Adverse Childhood Experiences and Trauma-Informed Care in Orthopedic Practice

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Disclosure Statement

- I do not have any relevant financial relationships with any commercial interests.

Outline

- Review the original Adverse Childhood Experiences (ACEs) Study
- Discuss the physiology of toxic stress and clinical manifestations of trauma
- Explore how ACEs may impact orthopedic care
- Equip providers with a framework of trauma-informed care

American Academy of Pediatrics: Pediatric Approach to Trauma, Treatment, and Resilience

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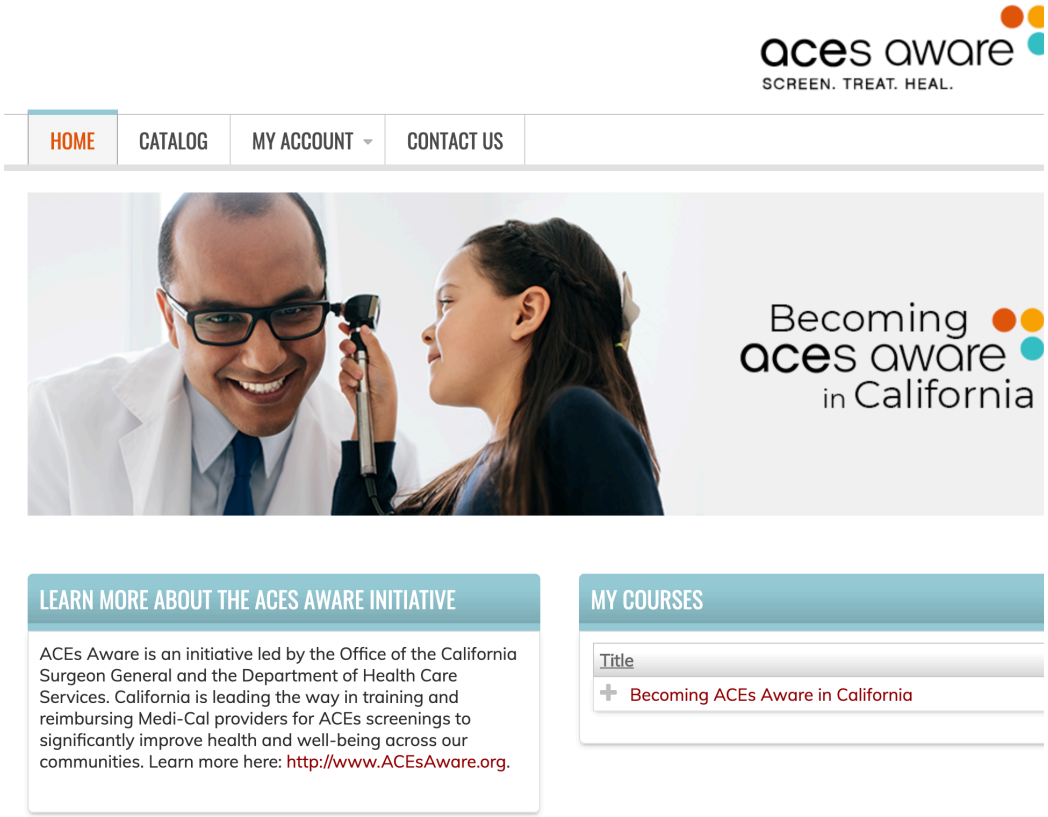


What are Adverse Childhood Experiences?

- **Adverse Childhood Experiences, or ACEs,** are often discussed in the context of the landmark 1998 study by the Centers for Disease Control and Prevention and Kaiser Permanente.[1]
- Stressful or traumatic experiences people have by 18 years of age
- Identified as 10 categories of adversities across 3 domains
- Linked to chronic health problems, mental illnesses, and substance abuse in adulthood

[1]Felitti VJ, Anda RF, Nordenberg D, Williamson DF, Spitz AM, Edwards V, Koss MP, Marks JS. Relationship of childhood abuse and household dysfunction to many of the leading causes of death in adults: the adverse childhood experiences (ACE) study. Am J Prev Med. 1998;14:245–258.

10 Categories of Adverse Childhood Experiences

ABUSE

Physical, emotional, or sexual

Physical

Emotional

Sexual

NEGLECT

Physical or emotional

Physical

Emotional

HOUSEHOLD CHALLENGES

Growing up in a household with incarceration, mental illness, substance dependence, absence due to separation or divorce, or intimate partner violence

Mental Illness

Intimate Partner Violence

Parental Separation or Divorce

Incarceration

Substance Dependence

aces aware
SCREEN. TREAT. HEAL.

From Dr. Anda[1], Co-Principal Investigator to the ACE Study

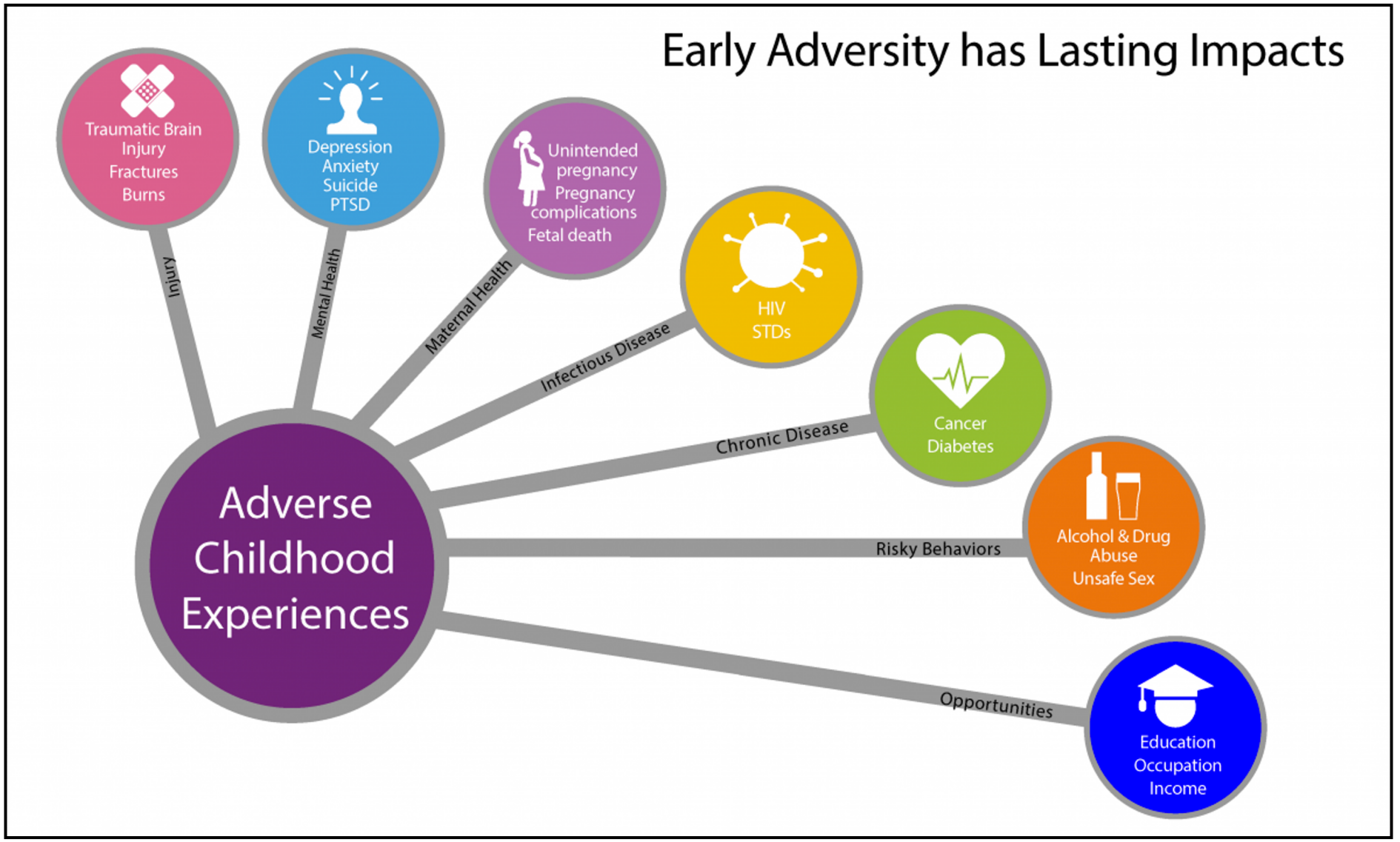
- ACEs are common.
- ACEs tend to occur in clusters, rather than single experiences.
- The cumulative impact of multiple exposures can be captured in an "ACE Score".
- The ACE Score likely captures the cumulative (neuro)developmental consequences of traumatic stress.
- The ACE Score has a strong, graded relationship to numerous health, social, and behavioral problems throughout a person's lifespan.

[1]Anda R. The Health and Social Impact of Growing Up With Adverse Childhood Experiences The Human and Economic Costs of the Status Quo.

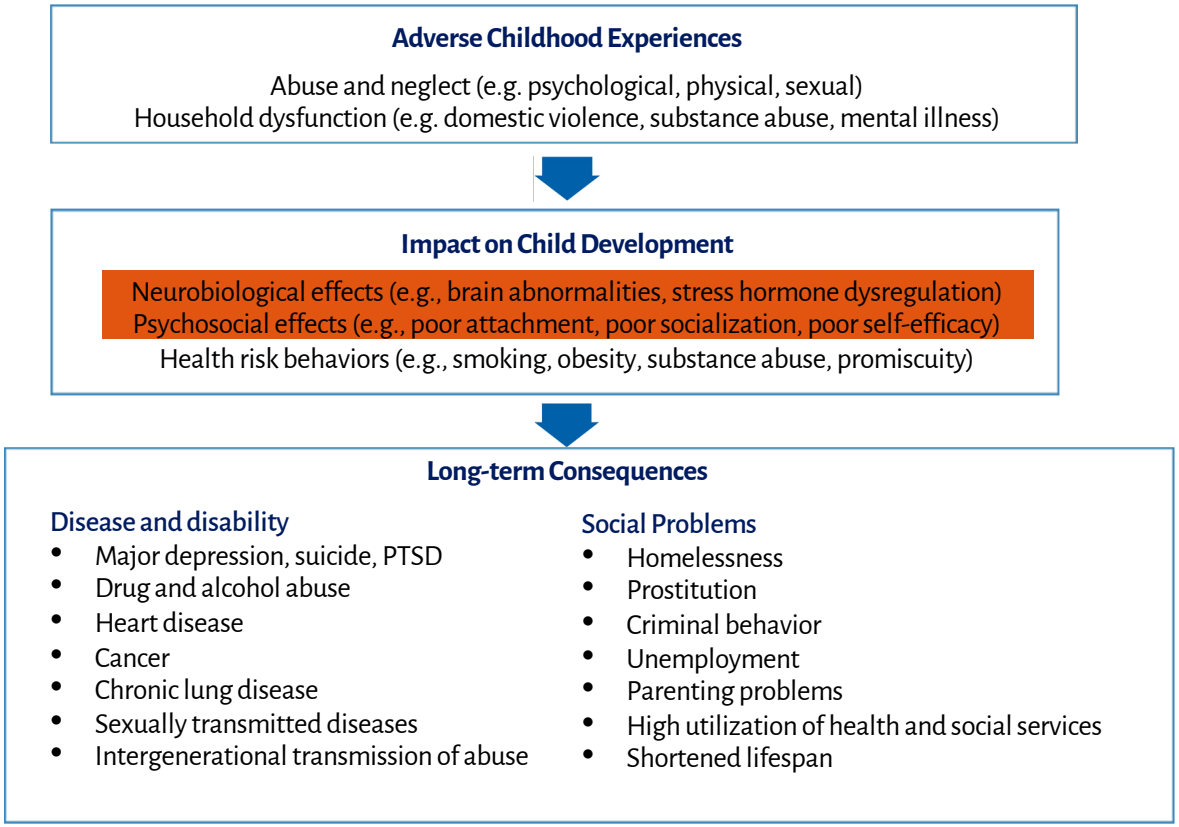
ACEs Dramatically Increase Risk for at Least 9 of the 10 Leading Causes of Death in the U.S.

	Leading Causes of Death in the U.S., 2017	Odds Ratios for ≥ 4 ACEs (relative to no ACEs)
1	**Heart disease**	2.1
2	**Cancer**	2.3
3	**Accidents** (unintentional injuries)	2.6
4	**Chronic lower respiratory disease**	3.1
5	**Stroke**	2.0
6	**Alzheimer's** or dementia	11.2
7	**Diabetes**	1.4
8	**Influenza and pneumonia**	Risk Unknown
9	**Kidney disease**	1.7
10	**Suicide** (attempts)	37.5

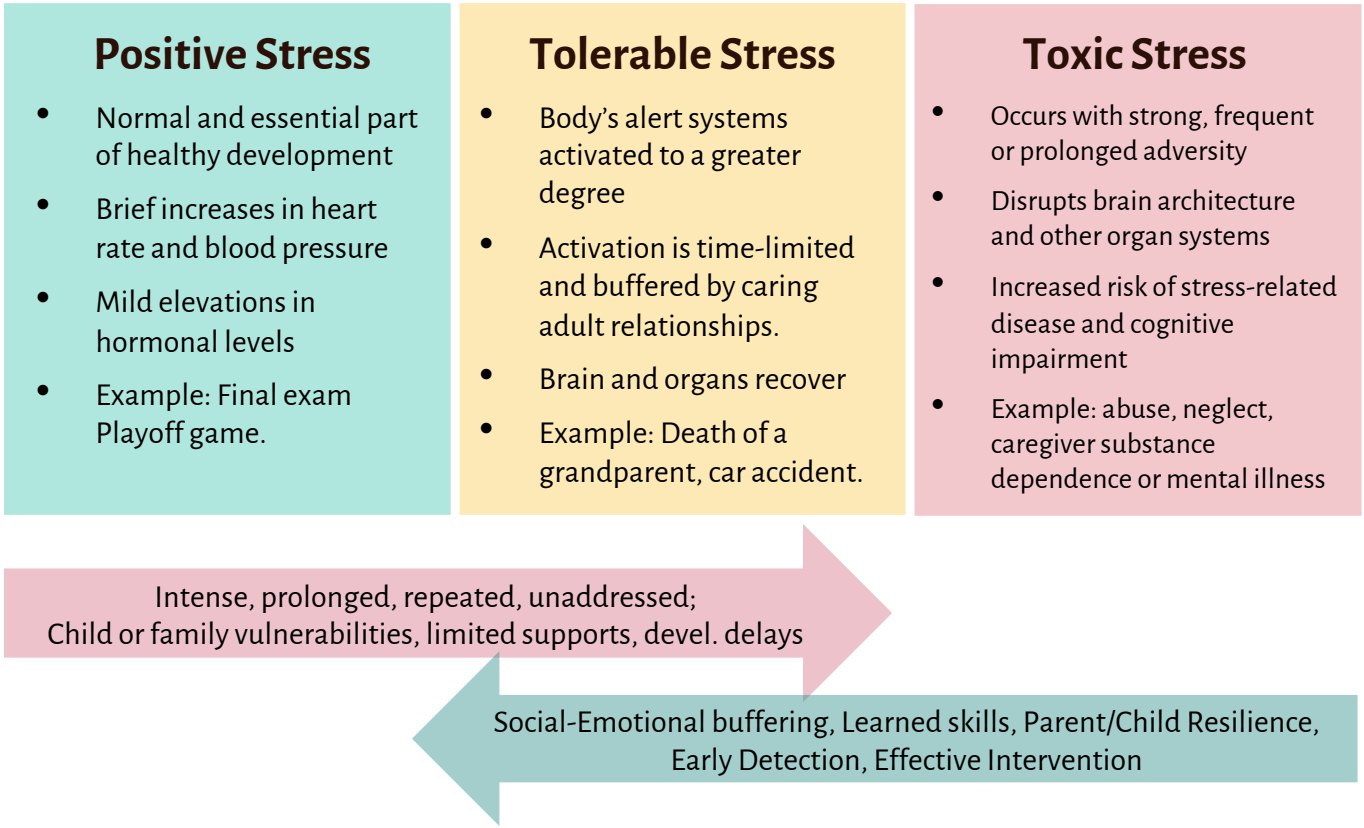
Association between ACEs and negative outcomes



How ACEs work



Center on the Developing Child at Harvard University. The foundations of lifelong health are built in early childhood
https://developingchild.harvard.edu/resources/the-foundations-of-lifelong-health-are-built-in-early-childhood/



Shonkoff JP. Building a new biodevelopmental framework to guide the future of early childhood policy. Child Dev. 2010;81(1):357–367
National Scientific Council on the Developing Child. Excessive Stress Disrupts the Architecture of the Developing Brain:
Center on the Developing Child at Harvard University. The foundations of lifelong health are built in early childhood

Definition of Toxic Stress

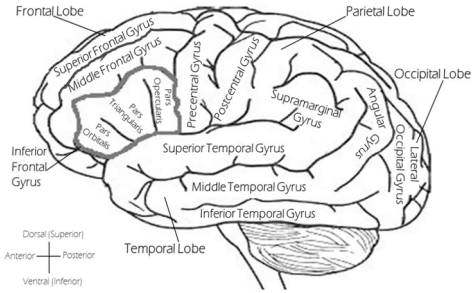
Brief increases in heart rate, mild elevations in stress hormone levels.

Serious, temporary stress responses, buffered by supportive relationships.

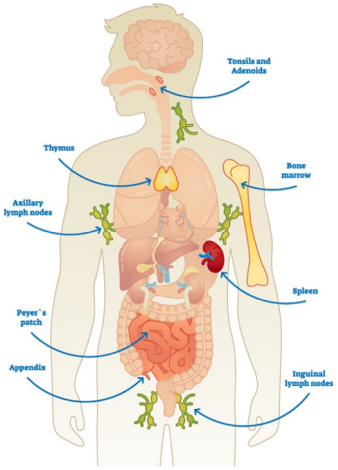
Prolonged activation of stress response systems in the absence of protective relationships.

Toxic stress triggers potentially permanent changes through 3 mechanisms:

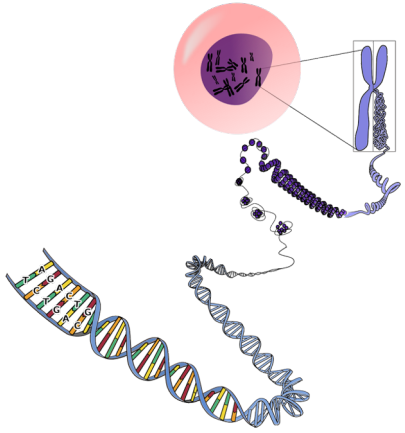
Neurobiology



Immunology



Epigenetics

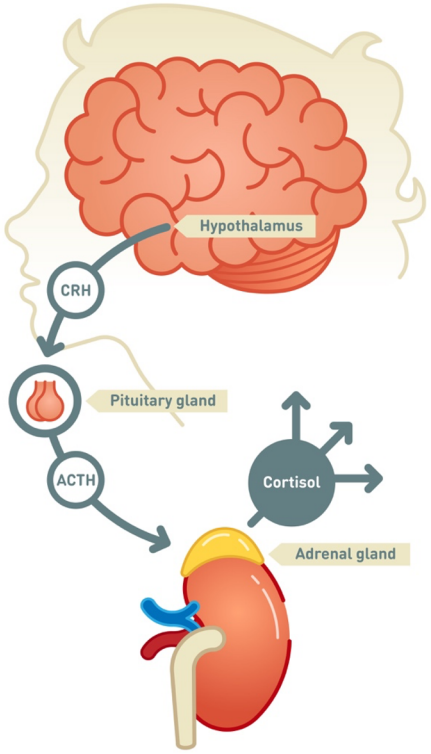


The Lifelong Effects of Early Childhood Adversity and Toxic Stress. Jack P. Shonkoff, Andrew S. Garner, THE COMMITTEE ON PSYCHOSOCIAL ASPECTS OF CHILD AND FAMILY HEALTH, COMMITTEE ON EARLY CHILDHOOD, ADOPTION, AND DEPENDENT CARE, AND SECTION ON DEVELOPMENTAL AND BEHAVIORAL PEDIATRICS, Benjamin S. Siegel, Mary I. Dobbins, Marian F. Earls, Andrew S. Garner, Laura McGuinn, John Pascoe and David L. Wood. Pediatrics January 2012, 129 (1) e232-e246; DOI: https://doi.org/10.1542/peds.2011-2663

Neurobiology of Trauma

Hypothalamic-Pituitary-Adrenal Axis (HPA)

- Activated by stress
- Releases cortisol
- Stimulates multiple areas of body and immune system



Source: Johnson SB, Riley AW, Granger DA, Riis J. The science of early life toxic stress for pediatric practice and advocacy. Pediatrics. Feb 2013;131(2):319-327.

Trauma

Stress and the tiger

- Bodies designed to respond to stress
- Adrenaline and cortisol help us run or hide from the tiger
- Duration of threat is short

Source: Johnson SB, Riley AW, Granger DA, Riis J. The science of early life toxic stress for pediatric practice and advocacy. *Pediatrics.* Feb 2013;131(2):319-327.


But...when the tiger lives in your home...or life...
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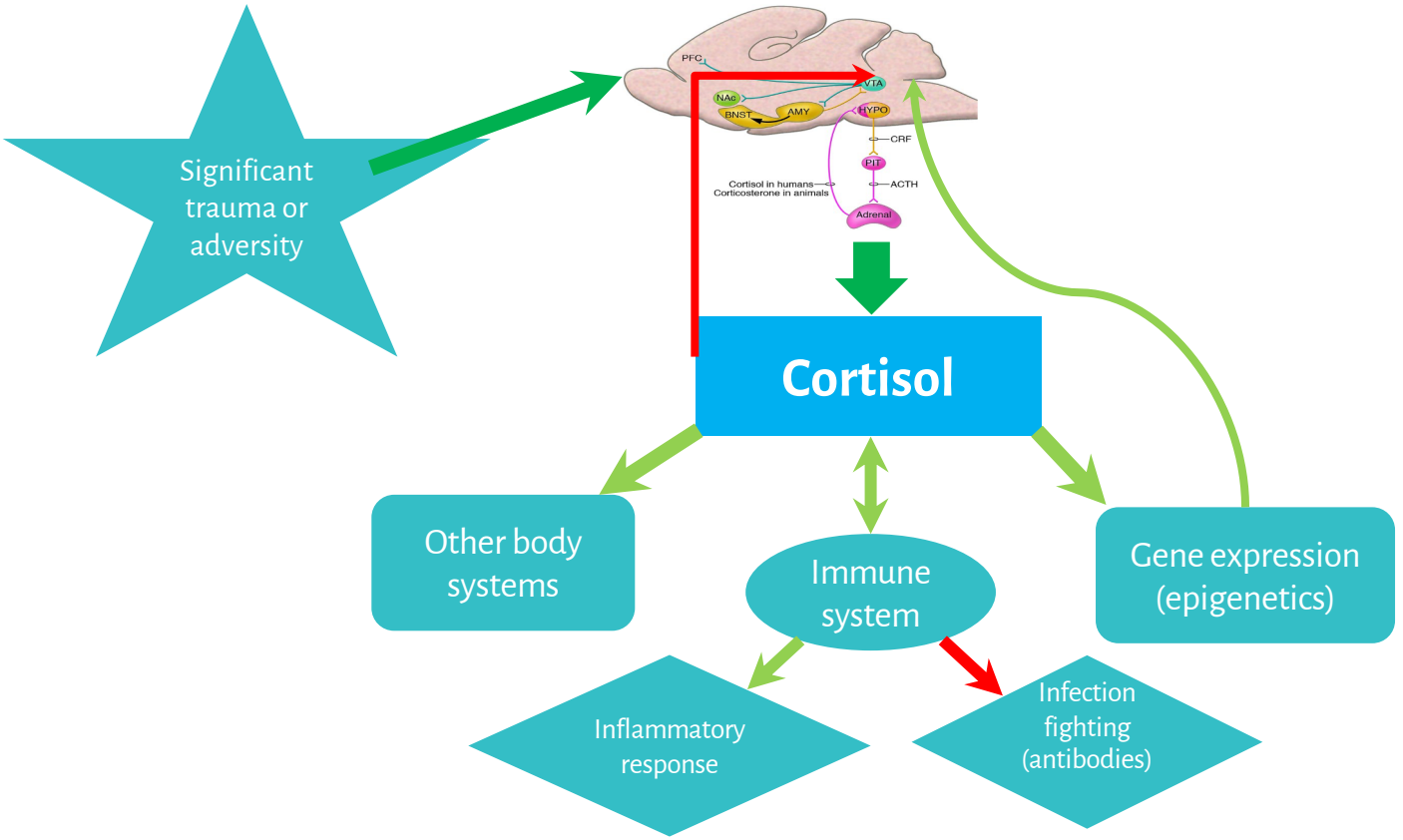
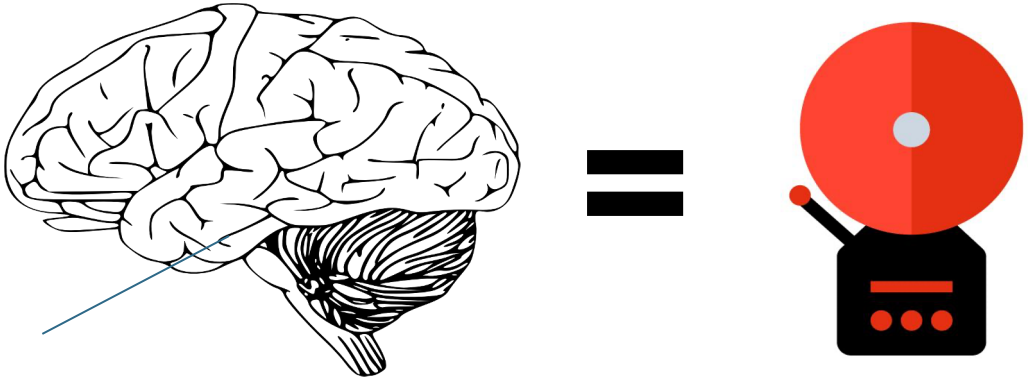


Source: Johnson SB, Riley AW, Granger DA, Riis J. The science of early life toxic stress for pediatric practice and advocacy. Pediatrics. Feb 2013;131(2):319-327.

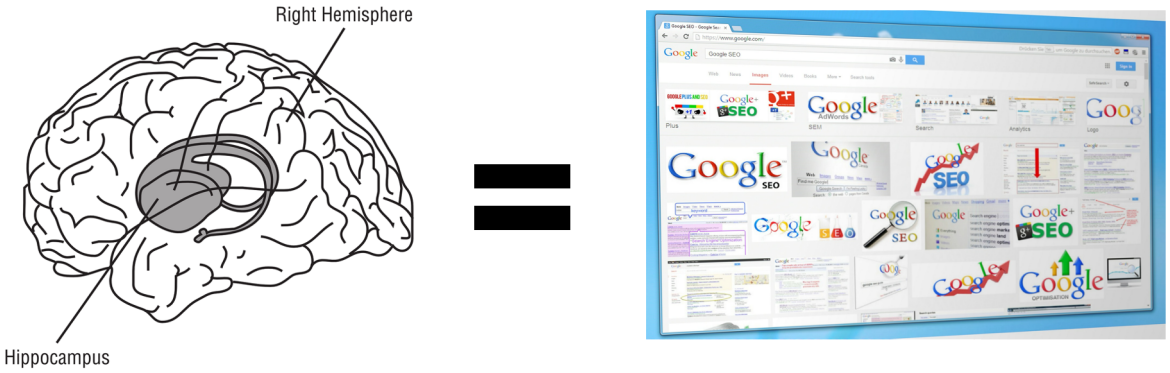
Amygdala

- Input from sensory, memory, and attention center
- Emotional memory system
  - The brain's alarm system



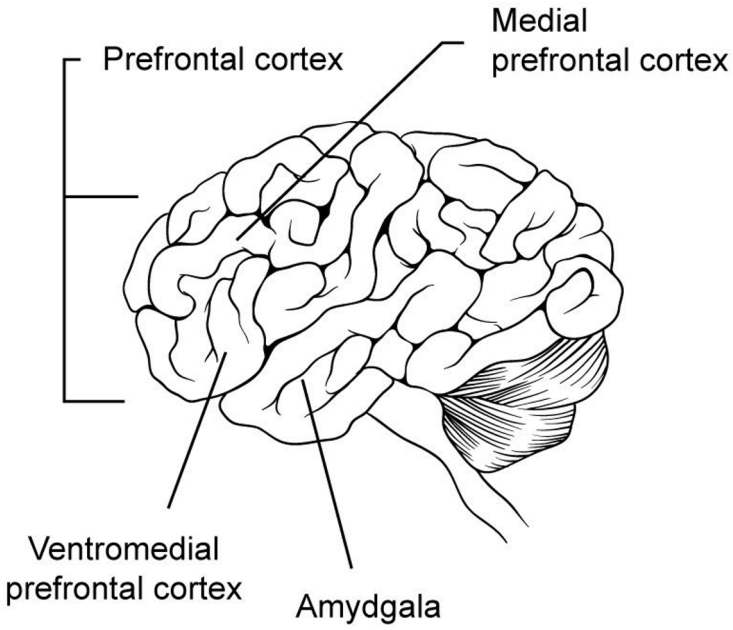
Hippocampus

- Interface between cortex and lower brain areas
- Major role in memory and learning
  - The brain's file cabinet or search engine

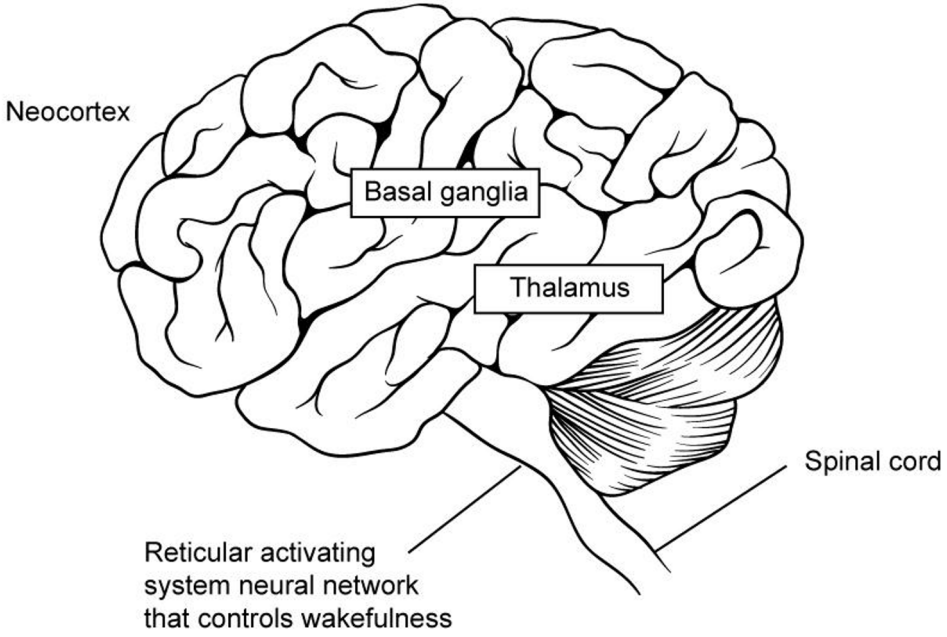


Prefrontal cortex

- Executive function
  - Impulse control
  - Working memory
  - Cognitive flexibility



Not Sleeping




Frontal
lobe

What does trauma look like in children?

Response to Trauma: Development and Learning[15,16]			
AGE	**IMPACT ON WORKING MEMORY**	**IMPACT ON INHIBITORY CONTROL**	**IMPACT ON COGNITIVE FLEXIBILITY**
Infant / toddler / pre-schooler	Difficulty acquiring developmental milestones	Frequent severe tantrums Aggressive with other children Attachment may be impacted	Easily frustrated
School-aged child	Difficulty with school skill acquisition Losing details can lead to confabulation, viewed by others as lying	Frequently in trouble at school and with peers for fighting and disrupting	Organizational difficulties Can look like learning problems or ADHD
Adolescent	Difficulty keeping up with material as academics advance Trouble keeping school work and home life organized Confabulation increasingly interpreted by others as integrity issue	Impulsive actions which can threaten health and well-being Actions can lead to involvement with law enforcement and increasingly serious consequences	Difficulty assuming tasks of young adulthood which require rapid interpretation of information: ie, driving, functioning in workforce

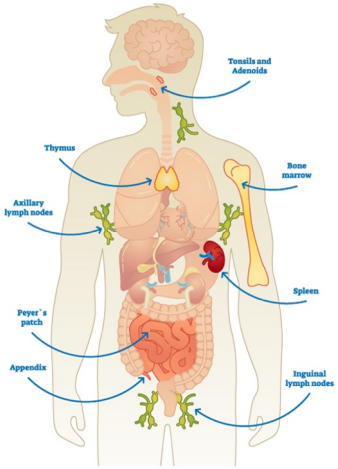
American Academy of Pediatrics, Dave Thomas Foundation for Adoption. Helping foster and adoptive families cope with trauma. https://www.aap.org/en-us/Documents/hfca_foster_trauma_guide.pdf.

Toxic stress triggers potentially permanent changes through 3 mechanisms:

Neurobiology

Immunology

Epigenetics



The Impact on the Immune System

Immune consequences

- Suppression of immune system
- Inflammatory pathways not responsive to cortisol - upregulated
- Impact on areas of brain can lead to depression (subset of depression - inflammatory mediated)

Developing system is chronically pressed into action

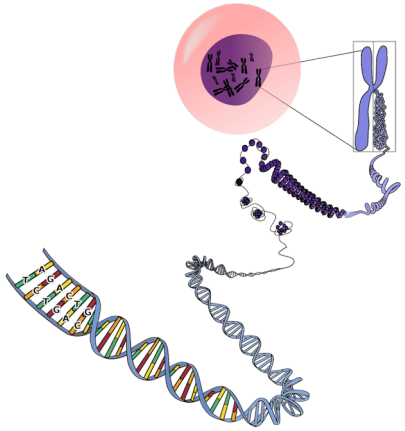
- Excessive cortisol suppresses humoral immunity, increasing risk of infection
- Inflammatory response persists after it is no longer needed
- Somatic perception impaired

Toxic stress triggers potentially permanent changes through 3 mechanisms:

Brain connectivity

Immune function

Epigenetics



The Impact on Epigenetics

- Challenges us to look beyond genetic predispositions to examine how environmental influences and early experiences affect when, how, and to what degree different genes are actually activated

A pup that is raised by an anxious, low-nurturing mother becomes an anxious adult.

A pup that is raised by a relaxed, high-nurturing mother becomes a relaxed adult.

ACE-Associated Health Conditions – Pediatrics

Symptom or Health Condition	For ≥ X ACEs (compared to 0)	Odds Ratio
Asthma[26, 33]	4	1.7 - 2.8
Allergies[33]	4	2.5
Dermatitis and eczema[39]	3*	2.0
Urticaria[39]	3*	2.2
Increased incidence of chronic disease, impaired management[25]	3	2.3
Any unexplained somatic symptoms[25] (eg, nausea/vomiting, dizziness, constipation, headaches)	3	9.3
Headaches[33]	4	3.0
Enuresis; encopresis[5]	–	–
Overweight and obesity[3]	4	2.0
Failure to thrive; poor growth; psychosocial dwarfism[5, 2, 41]	–	–
Poor dental health[16, 22]	4	2.8
Increased infections[39] (viral, URIs, LRTIs and pneumonia, AOM, UTIs, conjunctivitis, intestinal)	3*	1.4 - 2.4
Later menarche[40] (≥ 14 years)	2*	2.3
Sleep disturbances[5, 31]	5**	PR 3.1
Developmental delay[30]	3	1.9
Learning and/or behavior problems[3]	4	32.6
Repeating a grade[15]	4	2.8
Not completing homework[15]	4	4.0
High school absenteeism[33]	4	7.2
Graduating from high school[29]	4	0.4
Aggression; physical fighting[28]	For each additional ACE	1.9
Depression[29]	4	3.9
ADHD[42]	4	5.0
Any of: ADHD, depression, anxiety, conduct/behavior disorder[30]	3	4.5
Suicidal ideation[28]	For each additional ACE	1.9
Suicide attempts[28]		1.9 - 2.1
Self-harm[28]		1.8
First use of alcohol at < 14 years[7]	4	6.2
First use of illicit drugs at < 14 years[10]	5	9.1
Early sexual debut[21] (<15-17 y)	4	3.7
Teenage pregnancy[21]	4	4.2

For more details, see the ACEs and Toxic Stress Risk Assessment Algorithms at: ACEsAware.org/clinical-assessment

ACE-Associated Health Conditions – Adults

Symptom or Health Condition	Odds Ratio (excluding outliers)
Cardiovascular disease[21] (CAD, MI, ischemic heart disease)	2.1
Tachycardia[37]	≥ 1 ACE: 1.4
Stroke[20]	2.0
Chronic obstructive pulmonary disease (emphysema, bronchitis)[21]	3.1
Asthma[43]	2.2
Diabetes[21]	1.4
Obesity[20]	2.1
Hepatitis or jaundice[1]	2.4
Cancer, any[21]	2.3
Arthritis[32, 7] (self-reported)	3 ACEs, HR: 1.5 ≥ 1 ACE: 1.3
Memory impairment[20] (all causes, including dementias)	4.9
Kidney disease[43]	1.7
Headaches[11]	≥ 5 ACEs: 2.1
Chronic pain, any[38] (using trauma z-score)	1.2
Chronic back pain[38] (using trauma z-score)	1.3
Fibromyalgia[37]	≥ 1 ACE: 1.8
Unexplained somatic symptoms, including somatic pain, headaches[20, 2]	2.0 - 2.7
Skeletal fracture[1]	1.6 - 2.6[20]
Physical disability requiring assistive equipment[23]	1.8
Depression[21]	4.7
Suicide attempts[21]	37.5
Suicidal ideation[20]	10.5
Sleep disturbance[20]	1.6
Anxiety[21]	3.7
Panic and anxiety[20]	
Post-traumatic stress disorder[37]	4.5
Illicit drug use[21] (any)	5.2
Injected drug, crack cocaine, or heroin use[21]	10.2
Alcohol use[21]	6.9
Cigarettes or e-cigarettes use[35]	6.1
Cannabis use[35]	11.0
Teen pregnancy[21]	4.2
Sexually transmitted infections, lifetime[21]	5.9
Violence victimization[21] (intimate partner violence, sexual assault)	7.5
Violence perpetration[21]	8.1

For more details, see the ACEs and Toxic Stress Risk Assessment Algorithms at: ACEsAware.org/clinical-assessment

Consider implications in orthopedic care…

- ACE-Associated Health Conditions[1-3]
  - Skeletal fractures
  - Physical disability req assistive equipment
  - Comorbidities: obesity, diabetes, cardiovascular disease
  - Mental health: depression, substance abuse
- Risk factor for adult-onset chronic pain[4]
- Barriers to post-operative care and recovery
  - ACEs raise the risk for failure
  - Trauma history can influence adherence with treatment plan
  - Trauma history may be contributing to negative health behaviors
  - Patients perceived as "non-compliant" or "difficult"

[1]Felitti VJ, Anda RF, Nordenberg D, et al. Relationship of childhood abuse and household dysfunction to many of the leading causes of death in adults. Am J Prev Med; : 14.
[2]Petruccelli K, Davis J, Berman T. Adverse childhood experiences and associated health outcomes: A systematic review and meta-analysis. Child Abuse & Neglect 2019; 97: 104127.
[3]Hughes K, Bellis MA, Hardcastle KA, et al. The effect of multiple adverse childhood experiences on health: a systematic review and meta-analysis. The Lancet Public Health 2017; 2: e356–66.
[4]Davis DA, Luecken LJ, Zautra AJ. Are reports of childhood abuse related to the experience of chronic pain in adulthood? A meta-analytic review of the literature. Clin J Pain. 2005; 21:398-405.

ACEs and Obesity

- The ACEs Study began in an obesity clinic
- While interviewing patients who had dropped out, Dr. Felitti recognized ACEs to be a major determinant of the health and social well-being of members
- Childhood abuse and other early-life stressors have been associated with being overweight or obese later in life and with unhealthy weight control behaviors
  - Downstream effects of toxic stress, living in constant danger, fight or flight mode, overloaded with stress hormones
- In adults, obesity associated with higher risk of arthritis of the hip and knee, back pain, and spinal stenosis
- In pediatric obese patients, higher risk of knee and hip deformities, including slipped capital femoral epiphysis (SCFE)

Does recognizing trauma impact care?

The bottom line: **Yes.**

- Significant adversity results in less than optimal outcomes later in life.

How does recognizing trauma impact care?

Trauma responses are adaptive and protective when in threatening situation

Same bodily functions and behaviors may be maladaptive when removed from the stressor

When not examined within the context of past traumas, they can be misinterpreted as pathologic

Shift from "What is wrong with you?" to

"What happened to you?"

Trauma-informed care is good care even for those who have not experienced trauma.

Trauma-informed care understands, recognizes, and responds to the various effects of trauma to better support the health needs of patients who have experienced ACEs and toxic stress.

What is trauma-informed care?

Trauma-informed care provides safe and sensitive care that intentionally avoids re-traumatization.

- **Understanding** the prevalence of trauma and adversity and their impacts on health and behavior.
- **Recognizing** the effects of trauma and adversity on health and behavior.
- **Training** leadership, providers, and staff on **responding** to patients with best practices for trauma-informed care.
- **Integrating** knowledge about trauma and adversity into policies, procedures, practices, and treatment planning.
- **Resisting** re-traumatization by approaching patients who have experienced ACEs or other adversities with non-judgmental support.

Trauma-Informed Care Principles

Safety	Establish the physical and emotional safety of patients and staff
Trustworthiness and transparency	Build trust between providers and patients
Peer support	Recognize the effects of trauma exposure on physical and mental health and utilize peers to promote recovery and healing
Empowerment voice and choice	Promote patient-centered, evidence-based care
Collaboration and mutuality	Ensure provider and patient collaboration by bringing patients into the treatment process and discussing mutually agreed upon goals for treatment
Sensitivity	Provide care that is sensitive to the patient's racial, ethnic, and cultural background, and gender identity

What does trauma-informed care look like?

Appropriate whether or not there is a known history of trauma	
Empathetic, nonjudgmental, and therapeutic	*Example - Your chart indicates that you had been homeless at one point; that must have been very difficult for you.*
Open-ended questions:	*What is it you would like to discuss today?* *Has your home life changed in any significant way?* *What questions do you have?*
Surveillance question:	*Since the last time I saw you, has anything happened to you or your family?*
Anticipatory guidance:	*The symptoms you describe may indicate that the brain and body are responding to a stress or threat. Do you have any concerns that your child is being exposed to stress or something that would be scary to them?*

Additional Resources:

- California ACEs Aware
- The National Child Traumatic Stress Network (NCTSN)
- The Substance Abuse and Mental Health Services Administration (SAMHSA)
- The American Academy of Pediatrics (AAP)
  - Pediatric Approach to Trauma, Treatment and Resilience Project
  - The Resilience Project
  - Trauma Informed Care

Thank you.
Questions?