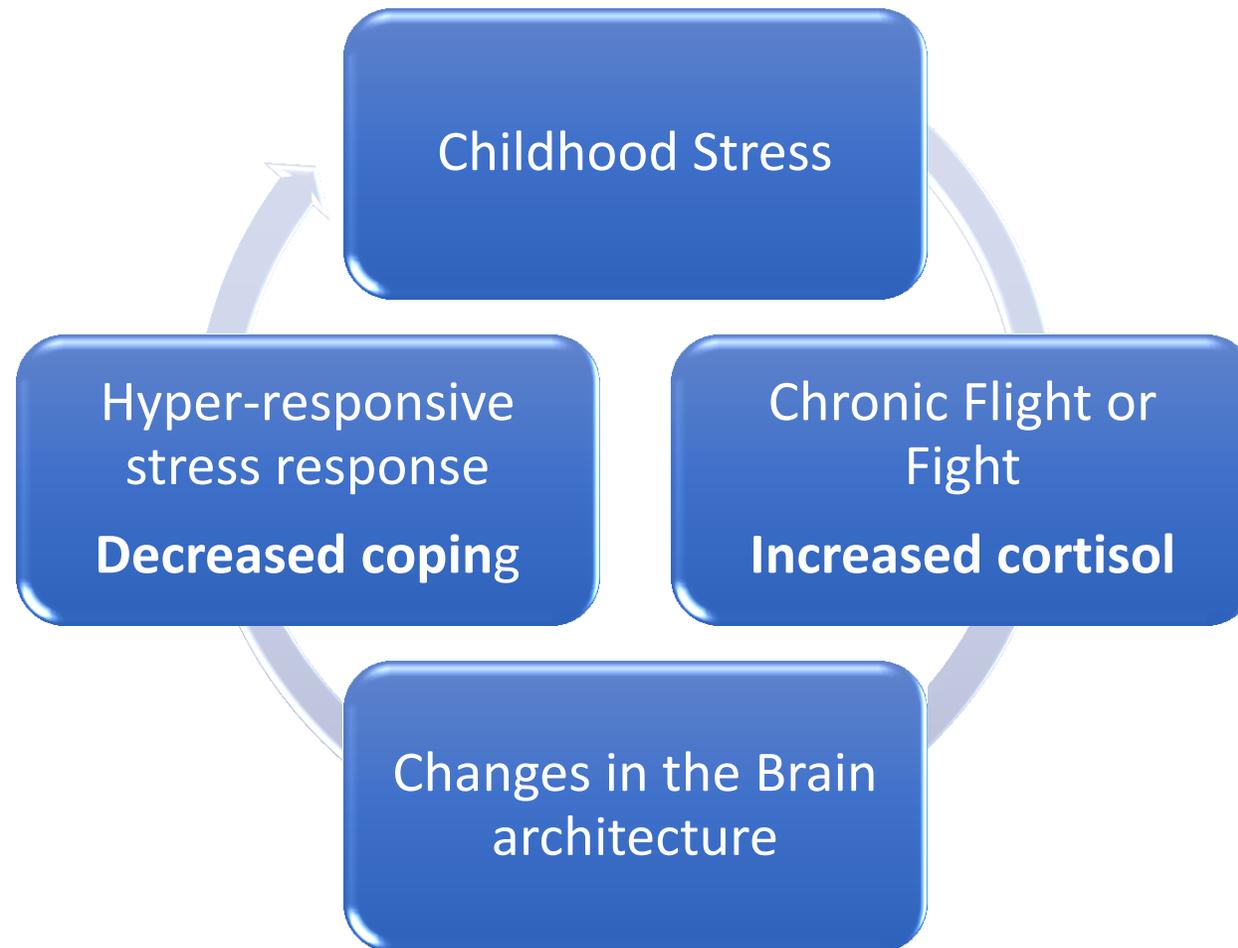
# Normative Danger Responses

## Autonomic Nervous Response System

- Fight
- Flight
- Freeze
- Flock



# Impact of Toxic Stress



# Impact of toxic stress on immune system

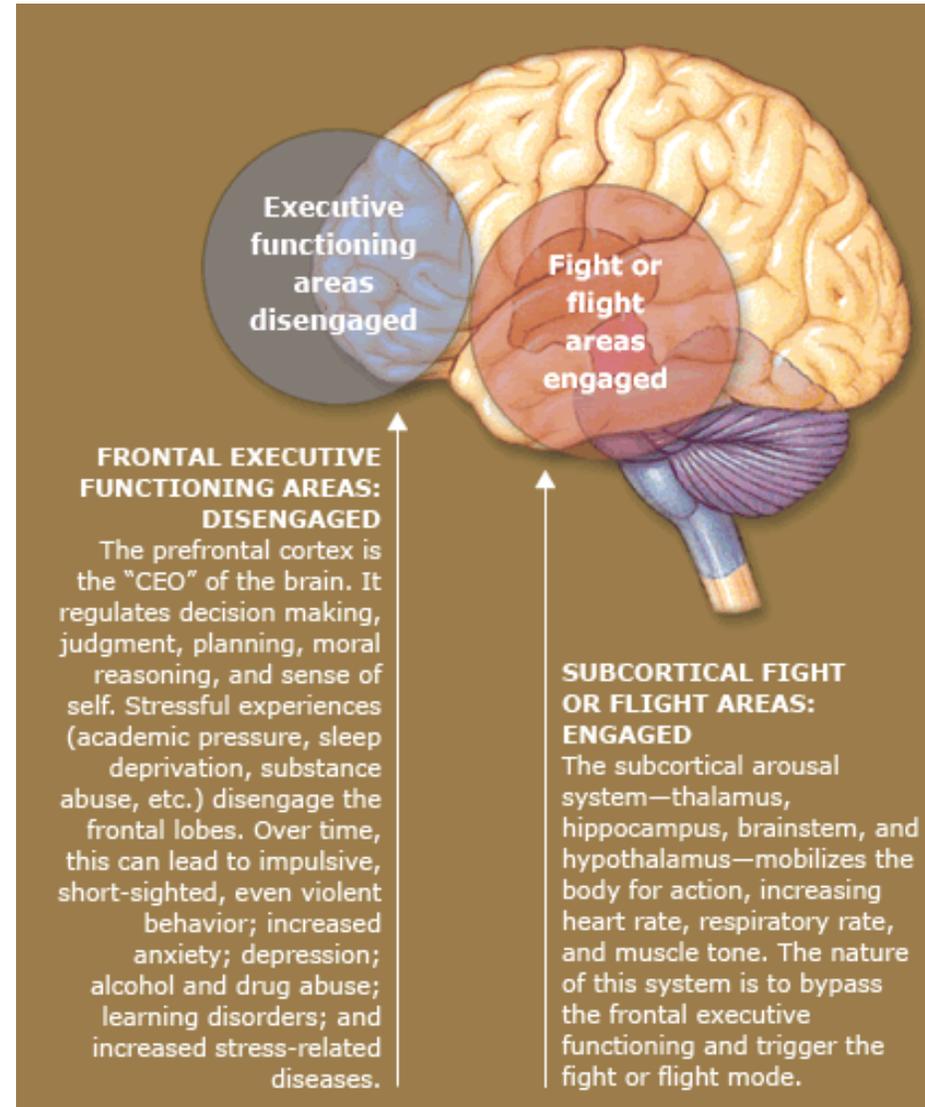
- Developing system is chronically pressed into action
  - Too much cortisol suppresses immunity, increasing risk of infection
  - Inflammatory response persists after it is no longer needed



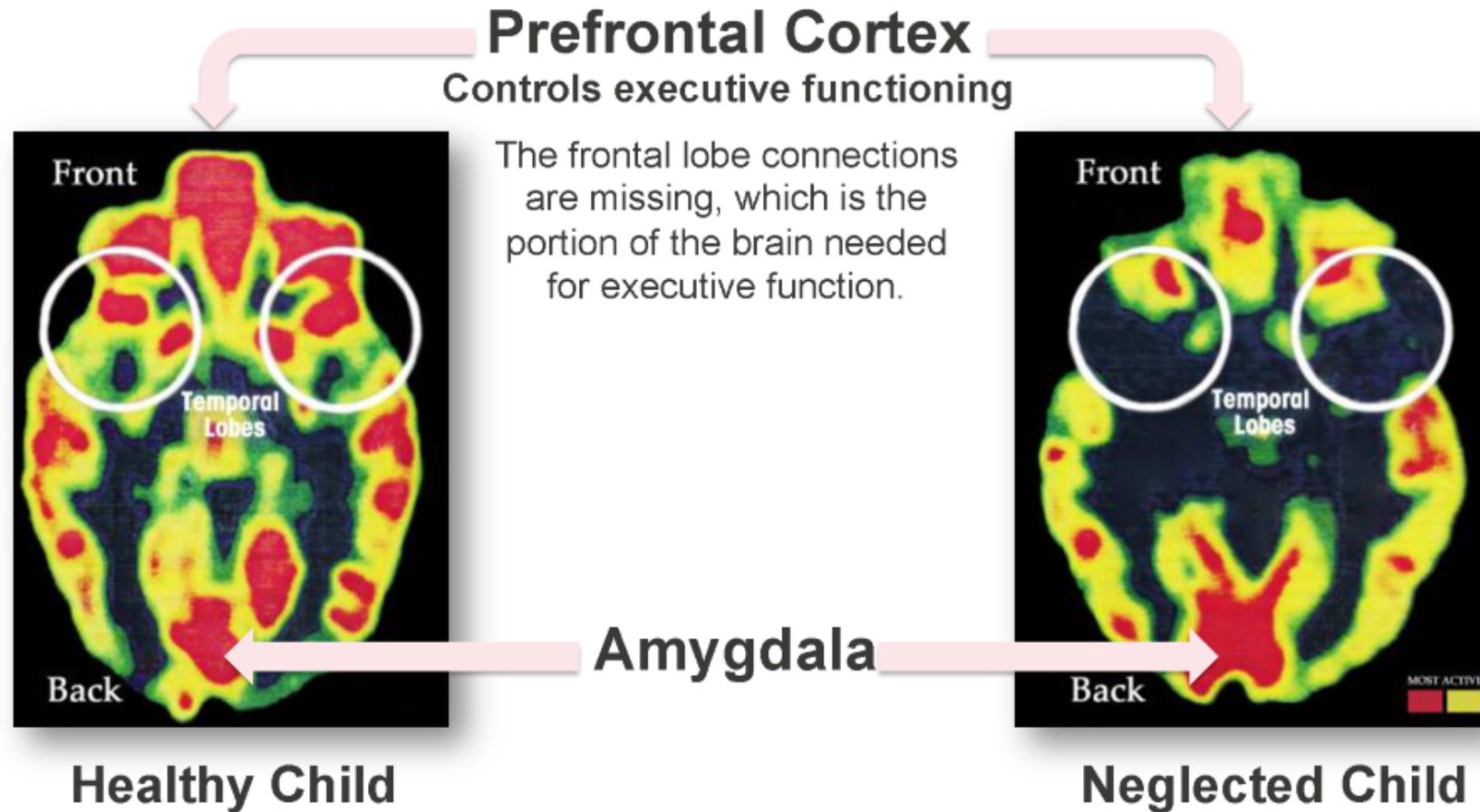
**BRAIN IS NOT SUPPOSED TO BATHE IN CORTISOL**

# Impact on the Brain

- If there is danger, the “thinking” brain shuts down, allowing the “doing” brain to act
- Traumatized children experience changes in brain structures, neuro-chemistry & genetic expression
- Thinking brain is less developed; “doing” brain is overdeveloped

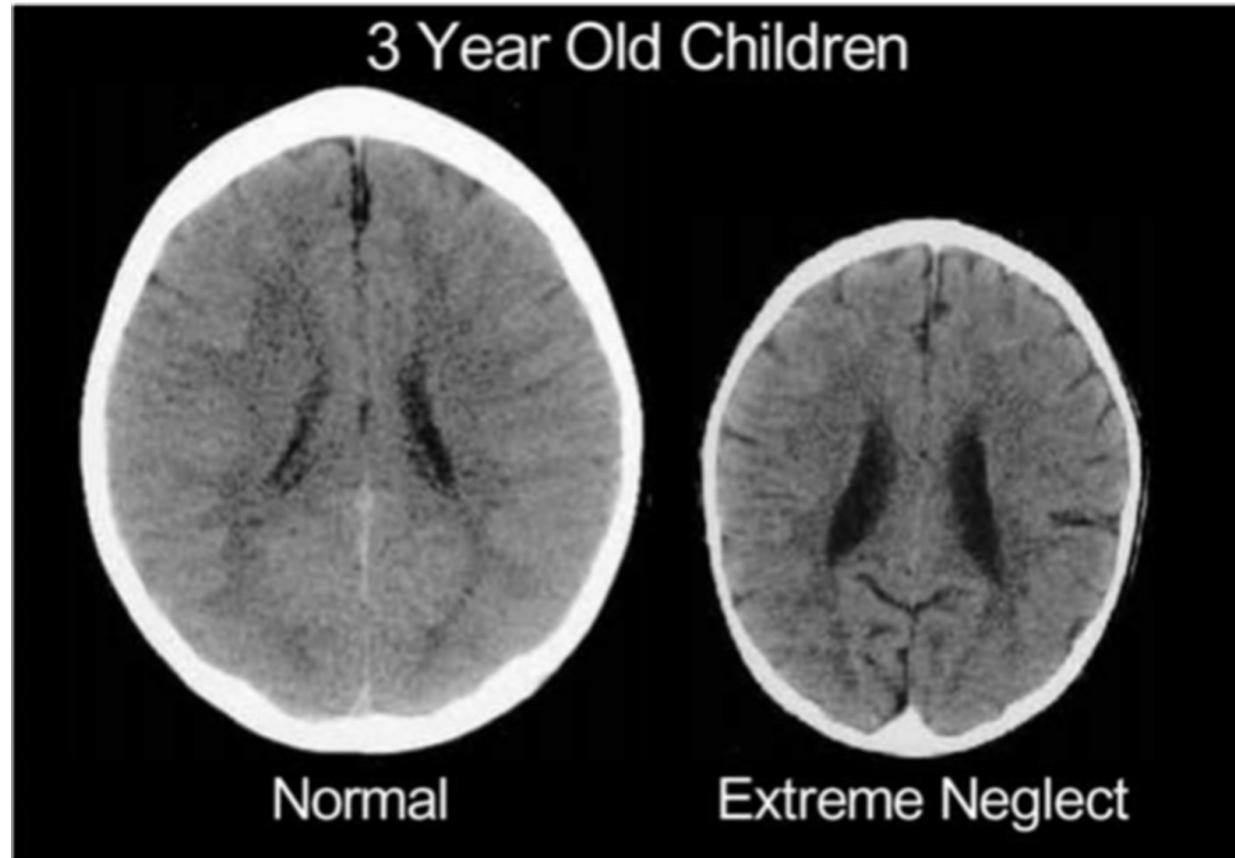


# Trauma & Toxic Stress Interfere with Brain Development



Source: Courtesy of Dr. H.T. Chugani, Children's Hospital of Michigan, Wayne State University

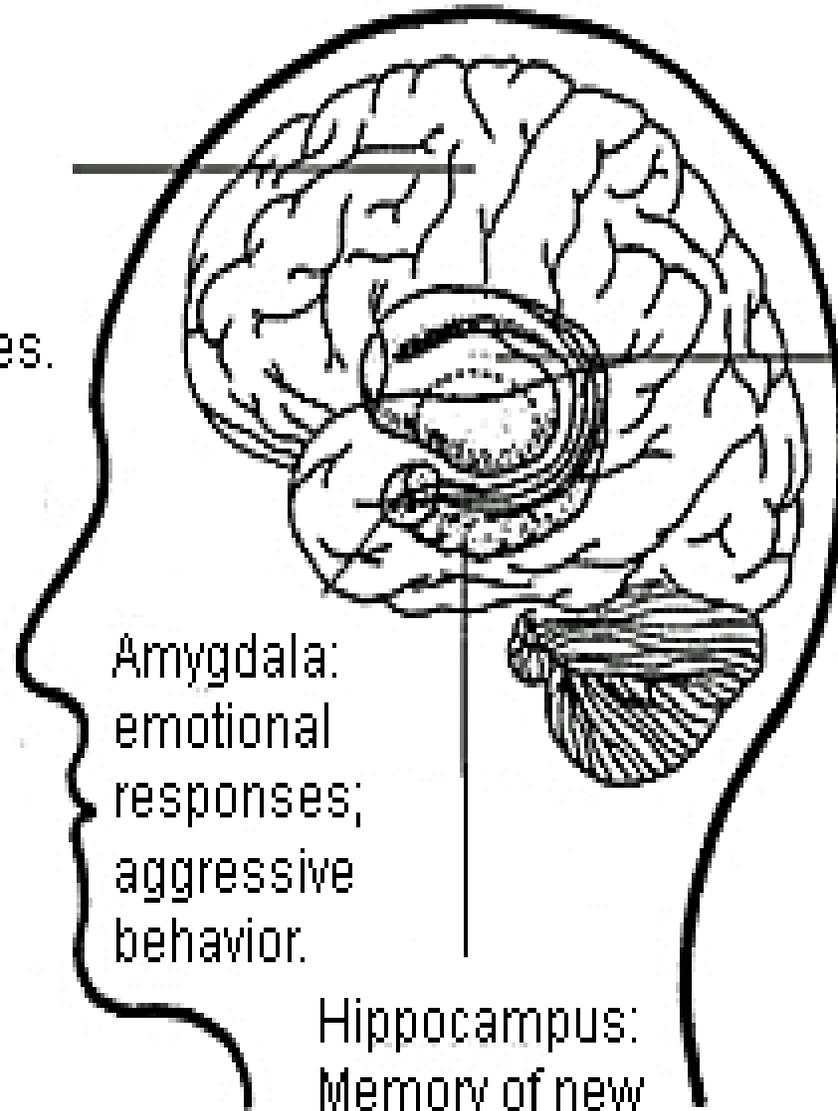
# NEGLECT=WORST FOR DEVELOPING BRAIN



# Trauma and the Developing Brain

- Trauma is a “neuro-developmental insult” and impacts the development of the brain.
- When triggered into a trauma response over and over there are major multi-systemic impacts on the developing brain
- Brain architecture is “experience dependent” (*neuroplasticity*)

Neocortex: higher mental functions, general movement, perception, and behavioral responses.



Corpus Striatum (formerly basal ganglia): connection between cerebral cortex and cerebellum; helps regulate automatic movement.

Amygdala: emotional responses; aggressive behavior.

Hippocampus: Memory of new information and recent events.

# Brains Harmed by Trauma

- Traumatized children have brains that are different: cortisol bath is bad—
  - **Amygdala develops too well:**
    - Alarm turned on – not able to take input from other areas to quiet alarm, stops working the way it needs to. It's bigger--too active
  - **Hippocampus doesn't develop well**
    - Difficulty with learning and memory
    - School problems “Swiss cheese kids”
  - **Frontal cortex doesn't develop well**
    - Shut down of executive function – impulse control, working memory and cognitive flexibility
  - **Smaller corpus callosum**—small, fast, inaccurate info transfer
- Some of the most important consequences of developmental adversity are the result of abnormal development and functioning of the brain's stress response systems

## 2. WHAT IS THE DIFFERENCE BETWEEN SINGLE EVENT TRAUMA AND GROWING UP WITH NEAR-CONSTANT STRESS

### **ACUTE TRAUMA** (SOMETIMES CAUSING PTSD)

-A SINGLE TIME-LIMITED EVENT: CAR ACCIDENT, RAPE, FIRE...

### **CHRONIC TRAUMA** (CAN BE ATTRIBUTED PARTLY TO THE CASCADING EFFECTS OF POVERTY. KIDS AREN'T GRANTED SAFETY ANYWHERE)--

-MULTIPLE TRAUMATIC EXPOSURES AND/OR EVENTS OVER EXTENDED PERIODS OF TIME

### **DEVELOPMENTAL TRAUMA** (ALSO CALLED COMPLEX TRAUMA) EXPERIENCES OF MULTIPLE TRAUMATIC EVENTS (ACES), AND THE IMPACT OF EXPOSURE TO THESE EVENTS **WITHIN THE CAREGIVING SYSTEM**

**TOXIC STRESS IS THE CHILD'S EFFORT TO COPE WITH DANGER AND OVERWHELM ON HIS OWN** ADVERSE EXPERIENCES THAT LEAD TO STRONG, FREQUENT, OR PROLONGED ACTIVATION OF THE BODY'S STRESS RESPONSE SYSTEM—CAN INCLUDE BOTH CHRONIC TRAUMA AND DEVELOPMENTAL TRAUMA

**ACES NOW INCLUDE EVENTS THAT DESCRIBE EXPOSURE TO BOTH CHRONIC AND DEVELOPMENTAL TRAUMA**

# Many Other Types of Trauma Beyond ACEs

- New Research is Examining:

- Bullying
- Homelessness
- Growing Up in Care
- Extreme Illness
- Severe Injury
- Historical Trauma
- Community Violence

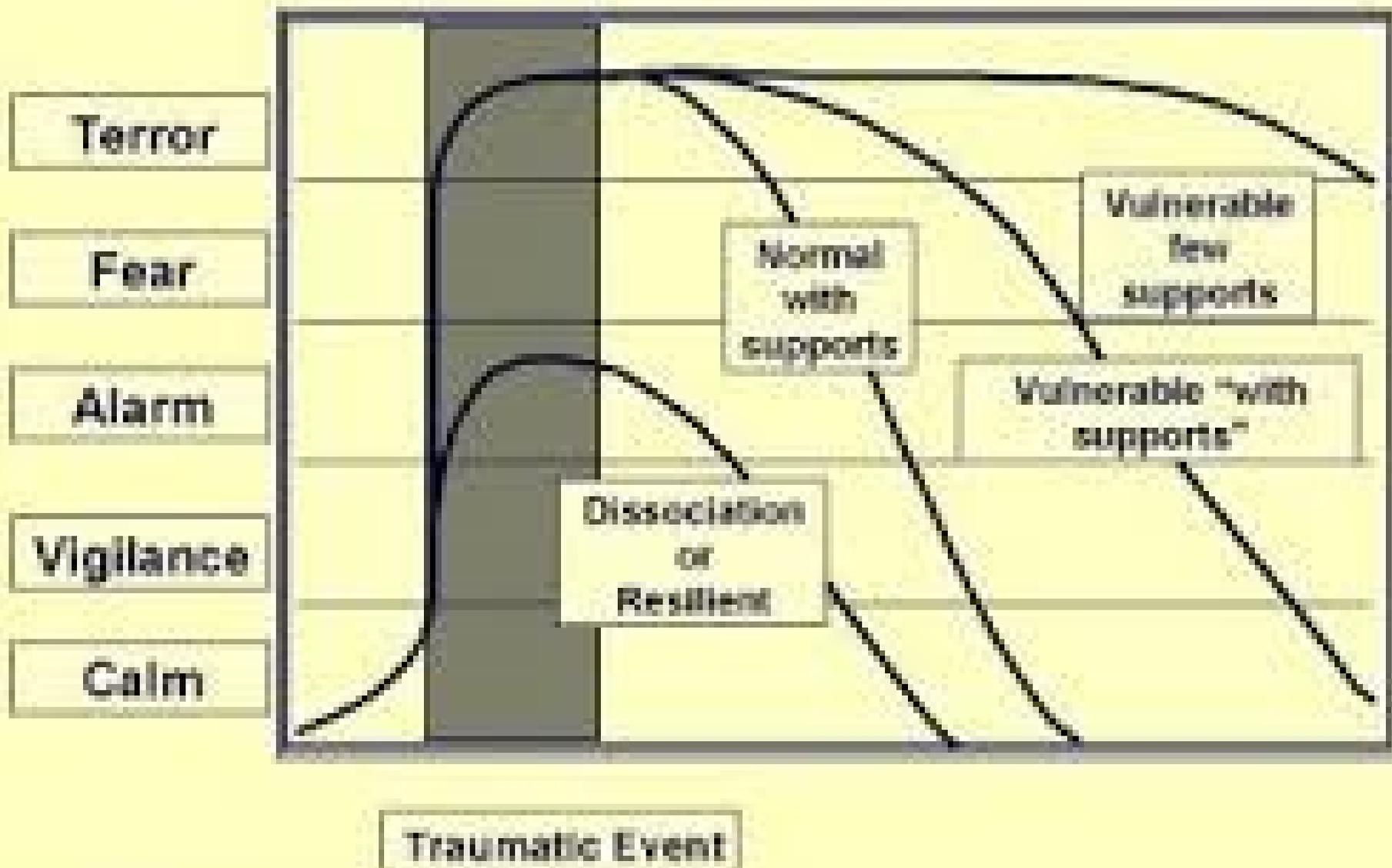


- Toxic stress in all forms: no one there to protect and support

# Types of Trauma

- **Acute Trauma** “is an emotional response to a terrible event like an accident, rape or natural disaster. Immediately after the event, shock and denial are typical”
- PTSD may develop
- If the child has sufficient support, symptoms abate

# ACUTE RESPONSE TO TRAUMA



# DEVELOPMENTAL TRAUMA/ACES

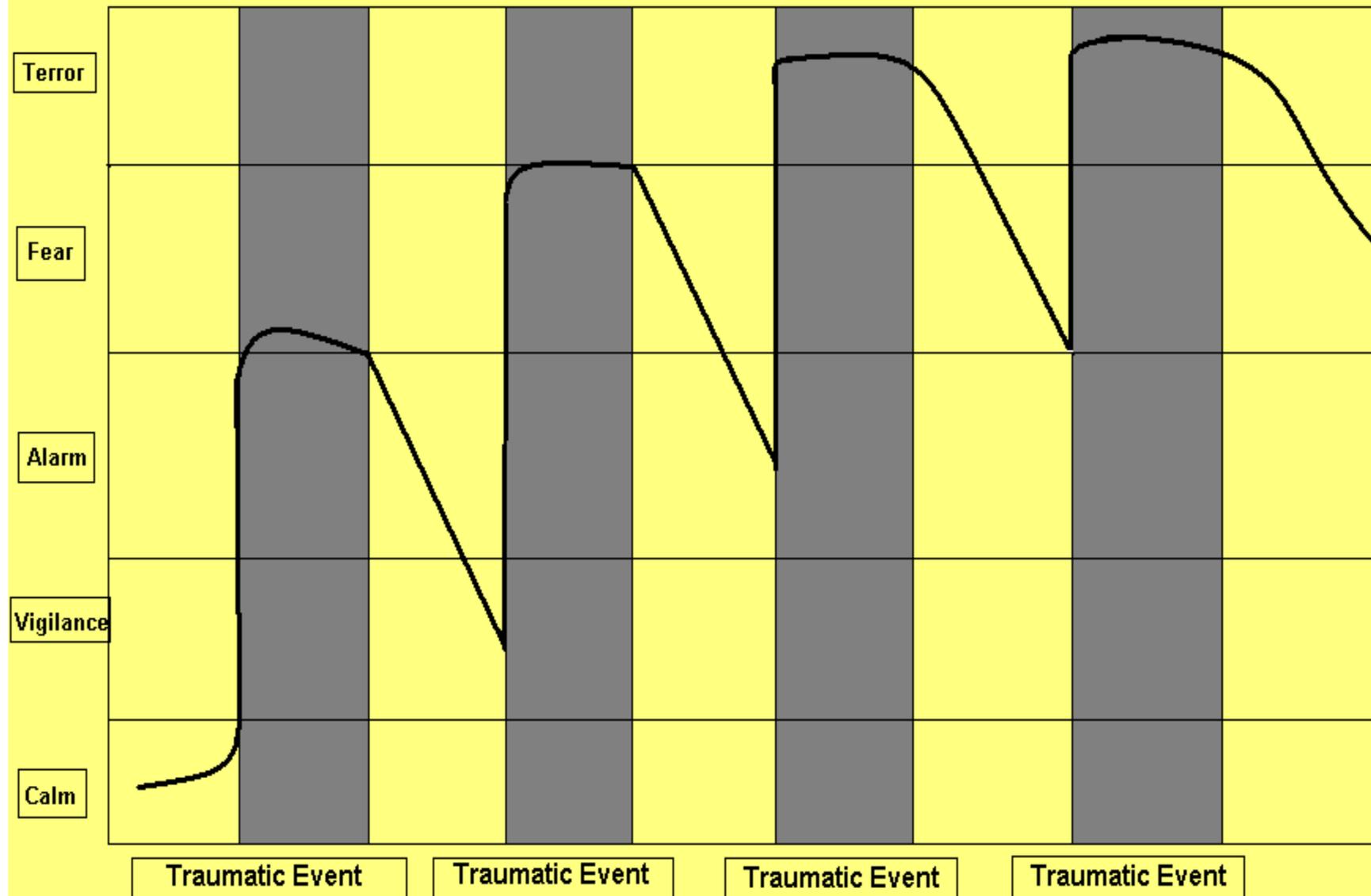
- A psychological and neurobiological injury that results from protracted and cascading exposure to **STRESSFUL** events in the home
- Derails typical development across all domains (neurological, psychological, cognitive, social, self/identity)
- Experiences often occur in the caregiving system. **THE CAREGIVER IS UNSAFE/UNRELIABLE**
- Impact is immediate and long term
- Effects will require all tiers of intervention

- **Complex/Chronic Trauma + childhood=**

- Exposure to multiple traumatic events, that are
  - Relational
  - Chronic
  - Long-term

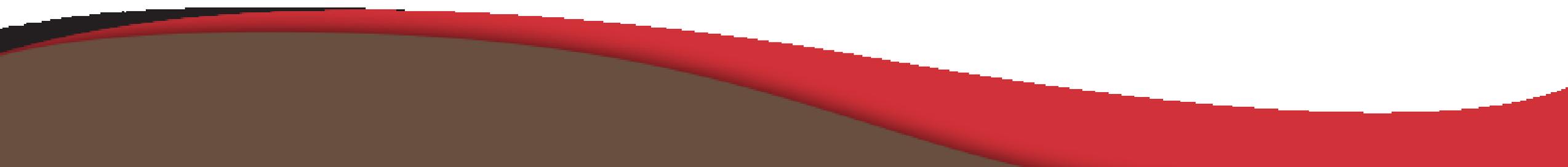
These events begin early in life and can impact the very formation of self, interfere with the child having a primary source of safety and stability created through secure attachment.

# RESPONSE TO MULTIPLE TRAUMAS



- “Traumatic events are extraordinary, not because they occur rarely, but rather because they overwhelm the ordinary human adaptations to life.” — **Judith Herman**, *Trauma and Recovery*
- “*Young children cannot manage most dangers*”-  
*Patricia Crittendon, PhD*

# The Stress Response and Trauma

- Overwhelms a person's usual ability to cope.
  - All who experience trauma have varied responses.
  - Most recover.
  - Some develop more severe difficulties.
  - The difference between a child's ability to recover and to be debilitated by toxic stress: Nurturing adults
- 

# Trauma Responses: Adaptive and Protective When in Threatening Situation

- Same bodily functions and behaviors may be maladaptive when children are removed from the stressor
- When not examined within the context of past traumas can be misinterpreted as pathologic instead of brilliant
- The child who is trying to survive may seem to have a limited set of skills that have enabled her to do so—but they have worked! Tantrums, dissociation, clingy demanding, helpless passivity—all survival strategies to manage the body's response to "the tiger"

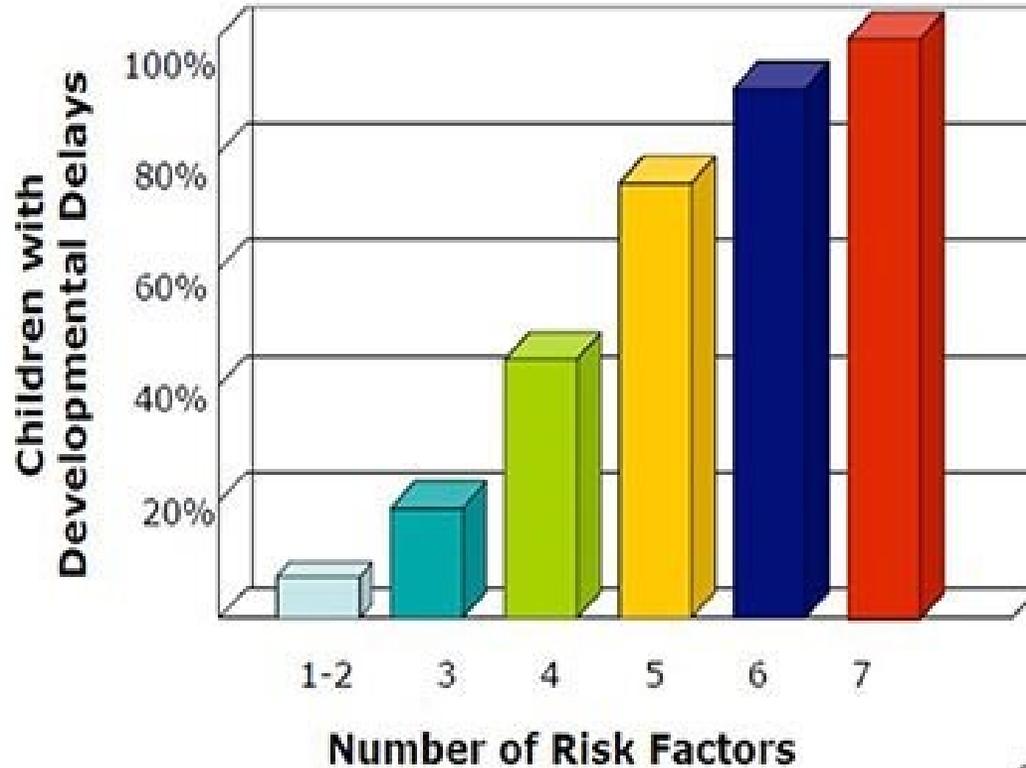
### **3. WHAT IS THE LONG-TERM IMPACT ON HEALTH AND LEARNING ON THESE CHILDREN?**

Toxic stress can disrupt the development of neural circuits in the brain in early childhood.

High levels of stress hormones can suppress the body's immune system and impact physical health.

Sustained high levels of cortisol can damage the hippocampus, an area of the brain responsible for memory and learning.

## Significant Adversity Impairs Development in the First Three Years



Source: Barth et al. (2008)

Children exposed to **5+** significant adversities in first 3 years face a **76%** likelihood of having **one or more delays** in development.

## Toxic stress from exposure to violence can impair healthy development

One study revealed that exposure to relationship-based violence and trauma in the first two years of life resulted in lower IQ scores at 5 and 8 years of age.

Enlow MB, Egland B, Blood EA, Wright RO, & Wright RJ (April 4, 2012)  
Interpersonal trauma exposure and cognitive development in children  
to age 8 years: a longitudinal study.  
[Journal of Epidemiology and Community Health Online First.](#)

# What else does this look like? Dysregulation:

**Physically:** *stomach problems, fast heart rates, difficulty sleeping.*

**Socially:** *relationships can be characterized by boundary problems or distrust. They can have difficulty empathizing with others.*

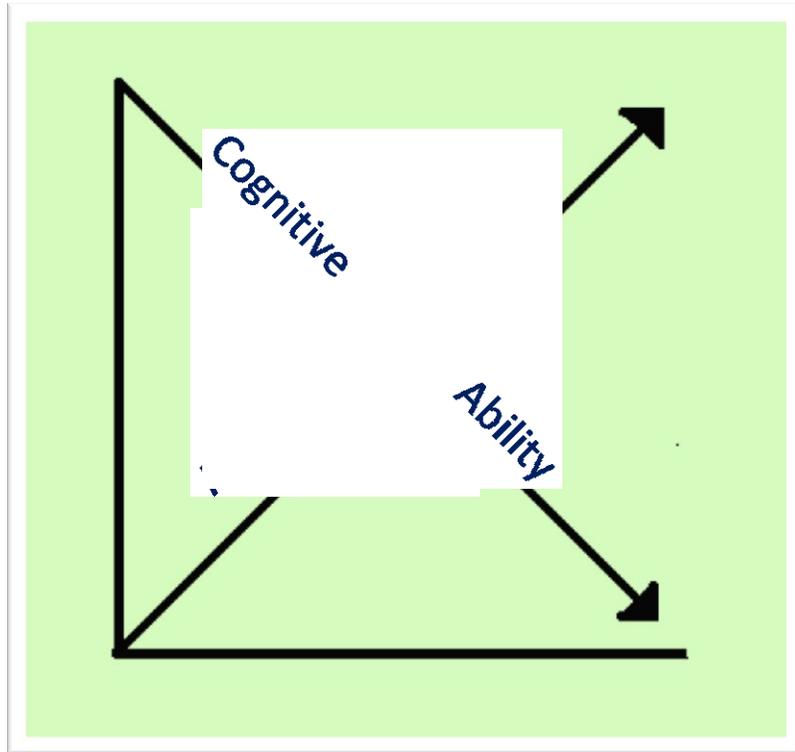
**Intellectually:** *trouble focusing, completing tasks, understanding their part in what happens to them, learning difficulties.*

**Emotionally:** *difficulty regulating mood, knowing their feelings, low self esteem, not a clear sense of self.*

**Behaviorally:** *poor impulse control, aggression, or passive and fearful, have a heightened awareness of potential dangers.*

*“Ready, Fire, Aim.”*

# AROUSAL AND COGNITION



As arousal increases cognitive ability decreases. Hyper-aroused children may be defiant, resistant and/or aggressive.

They are stuck in survival mode and may freeze, fight, or flee.

**A child in a hyper-aroused state can not be reasoned with,** she needs you to help her reduce her arousal level.

# The Amygdala Hijack

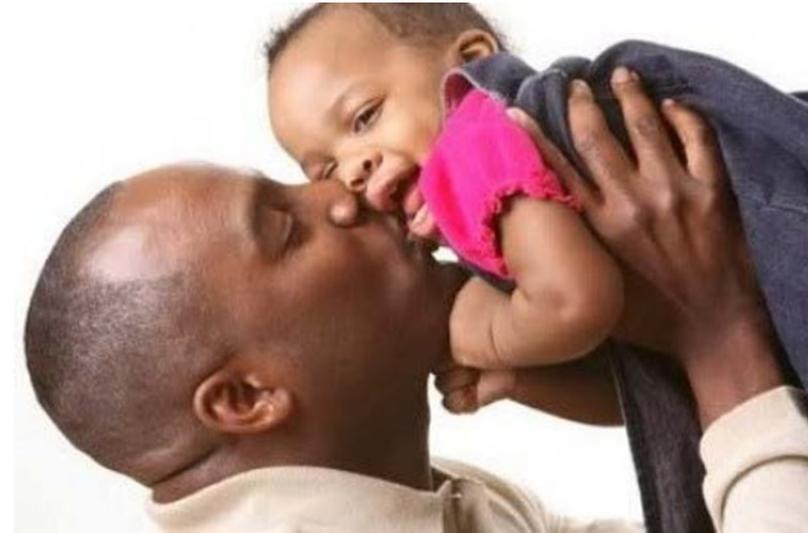
**It interprets messages that there's danger or it's safe. It knows nothing about reasoning or cognitive functions. *And it remembers what you're afraid of in your body...***

**Amygdala scans the visual field. Searches for possible threats; a sudden movement, a looming shadow. It monitors every sound, smell, possibility of danger.**

**The amygdala “hijacks” the other portions of the brain.. It gets you ready to fight or flight.**

# Bottom Line

**Stable nurturing relationships foster the development of healthy circuitry.**



**Unstable, traumatic, abusive or neglectful relationships disrupt the circuitry of the brain's architecture as its being built.**

**Children living with high ACEs and the associated toxic stress are wired for survival, not learning in school.**



## 4. HOW DO THESE CHILDREN SHOW UP IN THE CLASSROOM, AND WHAT IS THE ROLE OF SCHOOLS TO HELP?

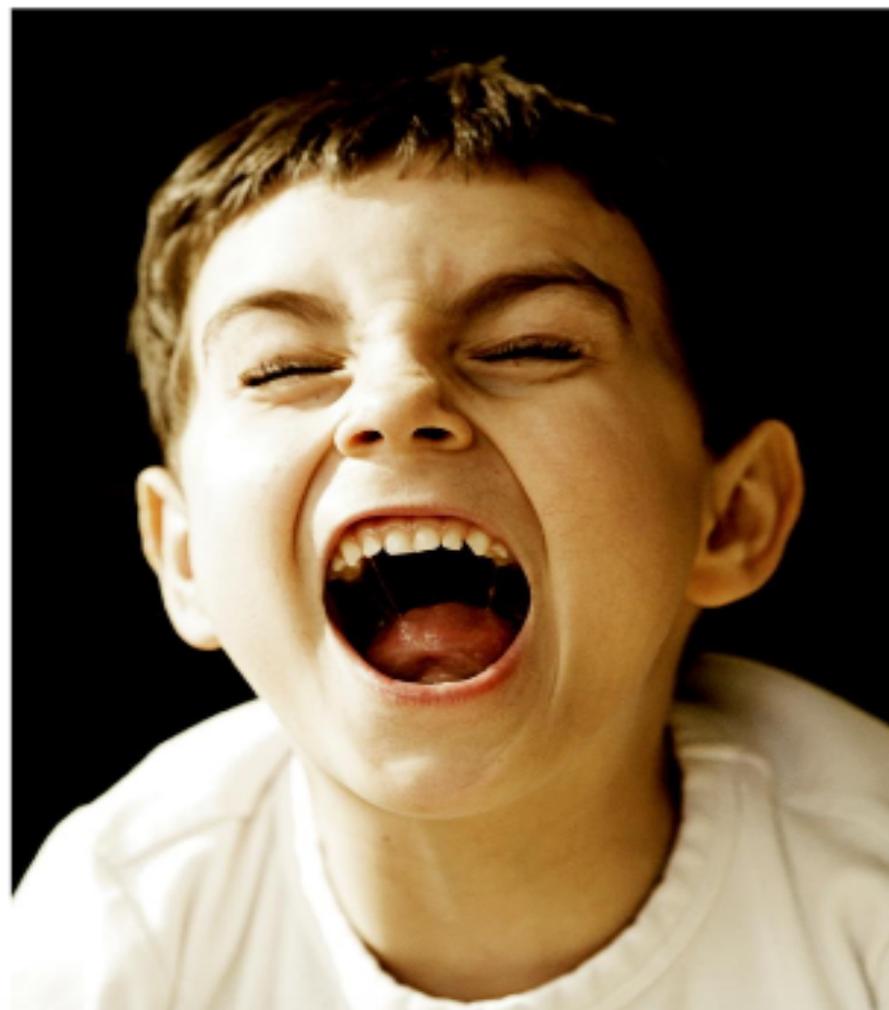
### Toxic Stress Interferes with Ability to Learn

- Exaggerated and prolonged response to stressors
- Affects ability to regulate emotions and behavior



**“Youth struggling with self-regulation may not communicate needs in clear, direct manner → look past behavior to find hidden need”**

# What ACEs Can Look Like in the Classroom



- Children with 3 or more ACEs are nearly 4 times (OR=3.66) more likely to have developmental delays (Marie-Mitchell et al, 2013)
- Children with 4 or more ACEs are 32 times more likely to have behavioral problems in school (Burke et al, 2011)

# ACEs in the Classroom

- Greatest single predictor for health, attendance and behavior problems
- Second strongest predictor, (after special education status) for academic failure
- Overlap with special education status



# ACEs are Implicated in the Pipeline from School to Prison



Childhood and Adult Trauma Experiences of Incarcerated Pers

ed Care for Children Makes Sense.

# Trauma in the Classroom

- Classrooms are Designed for Regulated Kids
- 1/3 of Kids have Trauma
- Can't Teach Kids in Dysregulation
- Kids Can't Reflect on Their Behaviors Until They are Regulated
- “Universal Precautions”



# ACEs in Foster Care

- **More than half** of kids reported for child abuse experienced **4 or more** ACEs by time of contact with child welfare
- **More than 90%** referred to child welfare have experienced **multiple ACEs**

(Nat'l Survey Child and Adolescent Well-Being (NSCAW), No. 20: Adverse Child Experiences in NSCAW, 2013)





- Children who have experienced **4 or more ACEs** are **three times as likely to take ADHD medication** when compared with children with fewer than four ACEs

(Ruiz "[How Childhood Trauma Could Be Mistaken for ADHD](#)", *The Atlantic*, 7 July 2014)

# SCHOOLS CAN HELP BY BECOMING TRAUMA-INFORMED

- TRAUMA SENSITIVE SCHOOLS “RISING TIDE FLOATS ALL BOATS”
- TRAUMA SENSITIVITY DURING IEP PROCESS
  - TRAUMA SENSITIVE PSYCH EVALS: Developmental trauma has a significant impact on learning and regulation—recommendations need to extend beyond narrow band
  - TRAUMA SENSITIVE SPEECH AND LANGUAGE EVALS: Many children with complex childhood trauma are challenged by receptive and expressive language delays, age-appropriate perspective taking, and social cueing.
  - FUNCTIONAL BEHAVIORAL ANALYSIS: Traumatized children are easily triggered by fear and their behavior has to be understood in terms of environmental triggers due to trauma (transitions, changes in routine, authority)
  - OCCUPATIONAL THERAPY EVALS: Recs might include changes to the environment so the child feels calmer and safer—beyond fine motor skills, etc.
- COLLABORATION WITH FAMILIES: The intergenerational nature of developmental trauma means schools that have a high level of outreach, communication, support and engagement will do better with these students.

# Building trauma *sensitivity* in schools

- 1) Teach about Trauma: didactic and experiential curriculum to teach administrators, teachers and students about the fundamentals of stress, traumatic stress, and how these impact the body and brain (with a focus on learning);
- 2) Train Teachers and MH Personnel in Trauma ID: individuals (students, staff and teachers) who, by virtue of history of exposure to violence, adversity, trauma are at heightened risk and by current functioning (e.g., impulsivity, learning problems, aggression) appear to have possible trauma-related signs and symptoms;
- 3) Develop Social-Emotional Learning Curricula (SEL): trauma prevention program/self-care for the teachers and staff and a resilience-promoting program for the students;
- 4) Timely Referral to Treatment: a process to ensure that individuals (both staff and students) at risk or currently symptomatic get appropriate referral to high-quality services with 'trauma-aware' and developmentally-informed practices and programs

# Federal Class Action Lawsuit in Los Angeles 2015



- Peter P. vs. Compton Unified School District
- Alleges District failed to recognize and address trauma-induced disabilities
- Argues that Developmental Trauma is a barrier to learning
- Therefore traumatized students, punished and excluded from appropriate learning opportunities, are being denied legal right to equal education under the law

# **THINK ABOUT THE KIDS YOU LOVE...**

**IN THE EARLIEST YEARS, BABIES AND YOUNG CHILDREN (MAYBE LIKE YOURS—WITH LOW ACES) DEVELOP THESE LIFELONG NON-COGNITIVE SKILLS THAT MEAN EVERYTHING FOR ACADEMIC SUCCESS**

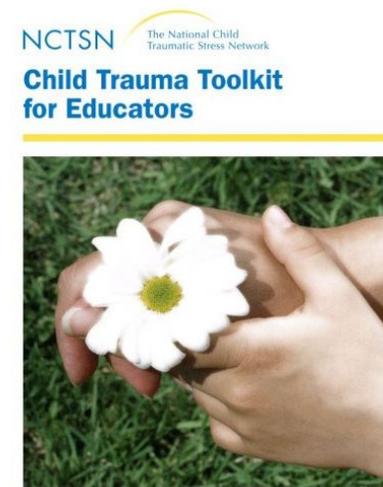
- **Self-regulation**
- **Self-control**
- **Motivation**
- **Far-sightedness**
- **Conscientiousness**
- **Adventurousness and Curiosity**
- **Perseverance**
- **Tenacity**

**...CHILDREN GROWING UP WITH CHRONIC STRESS ARE IN SURVIVAL MODE AND MAY NOT BE ABLE TO ORGANIZE AND REGULATE THEIR BRAINS TO DO THESE WONDERFUL THINGS**

# Compassionate Schools Movement

<http://traumasensitiveschools.org/why-trauma-sensitive-school/>

- School-wide Policies & Practices
- Classroom Strategies
- Links to Mental Health Services
- Family Partnerships
- Community Links



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# Some Resources on Trauma Sensitive Schools

- <http://learn.nctsn.org/>
- <https://traumasensitiveschools.org/get-involved/creating-trauma-sensitive-schools/>
- <https://traumasensitiveschools.org/>
- <https://safesupportivelearning.ed.gov/trauma-sensitive-schools-training-package>