

Adverse Childhood Experience (ACE) Questionnaire

Finding your ACE Score ra hbr 10 24 06

While you were growing up, during your first 18 years of life:

1. Did a parent or other adult in the household **often** ...

Swear at you, insult you, put you down, or humiliate you?



or

Act in a way that made you afraid that you might be physically hurt?

Yes No

If yes enter 1 _____

2. Did a parent or other adult in the household **often** ...
Push, grab, slap, or throw something at you?

or

Ever hit you so hard that you had marks or were injured?

Yes No

If yes enter 1 _____

3. Did an adult or person at least 5 years older than you **ever**...

Touch or fondle you or have you touch their body in a sexual way?

or

Try to or actually have oral, anal, or vaginal sex with you?

Yes No

If yes enter 1 _____

4. Did you **often** feel that ...

No one in your family loved you or thought you were important or special?

or

Your family didn't look out for each other, feel close to each other, or support each other?

Yes No

If yes enter 1 _____

5. Did you **often** feel that ...

You didn't have enough to eat, had to wear dirty clothes, and had no one to protect you?

or

Your parents were too drunk or high to take care of you or take you to the doctor if you needed it?

Yes No

If yes enter 1 _____

6. Were your parents **ever** separated or divorced?
Yes No

If yes enter 1 _____

7. Was your mother or stepmother:

Often pushed, grabbed, slapped, or had something thrown at her?

or

Sometimes or often kicked, bitten, hit with a fist, or hit with something hard?

or

Ever repeatedly hit over at least a few minutes or threatened with a gun or knife?

Yes No

If yes enter 1 _____

8. Did you live with anyone who was a problem drinker or alcoholic or who used street drugs?
Yes No If yes enter 1 _____

9. Was a household member depressed or mentally ill or did a household member attempt suicide?
Yes No If yes enter 1 _____

10. Did a household member go to prison?

Yes No

If yes enter 1 _____

Now add up your “Yes” answers: _____ This is your ACE Score

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Now add up your "Yes" answers: _____ This is your ACE Score

What are Adverse Childhood Experiences (ACEs)?

- **Growing up (prior to age 18) in a household with:**
 - Recurrent physical abuse.
 - Recurrent emotional abuse.
 - Sexual abuse.
 - Emotional or physical neglect.

Growing up (prior to age 18) in a household with (cont):

- An alcohol or drug abuser
- An incarcerated household member.
- Someone who is chronically depressed, suicidal, institutionalized or mentally ill.
- Mother being treated violently.
- One or no parents.



What Are ACEs?

Adverse Childhood Experiences

- ACEs are experiences in childhood that are unhappy, unpleasant, hurtful.
- Sometimes referred to as toxic stress or childhood trauma.



Regional Child Abuse Prevention Councils 2011

strong communities raise strong kids

¹ Definition of Trauma

According to the Substance Abuse and Mental Health Services Agency (SAMHSA), individual trauma results from an:

- ♦ **Event**, series of events, or set of circumstances that is
- ♦ **Experienced** by an individual a physically and/or emotionally harmful or threatening and that has lasting adverse
- ♦ **Effects** of the individual's functioning and mental, physical, social, emotional, or spiritual wellbeing.

(SAMHSA's Concept of Trauma and Guidance for a Trauma informed Approach; July 2014)

What is trauma?

Interpersonal violence tends to be more traumatic than natural disasters because it is more disruptive to our fundamental sense of trust and attachment, and is typically experienced as intentional rather than as “an accident of nature.”

(International Society for the Study of Trauma and Dissociation, 2009)

What Is Child Traumatic Stress?

- Child traumatic stress refers to the *physical and emotional responses* of a child to events that threaten the life or physical integrity of the child or of someone critically important to the child (such as a parent or sibling).
- Traumatic events overwhelm a child's capacity to cope and elicit feelings of terror, powerlessness, and out-of-control physiological arousal.

Complex Trauma

- ^IComplex trauma: describes the dual problem of children's exposure to traumatic events and the impact of this exposure on immediate and long-term functioning. Complex traumatic exposure refers to children's experiences of multiple traumatic events that occur within the caregiving system [and typically] refers to chronic maltreatment beginning in early childhood.

The Role of Adversity and Toxic Stress

Toxic stress response can occur when an individual experiences strong, frequent, and/or prolonged adversity—such as physical or emotional abuse, chronic neglect, caregiver substance abuse or mental illness, exposure to violence, and/or the accumulated burdens of family economic hardship—without adequate support. This kind of prolonged activation of the stress response systems can disrupt the development of brain architecture and other organ systems, and increase the risk for stress-related disease and cognitive impairment, well throughout the lifespan.

(Center on the Developing Child; Harvard University, 2016)

Even the Experts are Confused as to Which Term is Best



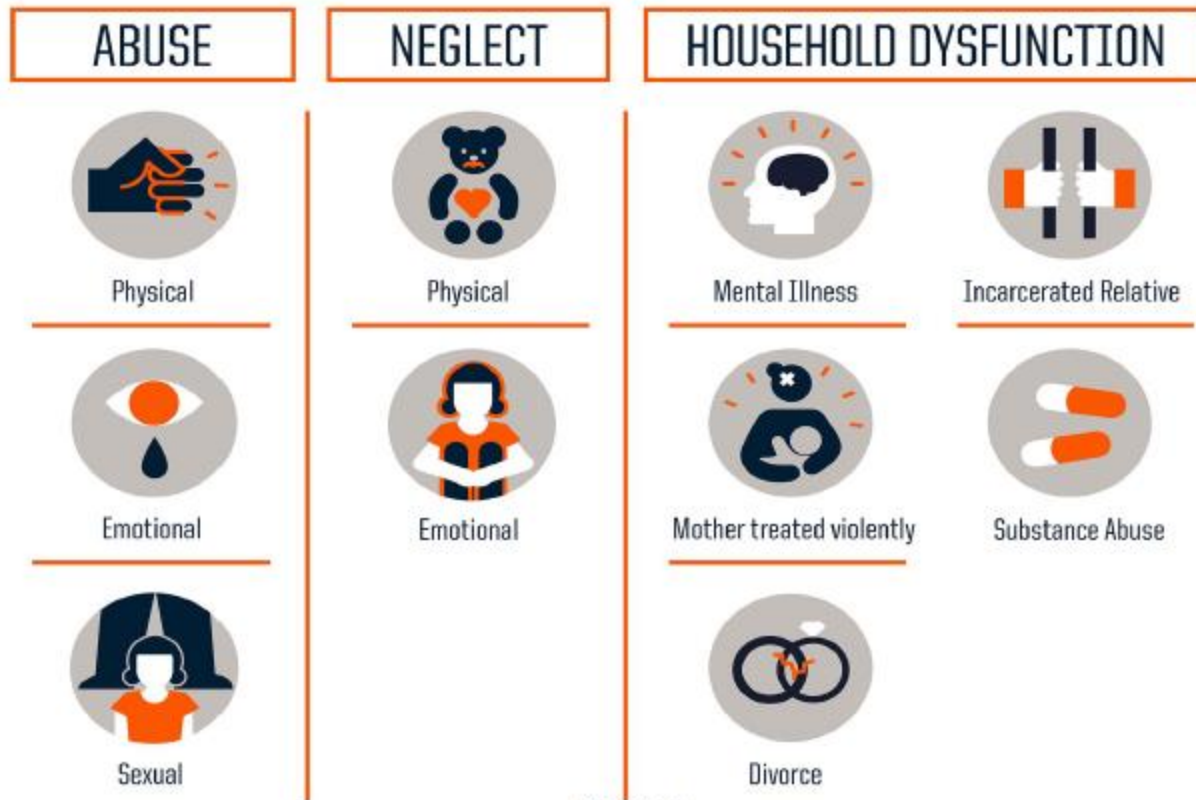


Figure 2
wjf.org and cdc.gov, 2014

Landmark CDC-Kaiser ACE Study

Between 1995 and 1997, over 17,000 Health Maintenance Organization members from San Diego, California receiving physical exams completed confidential surveys regarding their childhood experiences and current health status and behaviors. Almost two-thirds of adults surveyed reported at least one ACE – and the majority of respondents who reported at least one ACE reported more than one.

ACE Study Design

Survey Wave I

n=13 000
71% response

*All medical evaluations
abstracted*

Survey Wave II

n=13 000

*All medical evaluations
abstracted*

VS

Present Health Status

17 337 adults

Mortality

National Death Index

Morbidity

Hospital Discharges
Doctor Office Visits
Emergency Room Visits

Demographic information is from the entire ACE Study sample (n=17,337).

Demographic Information for CDC-Kaiser ACE Study Participants, Waves 1 and 2.

Demographic Information	Percent (N = 17,337)
Gender	
Female	54.0%
Male	46.0%
Race/Ethnicity	
White	74.8%
Hispanic/Latino	11.2%
Asian/Pacific Islander	7.2%
African-American	4.5%
Other	2.3%
Age (years)	
19-29	5.3%
30-39	9.8%
40-49	18.6%
50-59	19.9%
60 and over	46.4%
Education	
Not High School Graduate	7.2%
High School Graduate	17.6%
Some College	35.9%
College Graduate or Higher	39.3%

ACE Score Prevalence for CDC-Kaiser ACE Study Participants by Sex, Waves 1 and 2.

Number of Adverse Childhood Experiences (ACE Score)	Women	Men	Total
	Percent(N = 9,367)	Percent (N = 7,970)	Percent (N = 17,337)
0	34.5%	38.0%	36.1%
1	24.5%	27.9%	26.0%
2	15.5%	16.4%	15.9%
3	10.3%	8.5%	9.5%
4 or more	15.2%	9.2%	12.5%

The prevalence estimates reported below are from the entire ACE Study sample (n=17,337).

Prevalence of ACEs by Category for CDC-Kaiser ACE Study Participants by Sex, Waves 1 and 2.

ACE Category	Women	Men	Total
	Percent (N = 9,367)	Percent (N = 7,970)	Percent (N = 17,337)
ABUSE			
Emotional Abuse	13.1%	7.6%	10.6%
Physical Abuse	27%	29.9%	28.3%
Sexual Abuse	24.7%	16%	20.7%
HOUSEHOLD CHALLENGES			
Mother Treated Violently	13.7%	11.5%	12.7%
Household Substance Abuse	29.5%	23.8%	26.9%
Household Mental Illness	23.3%	14.8%	19.4%
Parental Separation or Divorce	24.5%	21.8%	23.3%
Incarcerated Household Member	5.2%	4.1%	4.7%
NEGLECT			
Emotional Neglect ³	16.7%	12.4%	14.8%
Physical Neglect ³	9.2%	10.7%	9.9%

Adverse Childhood Experiences and their Relationship to Adult Well-being and Disease :

Turning gold into lead



A collaborative effort between
Kaiser Permanente and the Centers for Disease Control



The National Council Webinar
USA August 27, 2012

Robert F. Anda, M.D.
Vincent J. Felitti, M.D.

Prevalence of Adverse Childhood Experiences

	Prevalence (%)
Abuse, by Category	
Psychological (by parents)	11%
Physical (by parents)	28%
Sexual (anyone)	22%
Neglect, by Category	
Emotional	15%
Physical	10%
Household Dysfunction, by Category	
Alcoholism or drug use in home	27%
Loss of biological parent < age 18	23%
Depression or mental illness in home	17%
Mother treated violently	13%
Imprisoned household member	5%

Adverse Childhood Experiences Score

Number of categories (not events) is summed...

<i>ACE Score</i>	<i>Prevalence</i>
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0	33%
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1	25%
---	-----

2	15%
---	-----

3	10%
---	-----

4	6%
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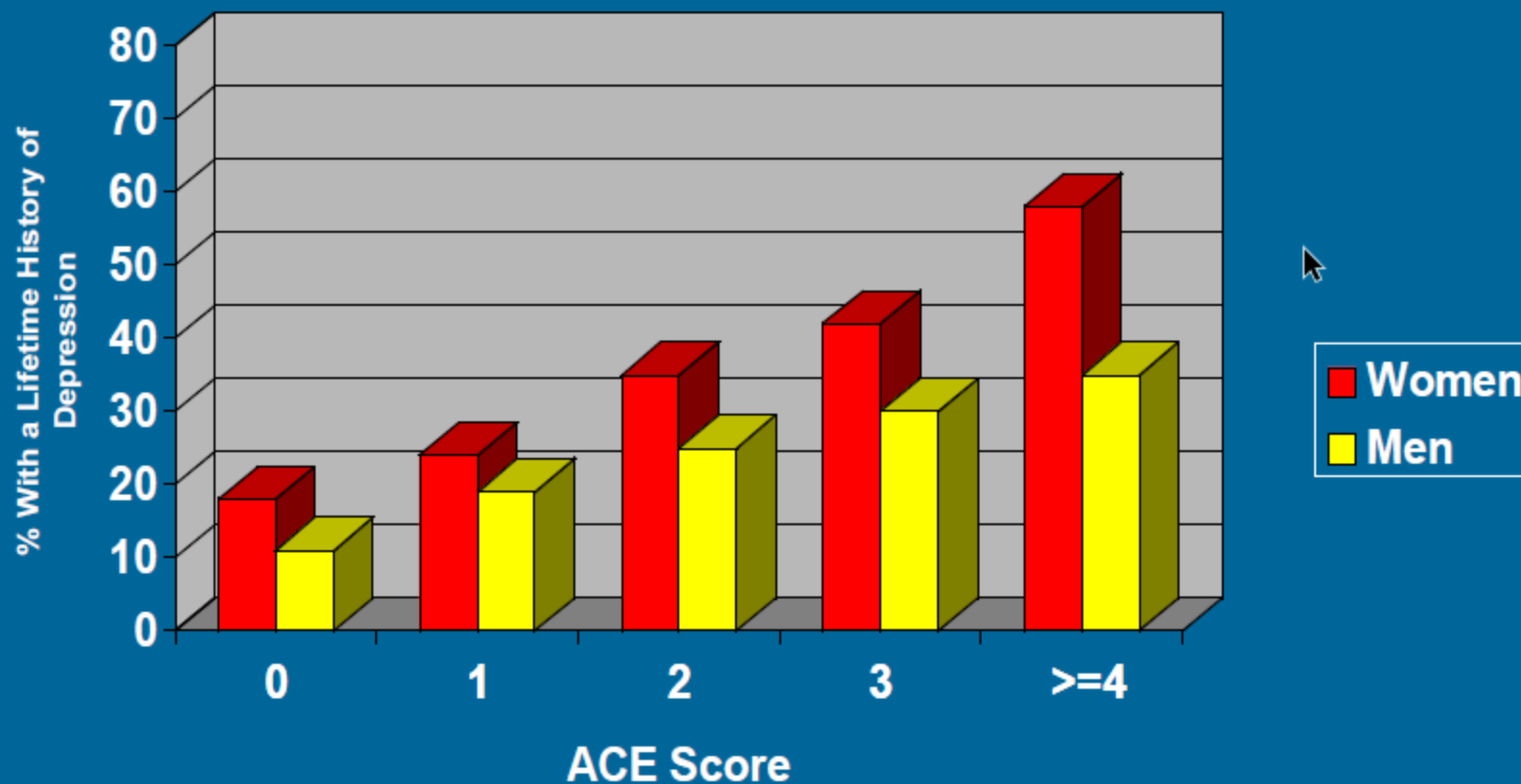
5 or more	11%*
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- Two out of three experienced at least one *category* of ACE.
- If any one ACE is present, there is an 87% chance *at least one* other category of ACE is present, and 50% chance of 3 or >.
- * Women are 50% more likely than men to have a Score >5.

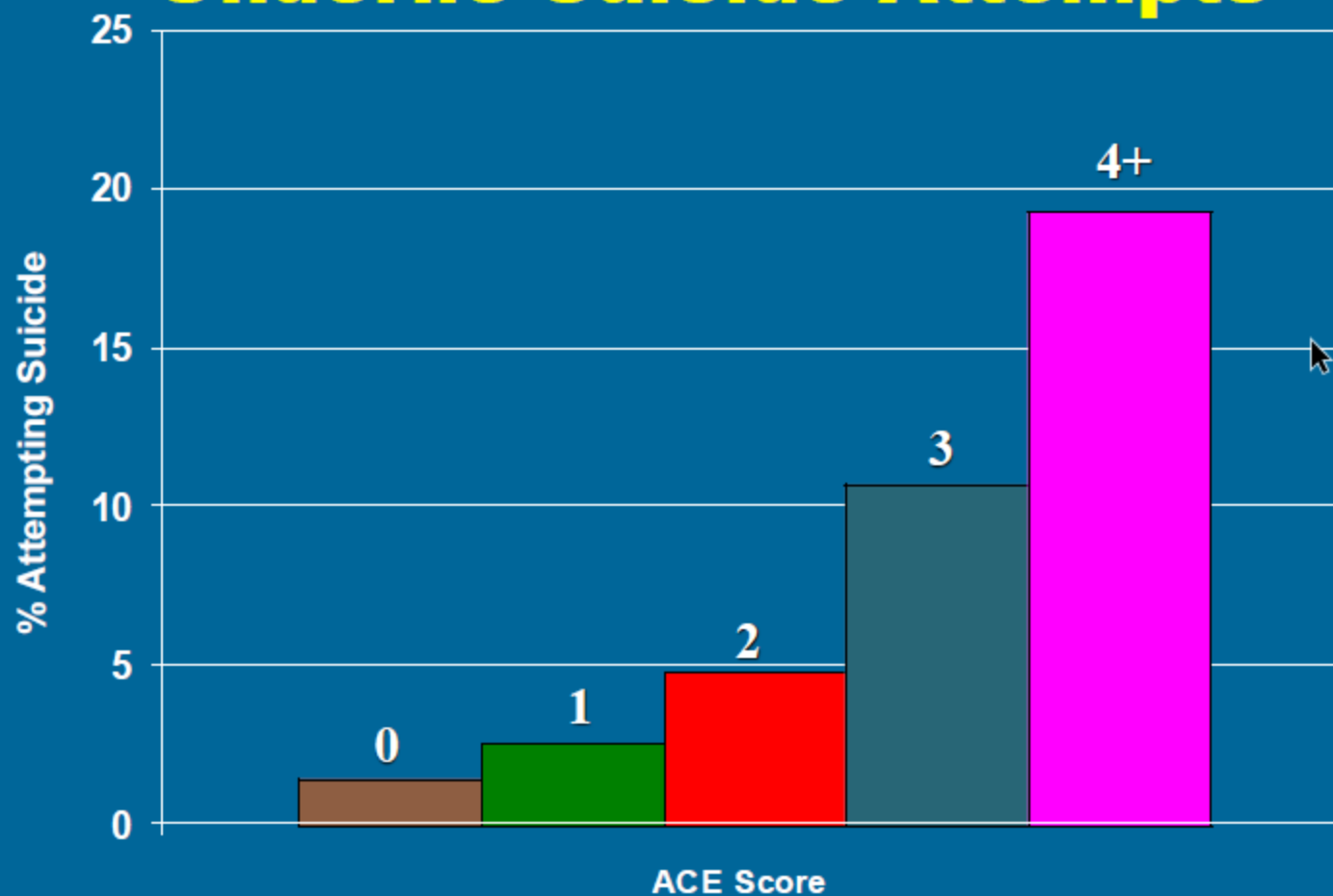
Well-being

Childhood Experiences Underlie Chronic Depression



Well-being

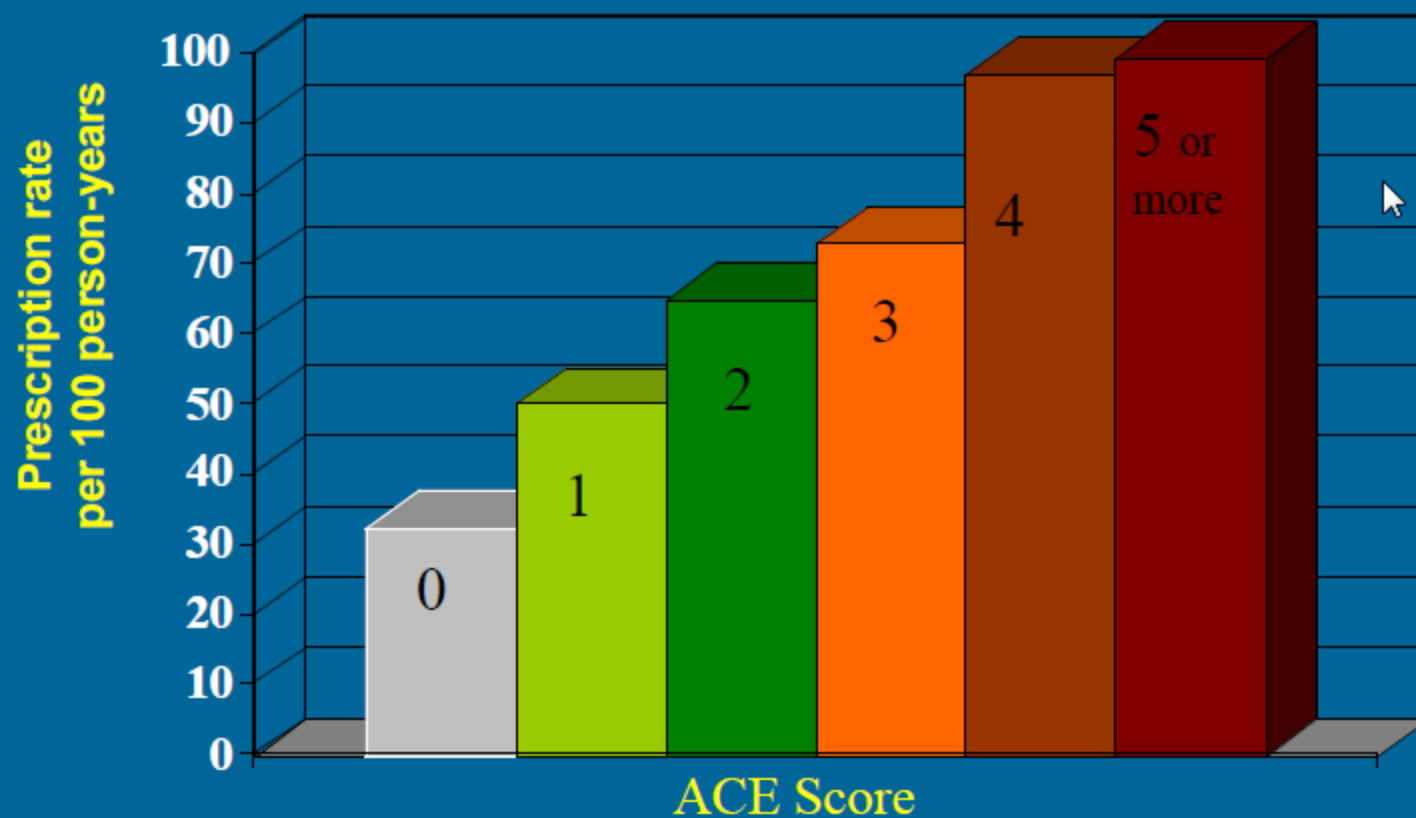
Childhood Experiences Underlie Suicide Attempts



Costs

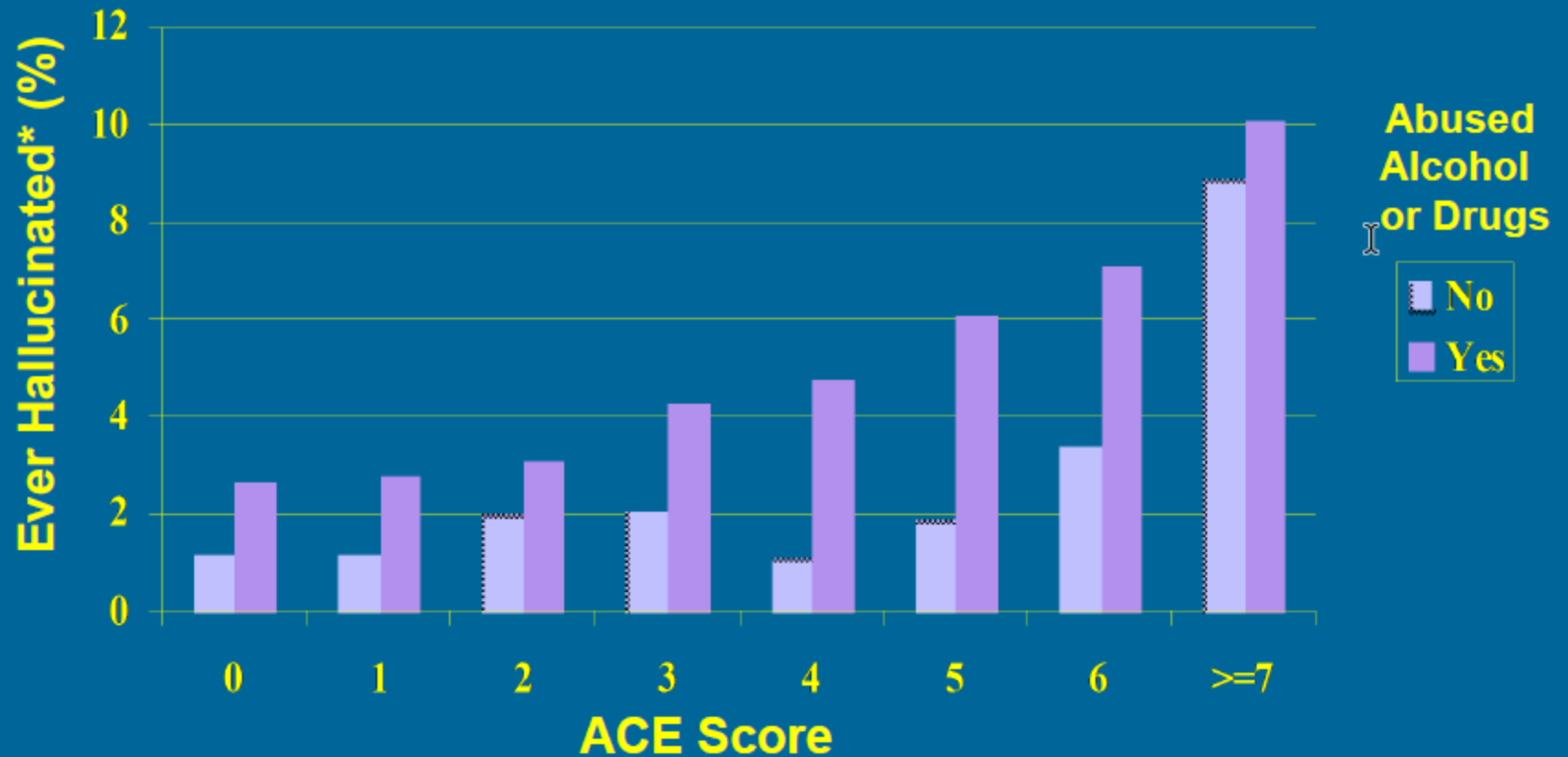
ACE Score and Rates of Antidepressant Prescriptions

approximately 50 years later



Well-being

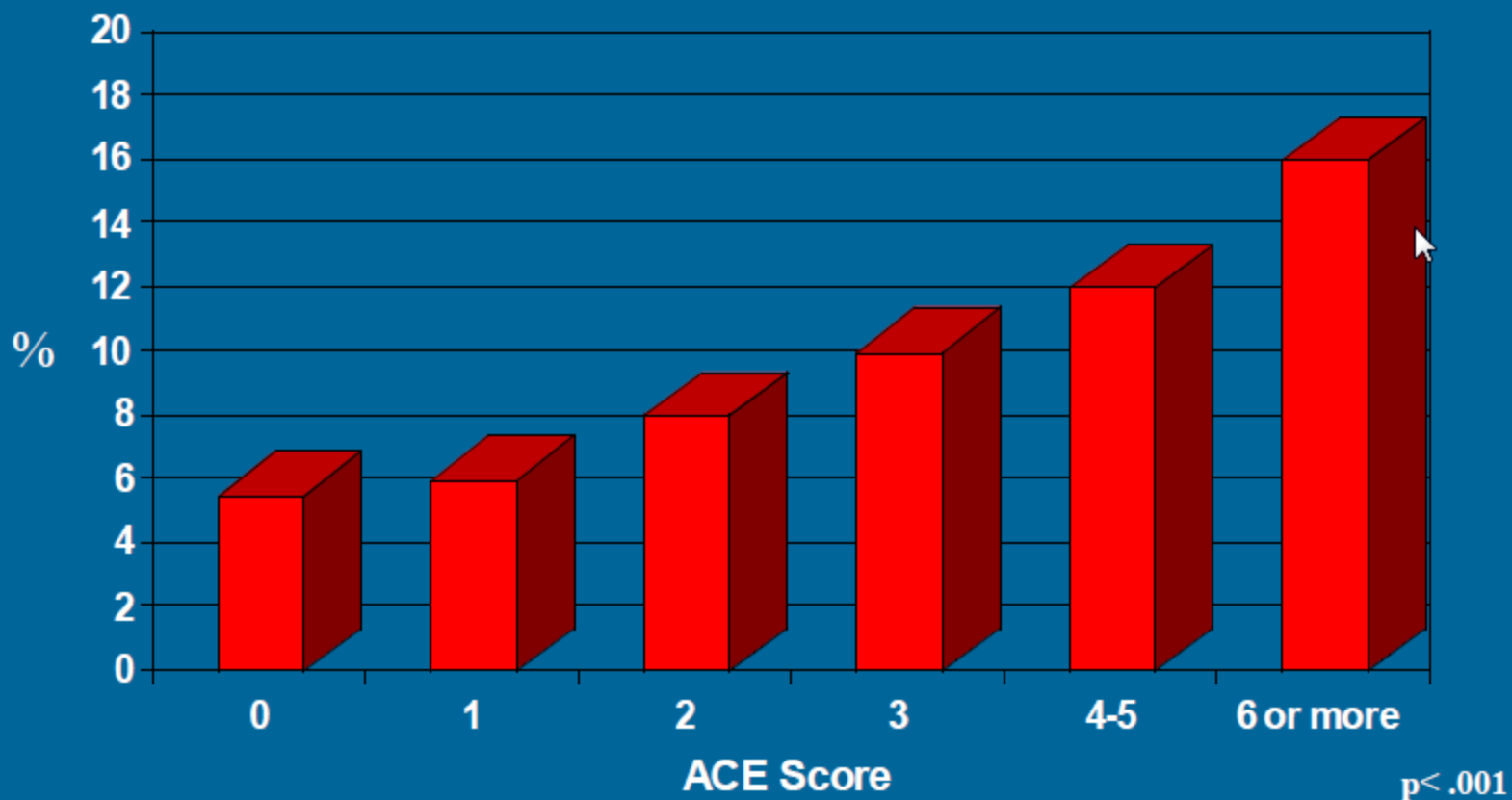
ACE Score and Hallucinations



*Adjusted for age, sex, race, and education.

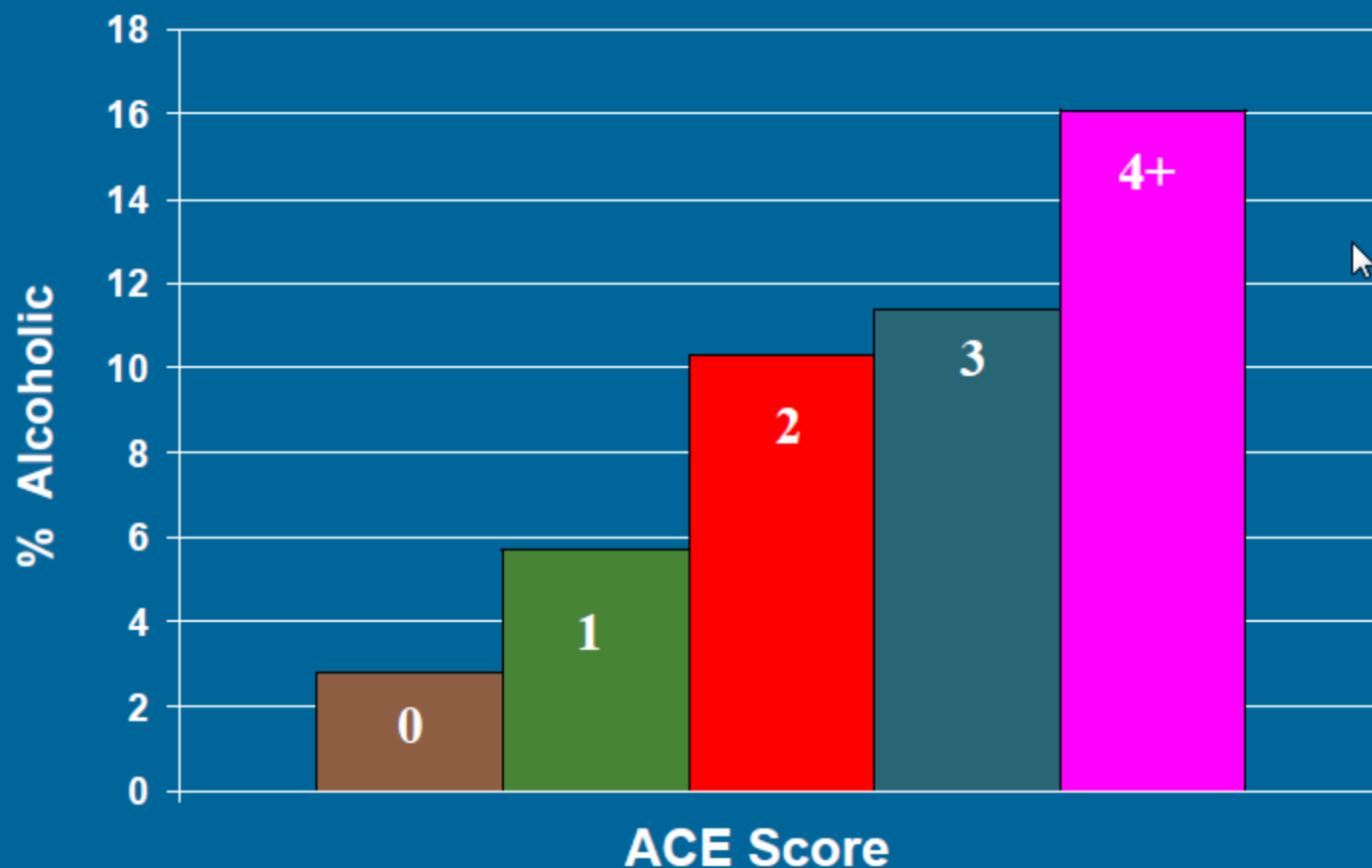
Health Risks

Adverse Childhood Experiences vs. Smoking as an Adult



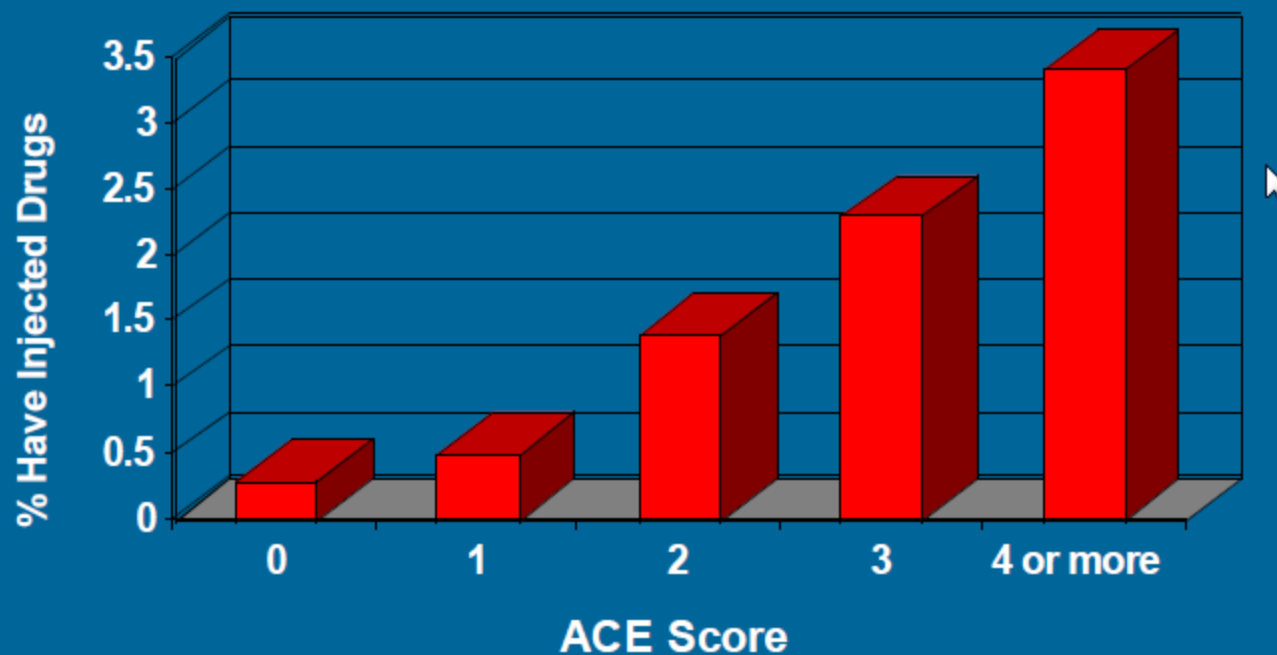
Health Risks

Childhood Experiences vs. Adult Alcoholism



Health risks

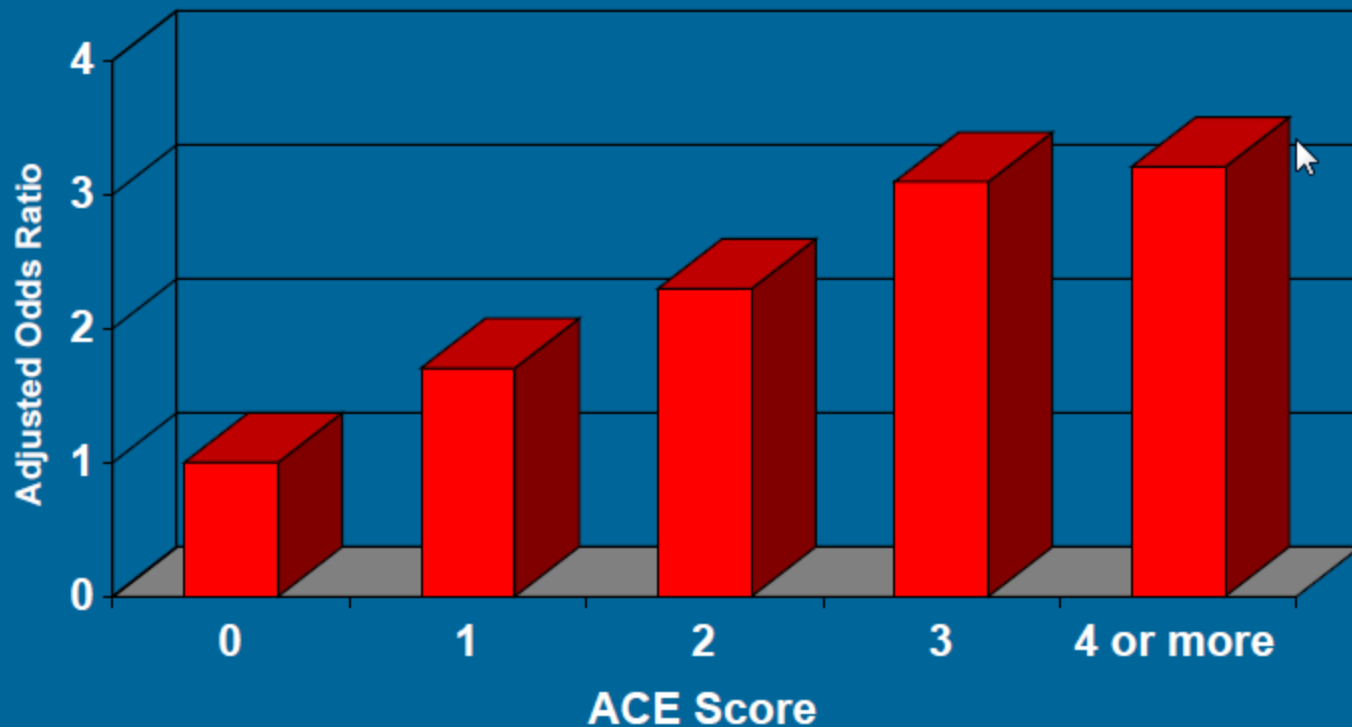
ACE Score vs Injection Drug Use



$p < 0.001$

Health risks, Social function:

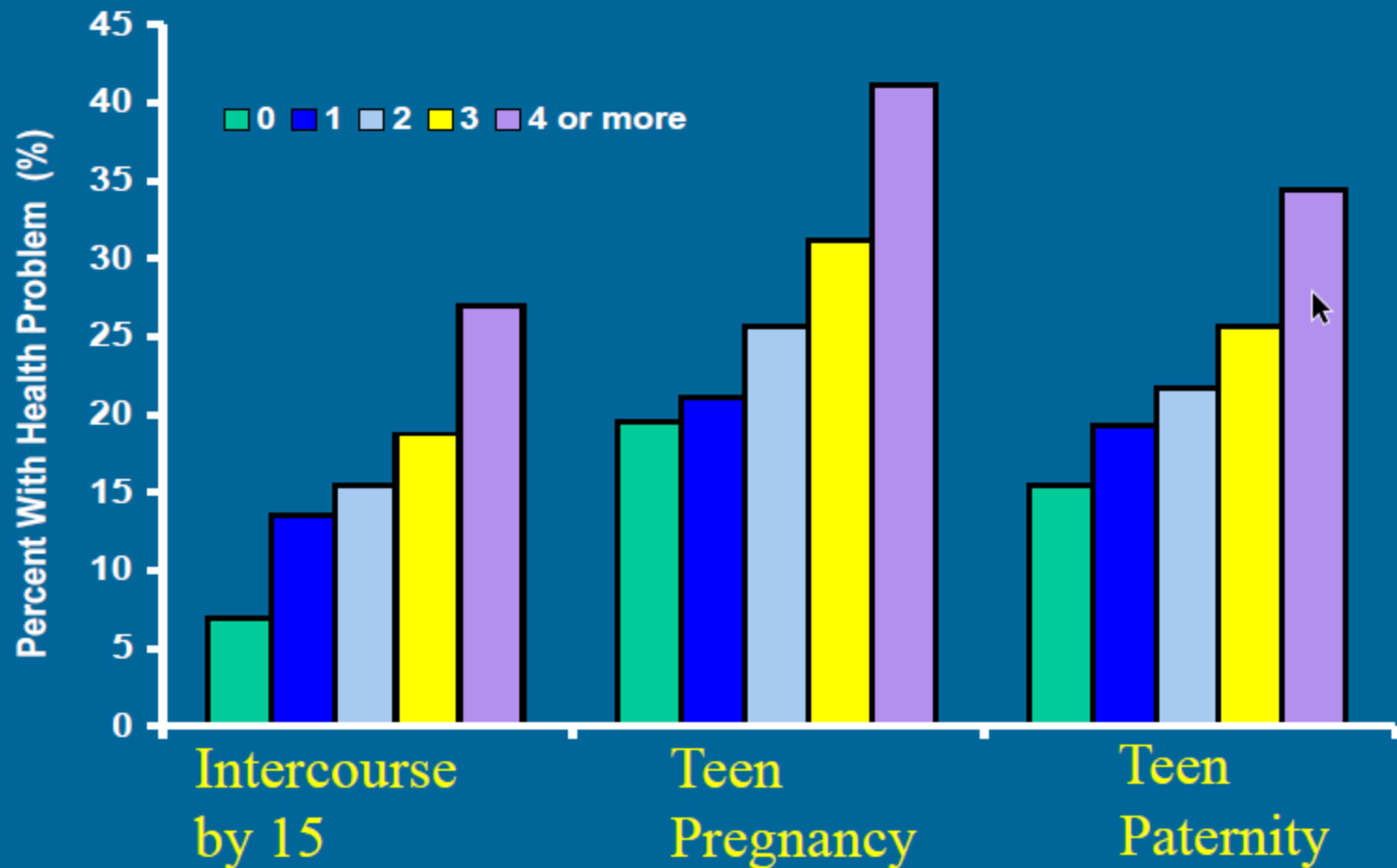
Looking for Love ACE Score vs > 50 Sexual Partners



Social function

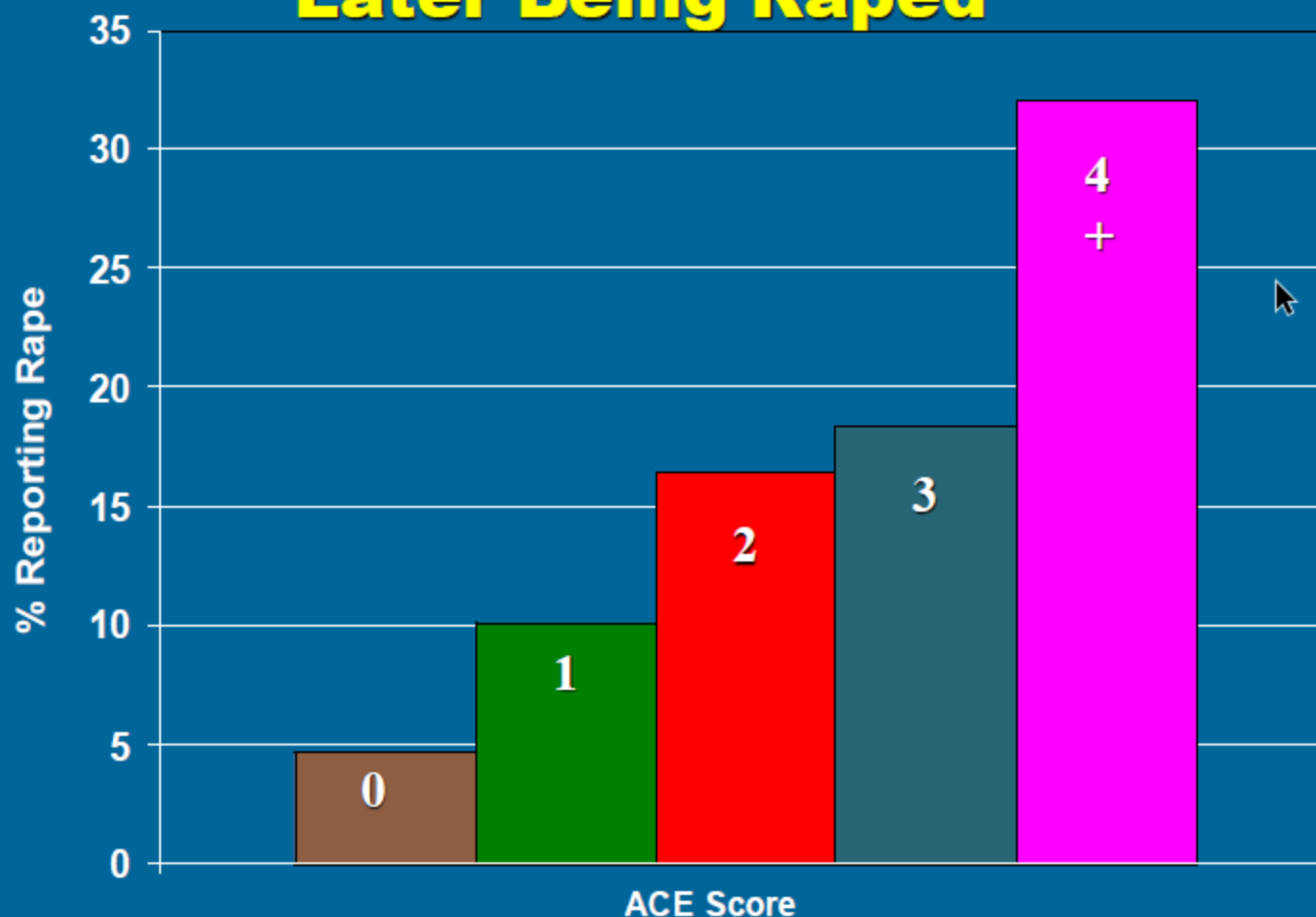
ACE Score and Teen Sexual Behaviors

Looking for love



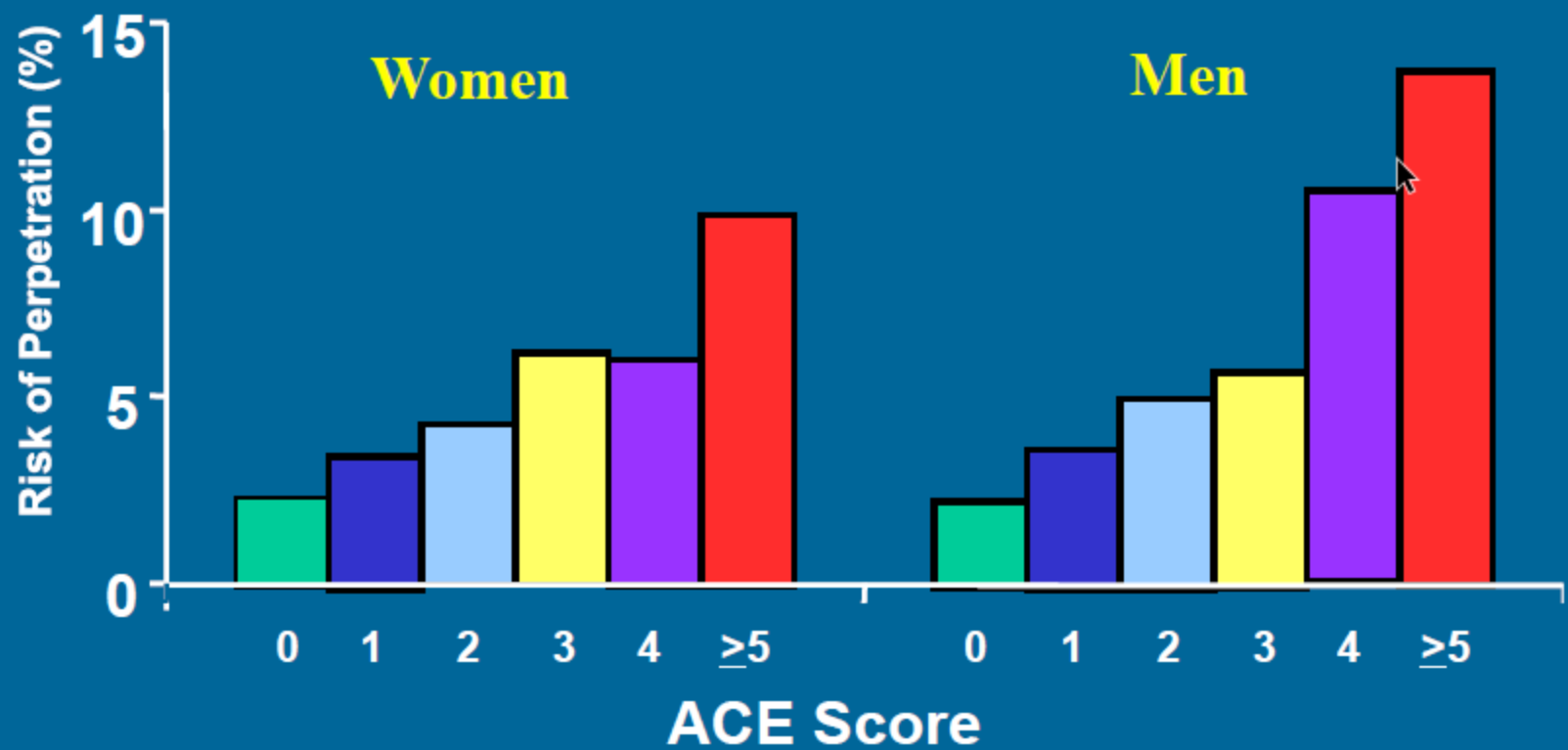
Well-being

Childhood Experiences Underlie Later Being Raped



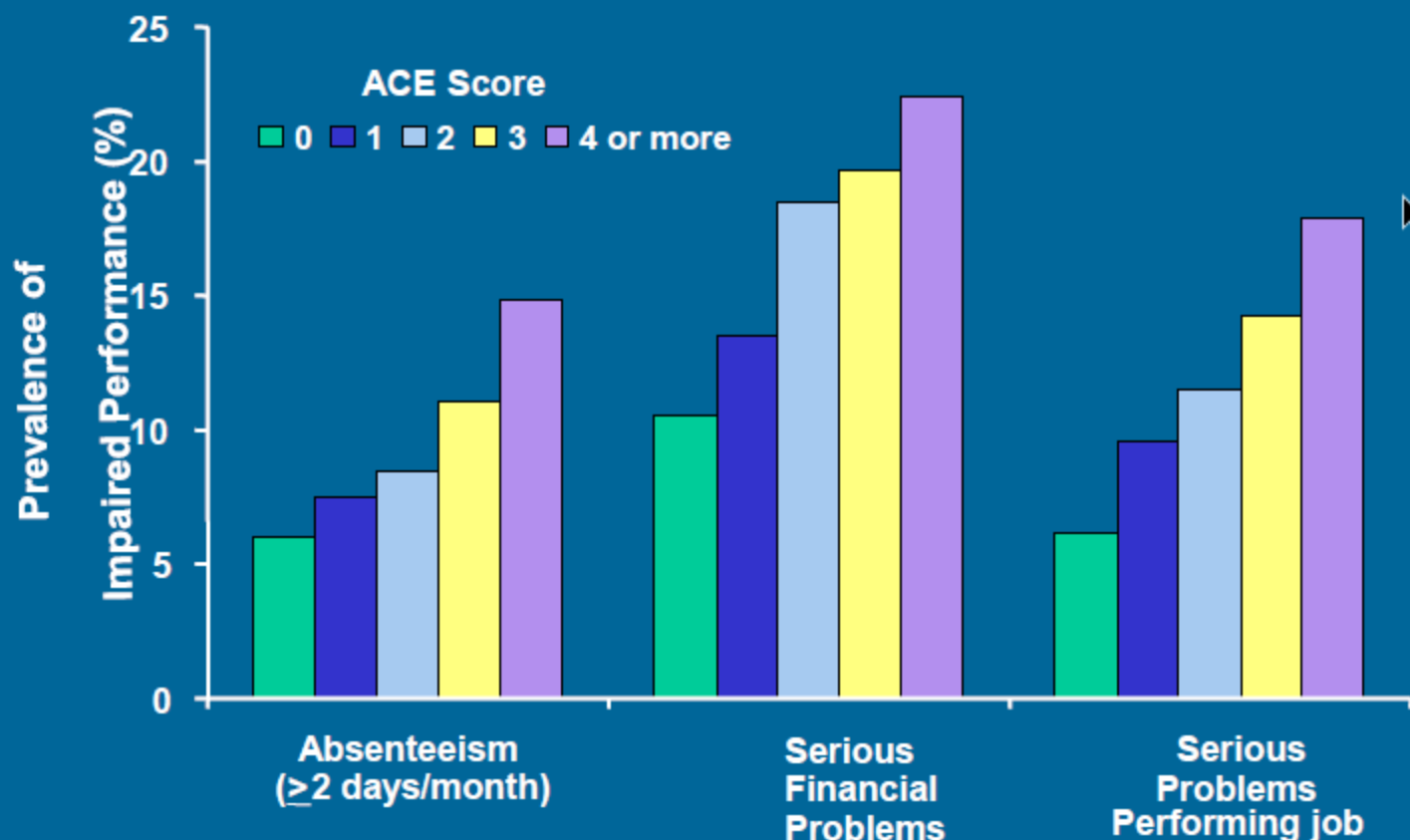
Social function:

ACE Score and the Risk of *Perpetrating* Domestic Violence



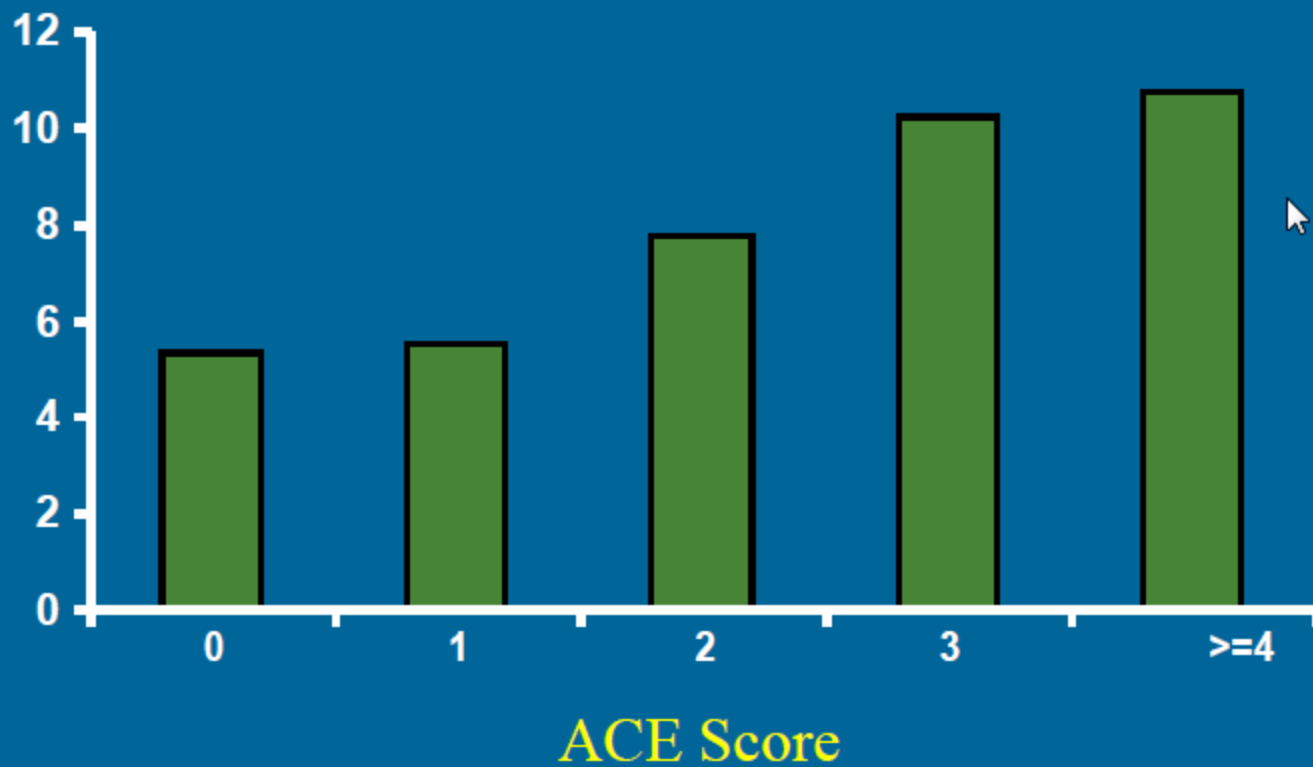
Social function:

ACE Score and Indicators of Impaired Worker Performance



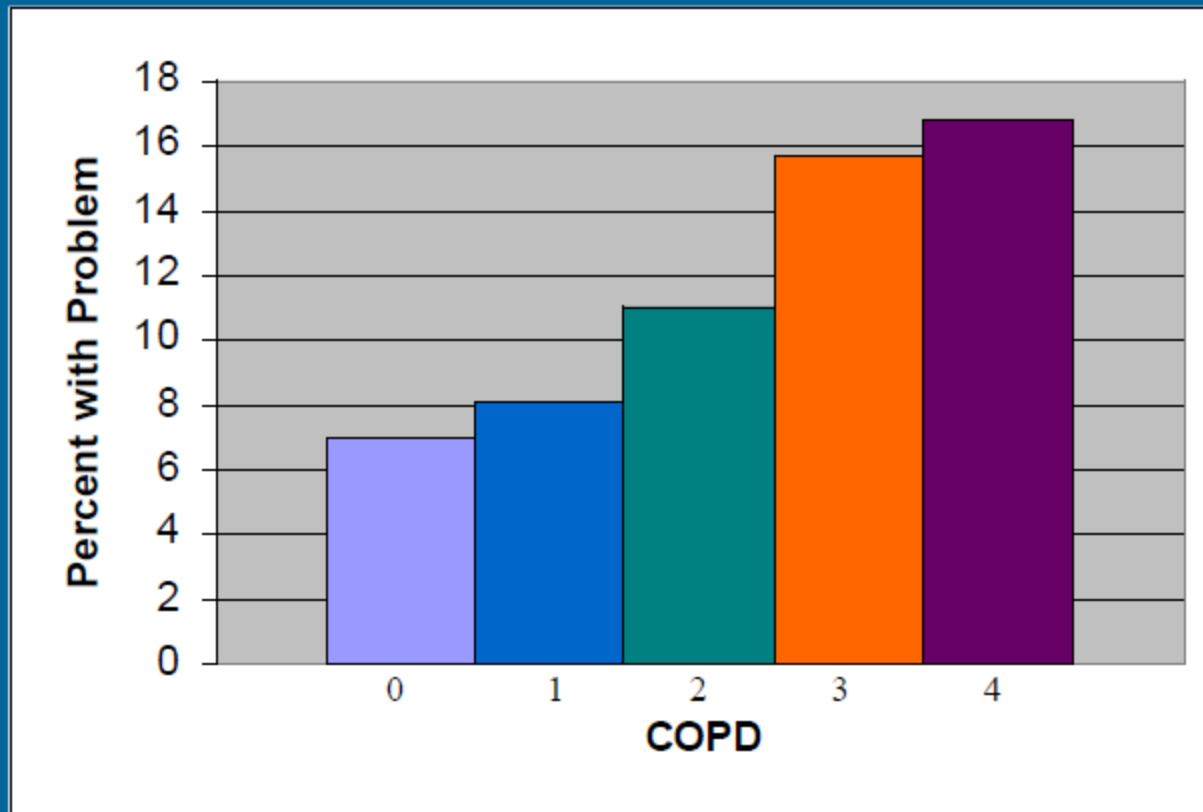
Biomedical Disease

The ACE Score and the Prevalence of Liver Disease (Hepatitis/Jaundice)



Biomedical Disease

ACE Score vs. COPD



Biomedical disease

ACEs Increase Likelihood of Heart Disease*

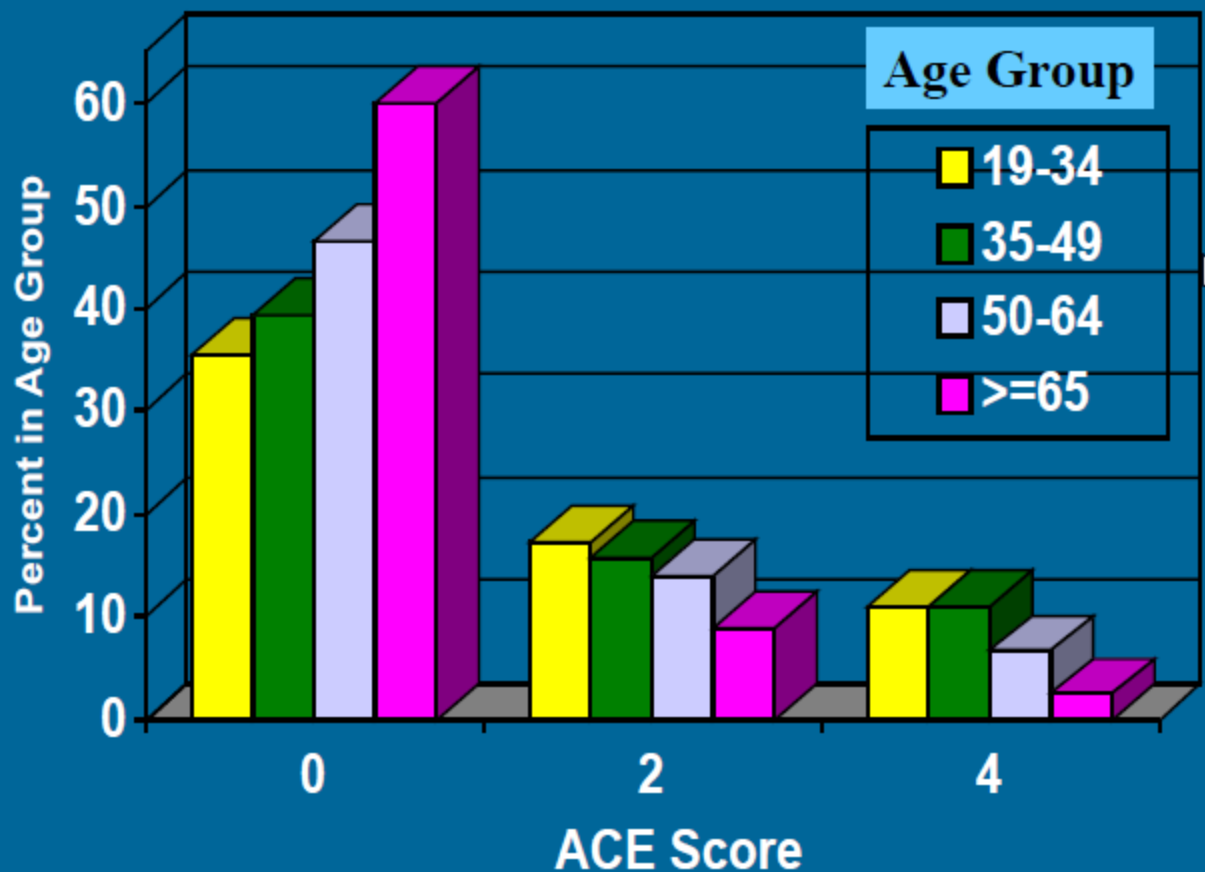
- Emotional abuse 1.7x
- Physical abuse 1.5x
- Sexual abuse 1.4x
- Domestic violence 1.4x
- Mental illness 1.4x
- Substance abuse 1.3x
- Household criminal 1.7x
- Emotional neglect 1.3x
- Physical neglect 1.4x



*After correction for age, race, education, and conventional riskfactors like smoking and diabetes. *Circulation*, Sept 2004

Effect of ACEs on Death Rate

(Null hypothesis)



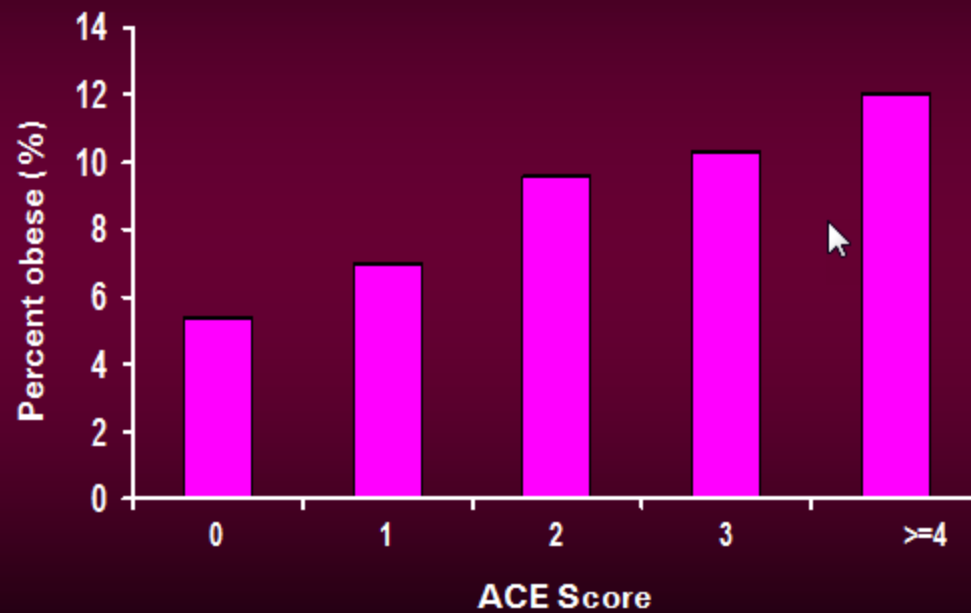
**The Health and Social Impact of Growing Up With
Adverse Childhood Experiences**

The Human and Economic Costs of the Status Quo

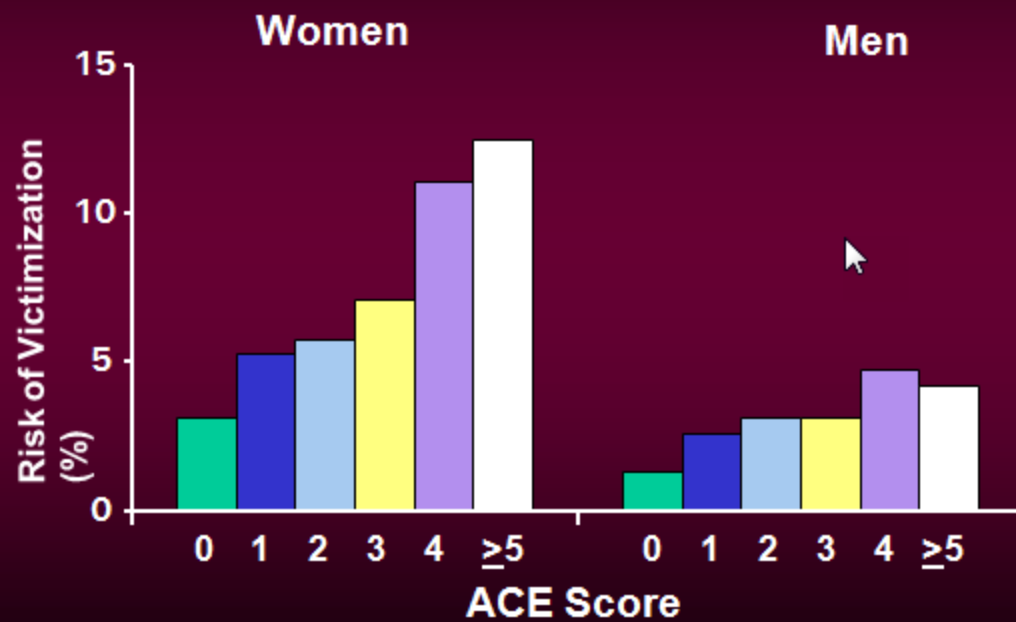
Robert Anda, MD, MS

Co-Principal Investigator
Adverse Childhood Experiences (ACE) Study

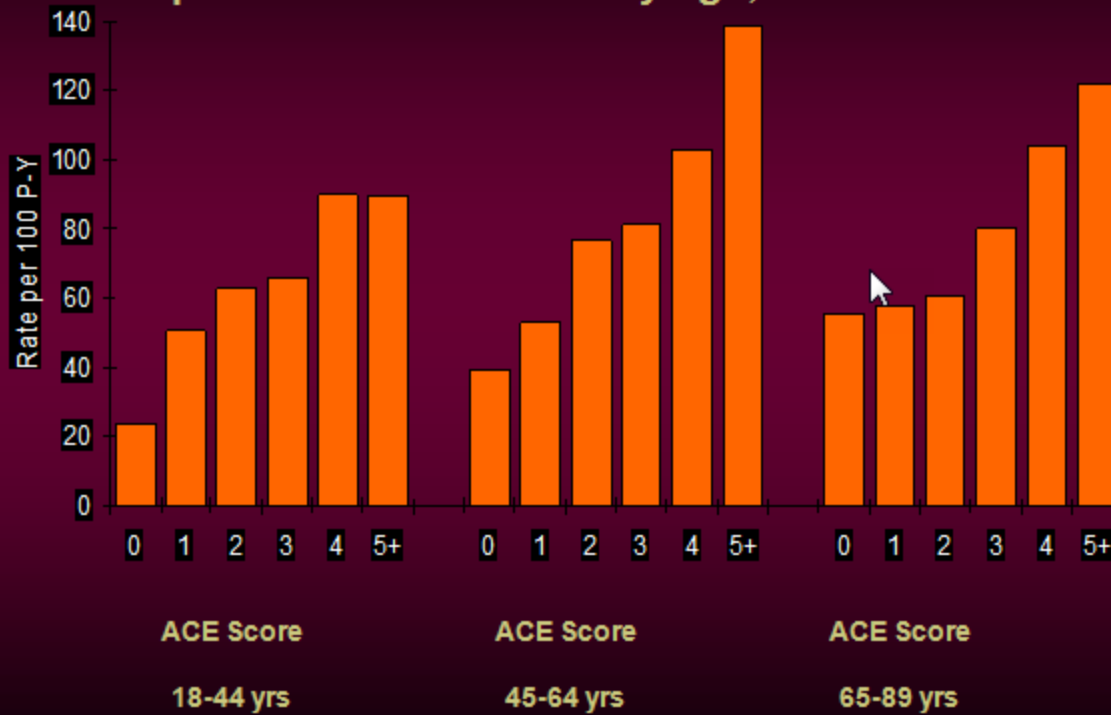
The ACE Score and the Prevalence of Severe Obesity



ACE Score and the Risk of Being a Victim of Domestic Violence



ACE Score and Rates of Prescribed Antidepressant Medications by Age, 1997-2004



**Adverse Childhood Experiences
As a National Health and Economic Issue**

ACEs have a strong influence on:

- adolescent health
- reproductive health
- smoking
- alcohol abuse
- illicit drug abuse
- sexual behavior
- mental health
- risk of revictimization
- stability of relationships, homelessness
- performance in the workforce



Adverse Childhood Experiences As a National Health Issue

ACEs increase the risk of:

- Heart disease**
- Chronic Lung disease**
- Liver disease**
- Suicide**
- Injuries**
- HIV and STDs**
- and other risks for the leading
causes of death**



ADVERSE CHILDHOOD EXPERIENCES

looking at how ACEs affect our lives & society

1 2 3 4 5 i



HOW ACEs
AFFECT OUR
LIVES

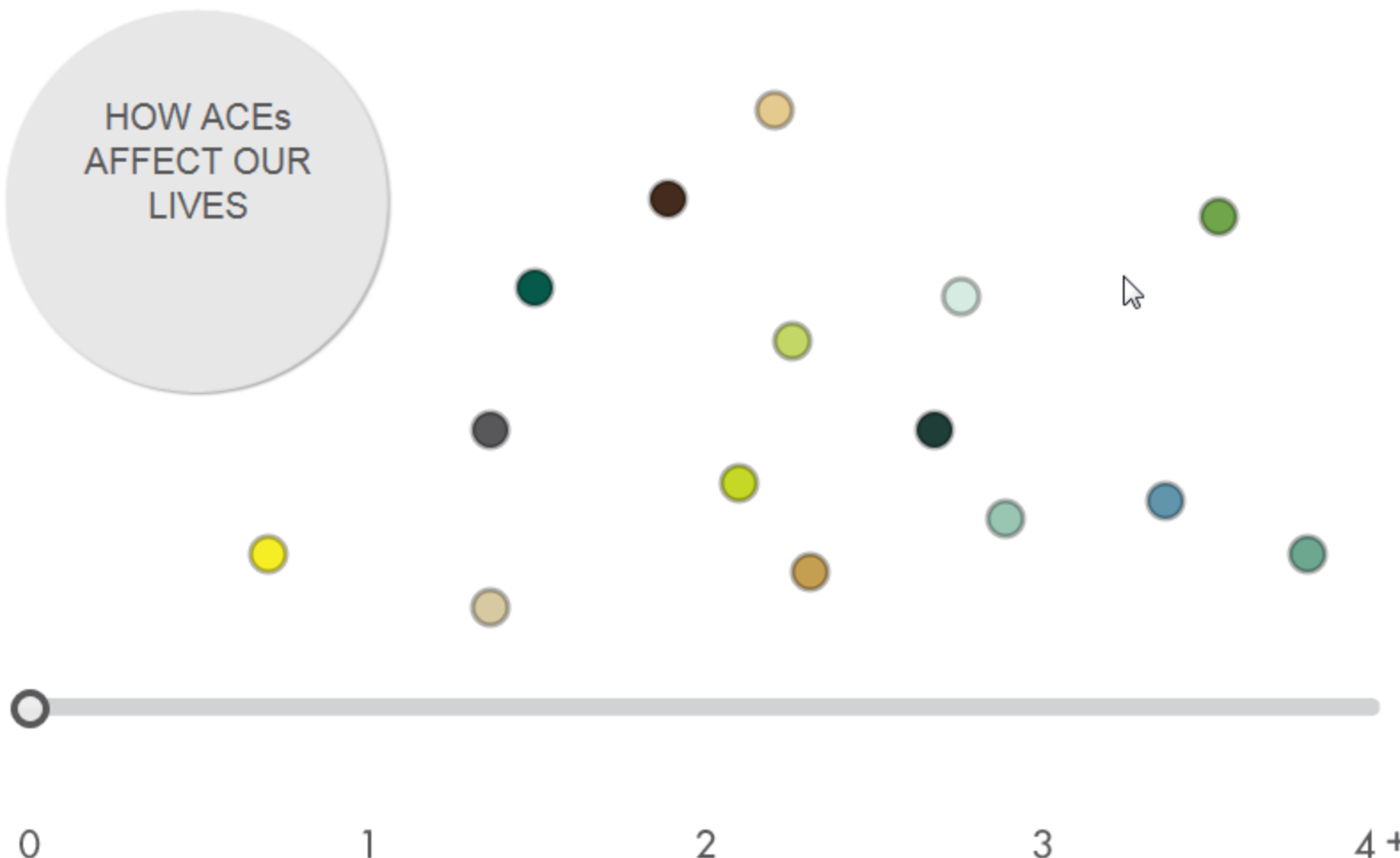
BEHAVIORS

- LACK OF PHYSICAL ACTIVITY
- SMOKING
- ALCOHOLISM
- DRUG USE
- MISSED WORK

PHYSICAL & MENTAL HEALTH

- SEVERE OBESITY
- DIABETES
- DEPRESSION
- SUICIDE ATTEMPTS
- STDS
- HEART DISEASE
- CANCER
- STROKE
- COPD
- BROKEN BONES

ACE SCORE



ADVERSE CHILDHOOD EXPERIENCES

looking at how ACEs affect our lives & society

HOW ACEs
AFFECT OUR
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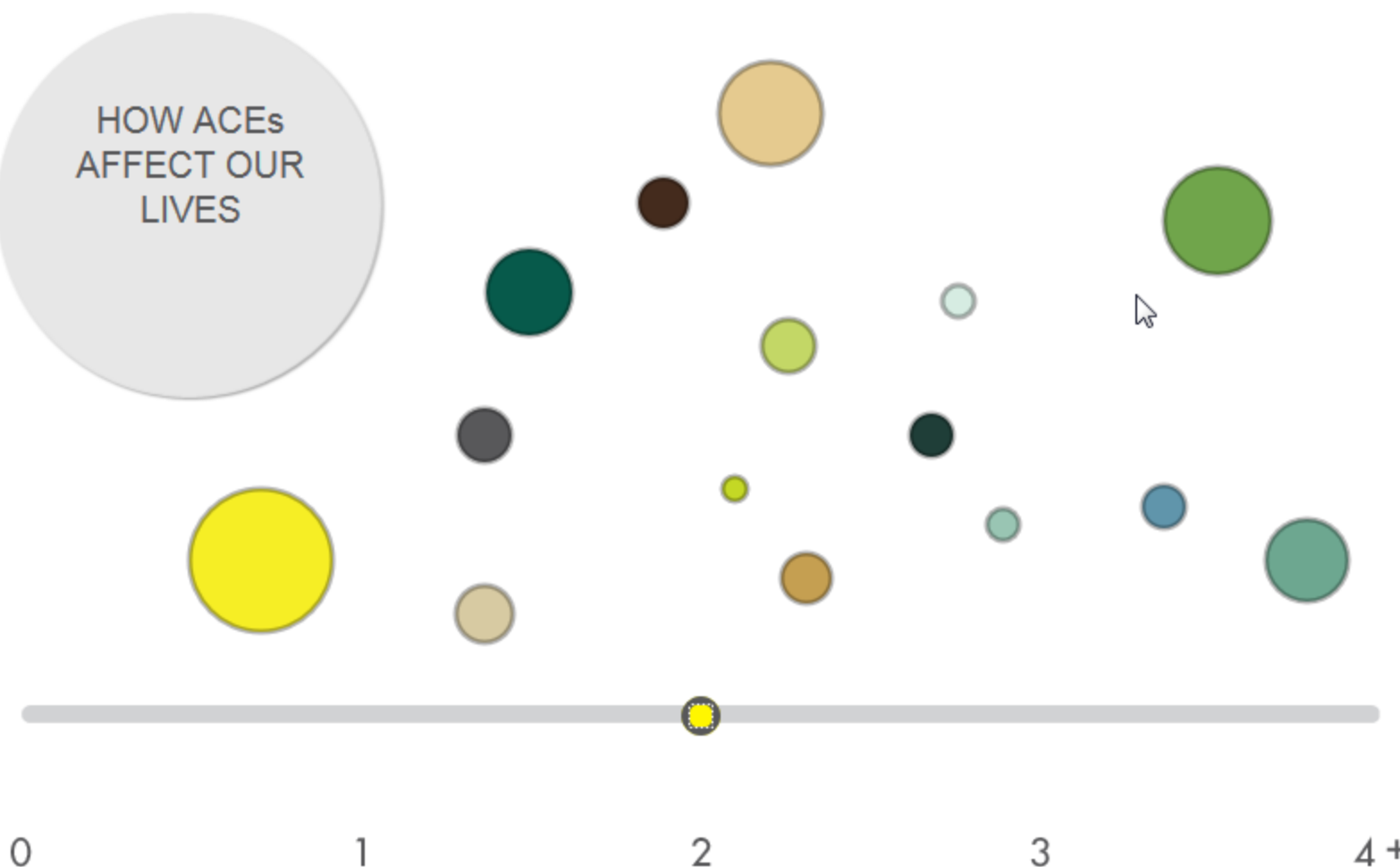
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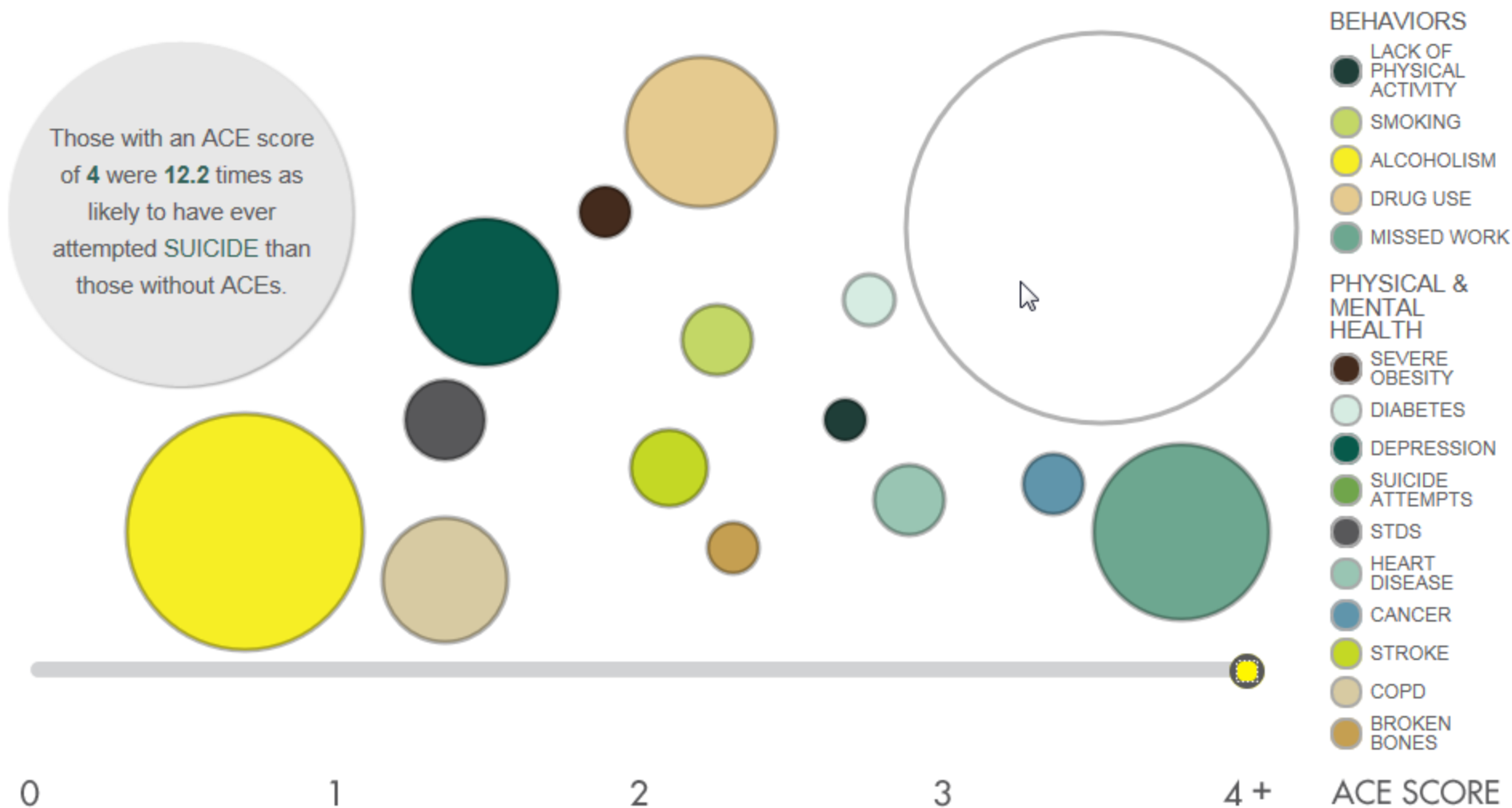
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ACE SCORE



— *looking at how ACEs affect our lives & society* —

1 2 3 4 5 i



Possible Risk Outcomes:

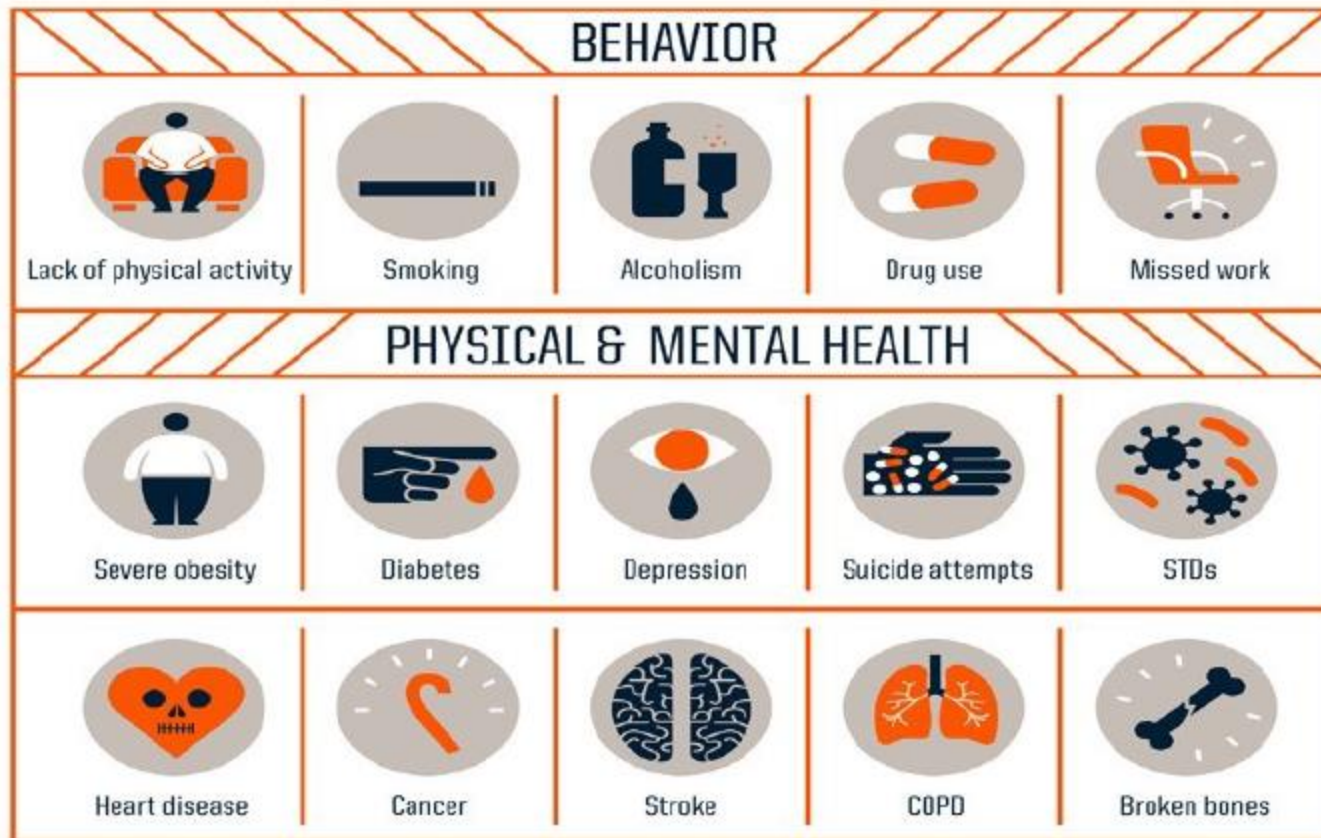


Figure 4

Figure 4 lists the possible mental and physical health outcomes of ACEs as reported by the Center for Disease Control and Prevention 2013.

Why is This Important?

Because ACEs are:

- Surprisingly common
- Occur in clusters
- The basis for many common public health problems
- Strong predictors of later social functioning, well-being, health risks, disease, and death



ACE Attributable Problems

Risks

- Smoking
- Heavy drinking
- Obesity
- Risk of AIDS
- High on painkillers
- Obesity

Disease

- Cardiovascular
- Cancer
- Asthma
- Diabetes
- Auto immune
- COPD
- Ischemic heart disease
- Liver disease

Poor Mental Health

- Frequent mental distress
- Sleep disturbances
- Nervousness
- MH problem requiring medication
- Emotional problems restrict activities
- Serious & persistent mental illness

Health/Social Problems

- Fair or poor health
- Life dissatisfaction
- Health-related limits to quality of life
- Disability that impedes daily functioning
- Don't complete secondary education
- Unemployment
- History of adult homelessness

Intergenerational Transmission

- Mental Illness
- Drugs or Alcohol Problem
- Multiple divorces, separations
- Victim of family violence
- Adult incarceration

Table 1. Physical and Psychiatric Health Outcomes Associated with Childhood Trauma

Physical

Back pain
Bladder disorders
Chronic fatigue
Chronic pelvic pain
Diabetes mellitus
Fibromyalgia
Gastrointestinal disorders
Headache
Heart conditions
Neurologic disorders
Obesity
Respiratory disorders

Psychiatric

Depression
Dissociative disorders
Eating disorders
Hostility (also a risk factor for hypertension, coronary heart disease, and myocardial infarction)
Sexual dysfunction
Substance abuse disorders
Suicidal ideation

People Who Experience Trauma Are:

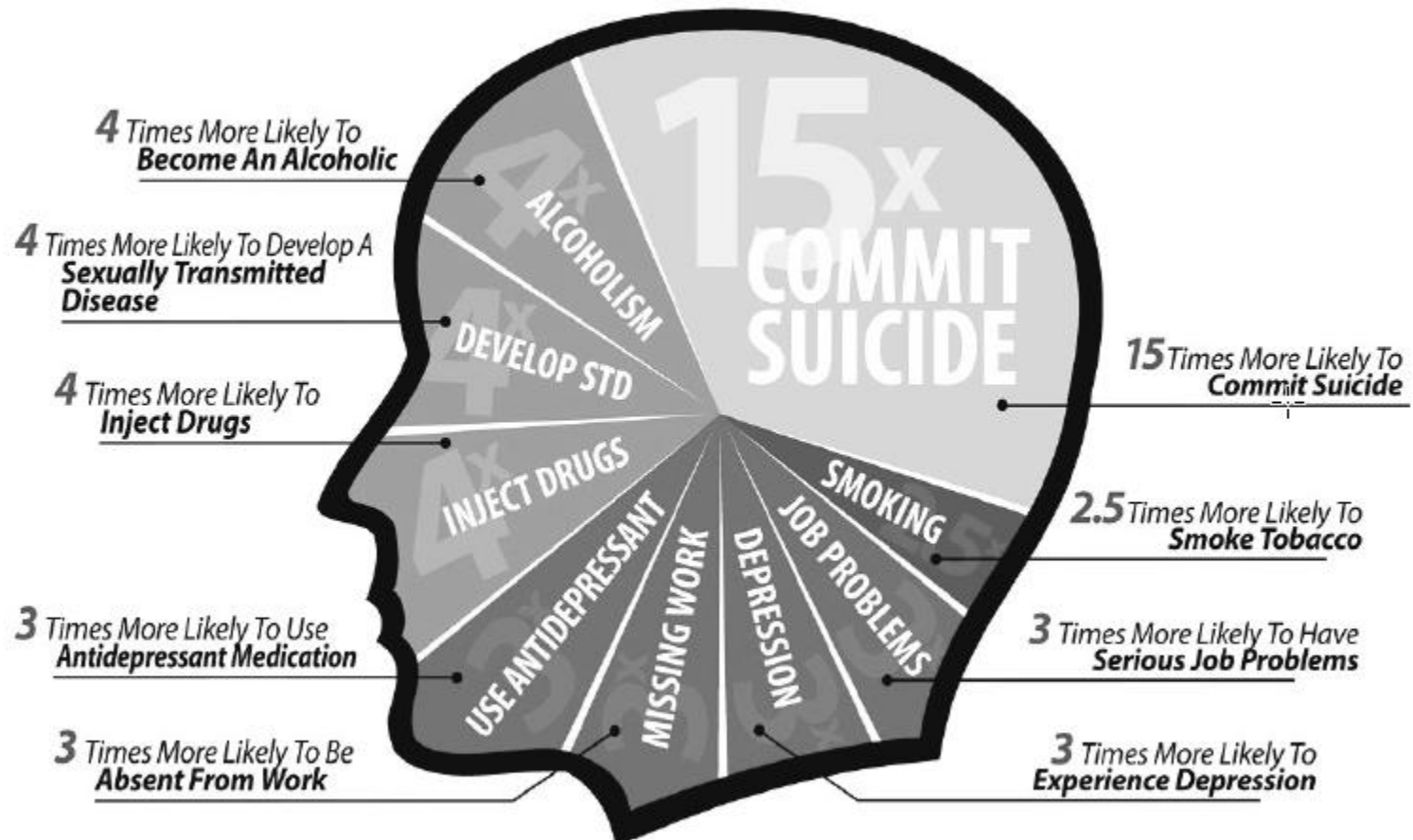


Figure 1

In Mears, C. L., *Reclaiming School in the Aftermath of Trauma: Advice Based on Experience*. Paigraive Macmillan, 2012



Top 10 risk factors for death in the USA

- ✓ smoking,
- ✓ severe obesity,
- ✓ physical inactivity,
- ✓ depression,
- ✓ suicide attempt,
- ✓ alcoholism,
- ✓ illicit drug use,
- ✓ injected drug use,
- ✓ 50+ sexual partners,
- ✓ history of STD



ACES can have lasting effects on....



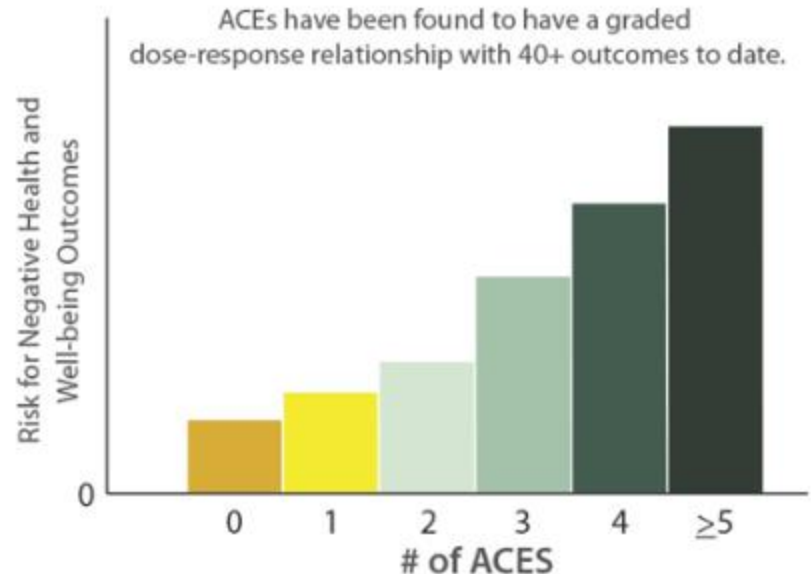
Health (obesity, diabetes, depression, suicide attempts, STDs, heart disease, cancer, stroke, COPD, broken bones)



Behaviors (smoking, alcoholism, drug use)



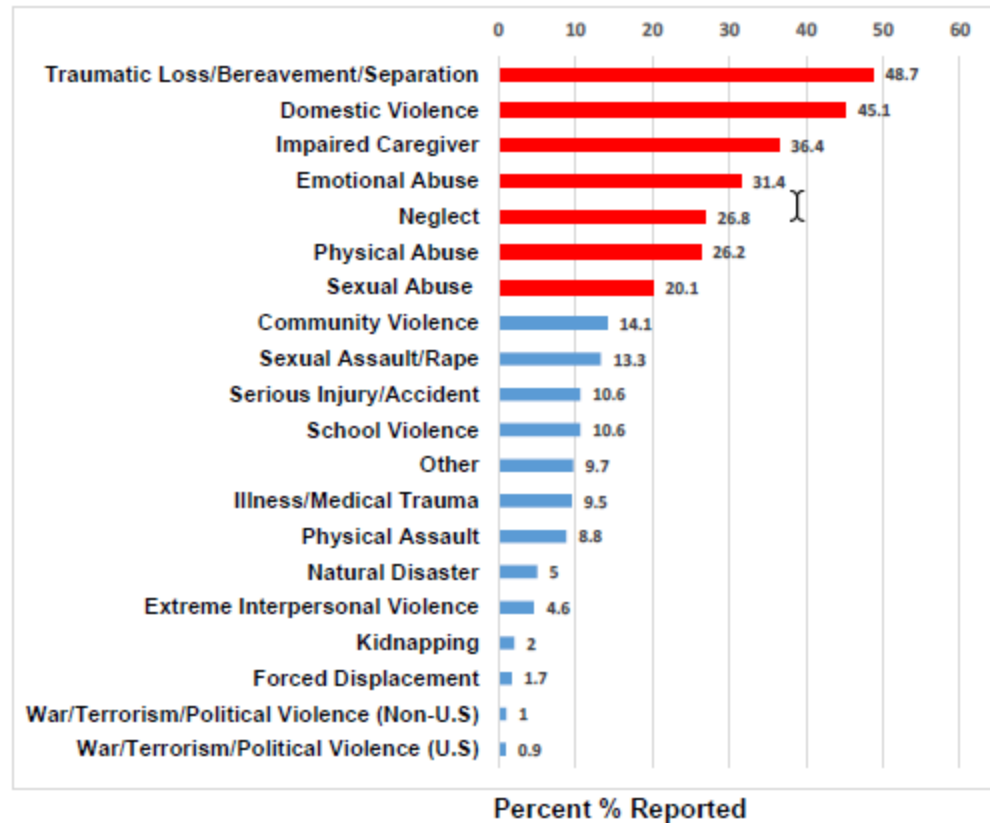
Life Potential (graduation rates, academic achievement, lost time from work)



*This pattern holds for the 40+ outcomes, but the exact risk values vary depending on the outcome.

The ACES are Among Many Childhood Traumas and Adversities Measured by the National Child Traumatic Stress Network N=10,991¹

- The original ACES (in red) are among the most commonly reported traumas in studies that look at additional traumas.
- Over 40% of the children and adolescents served by the NCTSN experienced 4 or more different types of trauma and adversity.

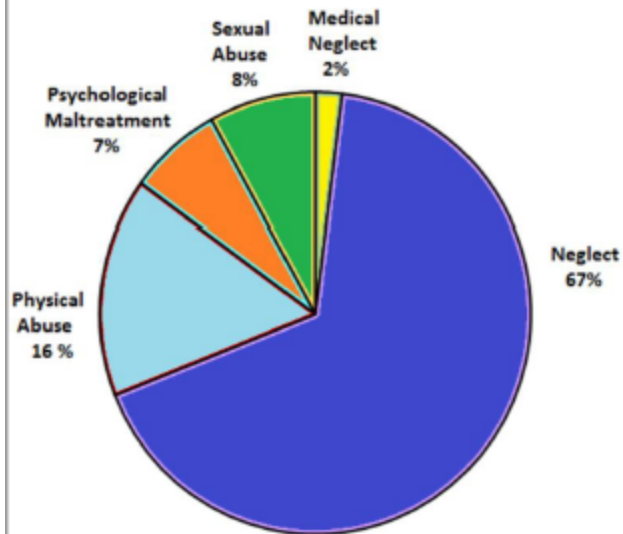


¹Pynoos et. al (2014). Psychological Trauma: Theory, Research, Practice and Policy. 6:S9-S13.

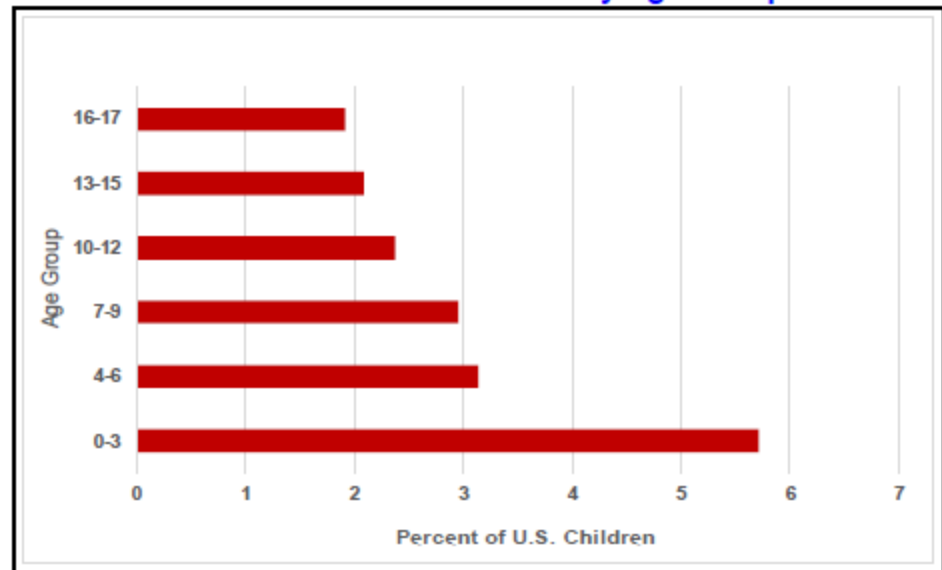
Rates of Maltreatment by Age¹

- Most maltreatment happens to younger children.
- Maltreatment has greater negative effects at younger ages.

Types of Child Maltreatment



Rates of Child Maltreatment by Age Group



¹Child Maltreatment 2012. Washington, DC: US Department of Health and Human Services; 2014.

ACES (Adverse Childhood Experiences)¹

- In this Narrative, ACES is used generically to refer to overlapping sets of traumatic and adverse childhood experiences and home environment factors that substantially increase a child's risk for serious, lifelong medical and mental illnesses.
- As the number of ACES increases, the negative outcome of interest (e.g., mental, medical, social, fiscal) increases in a graded (roughly stepwise) fashion.
- This cumulative “ACES-effect” occurs at multiple levels from biological markers of stress within a person to population-based markers of health such as rates of childhood asthma in a neighborhood.

¹<http://www.cdc.gov/violenceprevention/acestudy/prevalence.html>

How the ACES Work

Adverse Childhood Experiences

- Abuse and Neglect (e.g., psychological, physical, sexual)
- Household Dysfunction (e.g., domestic violence, substance abuse, mental illness)



Impact on Child Development

- Neurobiologic Effects (e.g., brain abnormalities, stress hormone dysregulation)
- Psychosocial Effects (e.g., poor attachment, poor socialization, poor self-efficacy)
- Health Risk Behaviors (e.g., smoking, obesity, substance abuse, promiscuity)



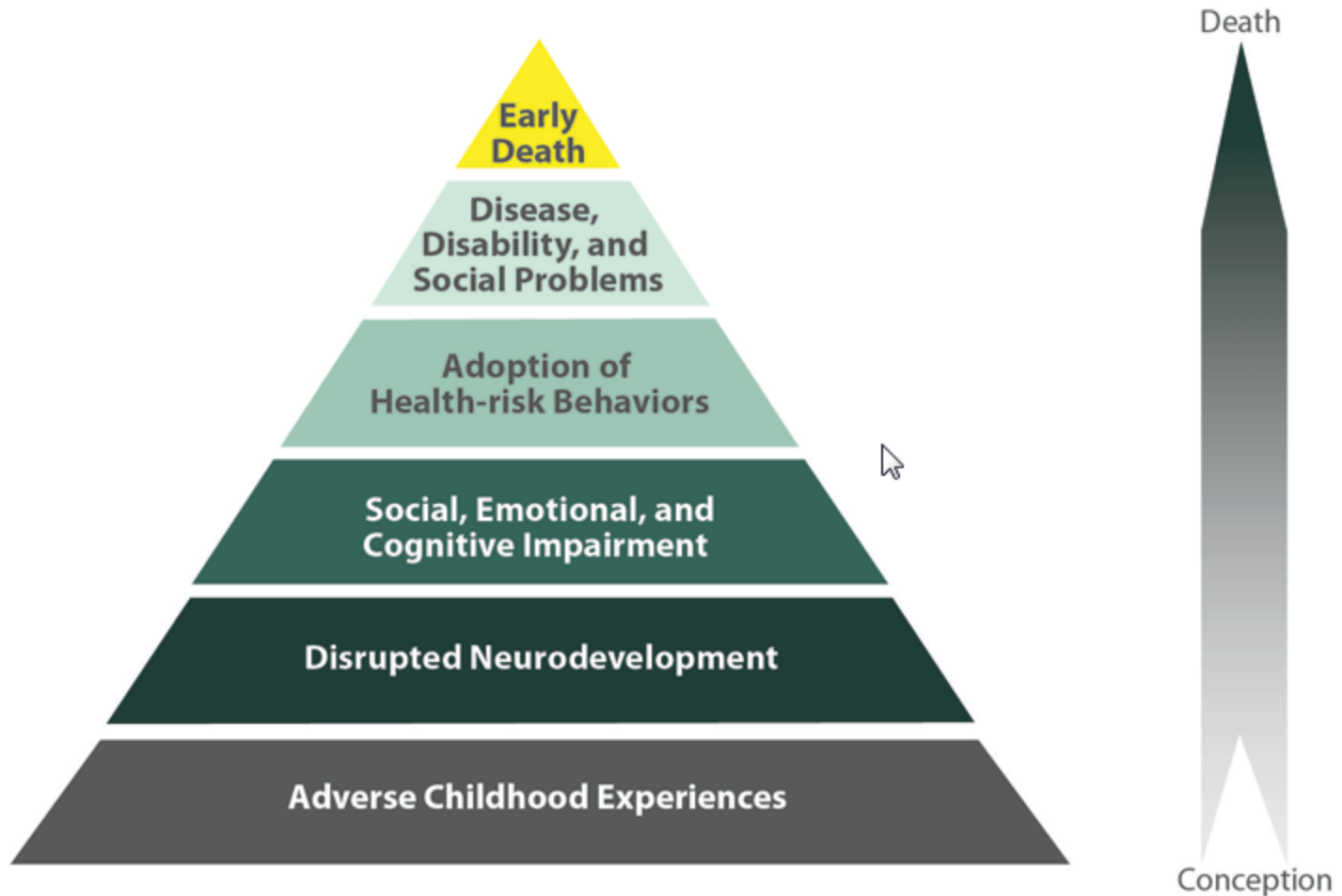
Long-Term Consequences

Disease and Disability

- Major Depression, Suicide, PTSD
- Drug and Alcohol Abuse
- Heart Disease
- Cancer
- Chronic Lung Disease
- Sexually Transmitted Diseases
- Intergenerational transmission of abuse

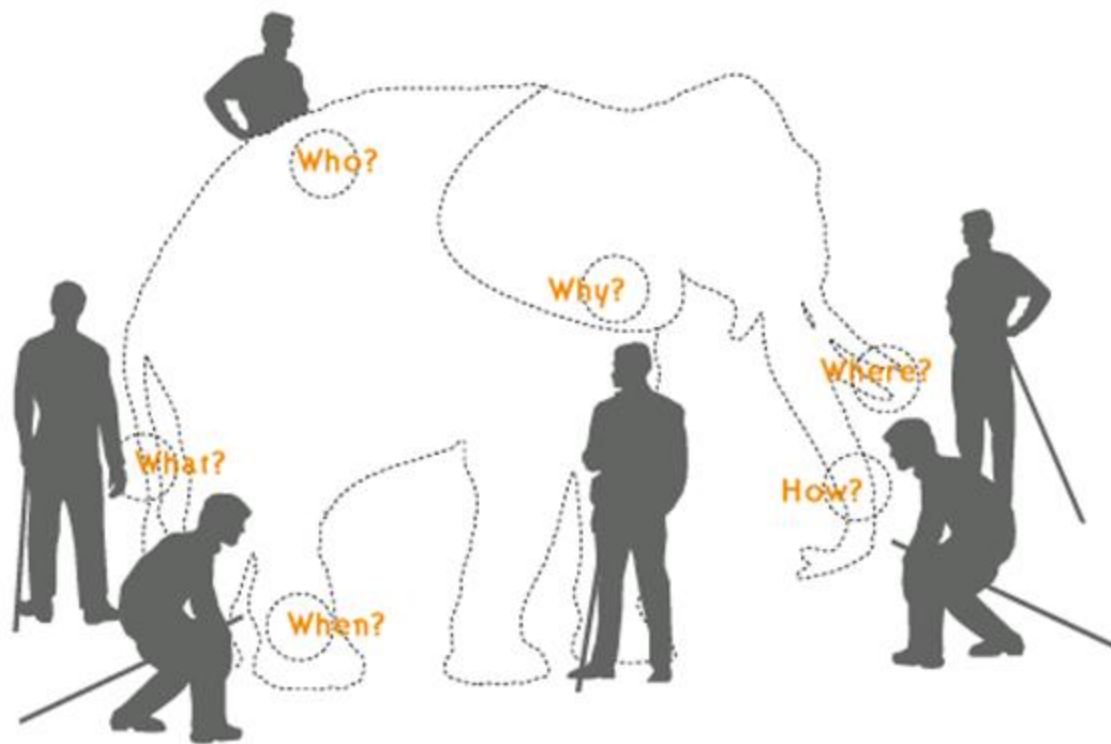
Social Problems

- Homelessness
- Prostitution
- Criminal Behavior
- Unemployment
- Parenting problems
- High utilization of health and social services
- Shortened Lifespan



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

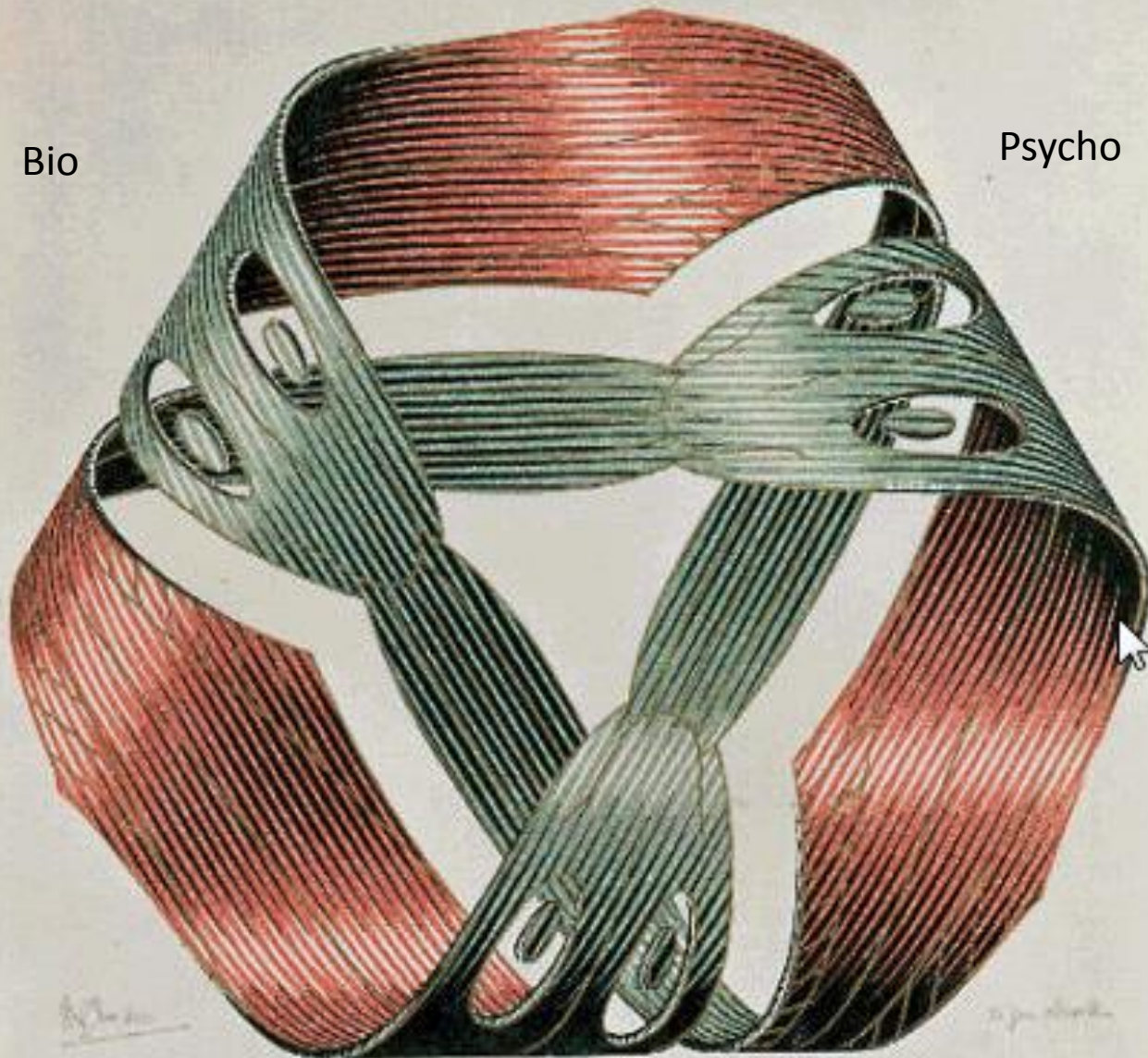




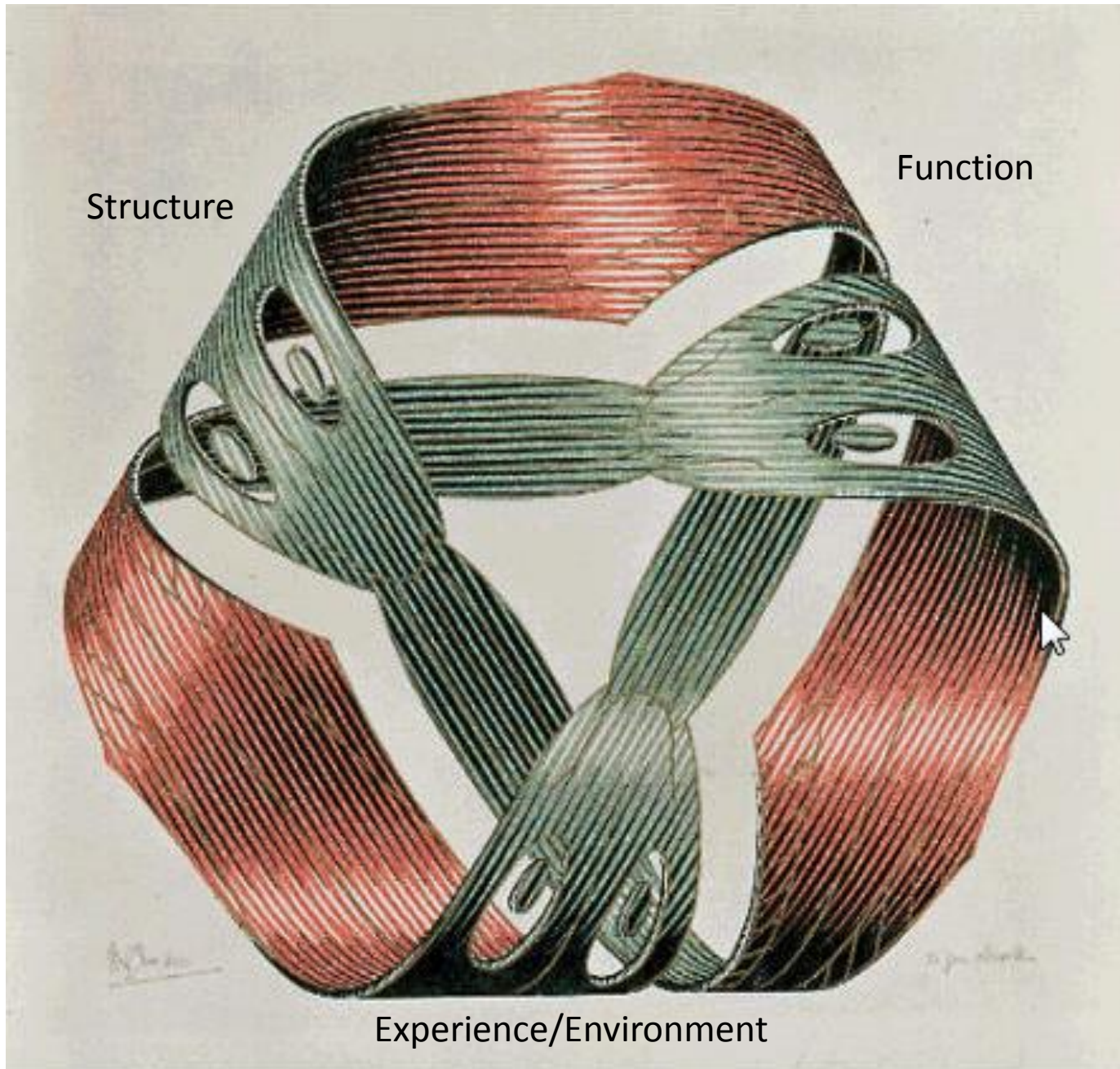
Development is an ongoing dynamic
and
The dynamic is always developing

Bio

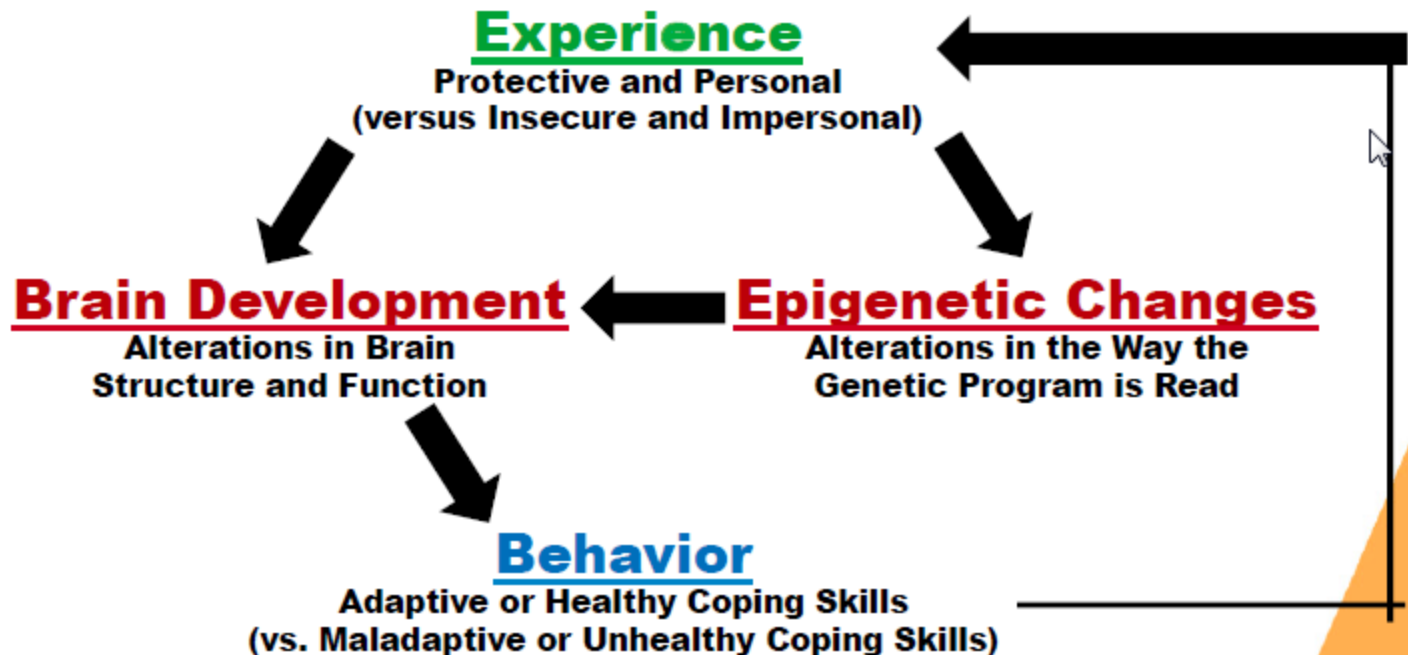
Psycho



Social



Development results from an on-going, re-iterative, and cumulative dance between **nurture** and **nature**



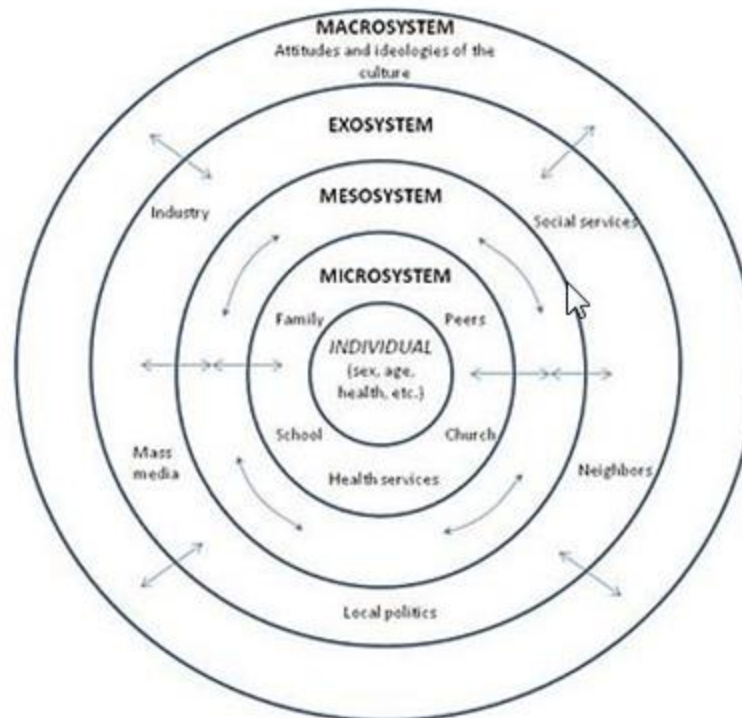


Illustration of Bronfenbrenner's ecological framework for human development

Core elements of positive developmental,
educational and therapeutic experiences – *i.e.*,
“trauma-informed” & developmentally respectful

- Relational (safe)
- Relevant (developmentally-matched)
- Repetitive (patterned)
- Rewarding (pleasurable)
- Rhythmic (resonant with biology)
- Respectful (child, family, culture)

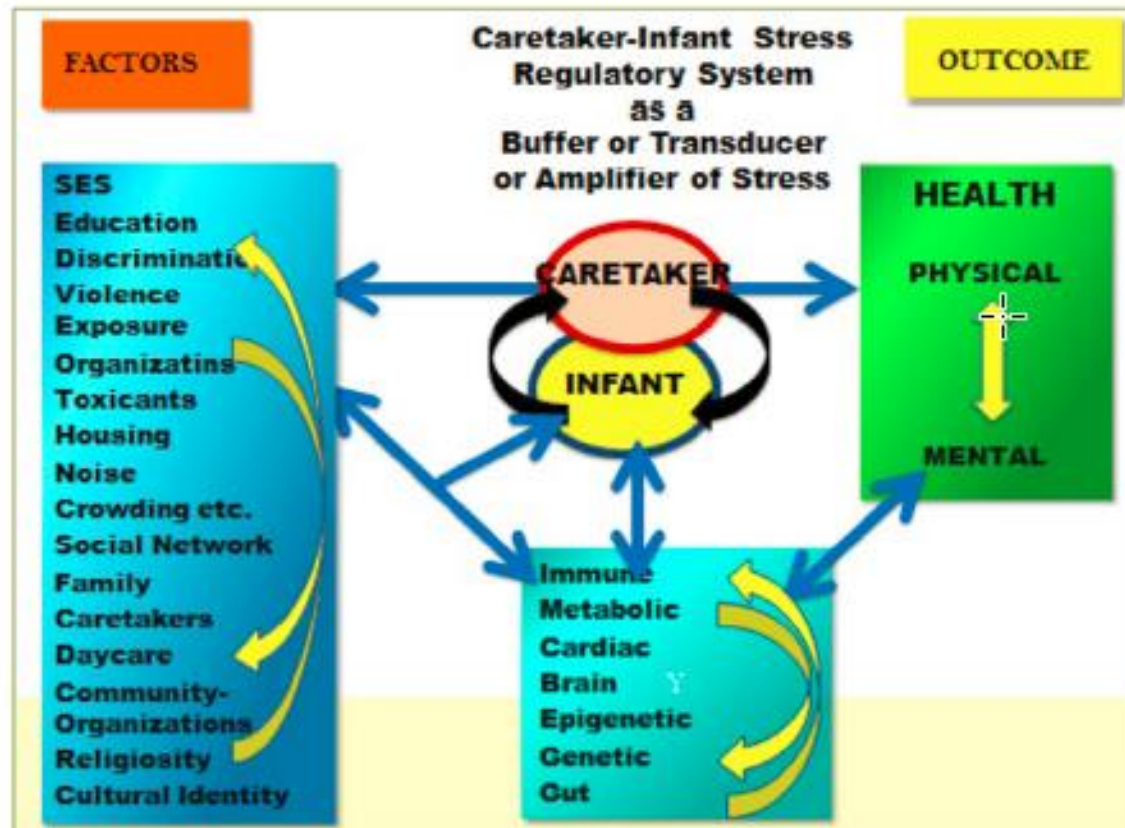


FIGURE 1 | On the left are some of the factors that affect physical and mental functioning to the right. In between are two distinct areas. The box at the bottom suggests some of the processes that mediate the effects of the factors on the left as they affect health outcomes. The figure in the middle is the caretaker offspring interactive system that in humans and many other mammals regulates the state of the infant. In this model the caretaker-offspring system can either buffer the offspring from the effects of factors on the left or transduce the effects of those factors to the offspring.

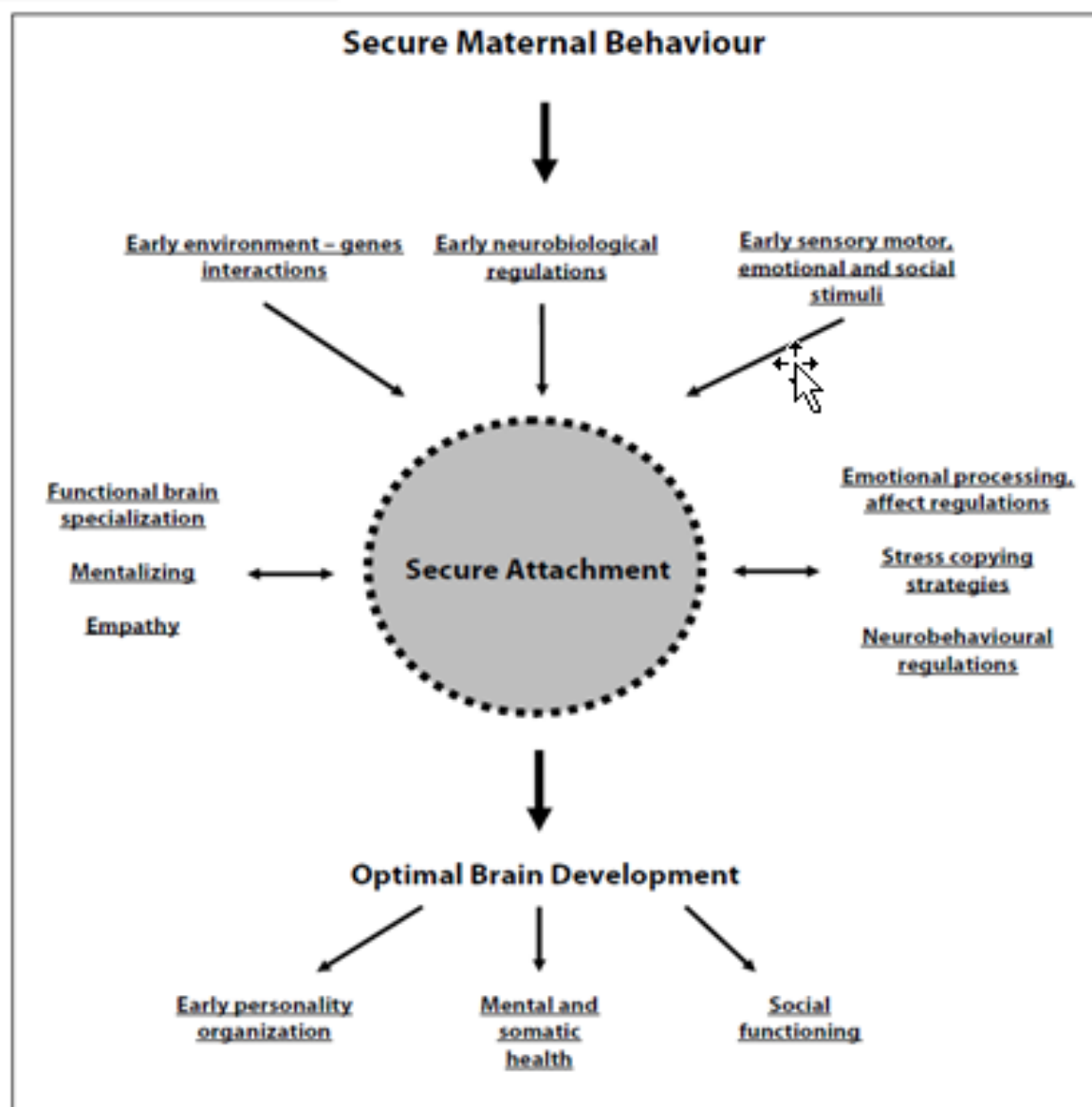


Fig. 1. Attachment and its importance for neurodevelopmental regulations.

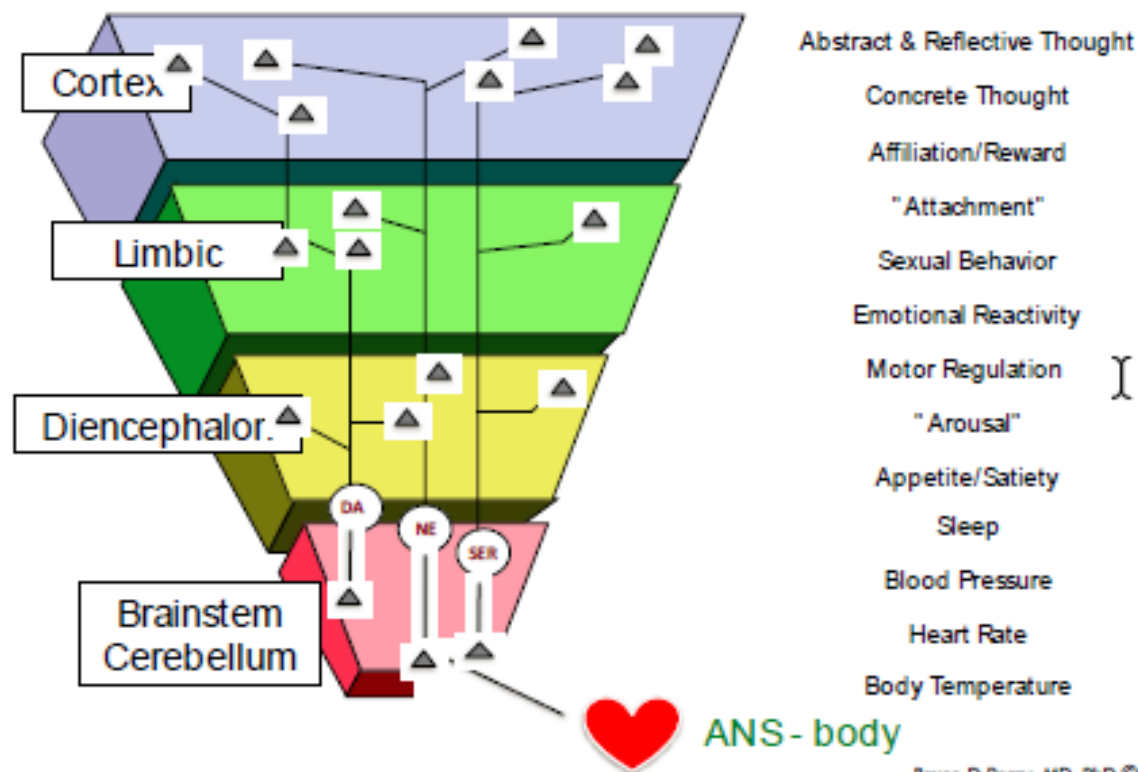
Sequential Neurodevelopment

age of Most active growth	'sensitive' brain area	Critical functions being organised	Primary developmental goal
0–9 months	Brainstem	Regulation of arousal, sleep and fear states	State regulation, primary attachment, flexible stress response, resilience
6 months–2 years	Diencephalon	Integration of multiple sensory inputs	Sensory integration, motor control, relational flexibility, attunement
1–4 years	Limbic system	Emotional states, social language, interpretation of nonverbal information	Emotional regulation, empathy, affiliation, tolerance
3–6 years	Cortex	Abstract cognitive functions, socio-emotional integration	Abstract reasoning, creativity, respect, moral and spiritual foundations

Literature Review —



a trauma-sensitive approach
for children aged 0–8 years



Bruce D Perry, MD, PhD © 2010-2015

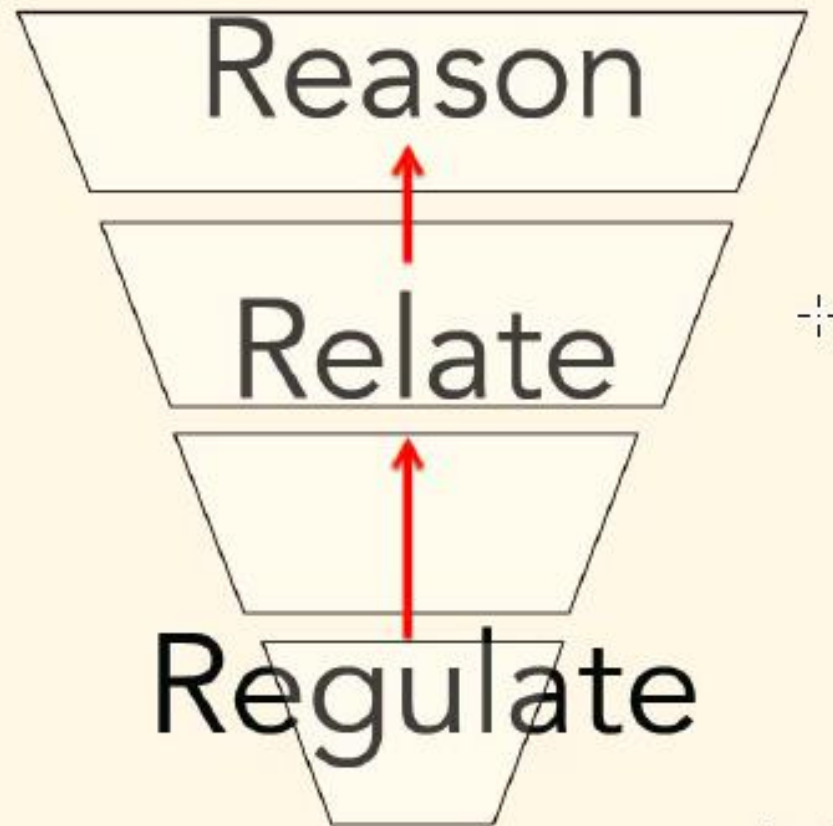
Figure 1. Hierarchy of brain organization and function.

The brain is organized in a hierarchy that develops in a sequential manner. Four developmentally distinct regions (brainstem, diencephalon, limbic, and cortical) are woven together by multiple neural networks. The monoamine (i.e., NE: norepinephrine- and DA: dopamine-containing) and other related (e.g., SER: serotonin-, ACH: acetylcholine-containing) systems originate in lower brain areas and have widespread impact on widely distributed "upstream" systems in the brain and the "downstream" systems of the body. These regulatory networks play a role in integrating, processing, and acting on incoming patterns of neural activity from the primary sensory networks (such as touch, vision, and sound that monitor the external environment), somatic networks (such as motor-vestibular, cardiovascular, and respiratory that monitor the internal environment) and cerebral networks (such as cortical modulating networks that monitor the brain's internal environment). This ongoing, dynamic input from the brain, body, and world is integrated, processed, and acted on to help regulate the individual.

Functional Brain Map Key (Part C)

Abstract Cognition	Math/ Symbolic Cognition	Performance	Modulate Reactivity/ Impulsivity	Verbal	Values/ Beliefs/ Morality
Speech/ Articulation	Language/ Communication	Somato/ Motorsensory Integration	Sense Time/ Delay Gratification	Self Awareness/ Self Image	Concrete Cognition
Share/ Relational	Attunement	Reward	Affect Regulation/ Mood	Psycho-sexual	Short-term memory/ Learning
	Neuroendocrine / Hypothalamic	Dissociative Continuum	Arousal Continuum	Primary Sensory Integration	
	Fine Motor Skills	Feeding/ Appetite	Sleep	Coordination/ Large Motor Functioning	
		Suck/Swallow/ Gag	Attention/ Tracking		
		Temperature regulation/ Metabolism	Extraocular Eye Movements		
		Cardiovascular	Autonomic Regulation		

Sequence of Engagement



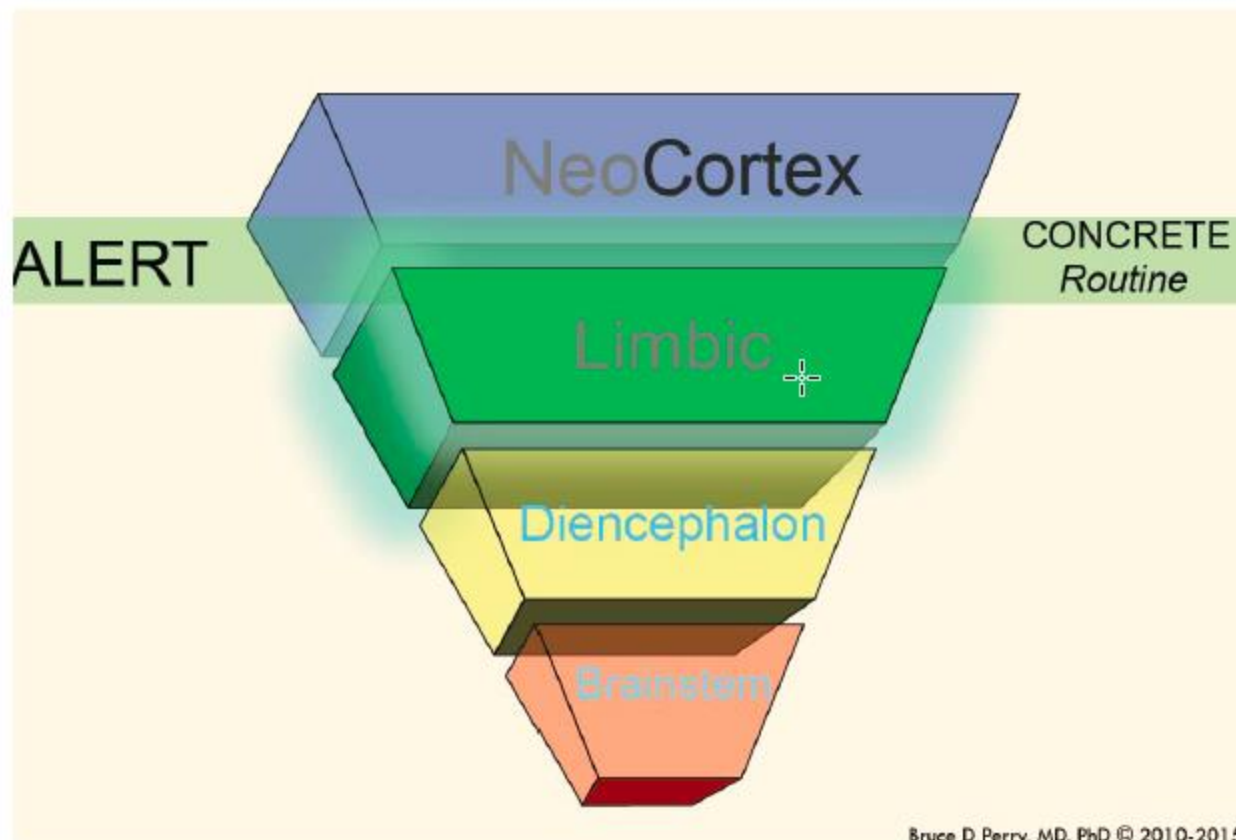


Figure 8b

When in the alert state, the individual will be externally focused and use existing problem-solving strategies. In this state, active-working memory and short term memory allow learning of new cognitive concepts.

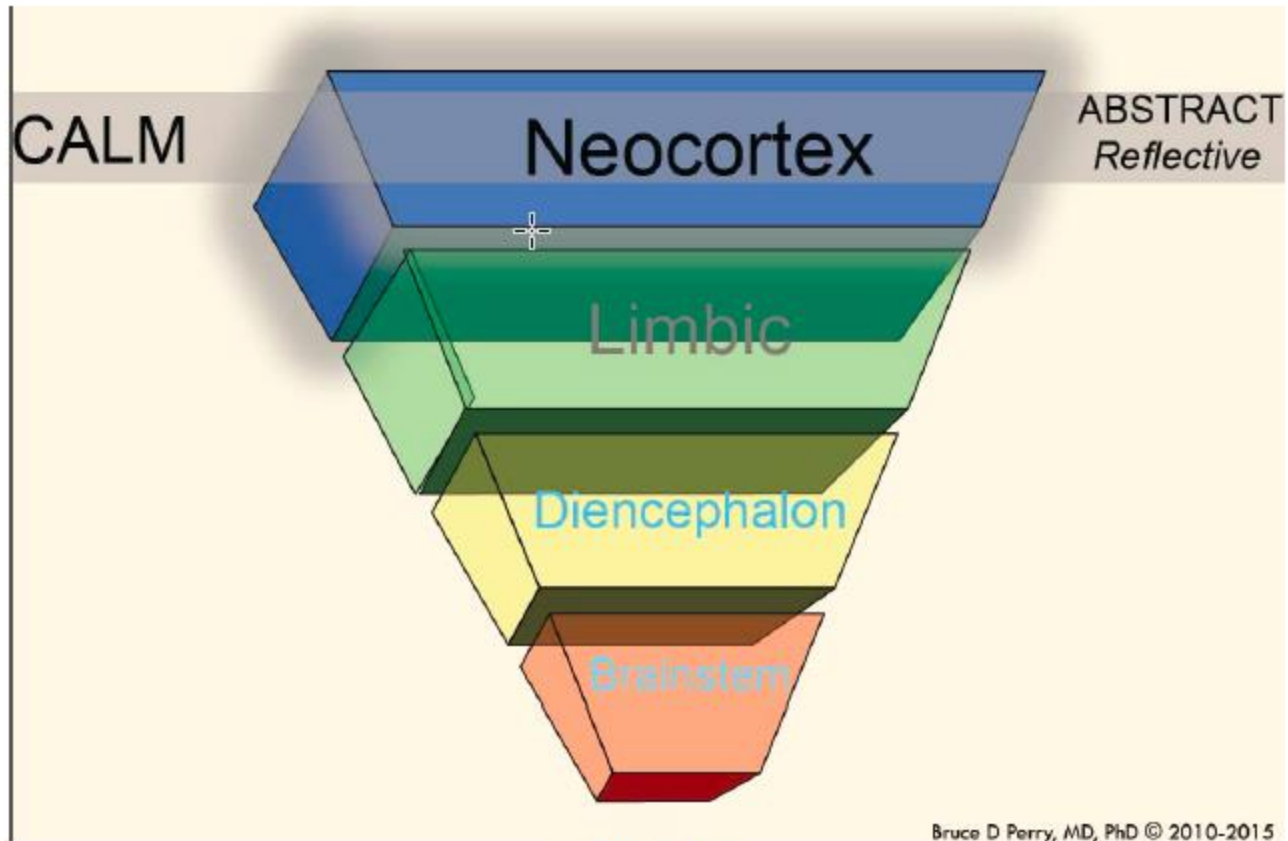


Figure 8a

When calm, an individual has access to systems that allow reflection and abstract thinking. In this state, the individual can take previously learned experience, reflect on it, and make “new” connections between two existing ideas, concepts, experiences etc. It is in this reflective state that we are most creative, innovative, and “future oriented.”

SUMMARY OF FEATURES OF BRAIN DEVELOPMENT AND ATTACHMENT

The brain is organised and matures in a hierarchical fashion from primitive to complex.

Neural development is use dependent. Repetitive experiences result in the development of neural pathways and the function of key structures in the brain.

Reliable, consistent caregiving contributes to the developing child's capacity to regulate arousal.

Trauma and neglect contribute to disorganisation and an inability to regulate arousal.

The limbic system is the early warning system for the brain and 'remembers' information it associates with threat. Because higher order cognitive functions are not involved in the threat response, the brain responds with alarm if it picks up signals that resemble the traumatic information.

The fight, flight and freeze responses in children are the activation of the threat response but can be mistaken for a range of behavioural problems.

Provision of a safe environment, attuned, reliable and consistent care and a patterned, repetitive response is the best approach to optimising children's development.

The first three years are a particularly sensitive time for brain development.

Literature Review —

a trauma-sensitive approach
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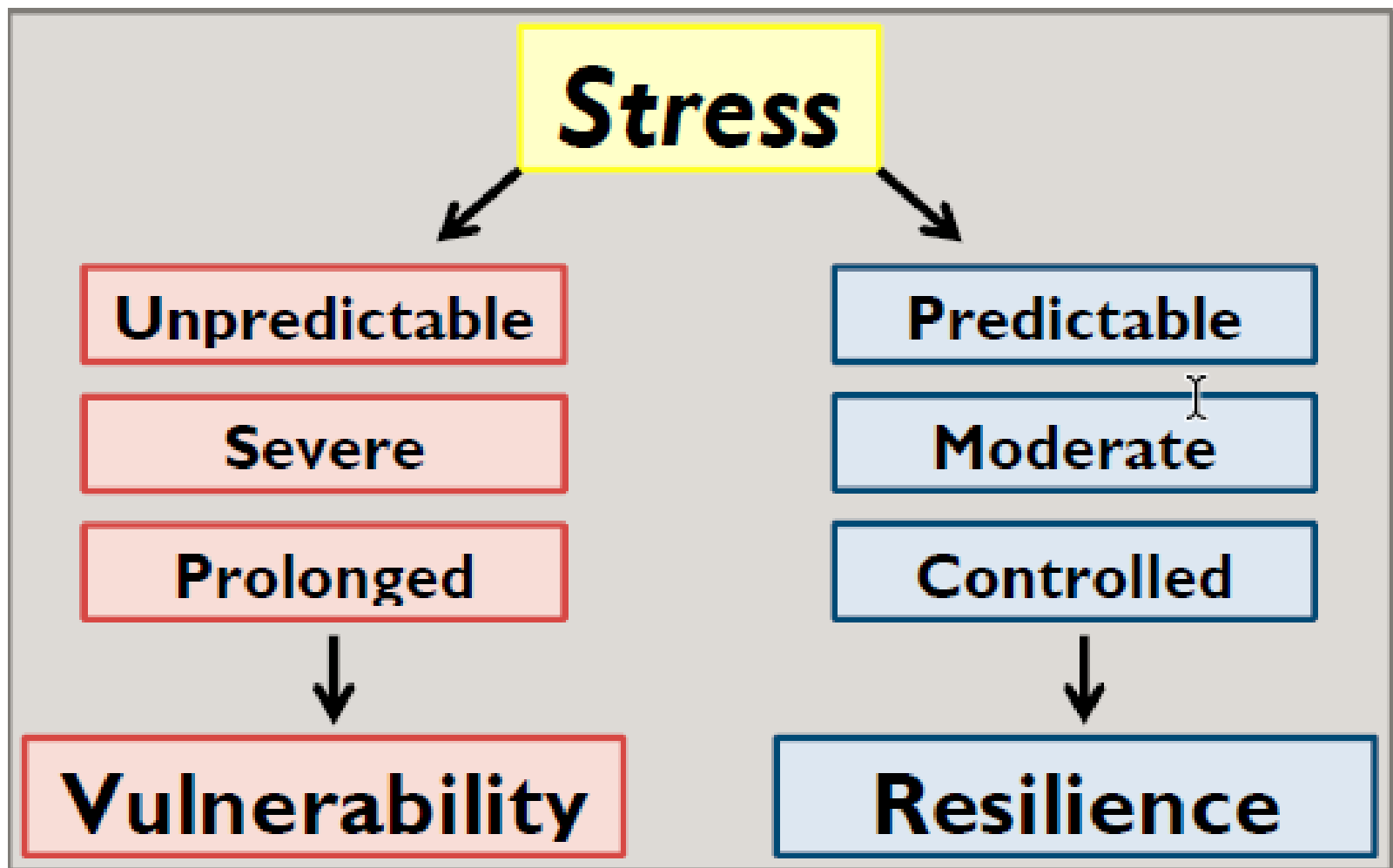


Figure 5: The Pattern of Stress has a Role in Determining Risk or Resilience

Responses to Stress, Distress, Trauma

- **Heterogeneity of response patterns**
- Adaptive changes in *cognition*
- Adaptive changes in *affects*
- Adaptive changes in *behavior*
- Adaptive changes in *neurophysiology*
- Adaptive changes in *physiology*

Defining **Adversity** or **Stress**

- **Toxic** Stress

- Long lasting, frequent, or strong intensity
- More extreme precipitants of childhood stress (**ACEs**)
 - Physical, sexual, emotional abuse
 - Physical, emotional neglect
 - Household dysfunction
- **Insufficient social-emotional buffering**
(Deficient levels of emotion coaching, re-processing, reassurance and support)
- Potentially permanent changes with long-term consequences
 - **Epigenetics** (there are life long / intergenerational changes in how the genetic program is turned **ON** or **OFF**)
 - **Brain architecture** (the mediators of stress impact upon the mechanisms of brain development / **connectivity**)

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

STRESS IN CHILDHOOD

Three Types

Stress is a mental, physical, or biochemical response to a perceived threat or demand. Stress is a natural and inevitable part of childhood. But the *type* of stress can make a difference in the impact on a child's brain and body, as well as potential effects that can last a lifetime.

POSITIVE STRESS

Normal, typical childhood experiences

Common Stressors

Child care drop off and pick up



Playground injuries



Losing a game

Buffering

No buffering support necessary



Brain & Body

Temporary, mild elevation in stress hormones



Brief increase in heart rate and blood pressure

Long-term

Increased resiliency and confidence



Coping skills development



Common Stressors

Buffering

Brain & Body

Long-term

TOLERABLE STRESS

More complicated, scary, challenging, and long-lasting



Natural or manmade tragedy

Parents' divorce

Poverty



Death of a loved one



Caring adult buffers stress

More severe, continuing cardiovascular and hormonal response



Adaption and recovery likely, but potential for lasting physical or emotional damage



TOXIC STRESS

Severe, long-lasting, uncontrollable, and/or frequent stress

Common Stressors



Physical, sexual, or mental abuse



Neglect

Exposure to violence



Severe economic hardship

Buffering



No adult buffers child from stress

Brain & Body



Prolonged activation of stress response system

Disrupted development of brain circuits

Immune system depression



Long-term

Possible lifelong changes, such as:



Heart disease

Alcoholism



Memory, learning, multitasking difficulties

Anxiety/depression

Cancer



Sources:

<http://www.nlm.nih.gov/health/publications/stress/index.shtml>

http://developingchild.harvard.edu/topics/science_of_early_childhood/toxic_stress_response

http://www.cdc.gov/npc/pub-res/pdf/childhood_stress.pdf

http://developingchild.harvard.edu/resources/reports_and_working_papers/working_papers/wp3

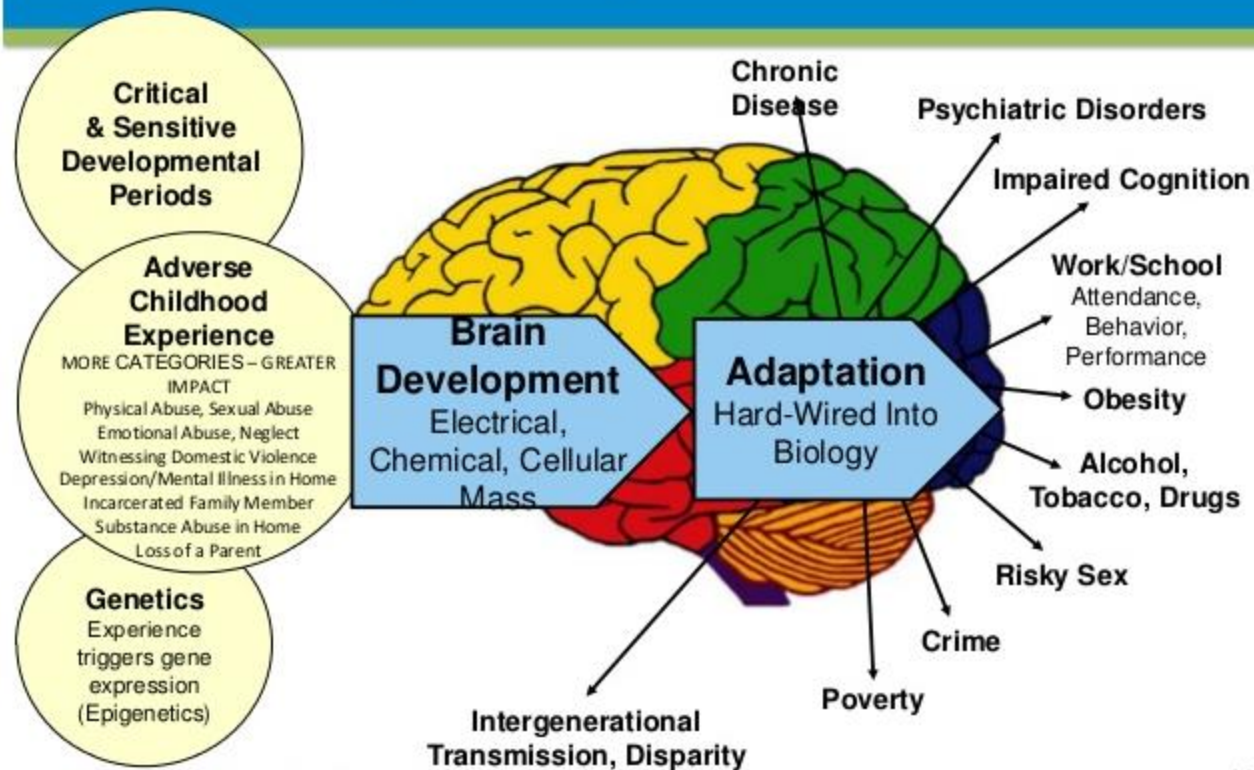


Positive Stress	Tolerable Stress	Toxic Stress
<ul style="list-style-type: none"> ▪ Normal and essential part of healthy development ▪ Brief increases in heart rate and blood pressure ▪ Mild elevations in hormonal levels ▪ <i>Example:</i> Final exam Playoff game. 	<ul style="list-style-type: none"> ▪ Body's alert systems activated to a greater degree ▪ Activation is time-limited and buffered by caring adult relationships. ▪ Brain and organs recover ▪ <i>Example:</i> Death of a grandparent, car accident. 	<ul style="list-style-type: none"> ▪ Occurs with strong, frequent or prolonged adversity ▪ Disrupts brain architecture and other organ systems ▪ Increased risk of stress-related disease and cognitive impairment ▪ <i>Example:</i> abuse, neglect, caregiver substance dependence or mental illness

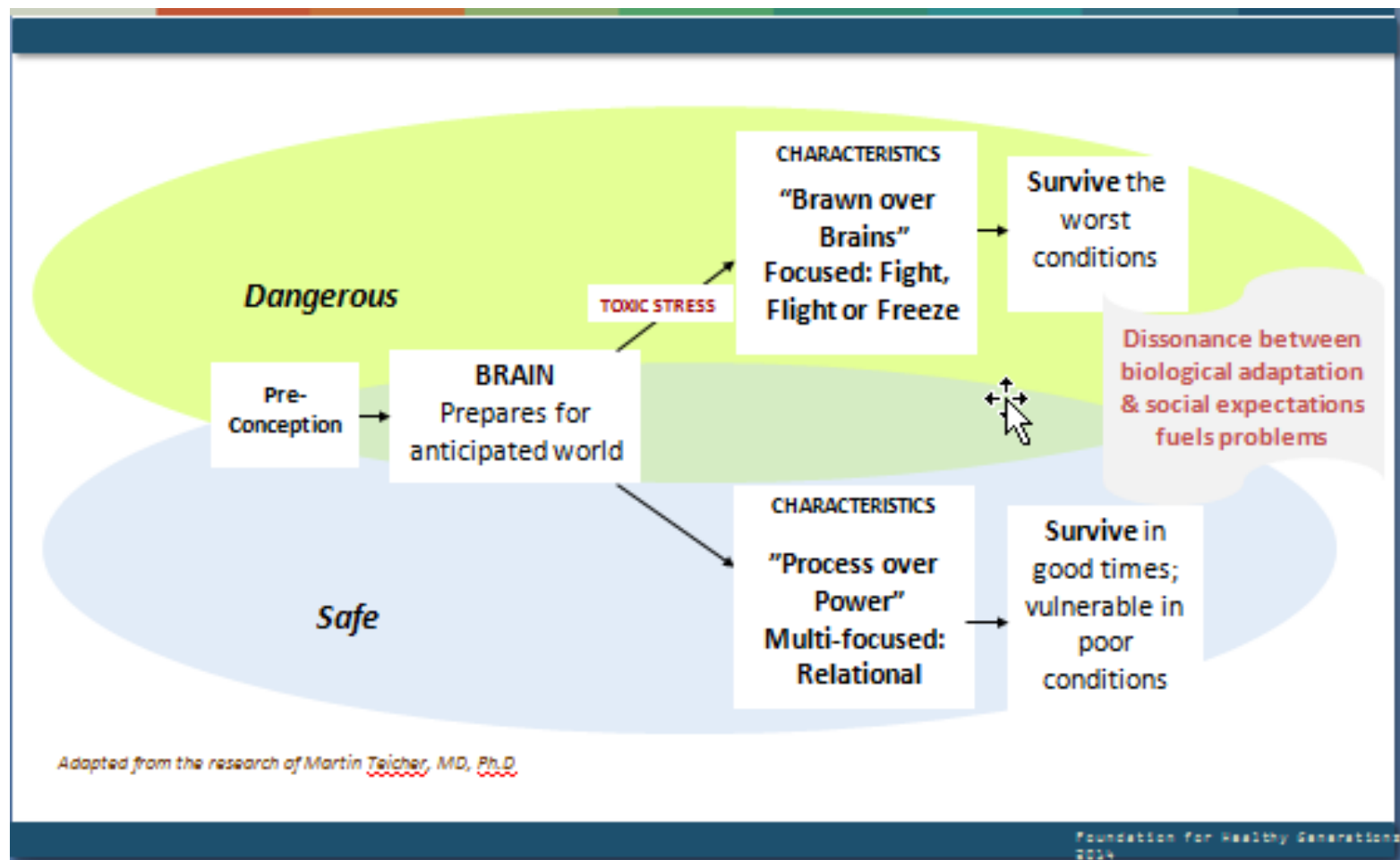
**Intense, prolonged, repeated, unaddressed;
Child or family vulnerabilities, limited supports, devel. delays**

**Social-Emotional buffering, Learned skills, Parent/Child
Resilience, Early Detection, Effective Intervention**

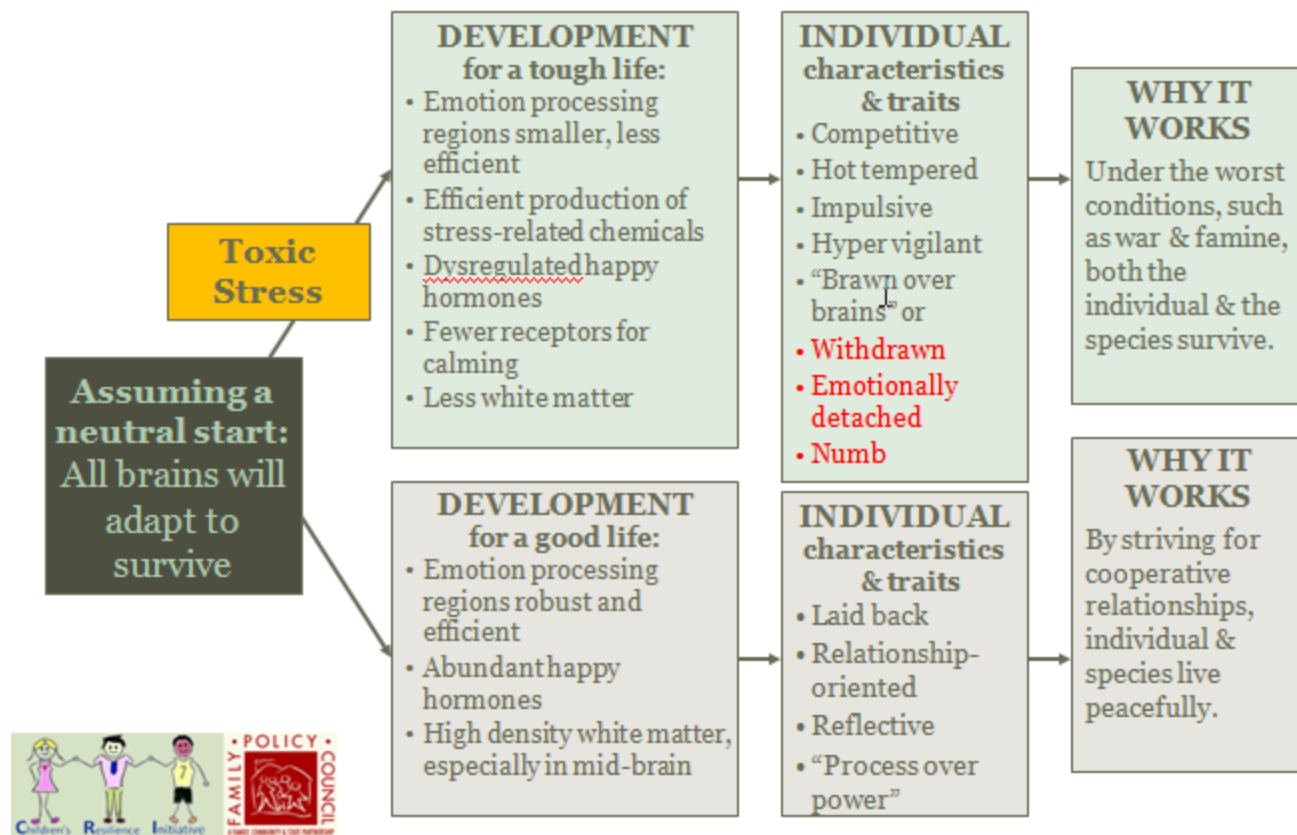
Lifespan Impacts of ACEs



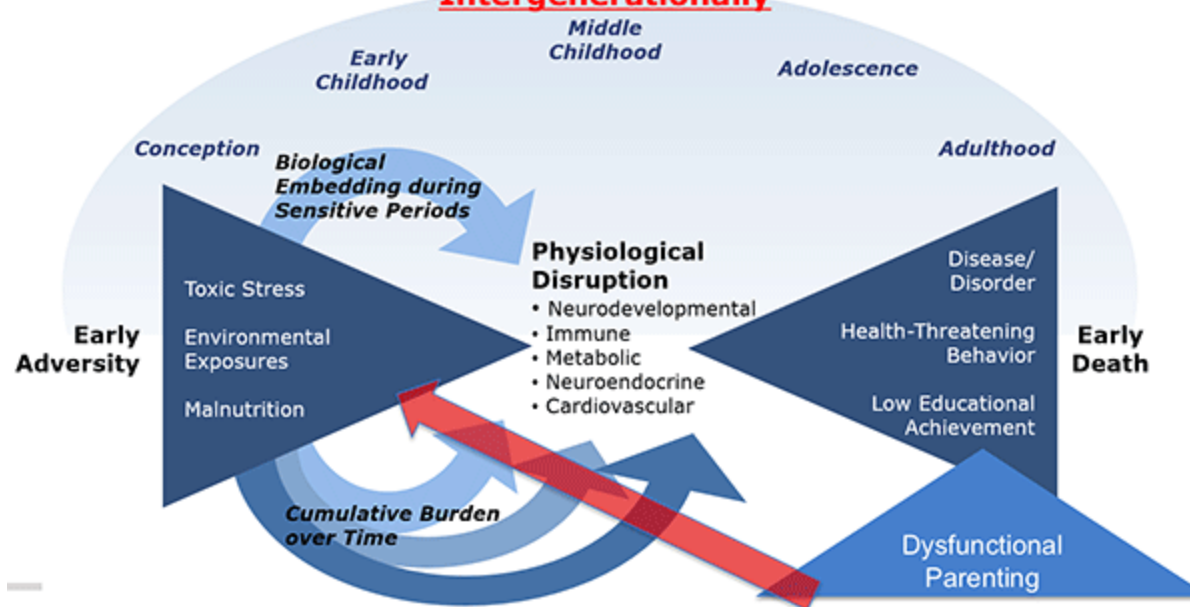
Source: Family Policy Council, 2012



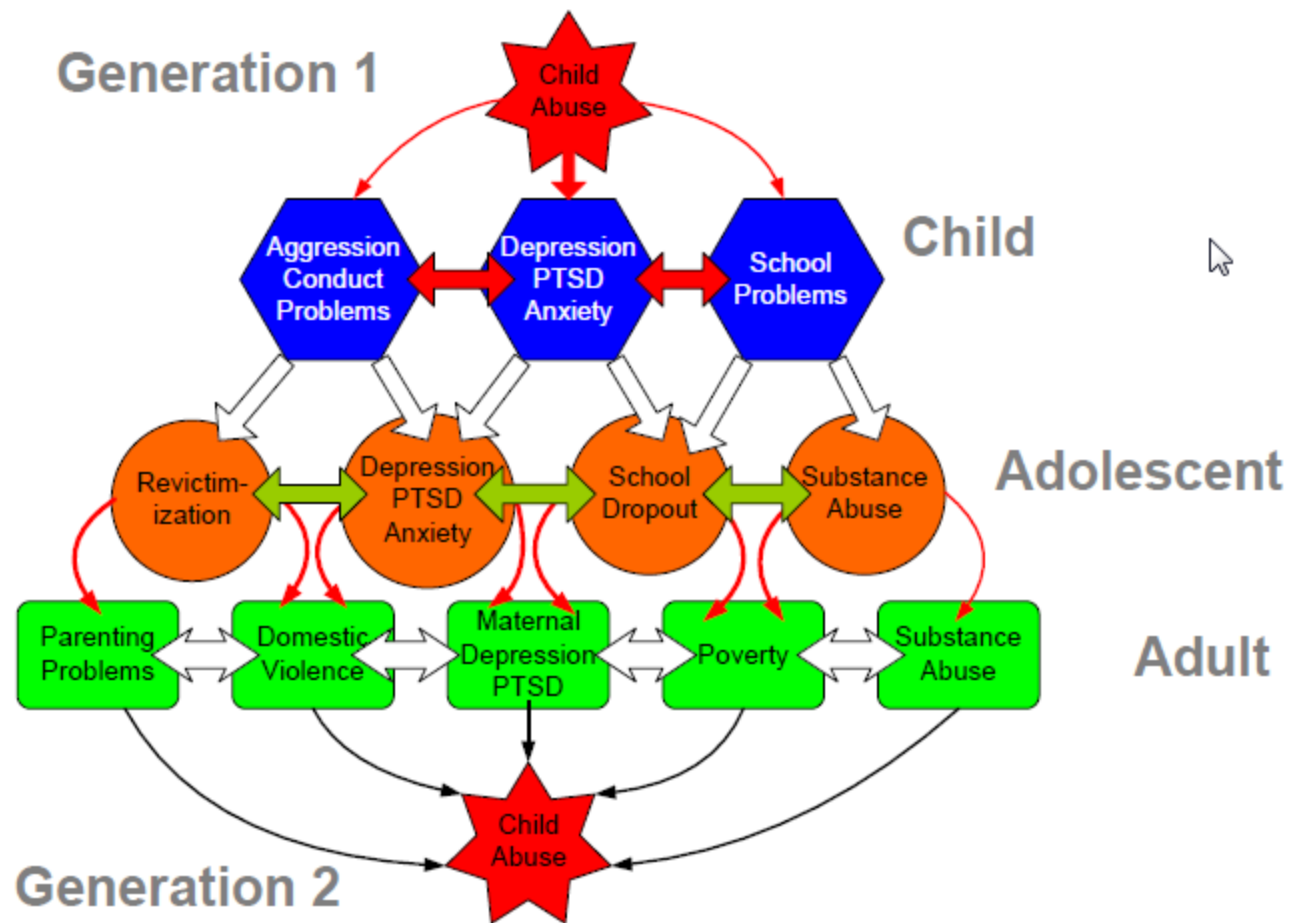
Brains to Fit the Life We'll Live



**The Childhood Roots of Health and Parenting Disparities:
How Adversity is Built Into the Body and Transmitted
Intergenerationally**



How ACES Cross Generations



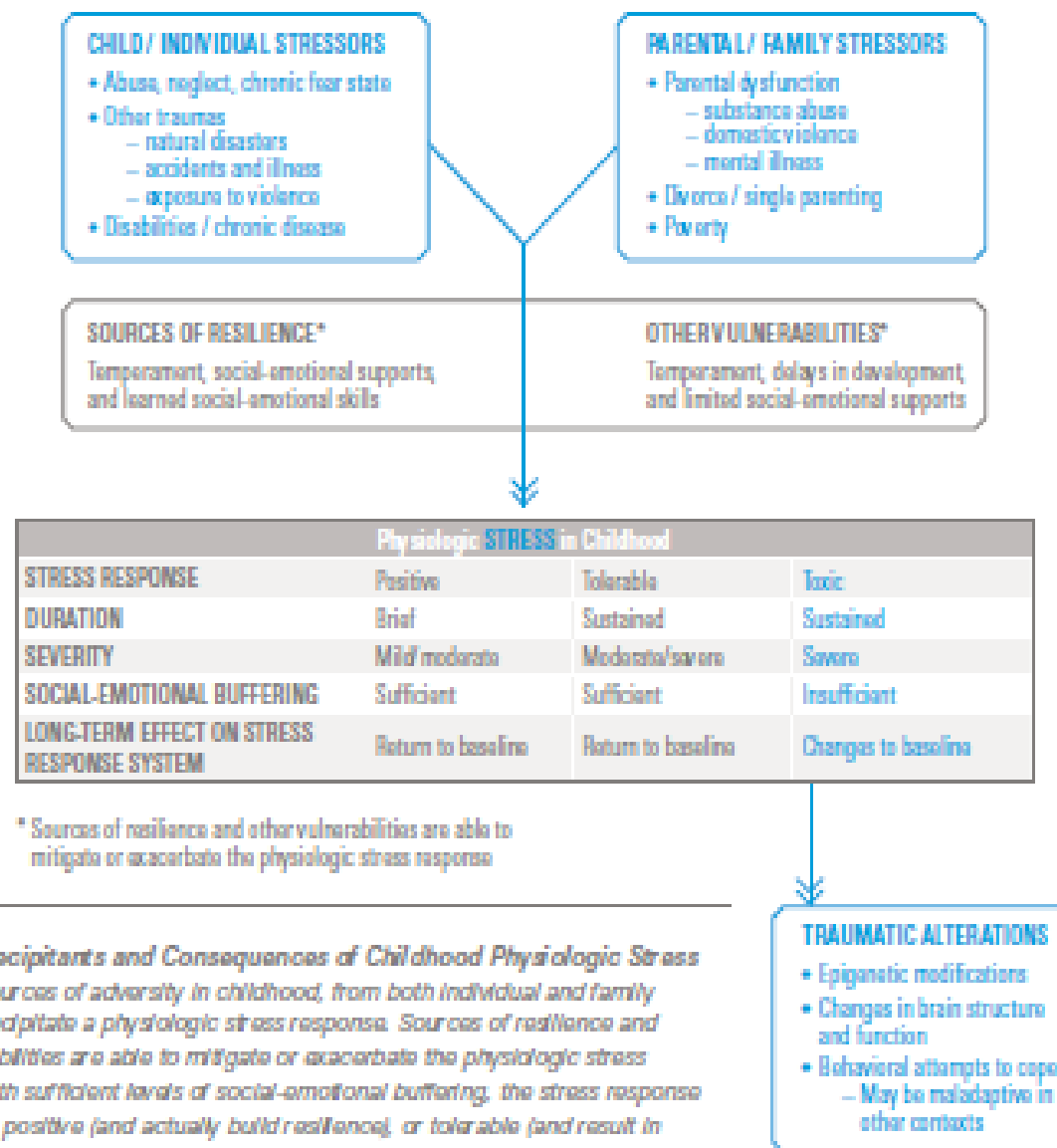


Figure 2 Precipitants and Consequences of Childhood Physiologic Stress
 Significant sources of adversity in childhood, from both individual and family stressors, precipitate a physiologic stress response. Sources of resilience and other vulnerabilities are able to mitigate or exacerbate the physiologic stress response. With sufficient levels of social-emotional buffering, the stress response can be either positive (and actually build resilience), or tolerable (and result in no sustained changes). With insufficient levels of social-emotional buffering, the physiologic stress response is sustained or severe and becomes toxic, resulting in potentially permanent alterations to the epigenome, brain structure, and behavior. These traumatic alterations may actually be adaptive in threatening or hostile environments, but they are often maladaptive in other, less threatening contexts.

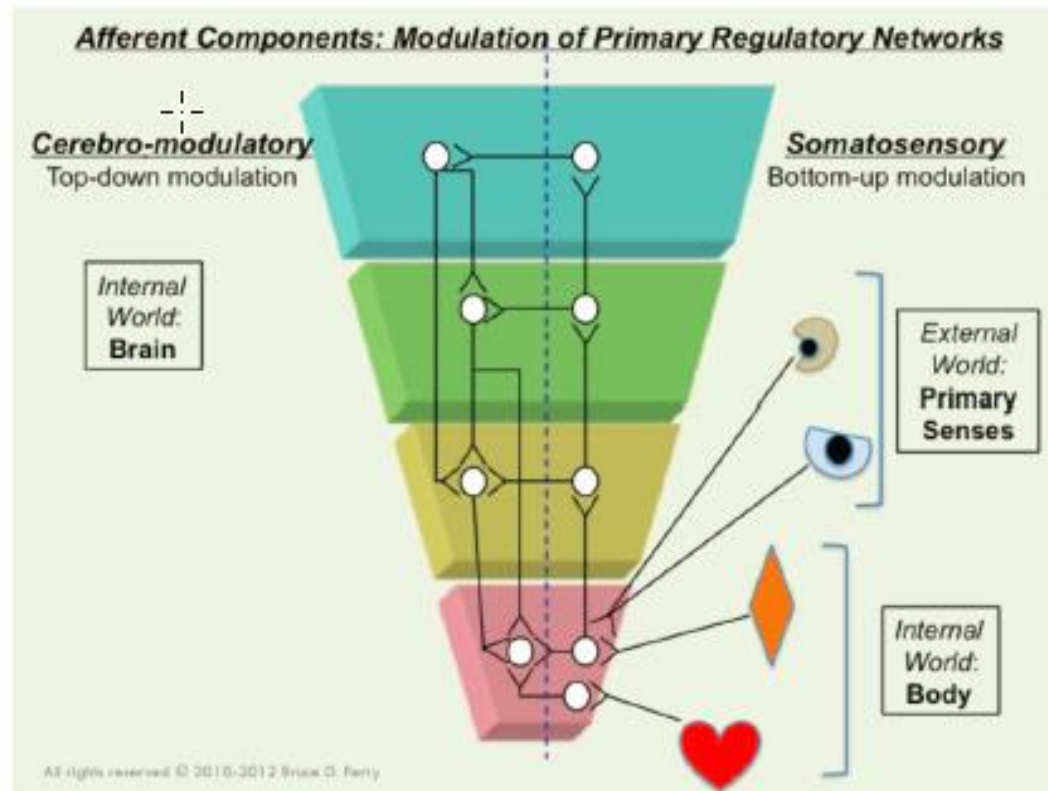


Figure 2: Modulation of regulatory networks

This schematic illustrates the afferent (incoming) neural networks that provide input to the set of regulatory neural networks that are in the lower regions of the brain (e.g., the norepinephrine, dopamine, serotonin, and acetylcholine-containing networks).⁶ The crucial regulatory neural networks involved in the stress response (and multiple other functions) are, themselves, modulated through patterned, repetitive and rhythmic input from both “bottom-up” (i.e., somatosensory) as well as “top-down” (i.e., cerebro-modulatory) systems. The brain processes (and acts) on incoming input at multiple levels; while the brain is essentially an open and interactive system, this multilevel process of sensing, processing, and acting on the world/environment basically “begins” at the site of initial input of sensory, somatic or cerebral input to the lower areas of the brain. Incoming modulatory input provides a direct route to these crucial regulatory neural networks and can influence the organization, re-organization, and functional status of these key systems. These regulatory networks (NE, DA, SER) can be altered and sensitized by prolonged or chaotic patterns of activation.⁷

Impact of Trauma

- ▣ Activation of survival responses:
 - Fight
 - Flight
 - Freeze
 - Submit
- ▣ Shutting down of non-essential tasks.
- ▣ Rational thought is less possible at this time.

(Hopper, 2009)



Impact of Trauma

- ▣ Prolonged exposure to trauma and/or repetitive traumatic events MAY:
 - Cause an individual's natural alarm system to no longer function as it should.
 - Create emotional and physical responses to stress.
 - Result in emotional numbing and psychological avoidance.
 - Affect an individual's sense of safety.
 - Diminish an individual's capacity to trust others

(Hopper, 2009)

RESPONSES to threat – the AROUSAL CONTINUUM					
threat RESPONSE CONTINUUM	CaLM	arousAL	alArM	fear	teRROR
Hyperarousal	<p>The 'fight, flight' reaction. The activation of the limbic system and the perception of degree of threat will determine how aroused the child becomes.</p> <p>When the brain perceives a serious threat the child's response moves further along the arousal continuum, with increased focus on survival and decreased cognitive capacity. The more primitive parts of the brain drive the process and the child's subjective experience moves along the continuum from fear to terror.</p> <p>Arousal behaviours can look like agitation, hyperactivity, defiance, aggression.</p>				
HYPERAROUSAL CONTINUUM	rest	Vigilance	resistance (CRYING)	defiance (tanTRUMS)	aggression
Dissociation	<p>Sometimes called the 'freeze' response. This means a shutting down, a feeling of detachment or of being removed from the event and watching from a distance. The intensity of dissociation varies depending on the duration of the event and intensity of fear. From the outside, dissociative children may look like they are simply concentrating, day-dreaming or detached.</p>				
dissociative CONTINUUM	rest	avoidance	COMPLIANCE (robotic/ detached)	dissociation fetal ROCKING	fainting

Source: Adapted from Child Trauma Academy, 2006, Lesson 2: pp.1–5.

Literature Review —



a trauma-sensitive approach
for children aged 0-8 years

Funded by the Australian Government Department of Families, Community Services and Indigenous Affairs

Annual Research Review: Enduring neurobiological effects of childhood abuse and neglect

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Background: Childhood maltreatment is the most important preventable cause of psychopathology accounting for about 45% of the population attributable risk for childhood onset psychiatric disorders. A key breakthrough has been the discovery that maltreatment alters trajectories of brain development. **Methods:** This review aims to synthesize neuroimaging findings in children who experienced caregiver neglect as well as from studies in children, adolescents and adults who experienced physical, sexual and emotional abuse. In doing so, we provide preliminary answers to questions regarding the importance of type and timing of exposure, gender differences, reversibility and the relationship between brain changes and psychopathology. We also discuss whether these changes represent adaptive modifications or stress-induced damage. **Results:** Parental verbal abuse, witnessing domestic violence and sexual abuse appear to specifically target brain regions (auditory, visual and somatosensory cortex) and pathways that process and convey the aversive experience. Maltreatment is associated with reliable morphological alterations in anterior cingulate, dorsal lateral prefrontal and orbitofrontal cortex, corpus callosum and adult hippocampus, and with enhanced amygdala response to emotional faces and diminished striatal response to anticipated rewards. Evidence is emerging that these regions and interconnecting pathways have sensitive exposure periods when they are most vulnerable. **Conclusions:** Early deprivation and later abuse may have opposite effects on amygdala volume. Structural and functional abnormalities initially attributed to psychiatric illness may be a more direct consequence of abuse. Childhood maltreatment exerts a prepotent influence on brain development and has been an unrecognized confound in almost all psychiatric neuroimaging studies. These brain changes may be best understood as adaptive responses to facilitate survival and reproduction in the face of adversity. Their relationship to psychopathology is complex as they are discernible in both susceptible and resilient individuals with maltreatment histories. Mechanisms fostering resilience will need to be a primary focus of future studies. **Keywords:** Child abuse; neglect; neuroimaging; resilience; stress.

Key points

- Childhood maltreatment is associated with consistent alterations in corpus callosum, anterior cingulate, dorsolateral prefrontal, orbitofrontal cortex and adult hippocampus.
- Maltreatment is consistently associated with enhanced amygdala response to threatening stimuli and diminished striatal response to anticipated reward.
- Brain regions and pathways reported to differ in maltreated individuals are predominantly part of circuits regulating threat detection and reward anticipation.
- Exposure to single types of abuse is associated with specific alterations in regions and pathways that convey the aversive experience.
- Maltreatment-associated brain changes make sense as adaptive responses to early adversity that can alter stress response and shift approach–avoidance decisions.
- Relationships between brain changes and psychopathology are complex as these changes have been reported in maltreated subjects without psychopathology.

Please cite this article in press as: Thomason ME, Marusak HA. Toward understanding the impact of trauma on the early developing human brain. *Neuroscience* (2016), <http://dx.doi.org/10.1016/j.neuroscience.2016.02.022>

Neuroscience xxx (2016) xxx–xxx

REVIEW

TOWARD UNDERSTANDING THE IMPACT OF TRAUMA ON THE EARLY DEVELOPING HUMAN BRAIN

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Key words: adversity, maltreatment, abuse, neural, children, adolescents.

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Dissociation of trauma types and of trauma	

Nat Rev Neurosci. 2016 Sep 19;17(10):652-66. doi: 10.1038/nrn.2016.111.

The effects of childhood maltreatment on brain structure, function and connectivity.

Teicher MH^{1,2}, Samson JA^{1,2}, Anderson CM^{1,2}, Ohashi K^{1,2}.

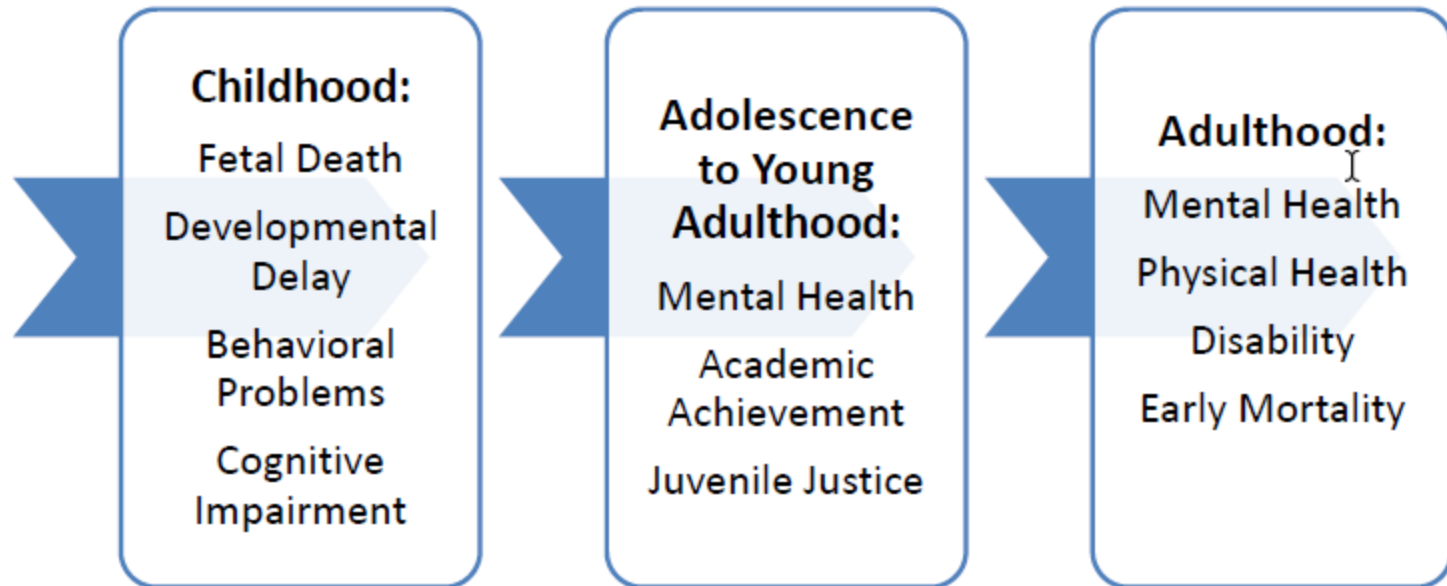
Author information

Abstract

Maltreatment-related childhood adversity is the leading preventable risk factor for mental illness and substance abuse. Although the association between maltreatment and psychopathology is compelling, there is a pressing need to understand how maltreatment increases the risk of psychiatric disorders. Emerging evidence suggests that maltreatment alters trajectories of brain development to affect sensory systems, network architecture and circuits involved in threat detection, emotional regulation and reward anticipation. This Review explores whether these alterations reflect toxic effects of early-life stress or potentially adaptive modifications, the relationship between psychopathology and brain changes, and the distinction between resilience, susceptibility and compensation.

PMID: 27640984 DOI: [10.1038/nrn.2016.111](https://doi.org/10.1038/nrn.2016.111)

Outcomes Associated with Adverse Childhood Experiences: A Life Course Perspective



SPECIAL ARTICLE

Developmental psychopathology: recent advances and future challenges

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The integrative field of developmental psychopathology is having a huge impact on our understanding of human health and behavior. In this paper, I use the example of children's early stress exposure to illustrate how developmental psychopathologists now tend to deemphasize diagnostic categories and, instead, emphasize the social and biological contexts, events and circumstances that have created opportunities for maladaptive responses and health problems in youth. This example shows that developmental psychopathology is increasing understanding of how children develop the abilities that allow them to cope effectively with challenges and what leads to failures in development of these abilities. Integrating research about the neurobiology of learning may prove to be a powerful future direction to understand how the environment regulates behavior. Learning processes become increasingly intricate and fine-tuned as relevant neuroanatomical systems develop, and as the range, complexity and amount of environmental information increases for the developing child. A focus on these processes allows psychopathologists to formulate questions about which neural mechanisms children use to process information, how these mechanisms are themselves shaped by social context, why adverse social environments confer risk for children, and, perhaps, what sorts of neutrally informed interventions might remediate the deficits in self-regulation that underlie common psychopathologies.

Key words: Developmental psychopathology, child stress, child psychiatry, child maltreatment, depression, child development, attention, learning

(*World Psychiatry* 2015;14:262–269)

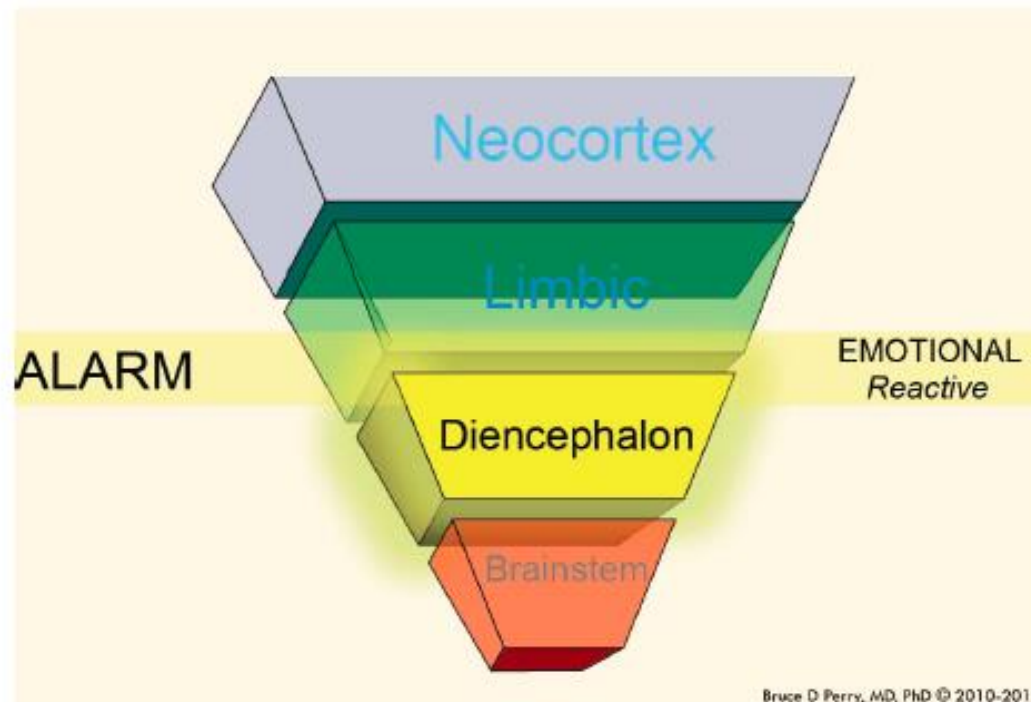


Figure 8c

When in the alarm state, the individual will shut down un-needed cognitive capabilities (such as the need to learn some new math concept) and focus on the immediate perceived threat. The capacity to learn still exists but what is learned will be different. Two children in the same classroom in different "states" of arousal will learn different things from the same lecture: the child in the active alert state will learn most of the academic, cognitive content of the lecture, the child in the state of alarm will focus on predominantly non-verbal relational cues such as who is whispering to whom in the back of the class, who the teacher looks at most, or who the teachers smiles at the most, as well as any other street or hallway noises. This hypervigilance is a common component of a child with a sensitized stress response system (as described above).

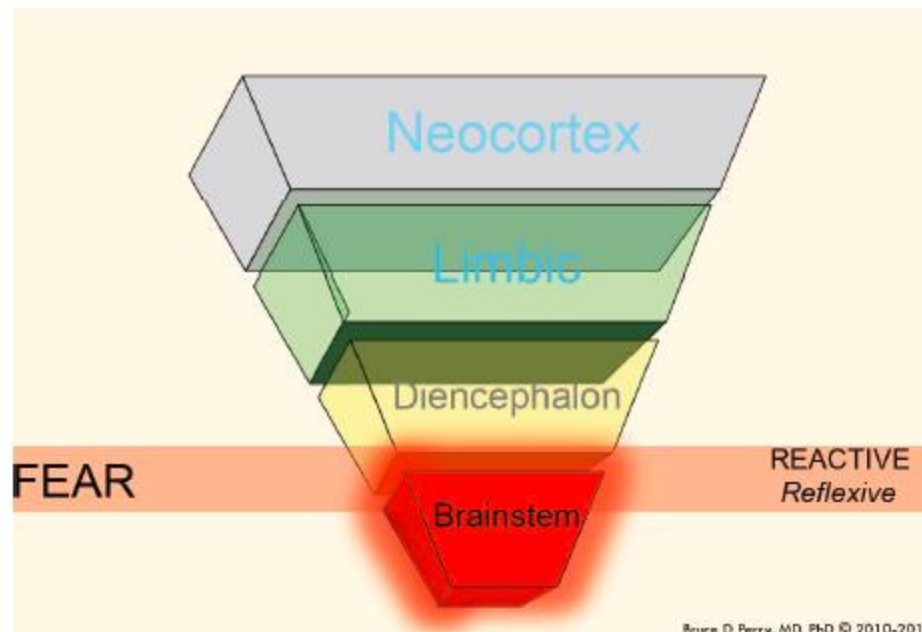


Figure 8d

By the time an individual is in the state of fear the capacity to focus on traditional cognitive content in the classroom is essentially gone. A child or youth in this state will frequently misunderstand attempts by teachers and staff to help them focus or "behave" and the resulting behaviors can be overt "fight" or "flee" in nature, resulting in a disrupted classroom and both a dysregulated teacher and student.

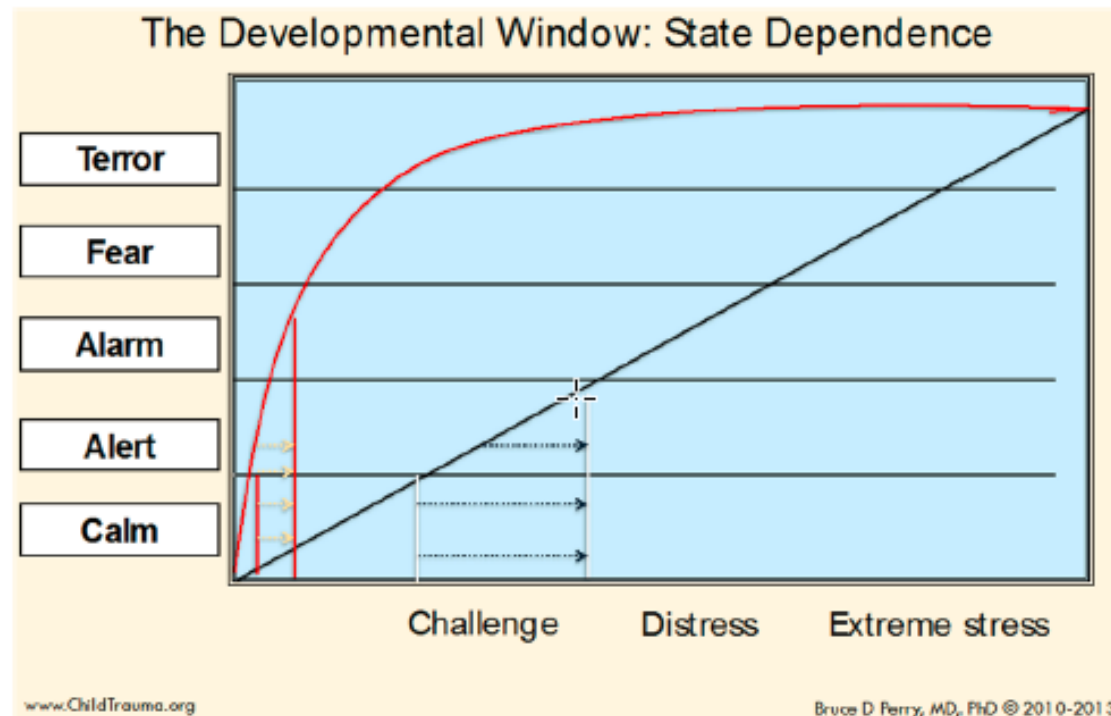


Figure 7. The Developmental Window

This figure illustrates two stress-reactivity curves; the black line indicates a neurotypical relationship between the level of external challenge, stress or threat and the appropriate proportional shift in internal state required to adapt, adjust and cope with the level of stress; with minor stressors, there are minor shifts in the internal state and with major challenges a larger shift in internal state is required. The red curve illustrates the distorted, sensitized stress-reactivity curve that results from patterns of extreme, unpredictable or prolonged stress activation such as is seen in many children from inter-country adoptions. In this case, there is a significant over-activity at baseline and an over-reaction even in the face of relatively minor challenges. All learning—social, emotional, behavioral, or cognitive—requires exposure to novelty; a novel set of experiences that will, with repetition, ultimately become familiar and then ‘internalized’ or learned. The hatched bars indicate the Developmental Window where enough—but not too much—stress activation occurs to promote optimal learning. Too little novelty would lead to little stress activation and minimal learning while too much activation leads to distress and inefficient internalization of information.

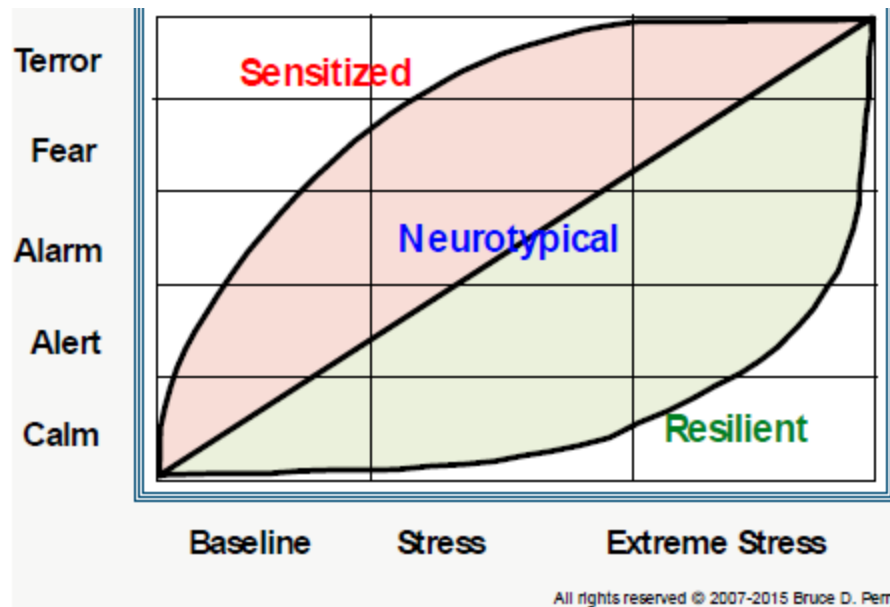
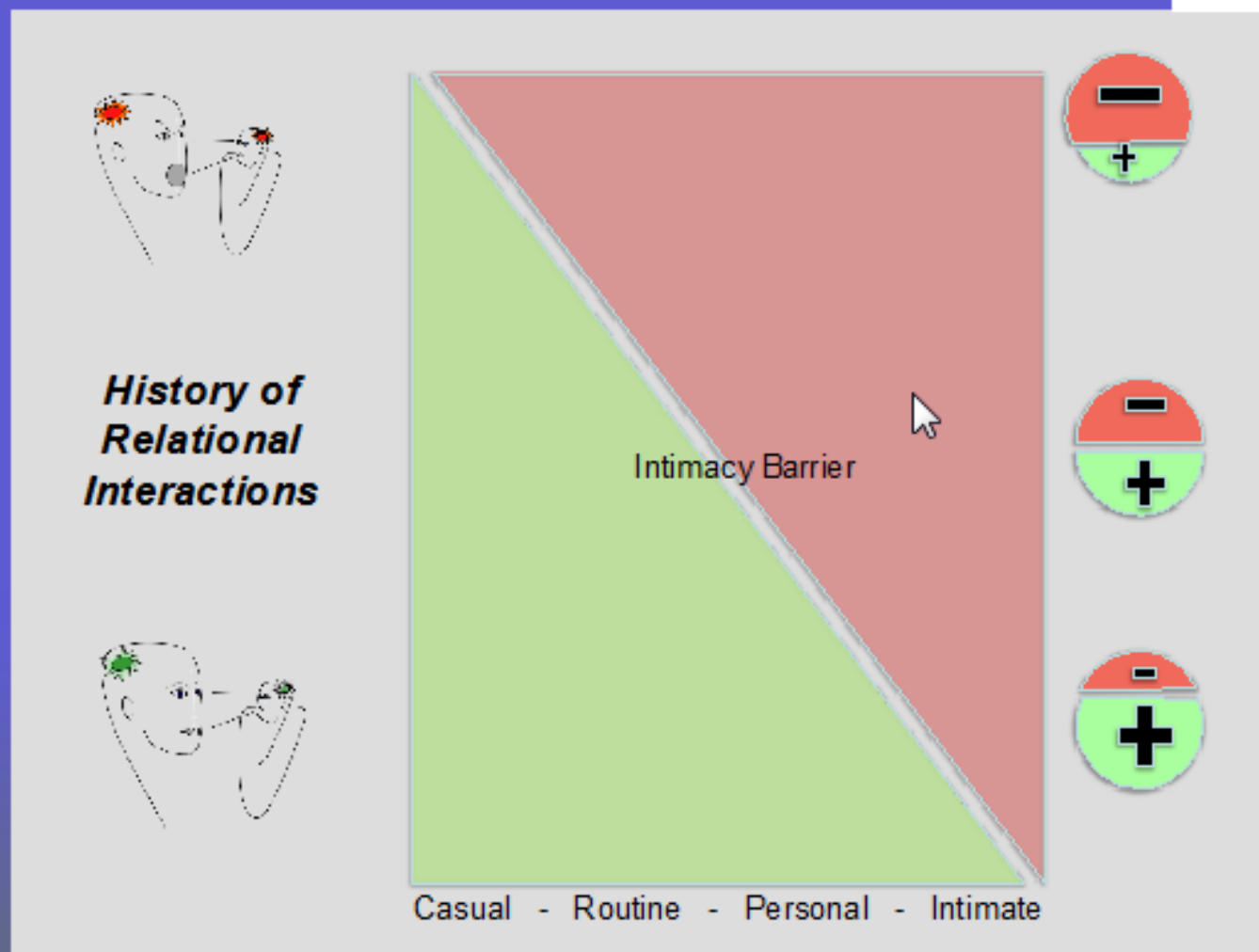


Figure 6. Differential Stress-Reactivity

This figure illustrates three stress-reactivity curves; the middle straight line indicates a neurotypical relationship between the level of external challenge, stress or threat and the appropriate proportional shift in internal state required to adapt, adjust, and cope with the level of stress; with minor stressors, there are minor shifts in the internal state and with major stressors a larger shift in internal state is required. The upper (Sensitized) curve illustrates the distorted, sensitized stress-reactivity curve that results from patterns of extreme, unpredictable or prolonged stress activation such as is seen in many youth and adults in the juvenile and criminal justice systems. In this case, there is a significant over-activity at baseline and an over-reaction even in the face of relatively minor challenges. All learning—social, emotional, behavioral, or cognitive—requires exposure to novelty; in turn, novelty will activate the stress response systems. In an individual with neurotypical reactivity this will create a moderate, but manageable, dose of “stress.” Repetition with novelty (such as in an academic setting—or certain therapeutic situations) will ultimately lead to a tolerance pattern²¹ and the capacity to demonstrate resilience (lower curve). In contrast, a sensitized individual will find the introduction to simple challenges such as transitions, new academic concepts, complex or unpredictable social situations overwhelming—even fear-inducing, thereby inhibiting opportunities for normal social, emotional and cognitive development. This sensitization is hypothesized to be one of the primary mechanisms underlying many of the emotional, behavioral, and learning problems seen in children and youth struggling in school.

Intimacy Barrier



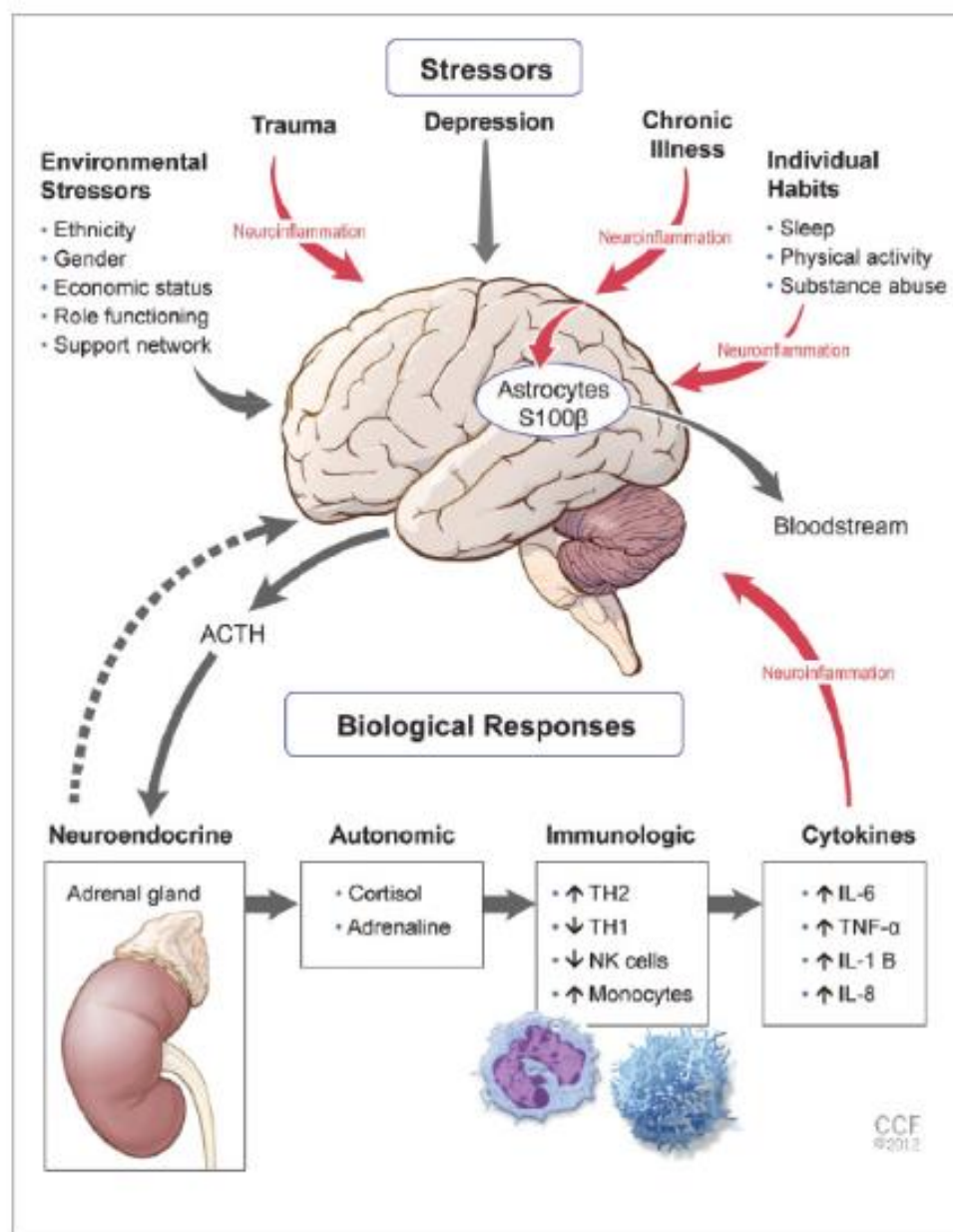


FIGURE1. Biological responses to stressors. Emotional trauma causes neuroinflammation, which is linked to multiple biological responses.

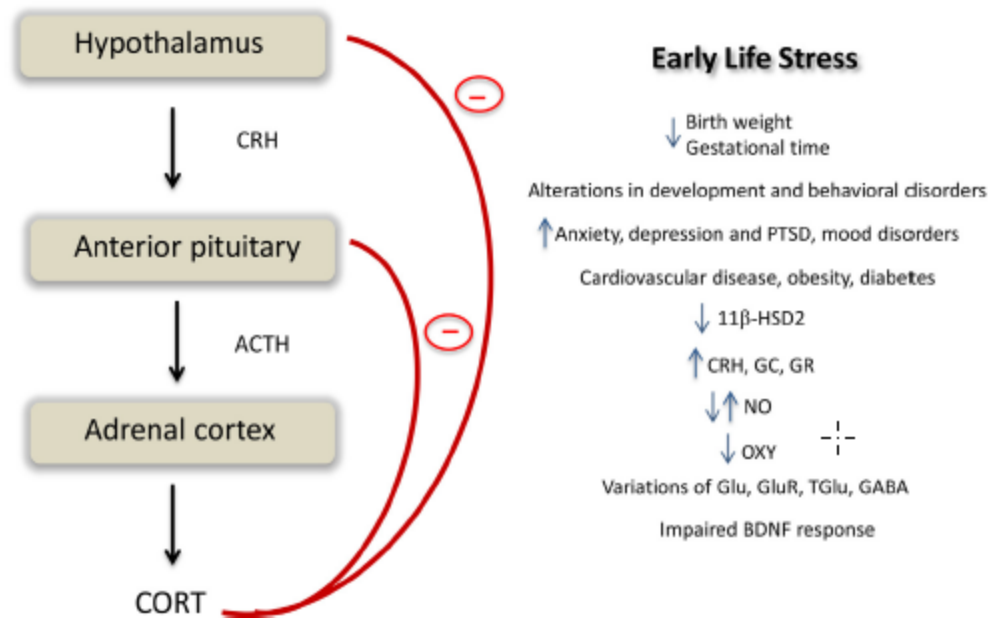
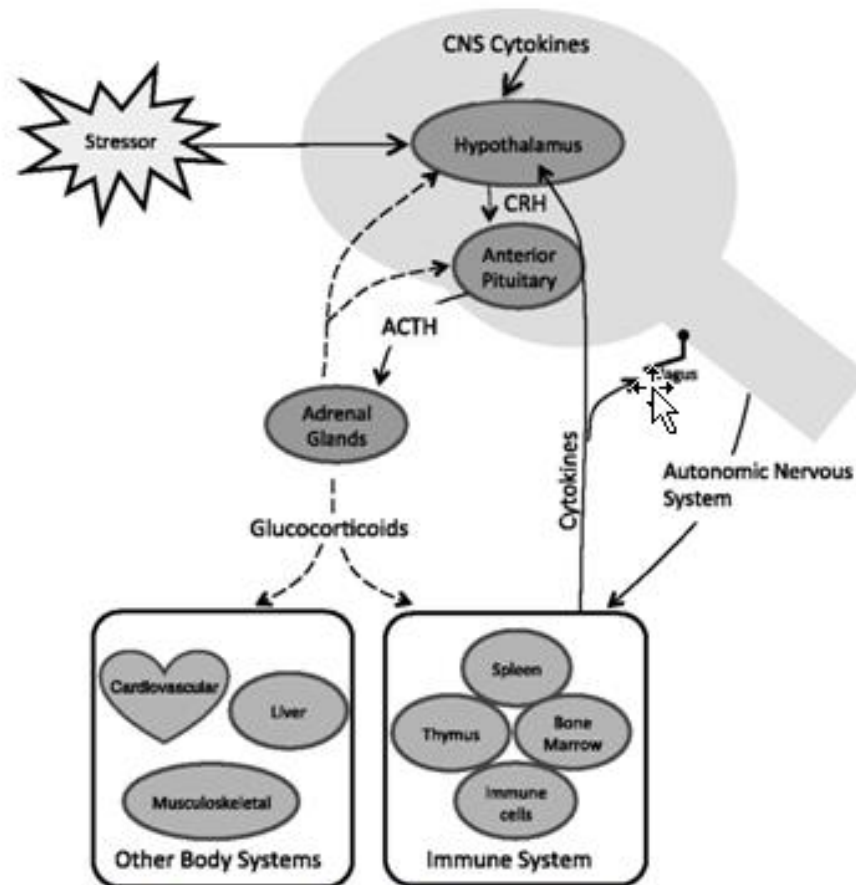


Fig. 1. Effects of stress exposure on the HPA axis activity. Early life adverse events may disrupt the HPA axis response at many levels thus affecting several systems. Alterations in the CNS development and the neurochemical response may contribute to the onset or development of long-last neurobehavioral and neurochemical changes later in life.

Relationship between the HPA axis, immune systems, and other body systems.



Sara B. Johnson et al. Pediatrics 2013;131:319-327

Table 1
Glucocorticoid effect on brain from toxic stress

Brain Area	Function	Neuronal Impact of Excess Glucocorticoid in Toxic Stress	Behavioral Consequence from Toxic Stress
Amygdala	Brain "alarm" Responsible for emotional memory Generates aggressive or impulsive behaviors to protect the body	Amygdala hypertrophy	Aggressive behavior with minimal threat Impulsivity that can mimic ADHD
Hippocampus	Brain "search engine" Allows brain to access information from other brain centers Role in learning and memory	Limits neuronal formation (normally, neuron formation in hippocampus occurs throughout lifespan)	Protective effect of some amnesia about prior trauma Limits learning Negatively impacts educational achievement
Prefrontal cortex	Suppresses impulses and emotion generated by limbic system Executive function: Impulse control, working memory, and cognitive flexibility	Slows synaptic connectivity	Limited ability to suppress aggression Limits ability to think through consequences of actions Can look like ADHD, aggression or oppositional defiant disorder

Abbreviation: ADHD, attention deficit hyperactivity disorder.

Foster Care and Healing from Complex Childhood Trauma

Heather Forkey, MD^{a,*}, Moira Szilagyi, MD, PhD^b

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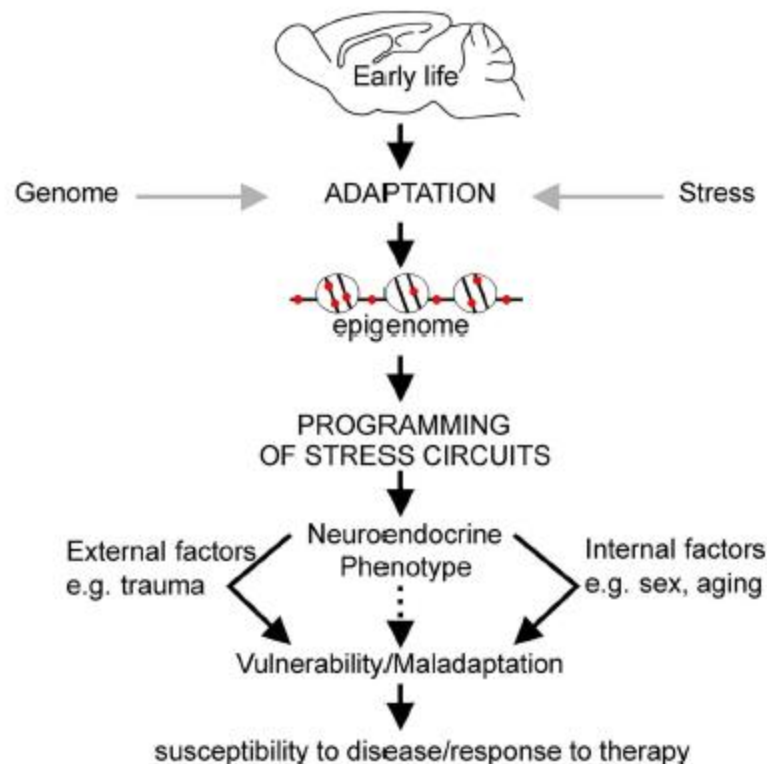


FIGURE 3 | Early life experience can persistently alter expression levels of key genes through epigenetic marking which can underpin changes in behavior, neuroendocrine, and stress responsivity throughout later life.

Collectively, this process is referred to as epigenetic programming. The nature of the environment throughout later life, in addition to the impact of biological processes associated with aging and genetic sex, may exacerbate the effects of programming established during early life resulting in increased vulnerability to mood disorders.

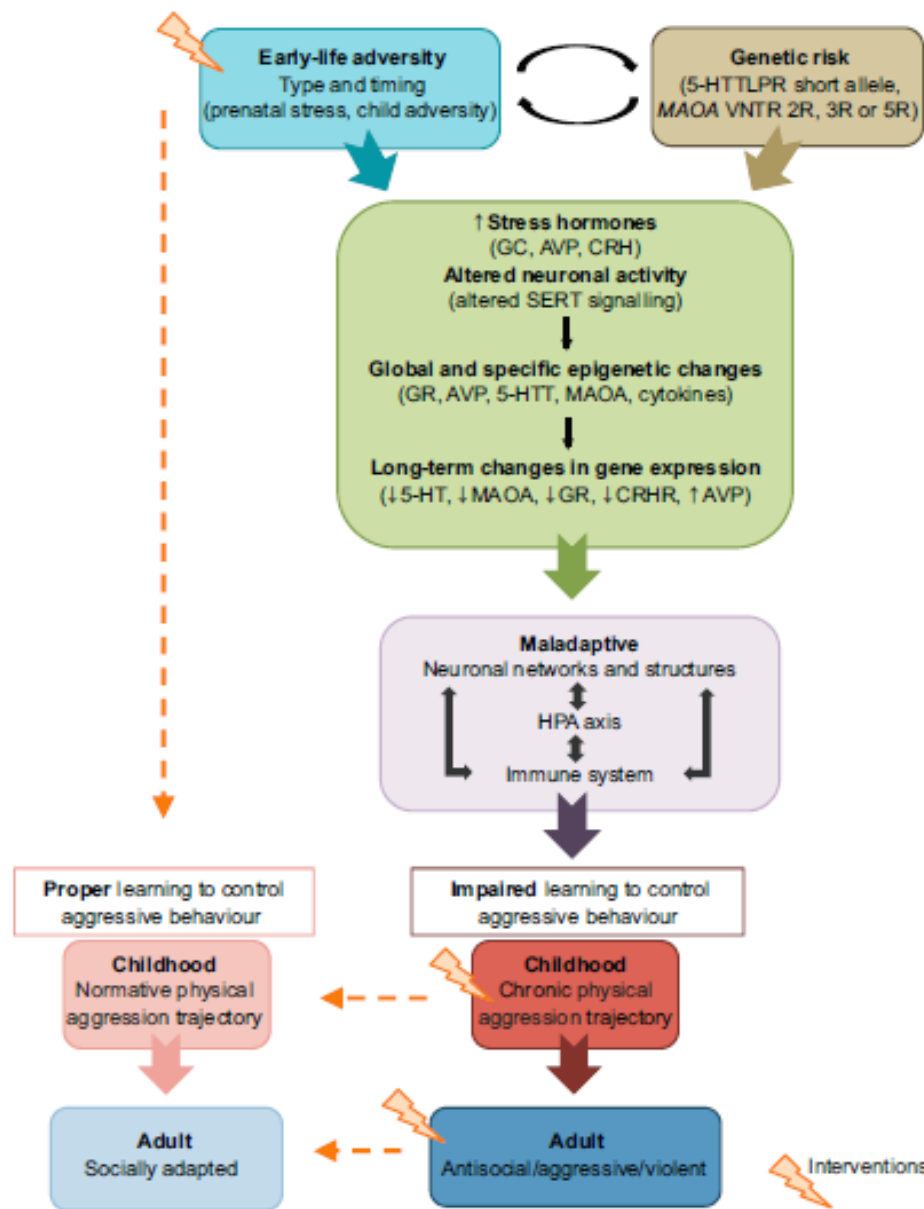


Fig. 1. Developmental mechanisms underlying the association between early-life adversity and the development of chronic physical aggression. Early life adversity is believed to produce acute and long-lasting epigenetic alterations that influence gene expression profiles in many systems, such as the HPA axis, neuronal networks, as well as the immune and endocrine systems that will, in turn, alter an individual's ability to learn to control physically aggressive behaviour. Genetic factors will probably moderate these effects of early-life stress on the epigenome and influence the risk or resilience to develop maladaptive behavioural outcomes. Because epigenetic alterations are potentially reversible by either drug or environmental interventions, these negative outcomes may be avoided. Biological, psychological and social interventions at different points during development could possibly reverse the phenotype by inducing global as well as specific epigenetic changes, allowing a resetting of the dysregulated systems (represented by dashed orange arrows) and potentially facilitating learning of alternatives to physical aggression. Interventions are likely to be more effective if put in place during pregnancy prior to the establishment of long-lasting epigenetic marks and the development of key neuronal networks and structures. 5-HTT, 5-hydroxytryptamine transporter (also known as SLC6A4); 5-HTTLPR, serotonin-transporter-linked polymorphic region, a degenerate repeat polymorphic region in SLC6A4; AVP, arginine vasopressin; CRH, corticotrophin-releasing hormone; CRHR, CRH receptor; GC, glucocorticoid; HPA, hypothalamic–pituitary–adrenal; MAOA, monoamine oxidase A; SERT, serotonin transporter 5-HTT; VNTR 2R, 3R, 5R, alleles of the variable number tandem repeat.

REVIEW

The developmental origins of chronic physical aggression: biological pathways triggered by early life adversity

Nadine Provençal^{1,*}, Linda Booij^{2,3,4,5} and Richard E. Tremblay^{2,6,7,8}

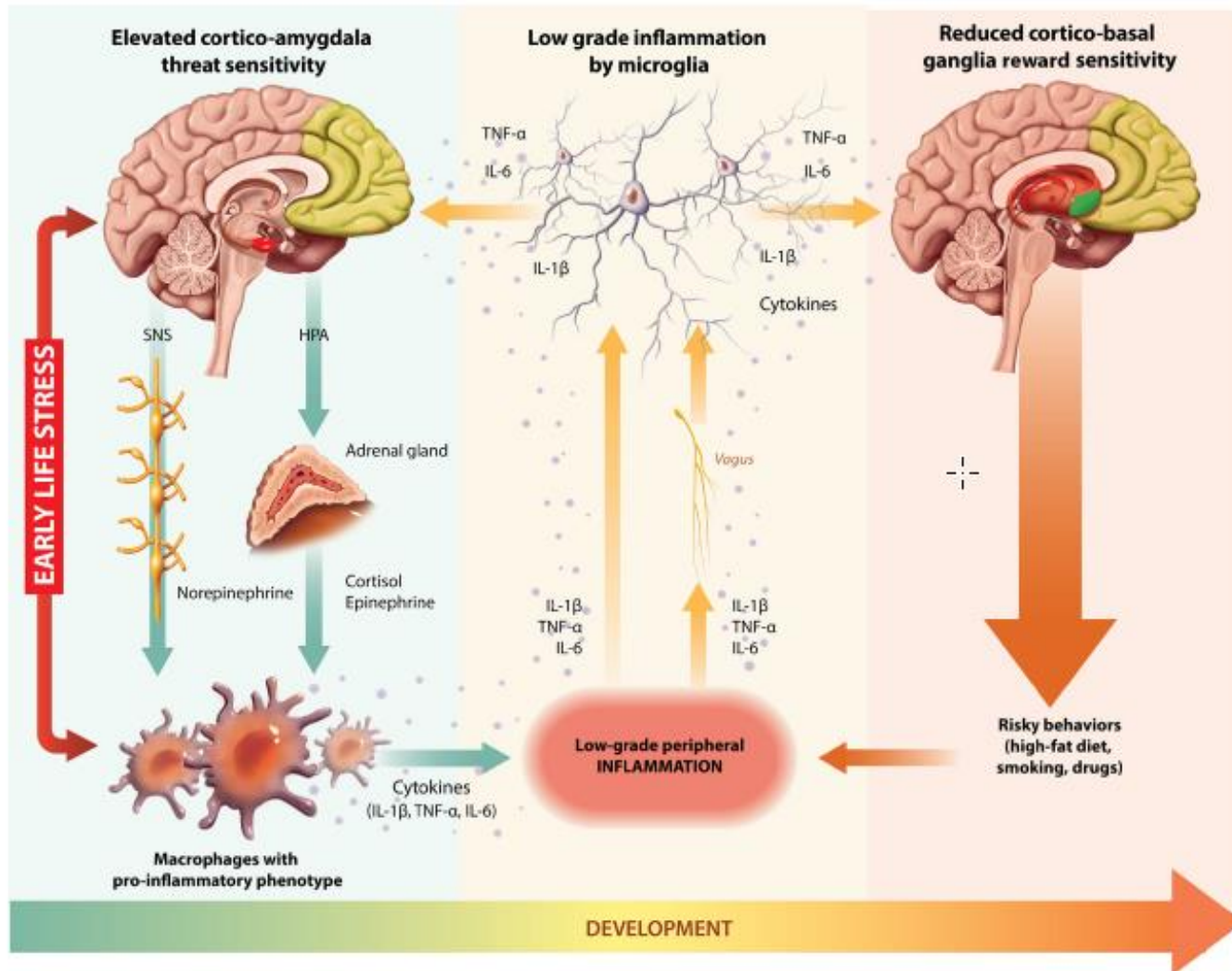


Figure 1. Depiction of neuroimmune network hypothesis. HPA, hypothalamic-pituitary-adrenocortical; IL-1 β , interleukin-1 β ; IL-6, interleukin-6; SNS, sympathetic nervous system; TNF- α , tumor necrosis factor-alpha. Illustration by Chi-Chun Liu and Qingyang Chen.

Early-Life Adversity and Physical and Emotional Health Across the Lifespan: A Neuroimmune Network Hypothesis

Robin Nusslock and Gregory E. Miller

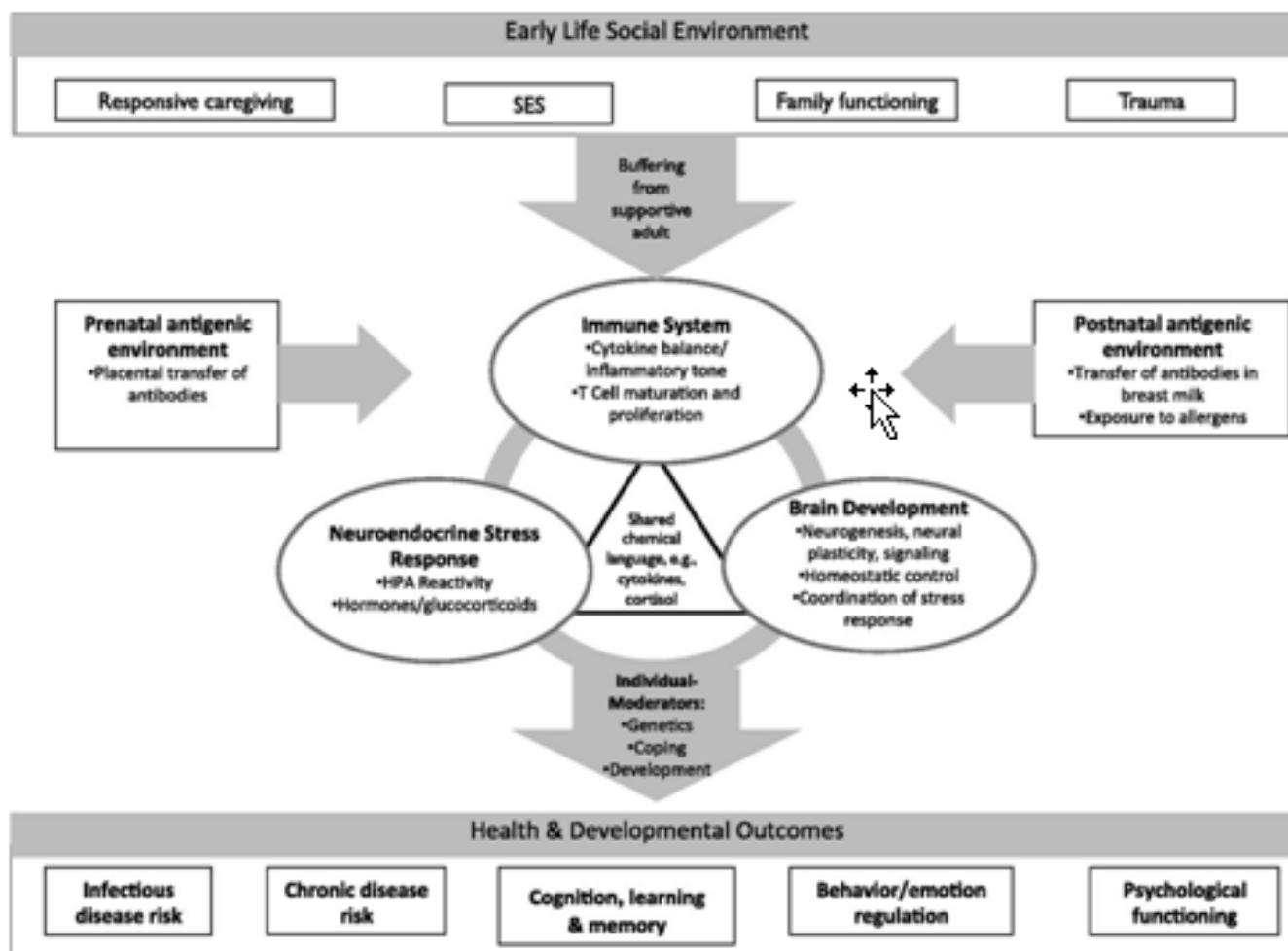
ABSTRACT

Children who experience chronic stressors are vulnerable to emotional and physical health problems across the lifespan. This phenomenon raises questions for scientists and clinicians alike. How does adversity get under the skin of the developing child? Through what mechanisms does it confer vulnerability to a heterogeneous set of mental and physical illnesses? And how does it instantiate risk across different life stages, engendering vulnerability to conditions that develop shortly after stressor exposure—like depression—and conditions that manifest decades later, like heart disease? Although answers to these questions have started to emerge, research has typically focused on single diseases or organ systems. To understand the plethora of health problems associated with childhood adversity, we argue that the field needs a second generation of research that recognizes multidirectional transactions among biological systems. To help facilitate this process, we propose a neuroimmune network hypothesis as a heuristic framework for organizing knowledge from disparate literatures and as a springboard for generating integrative research. Drawing on existing data, we argue that early-life adversity amplifies crosstalk between peripheral inflammation and neural circuitries subserving threat-related, reward-related, and executive control-related processes. This crosstalk results in chronic low-grade inflammation, thereby contributing to adiposity, insulin resistance, and other predisease states. In the brain, inflammatory mediators act on cortico-amygdala threat and cortico-basal ganglia reward, circuitries in a manner that predisposes individuals to self-medicating behaviors like smoking, drug use, and consumption of high-fat diets. Acting in concert with inflammation, these behaviors accelerate the pathogenesis of emotional and physical health problems.

Keywords: Depression, Heart disease, Inflammation, Maltreatment, Poverty, Stress

<http://dx.doi.org/10.1016/j.biopsycho.2015.05.017>

Mediating role of the NEI network in linking early life experiences to individual differences in health and functioning.



Sara B. Johnson et al. *Pediatrics* 2013;131:319-327

PEDIATRICS

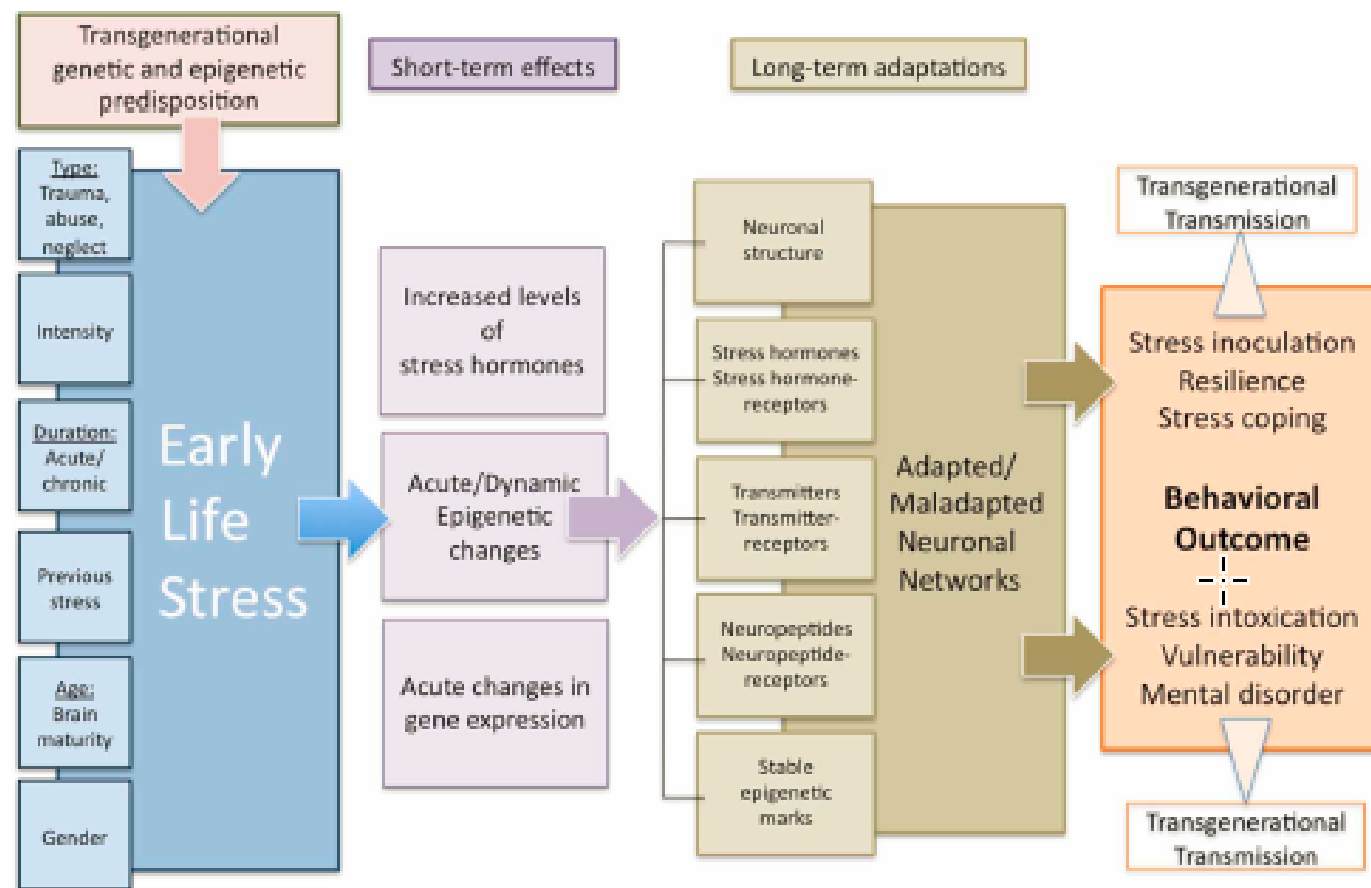


FIGURE 3 | Transgenerational programming of neuronal networks by early life stress. The extent to which early life stress results in either an adaptive or a maladaptive behavioral outcome depends on a variety of environmental and internal influences and includes transgenerational components in terms of both genetic predisposition as well as acquired and transgenerationally transmitted epigenetic marks. Lasting behavioral changes are supposed to derive from acute and dynamic stress-induced alterations in gene expression as well as endocrine

and epigenetic changes in interaction with the particular environmental and internal conditions resulting in stable long-term changes in neuronal networks. The adaptive or maladaptive changes determine the particular behavioral outcome under normal or stressful conditions in a positive or negative way. Additionally, these multi-level long-term adaptations might be transferred to following generations by epigenetic or behavioral mechanisms, representing a transgenerational predisposition for the adaptation to early life experiences.

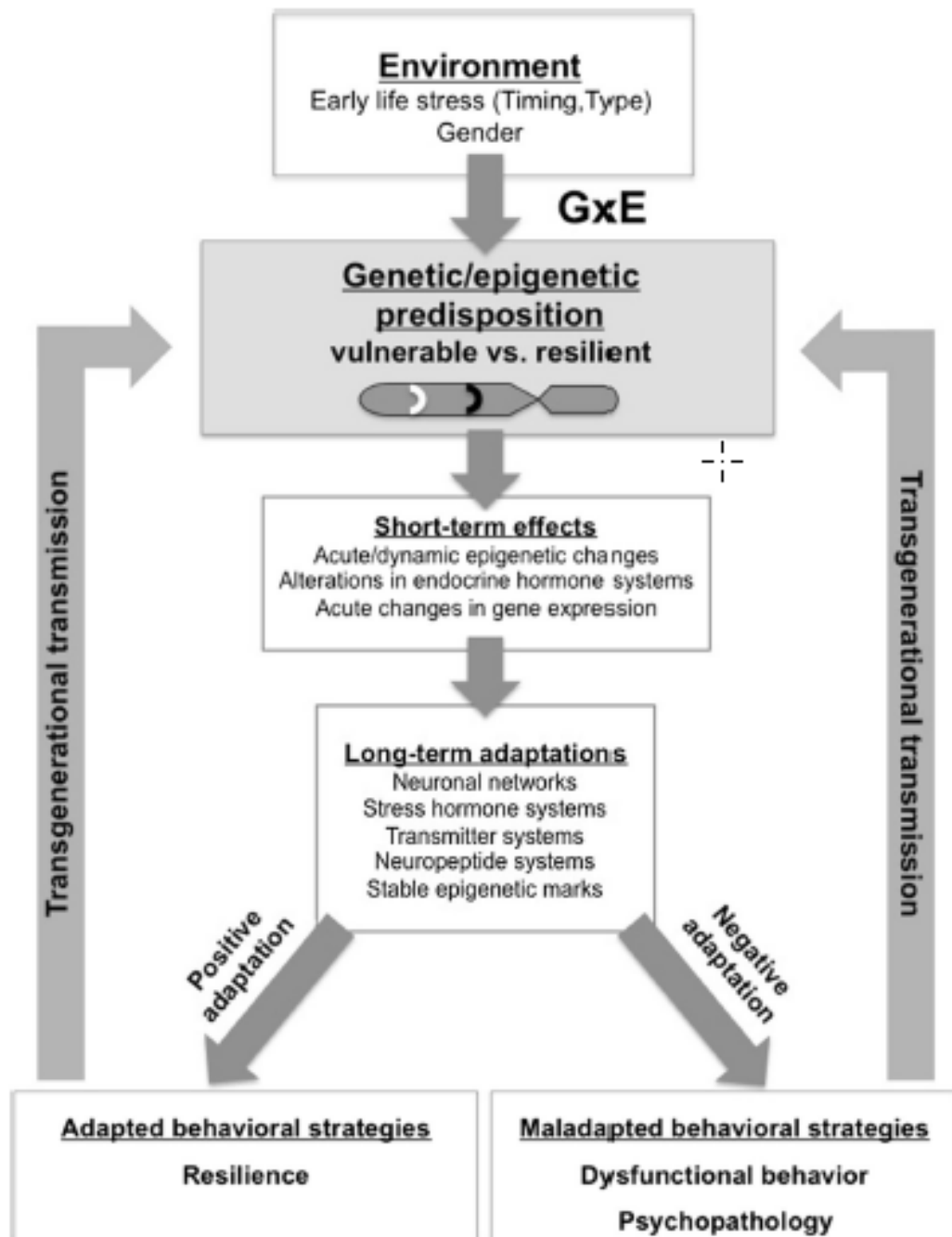


The transgenerational transmission of childhood adversity: behavioral, cellular, and epigenetic correlates

Nicole Gröger¹ · Emmanuel Matas¹ · Tomasz Gos² · Alexandra Lesse¹ ·
Gerd Poeggel³ · Katharina Braun^{1,5} · Jörg Bock^{4,5}



Fig. 1 Individual's susceptibility toward stressful events in life is the result of a well-balanced interplay of preprogrammed genetic and environmental factors (gene \times environment interaction, $G \times E$). Whether this balance is shifted to a rather resilient or vulnerable phenotype depends on the time, duration, intensity, and type of experienced stressors and also on gender. $G \times E$ induces short- and long-term endocrine, cellular, and molecular adaptations that lead to functional or dysfunctional neuronal networks. These adaptations are directly associated with the behavioral outcome that displays the ability or disability to properly cope with upcoming stressful situations. In addition, a transgenerational transmission cycle is induced where resilient and vulnerable phenotypes both cause a genetic and epigenetic predisposition in their offspring (adapted and modified after Bock et al. 2014a)



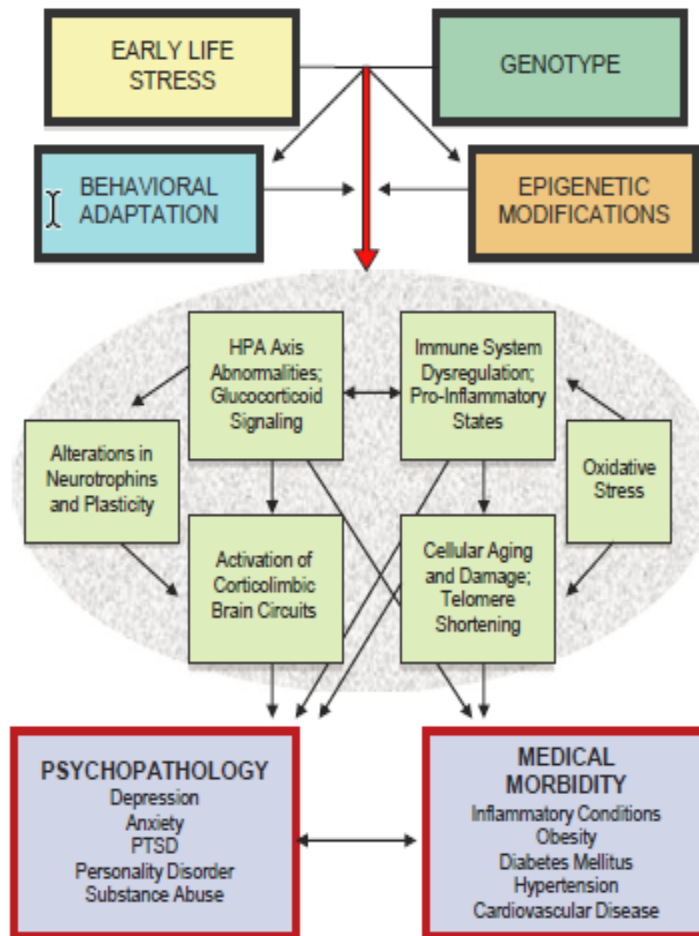


Fig. 1. Model: Neurobiological effects of childhood adversity. Childhood adversity engenders risk of psychopathology and medical morbidity through a number of inter-related pathways. Genetic sensitivity to environmental factors is an important determinant of risk, and epigenetic effects of early adversity influence the biological impact of stress exposure. Behavioral adaptation may exacerbate or ameliorate these effects. Ensuing alterations of neuroendocrine, neuroimmune, and neurotrophin pathways are thought to be mechanisms of the development of psychiatric disorders and related medical conditions.

[Acta Psychiatr Scand.](#) 2013 Dec;128(6):434-47. doi: 10.1111/acps.12143. Epub 2013 May 10.
The neurobiological correlates of childhood adversity and implications for treatment.
[Tyrka AR](#)¹, [Burgers DE](#), [Philip NS](#), [Price LH](#), [Carpenter LL](#).

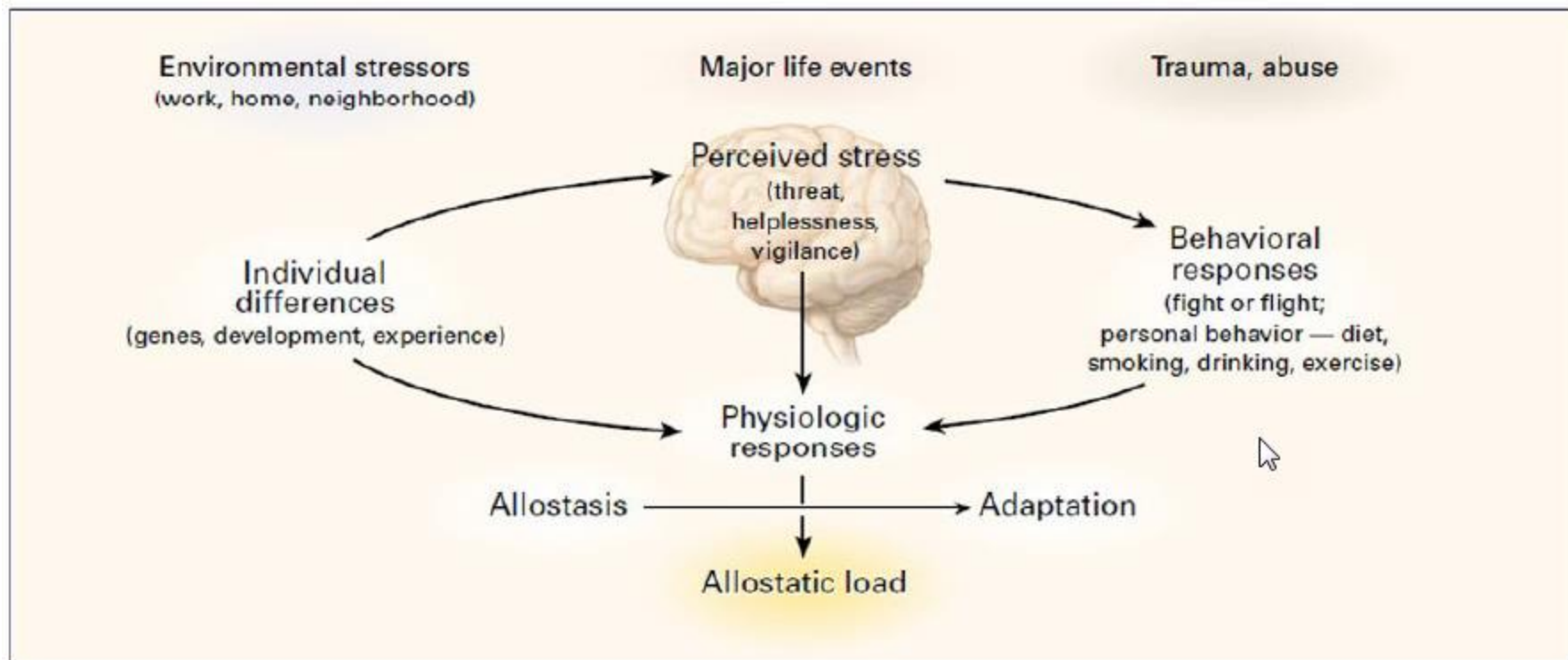


Fig. 1.

Allostatic load model. From "Protective and damaging effects of stress mediators," by B. S. McEwen, 1998, *New England Journal of Medicine*, 338, p. 172. Copyright © 1998 by the Massachusetts Medical Society. Reprinted with permission.

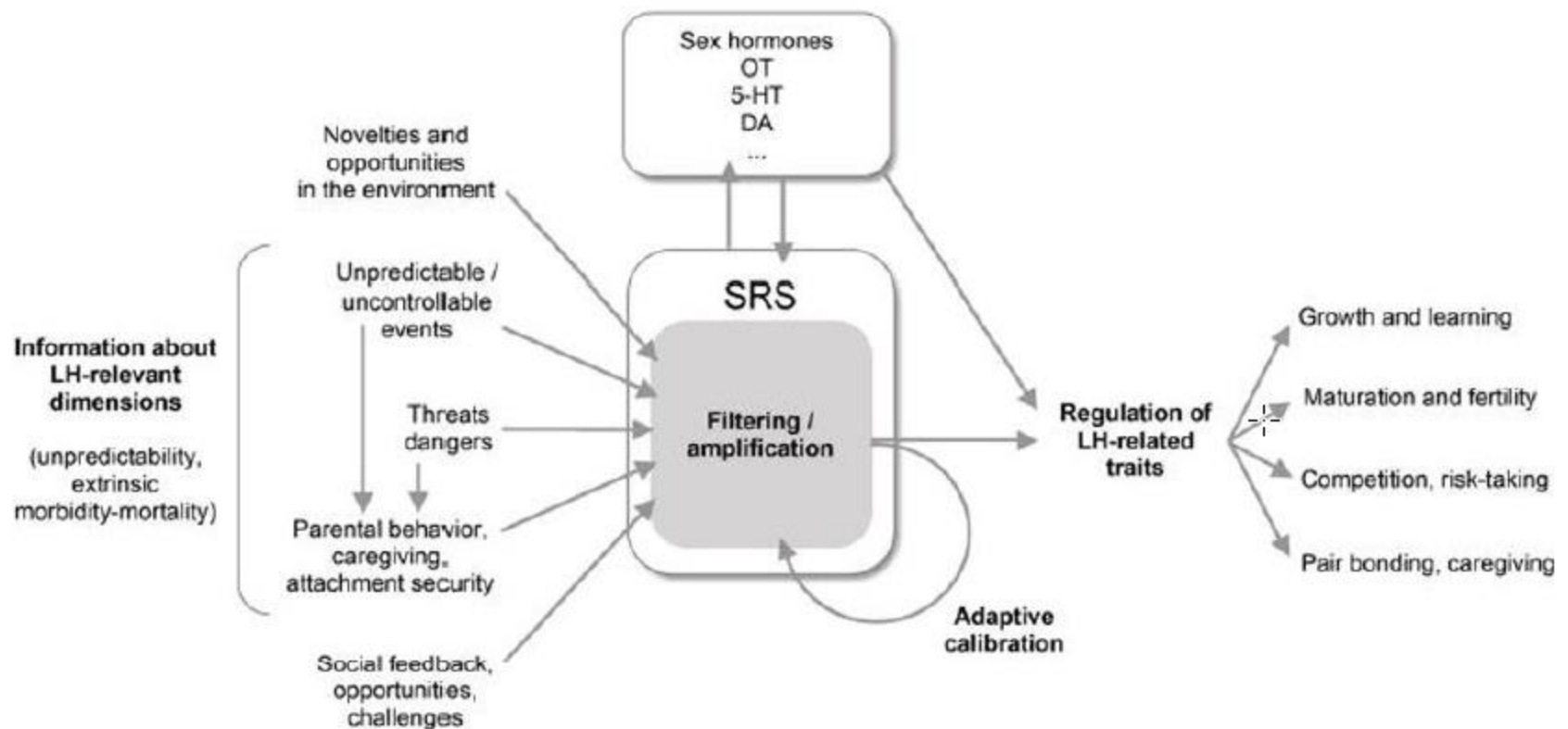


Fig. 2. Adaptive calibration model. SRS = stress-response system; LH = life history; OT = oxytocin; 5-HT = serotonin; and DA = dopamine. From “The adaptive calibration model of stress responsivity,” by M. Del Giudice, B. J., Ellis, and E. A. Shirtcliff, 2011, *Neuroscience & Biobehavioral Reviews*, 35, p. 1564. Copyright © 2011 by Elsevier Science. Reprinted with permission.

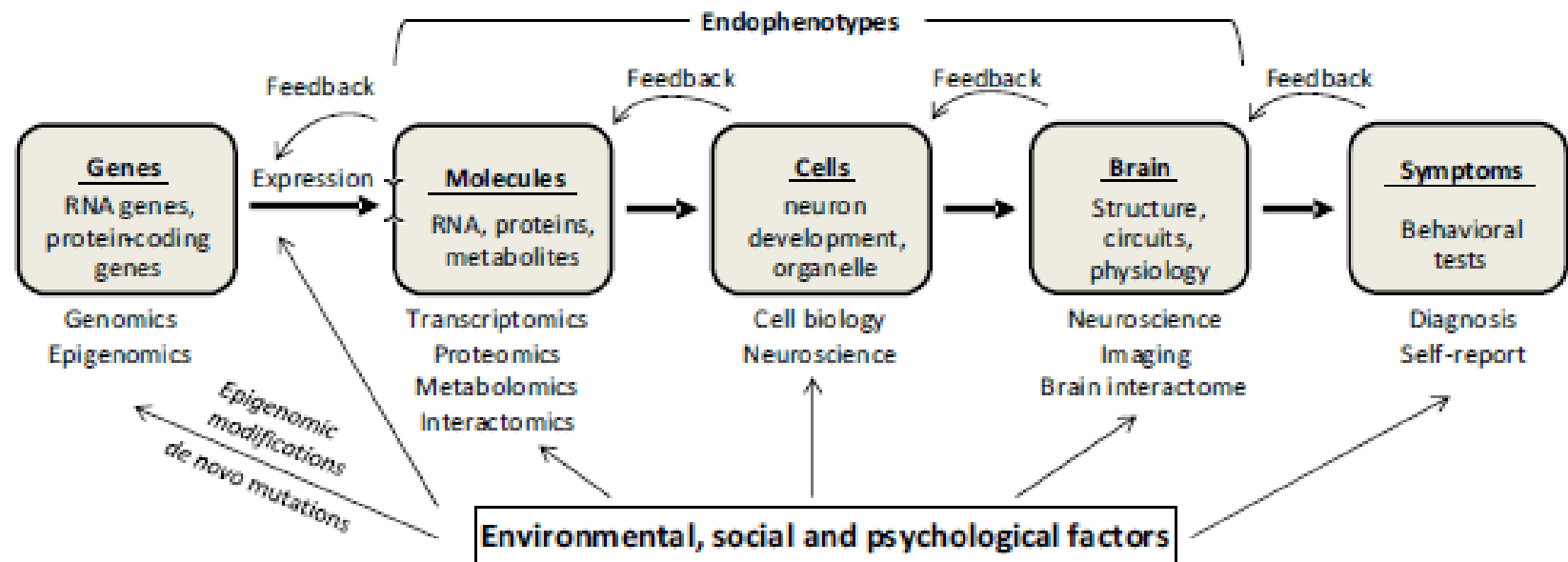


Figure 1 A simplified flow chart for psychiatric disorders: from genes to symptoms. In this flow chart, results from one level (gray box) can exert feedback regulation at several levels upstream although only one level immediately upstream is shown for simplicity. Environmental impacts on each level are indicated. The studies for understanding each level and consequently the corresponding data types are listed below each level



The relationship between early-life environment, the epigenome and the microbiota

Children exposed to early-life adversity carry a greater risk of poor health and disease into adulthood. This increased disease risk is shadowed by changes in the epigenome. Epigenetics can change gene expression to modify disease risk; unfortunately, how epigenetics are changed by the environment is unclear. It is known that the environment modifies the microbiota, and recent data indicate that the microbiota and the epigenome interact and respond to each other. Specifically, the microbiome may alter the epigenome through the production of metabolites. Investigating the relationship between the microbiome and the epigenome may provide novel understanding of the impact of early-life environment on long-term health.

Keywords: early-life adversity • environment • epigenetic • epigenome • histone modification • metabolite • methylation • microbiome

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Executive summary

- Early-life adversity influences adult health.
- The epigenome and the microbiome dynamically respond to the environment to effect health.
- The epigenome and the microbiome molecularly interact with each other and influence each others response.
- Microbial metabolites can influence epigenetic patterns and change gene expression.
- The microbiome may provide novel access to affect epigenetic modifications.
- Understanding the relationship between the epigenome and the microbiome may allow for novel ways to prevent, predict and treat disease.

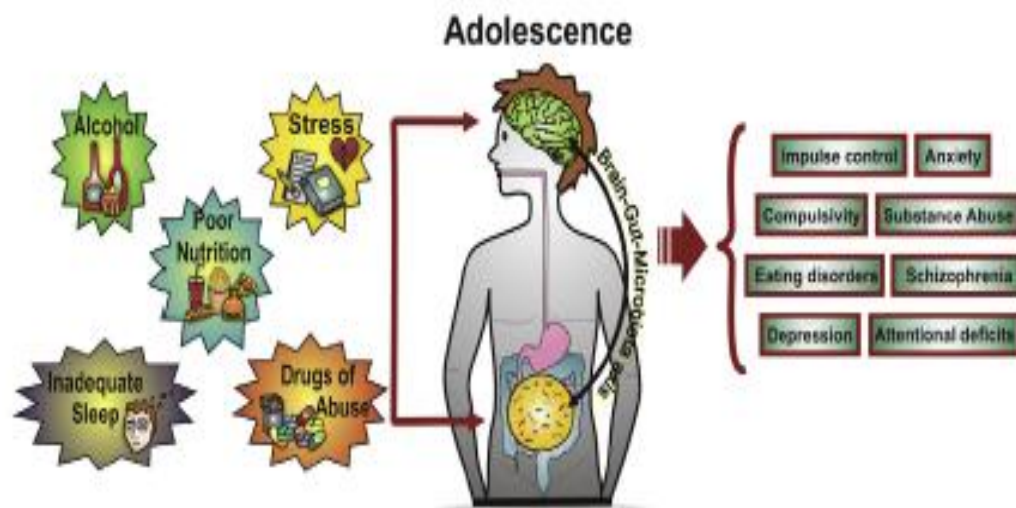


Fig. 1. The microbiota-gut-brain axis in adolescence. This bidirectional axis is generally healthy and functioning, but environmental factors frequently encountered by the developing teen – such as drugs of abuse, alcohol, altered nutrition and sleep, and stress all have known effects on the intestinal microbiota. Here we propose that these environmentally induced alterations to the microbiota may be playing a role in psychiatric disease pathogenesis, particularly in relation to those disorders that often first manifest in the teenage years.

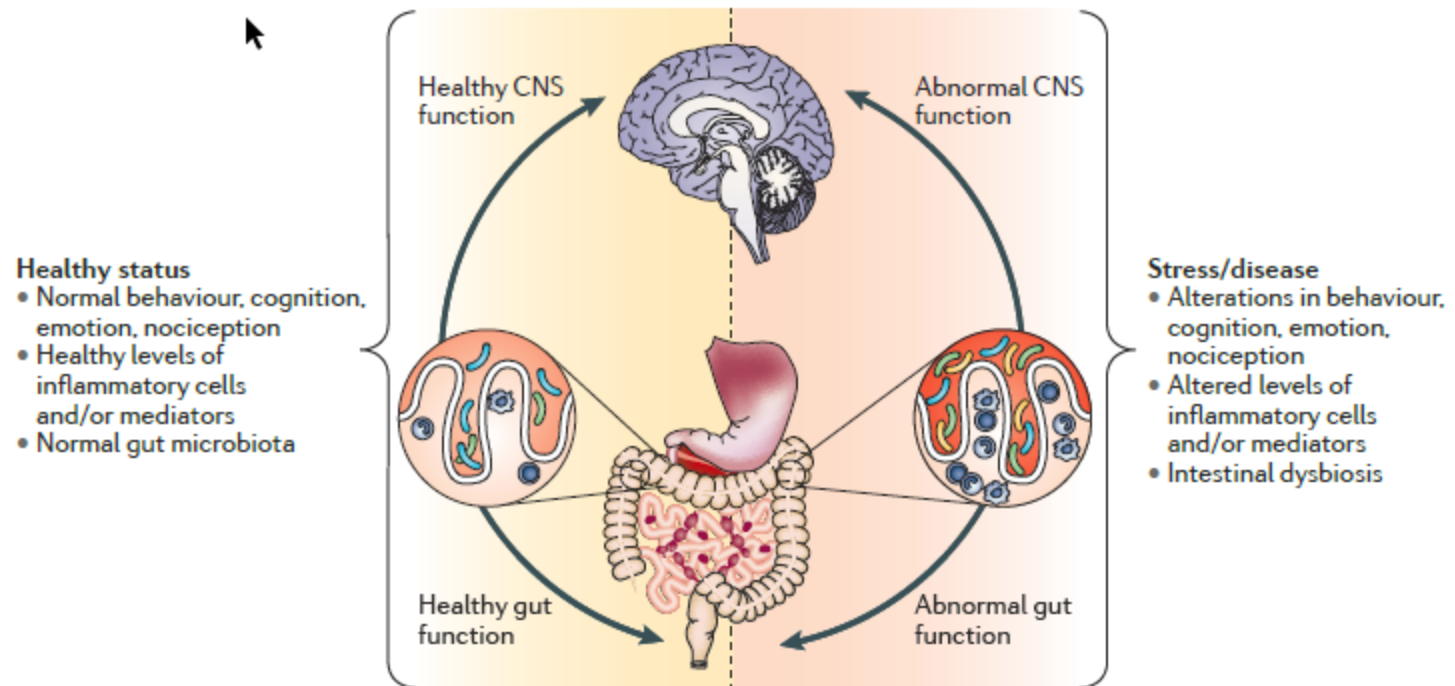
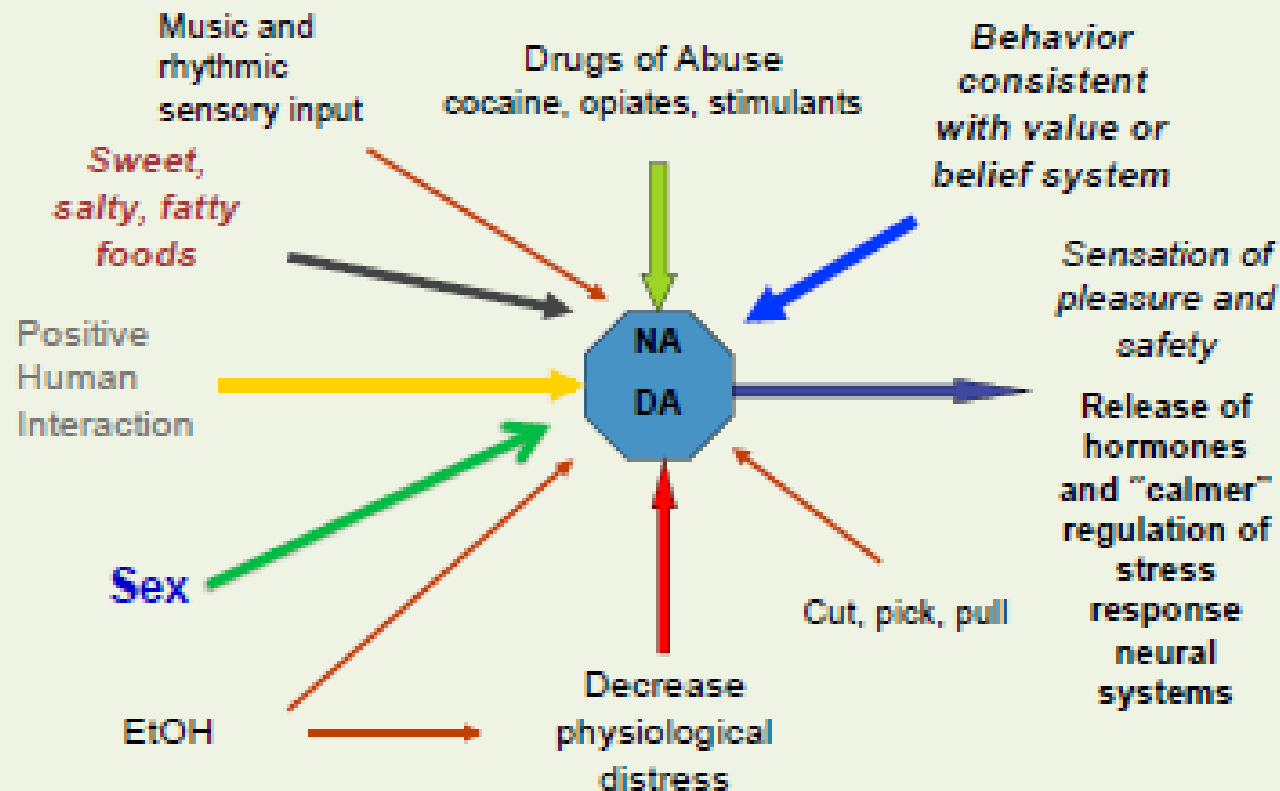


Figure 3 | Impact of the gut microbiota on the gut–brain axis in health and disease. It is now generally accepted that a stable gut microbiota is essential for normal gut physiology and contributes to appropriate signalling along the gut–brain axis and, thereby, to the healthy status of the individual, as shown on the left-hand side of the figure. As shown on the right-hand side of the figure, intestinal dysbiosis can adversely influence gut physiology, leading to inappropriate gut–brain axis signalling and associated consequences for CNS functions and resulting in disease states. Conversely, stress at the level of the CNS can affect gut function and lead to perturbations of the microbiota. Figure is modified from REF. 23.

Stimulation of “Reward” Neural Systems in the Human Brain: *Multiple*





Exploring the Relationship Between Childhood Maltreatment and Addiction: A Review of the Neurocognitive Evidence

Vanessa B. Puetz¹ · Eamon McCrory¹



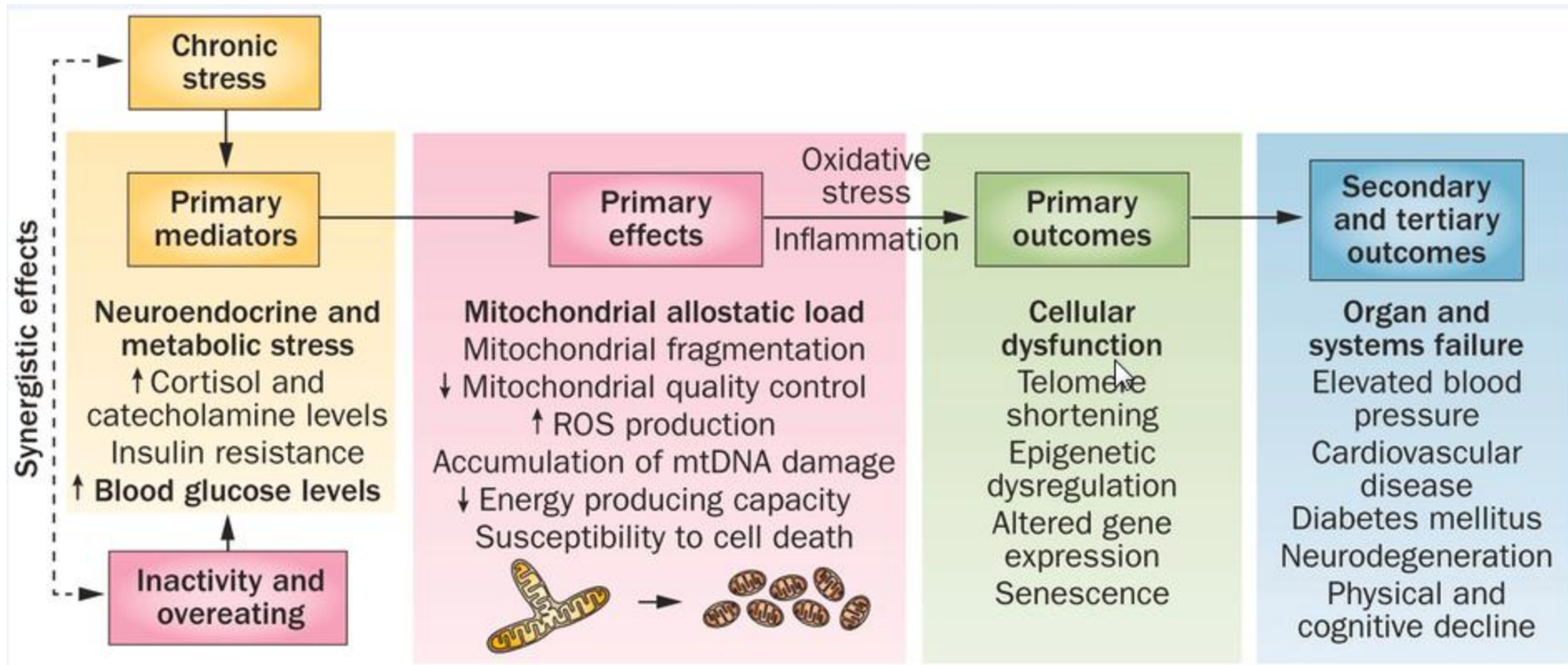
Impact of Early Life Adversity on Reward Processing in Young Adults: EEG-fMRI Results from a Prospective Study over 25 Years

Regina Boecker¹, Nathalie E. Holz¹, Arlette F. Buchmann¹, Dorothea Blomeyer¹, Michael M. Plichta², Isabella Wolf^{1,3}, Sarah Baumeister¹, Andreas Meyer-Lindenberg², Tobias Banaschewski¹, Daniel Brandeis^{1,4,5,6*}, Manfred Laucht^{1,7,8,9}

1 Department of Child and Adolescent Psychiatry and Psychotherapy, CIMH Medical Faculty Mannheim/Heidelberg University, Mannheim, Germany, **2** Department of Psychiatry and Psychotherapy, CIMH Medical Faculty Mannheim/Heidelberg University, Mannheim, Germany, **3** Department of Neuroimaging, CIMH Medical Faculty Mannheim/Heidelberg University, Mannheim, Germany, **4** Department of Child and Adolescent Psychiatry, University of Zurich, Zurich, Germany, **5** Center for Integrative Human Physiology, University of Zurich, Zurich, Germany, **6** Neuroscience Center Zurich, University of Zurich and ETH Zurich, Zurich, Germany, **7** Department of Psychology, University of Potsdam, Potsdam, Germany

Abstract

Several lines of evidence have implicated the mesolimbic dopamine reward pathway in altered brain function resulting from exposure to early adversity. The present study examined the impact of early life adversity on different stages of neuronal reward processing later in life and their association with a related behavioral phenotype, i.e. attention deficit/hyperactivity disorder (ADHD). 162 healthy young adults (mean age = 24.4 years; 58% female) from an epidemiological cohort study followed since birth participated in a simultaneous EEG-fMRI study using a monetary incentive delay task. Early life adversity according to an early family adversity index (EFA) and lifetime ADHD symptoms were assessed using standardized parent interviews conducted at the offspring's age of 3 months and between 2 and 15 years, respectively. fMRI region-of-interest analysis revealed a significant effect of EFA during reward anticipation in reward-related areas (i.e. ventral striatum, putamen, thalamus), indicating decreased activation when EFA increased. EEG analysis demonstrated a similar effect for the contingent negative variation (CNV), with the CNV decreasing with the level of EFA. In contrast, during reward delivery, activation of the bilateral insula, right pallidum and bilateral putamen increased with EFA. There was a significant association of lifetime ADHD symptoms with lower activation in the left ventral striatum during reward anticipation and higher activation in the right insula during reward delivery. The present findings indicate a differential long-term impact of early life adversity on reward processing, implicating hypo-responsiveness during reward anticipation and hyper-responsiveness when receiving a reward. Moreover, a similar activation pattern related to lifetime ADHD suggests that the impact of early life stress on ADHD may possibly be mediated by a dysfunctional reward pathway.



Mitochondrial allostatic load puts the 'gluc' back in glucocorticoids

Martin Picard Robert-Paul Juster Bruce S. McEwen

[Affiliations](#) | [Contributions](#) | [Corresponding author](#)

Nature Reviews Endocrinology **10**, 303–310 (2014) | doi:10.1038/nrendo.2014.22

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EXPOSURE TO VIOLENCE AND OTHER STRESSORS DURING
CHILDHOOD IS ASSOCIATED WITH TELOMERE EROSION FROM
5 TO 10 YEARS OF AGE: A LONGITUDINAL STUDY;
MOLECULAR PSYCHIATRY; SHALEV, ET AL.

TELOMERES

PROTECT THE ENDS OF THE CHROMOSOME

FRAYED TELOMERES ARE ASSOCIATED WITH CHRONIC DISEASE,
PREMATURE AGING WITH CHRONIC DISEASE ONSET, AND EARLY DEATH

*“Compared with their counterparts, the children who
experienced 2 or more kinds of violence exposure showed
significantly more telomere erosion by age 10...”*

Alterations of Mitochondrial DNA Copy Number and Telomere Length With Early Adversity and Psychopathology

Audrey R. Tyrka, Stephanie H. Parade, Lawrence H. Price, Hung-Teh Kao, Barbara Porton, Noah S. Philip, Emma S. Welch, and Linda L. Carpenter

ABSTRACT

BACKGROUND: Telomere shortening and alterations of mitochondrial biogenesis are involved in cellular aging. Childhood adversity is associated with telomere shortening, and several investigations have shown short telomeres in psychiatric disorders. Recent studies have examined whether mitochondria might be involved in neuropsychiatric conditions; findings are limited and no prior work has examined this in relation to stress exposure.

METHODS: Two-hundred ninety healthy adults provided information on childhood parental loss and maltreatment and completed diagnostic interviews. Participants were categorized into four groups based upon the presence or absence of childhood adversity and the presence or absence of lifetime psychopathology (depressive, anxiety, and substance use disorders). Telomere length and mitochondrial DNA (mtDNA) copy number were measured from leukocyte DNA by quantitative polymerase chain reaction.

RESULTS: Childhood adversity and lifetime psychopathology were each associated with shorter telomeres ($p < .01$) and higher mtDNA copy numbers ($p < .001$). Significantly higher mtDNA copy numbers and shorter telomeres were seen in individuals with major depression, depressive disorders, and anxiety disorders, as well as those with parental loss and childhood maltreatment. A history of substance disorders was also associated with significantly higher mtDNA copy numbers.

CONCLUSIONS: This study provides the first evidence of an alteration of mitochondrial biogenesis with early life stress and with anxiety and substance use disorders. We replicate prior work on telomere length and psychopathology and show that this effect is not secondary to medication use or comorbid medical illness. Finally, we show that early life stress and psychopathology are each associated with these markers of cellular aging.

Keywords: Anxiety disorder, Childhood, Depressive disorder, Early life stress, Mitochondria, Telomere

<http://dx.doi.org/10.1016/j.biopsych.2014.12.025>

[Proc Natl Acad Sci U S A](#). 2016 Oct 18;113(42):E6335-E6342. Epub 2016 Oct 3.

Lifespan adversity and later adulthood telomere length in the nationally representative US Health and Retirement Study.

[Puterman E](#)¹, [Gemmill A](#)², [Karasek D](#)³, [Weir D](#)⁴, [Adler NE](#)⁵, [Prather AA](#)⁵, [Epel ES](#)⁶.

Author information

Abstract

Stress over the lifespan is thought to promote accelerated aging and early disease. Telomere length is a marker of cell aging that appears to be one mediator of this relationship. Telomere length is associated with early adversity and with chronic stressors in adulthood in many studies. Although cumulative lifespan adversity should have bigger impacts than single events, it is also possible that adversity in childhood has larger effects on later life health than adult stressors, as suggested by models of biological embedding in early life. No studies have examined the individual vs. cumulative effects of childhood and adulthood adversities on adult telomere length. Here, we examined the relationship between cumulative childhood and adulthood adversity, adding up a range of severe financial, traumatic, and social exposures, as well as comparing them to each other, in relation to salivary telomere length. We examined 4,598 men and women from the US Health and Retirement Study. Single adversities tended to have nonsignificant relations with telomere length. In adjusted models, lifetime cumulative adversity predicted 6% greater odds of shorter telomere length. This result was mainly due to childhood adversity. In adjusted models for cumulative childhood adversity, the occurrence of each additional childhood event predicted 11% increased odds of having short telomeres. This result appeared mainly because of social/traumatic exposures rather than financial exposures. This study suggests that the shadow of childhood adversity may reach far into later adulthood in part through cellular aging.

Childhood Maltreatment and Telomere Shortening: Preliminary Support for an Effect of Early Stress on Cellular Aging

Audrey R. Tyrka, Lawrence H. Price, Hung-Teh Kao, Barbara Porton, Sarah A. Marsella, and Linda L. Carpenter

Background: Psychological stress and trauma are risk factors for several medical and psychiatric illnesses. Recent studies have implicated advanced cellular aging as a potential mechanism of this association. Telomeres, DNA repeats that cap the ends of chromosomes and promote stability, shorten progressively with each cell division; their length is a marker of biological aging. Based on previous evidence linking psychosocial stress to shorter telomere length, this study was designed to evaluate the effect of childhood adversity on telomere length.

Methods: Thirty-one adults with no current or past major Axis I psychiatric disorder participated. Subjects reported on their history of childhood maltreatment and telomere length was measured from DNA extracted from frozen whole blood using quantitative polymerase chain reaction.

Results: Participants reporting a history of childhood maltreatment had significantly shorter telomeres than those who did not report a history of maltreatment. This finding was not due to effects of age, sex, smoking, body mass index, or other demographic factors. Analysis of subscales showed that both physical neglect and emotional neglect were significantly linked to telomere length.

Conclusions: These results extend previous reports linking shortened leukocyte telomere length and caregiver stress to more remote stressful experiences in childhood and suggest that childhood maltreatment could influence cellular aging.

The long-term impact of adverse caregiving environments on epigenetic modifications and telomeres

<http://www.frontiersin.org/Journal/10.3389/fnbeh.2015.00079/abstract>

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Dev Psychopathol. 2013 Aug;25(3):577-85. doi: 10.1017/S0954579413000011. Epub 2013 Mar 26.

Parental responsiveness moderates the association between early-life stress and reduced telomere length.

Asok A¹, Bernard K, Roth TL, Rosen JB, Dozier M.

Author information

Abstract

Early-life stress, such as maltreatment, institutionalization, and exposure to violence, is associated with accelerated telomere shortening. Telomere shortening may thus represent a biomarker of early adversity. Previous studies have suggested that responsive parenting may protect children from the negative biological and behavioral consequences of early adversity. This study examined the role of parental responsiveness in buffering children from telomere shortening following experiences of early-life stress. We found that high-risk children had significantly shorter telomeres than low-risk children, controlling for household income, birth weight, gender, and minority status. Further, parental responsiveness moderated the association between risk and telomere length, with more responsive parenting associated with longer telomeres only among high-risk children. These findings suggest that responsive parenting may have protective benefits on telomere shortening for young children exposed to early-life stress. Therefore, this study has important implications for early parenting interventions.

- **Childhood adversity linked to blood pressure dysfunction**

- **November 15, 2016**

A difficult childhood may be associated with a risk of poor blood pressure regulation, according to research presented at the American Heart Association's Scientific Sessions 2016.

- Fluctuations in [blood pressure](#) readings ([blood pressure](#) variability) have been associated in some studies to elevated risk of cardiovascular disease and complications from hypertension. Researchers at the Augusta University Medical College of Georgia investigated the impact of "adverse [childhood](#) experiences" – [childhood abuse](#) or neglect, dysfunctional homes, or low socioeconomic status – during the transition from childhood to adulthood. Earlier research has linked adverse childhood experiences to faster increase of blood pressure in adulthood.
- Researchers conducted periodic around-the-clock blood pressure monitoring to capture day and nighttime pressure readings in 373 participants between the ages of 7 and 38 during a 23-year period. Those who reported childhood adversity were 17 percent more likely to have blood pressure higher than the clinical definition of hypertension during the daytime.
- "Adverse environments in early life have been consistently associated with the increased risk of hypertension in later life," said Shaoyong Su, Ph.D., lead author and an associate professor of pediatrics at Augusta University Medical College of Georgia. "We found that children who experienced childhood abuse or neglect, dysfunctional homes and low socioeconomic status, were far more likely to have higher blood pressure at night as well as blood pressure variability over 24 hours, in addition to more rapid onset of hypertension at an earlier age."

Childhood abuse, parental warmth, and adult multisystem biological risk in the Coronary Artery Risk Development in Young Adults study

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Contributed by Shelley E. Taylor, August 23, 2013 (sent for review July 16, 2013)

Childhood abuse increases adult risk for morbidity and mortality. Less clear is how this “toxic” stress becomes embedded to influence health decades later, and whether protective factors guard against these effects. Early biological embedding is hypothesized to occur through programming of the neural circuitry that influences physiological response patterns to subsequent stress, causing wear and tear across multiple regulatory systems. To examine this hypothesis, we related reports of childhood abuse to a comprehensive 18-biomarker measure of multisystem risk and also examined whether presence of a loving parental figure buffers against the impact of childhood abuse on adult risk. A total of 756 subjects (45.8% white, 42.7% male) participated in this ancillary substudy of the Coronary Artery Risk Development in Young Adults Study. Childhood stress was determined by using the Risky Families Questionnaire, a well-validated retrospective self-report scale. Linear regression models adjusting for age, sex, race, parental education, and oral contraceptive use found a significant positive relationship between reports of childhood abuse and multisystem health risks [B (SE) = 0.68 (0.16); $P < 0.001$]. Inversely, higher amounts of reported parental warmth and affection during childhood was associated with lower multisystem health risks [B (SE) = -0.40 (0.14); $P < 0.005$]. A significant interaction of abuse and warmth ($P < 0.05$) was found, such that individuals reporting low levels of love and affection and high levels of abuse in childhood had the highest multisystem risk in adulthood.

physiological regulatory systems in relation to childhood toxic stress, including increased levels of hemoglobin A1c, elevated total cholesterol, higher adiposity, and metabolic syndrome (13–15). Likewise, neuroendocrine changes have been observed in individuals reporting childhood stress, such as greater sympathetic nervous system (SNS) activity, disrupted hypothalamic-pituitary-adrenal (HPA) activity, and autonomic imbalance (11, 16). Childhood toxic stress has also been associated with a less healthy cardiovascular system profile (e.g., elevated blood pressure), increases in inflammation suggestive of proinflammatory immune system programming, and accelerated cellular aging (17–25). In addition to alterations in adult levels of these biomarkers of risk, several of these markers have been observed in children with stress (18, 23, 26–30), with one study reporting more pronounced effects of cumulative childhood stress on stress hormones, blood pressure, and fat deposition among those with mothers who were cold and unresponsive to their needs (27). This work indicates that the impact of childhood stress on these regulatory systems may begin in childhood, but might be buffered by a nurturing relationship with an adult.

Despite the considerable evidence that childhood toxic stress is associated with worse regulation across multiple biological systems in adulthood, research to date has largely focused on each of these separate, individual systems. Few studies have sought to evaluate the cumulative biological “toll” of childhood stress on adult health through a multifactorial lens rather than in

Significance

Adverse social relations in early life are thought to negatively influence health throughout the lifespan. The present findings provide a biological link regarding why negative early life experiences affect health and further suggest that a loving parental figure may provide protection. It is well recognized that providing children in adverse circumstances with a nurturing relationship is beneficial for their overall wellbeing. Our findings suggest that a loving relationship may also prevent the rise in biomarkers indicative of disease risk across numerous physiological systems, impacting adverse health outcomes decades later. The results contribute in a meaningful way to several biological literatures and to the social sciences and, as such, will have a substantial impact.

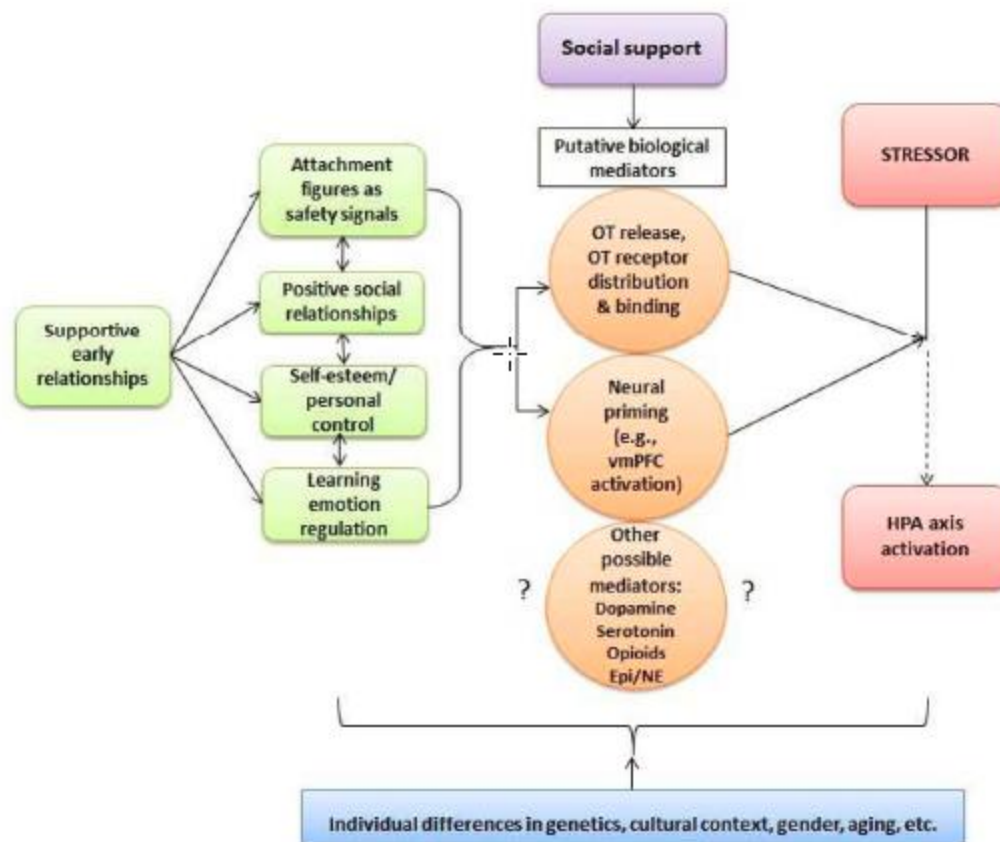


Figure 1. A Developmental Working Model of Social Buffering of the HPA Axis in Humans
 OT = oxytocin, vmPFC = ventro-medial prefrontal cortex, Epi = epinephrine, NE = norepinephrine.

Adverse Childhood Experiences and Adult Risk Factors for Age-Related Disease

Depression, Inflammation, and Clustering of Metabolic Risk Markers

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Objective: To understand why children exposed to adverse psychosocial experiences are at elevated risk for age-related disease, such as cardiovascular disease, by testing whether adverse childhood experiences predict enduring abnormalities in stress-sensitive biological systems, namely, the nervous, immune, and endocrine/metabolic systems.

Design: A 32-year prospective longitudinal study of a representative birth cohort.

Setting: New Zealand.

Participants: A total of 1037 members of the Dunedin Multidisciplinary Health and Development Study.

Main Exposures: During their first decade of life, study members were assessed for exposure to 3 adverse psychosocial experiences: socioeconomic disadvantage, maltreatment, and social isolation.

Main Outcome Measures: At age 32 years, study members were assessed for the presence of 3 age-related-disease risks: major depression, high inflammation levels (high-sensitivity C-reactive protein level >3 mg/L), and the clustering of metabolic risk biomarkers (overweight, high blood pressure, high total cholesterol,

low high-density lipoprotein cholesterol, high glycated hemoglobin, and low maximum oxygen consumption levels.

Results: Children exposed to adverse psychosocial experiences were at elevated risk of depression, high inflammation levels, and clustering of metabolic risk markers. Children who had experienced socioeconomic disadvantage (incidence rate ratio, 1.89; 95% confidence interval, 1.36-2.62), maltreatment (1.81; 1.38-2.38), or social isolation (1.87; 1.38-2.51) had elevated age-related-disease risks in adulthood. The effects of adverse childhood experiences on age-related-disease risks in adulthood were nonredundant, cumulative, and independent of the influence of established developmental and concurrent risk factors.

Conclusions: Children exposed to adverse psychosocial experiences have enduring emotional, immune, and metabolic abnormalities that contribute to explaining their elevated risk for age-related disease. The promotion of healthy psychosocial experiences for children is a necessary and potentially cost-effective target for the prevention of age-related disease.

Arch Pediatr Adolesc Med. 2009;163(12):1135-1143

Epidemiology. 2011 Jan;22(1):6-14. doi: 10.1097/EDE.0b013e3181ffb172.

Abuse in childhood and risk of uterine leiomyoma: the role of emotional support in biologic resilience.

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Author information

Abstract

BACKGROUND: Childhood adversities are associated with adult health. We hypothesize that exposure to physical and sexual abuse in childhood and adolescence will be associated with incidence of clinically symptomatic uterine leiomyomas (fibroids) through influences on health behaviors and reproductive hormone regulation.

METHODS: Participants included 68,505 women enrolled in the Nurses' Health Study II, an ongoing prospective cohort study of premenopausal women from 14 US states aged 25-42 years at enrollment (1989), who completed a retrospective questionnaire on childhood violence exposure (2001). A cumulative indicator of severity and chronicity of child/teen violence exposure was derived using factor analysis. We used a Cox proportional-hazards model to estimate the incidence rate ratios (IRRs) and 95% confidence intervals (CIs).

RESULTS: During the 728,865 woman-years of follow-up (1989-2005), 9823 incident diagnoses of ultrasound- or hysterectomy-confirmed uterine leiomyomas were reported; 65% reported any physical or sexual abuse. A dose-response association between cumulative abuse and fibroid risk was found. Compared with those who reported no abuse, multivariable IRRs for ultrasound or hysterectomy-confirmed uterine leiomyomas were 1.08 (95% CI = 1.03-1.13), 1.17 (1.10-1.24), 1.23 (1.14-1.33), 1.24 (1.10-1.39), and 1.36 (1.18-1.54), for cumulative exposures ranging from mildest to most severe. Increased emotional support in childhood also attenuated associations.

CONCLUSIONS: Severity and chronicity of child/teen sexual and physical abuse was associated with increasing risk of clinically detected fibroids among premenopausal women.

Adverse childhood event experiences, fertility difficulties and menstrual cycle characteristics.

Jacobs MB¹, Boynton-Jarrett RD, Harville EW.

⊕ Author information

Abstract

INTRODUCTION: Increased childhood adversity may be affect adult fertility, however, the mechanism through which this occurs is unclear. Menstrual cycle abnormalities are predictive of fertility difficulties, and stress influences menstrual cycle characteristics. Here, we assess whether adverse childhood experiences (ACEs) are associated with fertility difficulties and menstrual cycle dysregulation, offering a plausible mechanism for the link between lifetime stress and fertility.

METHODS: From April 2012 to February 2014, 742 pregnant and non-pregnant women aged 18-45 years residing in southeastern Louisiana provided information on childhood adversity and reproductive history. Associations between ACEs and fertility difficulties and menstrual cycle patterns were evaluated.

RESULTS: As the number of ACEs increased, risk of fertility difficulties and amenorrhea increased (RR = 1.09, 95% CI 1.05-1.13 and RR = 1.07, 95% CI 1.04-1.10, respectively), while fecundability decreased [fecundability ratio (FR) = 0.97, 95% CI 0.95-1.00]. Compared to women with no adversity, women in the high adversity group were more likely to experience both infertility and amenorrhea (RR = 2.75, 95% CI 1.45-5.21 and RR = 2.54, 95% CI 1.52-4.25, respectively), and reduced fecundability (FR = 0.75, 95% CI 0.56-1.00). Although similar patterns were seen for menstrual cycle irregularity, associations were diminished. Associations did not materially change following adjustment for age, body mass index, race, education, smoking and income. Results are constrained by the self-report nature of the study and the limited generalizability of the study population.

DISCUSSION: To our knowledge, this is the first study to present evidence of a link between childhood stressors, menstrual cycle disruption and fertility difficulties. The effect of childhood stress on fertility may be mediated through altered functioning of the HPA axis, acting to suppress fertility in response to less than optimal reproductive circumstances.

KEYWORDS: ACE; adverse childhood events; amenorrhea; fertility; menstrual cycle

Adverse Family Experiences During Childhood and Adolescent Obesity

William J. Heerman¹, Shanthi Krishnaswami², Shari L. Barkin¹, and Melissa McPheeters^{2,3}

Objective: To evaluate the association between adverse family experiences (AFEs) during childhood and adolescent obesity and to determine populations at highest risk for AFEs.

Methods: A cross-sectional analysis was performed of the 2011-2012 National Survey of Children's Health, including children aged 10-17 years. Weighted estimates of 31,258,575 children were based on interviews with 42,239 caregivers. Caregiver reports of nine psychosocial risk factors measured AFEs during childhood. Adolescent overweight and obesity were derived by caregiver-reported child height and weight.

Results: Nearly one-third (30.5%) of children had experienced ≥ 2 AFEs, with geographic variation by state. The prevalence of obesity among children experiencing ≥ 2 AFEs was 20.4%, when compared with 12.5% among children with 0 AFEs. Adjusted survey regression models were controlled for child, parent, household, and neighborhood characteristics. Children with ≥ 2 AFEs in childhood were more likely to have obesity (AOR = 1.8; 95% CI = 1.47-2.17; $P < 0.001$) than those with no AFEs, with Non-Hispanic, White children most affected.

Conclusions: Adolescents in this national sample who were exposed to greater numbers of AFEs in childhood also had higher rates of overweight and obesity. Geographic variation and differential associations based on race/ethnicity identified children at greatest risk.

Child Maltreatment's Heavy Toll:

The Need for Trauma-Informed Obesity Prevention

I

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aims of this paper are to:

1. raise awareness of the prevalence of childhood maltreatment;
2. present current evidence of the child maltreatment–obesity association;
3. highlight existing research on mechanisms; and
4. suggest areas for additional research, including trauma-informed obesity interventions that warrant testing.

Although this paper focuses on childhood maltreatment, particularly physical and sexual abuse, the presented information is potentially relevant to other types of early trauma, such as community violence and peer bullying.

Bullied Kids May Have Double the Risk of Being Overweight at 18

By Traci Pedersen

~ 2 min read

Childhood victims of bullying have nearly double the risk of being overweight at 18 years of age compared to non-bullied children, according to a new study by researchers at King's College London.

"Bullying is commonly associated with mental health problems, but there is little research examining the physical health of bullied children," said Dr. Andrea Danese at the Institute of Psychiatry, Psychology & Neuroscience (IoPPN) at King's College London.

"Our study shows that bullied children are more likely to be overweight as young adults, and that they become overweight independent of their genetic liability and after experiencing victimisation."



Nov 16, 2016

Toxic Stress, Behavioral Health, and the Next Major Era in Public Health

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Before the development of the germ theory in the late 19th century, infectious illnesses were largely uncontrollable and caused significant mortality. Implementing public hygiene, preventive, and treatment interventions created remarkable improvements in population health. Today's U.S. public health crises involve threats to health and human capital evidenced by multiple indicators of deteriorating wellbeing. These problems result from the interaction of risk and protective factors. Specifically, we argue that the interaction of genetic vulnerability and toxic stress are antecedents to a developmental cascade that undermines healthy development and human capital. We review relevant literature, summarize effective strategies to prevent or ameliorate this deterioration, and outline a theory of the mechanisms currently undermining our health. A series of strategies that we believe will constitute the next major era in public health are discussed, involving actions at the individual/family, community and societal level to reduce risk and strengthen protective factors.

How do you know you have a kid with ACES? What does it look like?

Poor Decision Making

Sleep Problems

No Way Out

Lack of Focus

Self Harm

Bed Wetting

Profanity

Eating Too Much

Kid on 10/ Turned up

Impulse Control

Regression

Hitting

Malnourished

Obesity

Aggressive

Scared

Worried

Parentified

Suicide Ideation

Big Emotions/Dysregulation

Difficulty with Transitions

Big Need for Attention

Language Difficulties

Hoarding

Sexual Acting Out

Looking Bored/ Flat affect

Accident Prone

Overweight

Chronic Illnesses

Rigidity

Disorganized

Hard to Learn

Doing Something to Get Shot

Forgetful

Milestones

News Analysis: Are We Misdiagnosing Childhood Traumas as ADHD?

Written by Rachel Barclay | Published on May 6, 2014



A new study shows that a child with an ADHD diagnosis is more likely to have also experienced stress and trauma early in life.

Children with attention deficit hyperactivity disorder (ADHD) receive a diagnosis based on their behavior: age-inappropriate fidgeting, inattentiveness, hyperactivity, and trouble sitting still and concentrating. However, according to new research presented today at the [Pediatric Academic Societies](#) annual meeting in Vancouver, Canada, these behaviors may also be linked to childhood trauma.

Advertisement

The advertisement features a woman with dark hair and a neutral expression, wearing a light-colored cardigan over a dark top. Above her head are several overlapping, colorful, swirling lines in shades of blue, green, yellow, and red, resembling a stylized brain scan or neural activity. To the right of the woman, the text reads: "Trintellix vortioxetine" in a large, blue, sans-serif font, with "5mg•10mg•20mg tablets" in a smaller font below it. Further down, it states: "TRINTELLIX is a prescription medicine used to treat MDD in adults". At the bottom right, there is a link that says "Learn more >".

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TRINTELLIX is a
prescription
medicine used to
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A functional serotonin transporter promoter gene polymorphism increases ADHD symptoms in delinquents: Interaction with adverse childhood environment

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Abstract

Although attention-deficit/hyperactivity disorder (ADHD) is highly heritable, environmental conditions play an important role in its manifestation during childhood development. Here, we report the results of an investigation on the interaction of adverse childhood environment with a functional polymorphism of the serotonin transporter promoter gene (5-HTTLPR) and its impact on ADHD psychopathology in young adult delinquents. Standardized instruments were used to assess childhood and current ADHD and adverse childhood environment in 184 male delinquents. Each subject was genotyped for 5-HTTLPR long (L) and small (S) alleles. Logistic regression analysis revealed independent effects of high childhood environmental adversity and the 5-HTTLPR LL-genotype on self-reported childhood ADHD and on persistent ADHD. In addition, a significant gene by environment interaction was found, indicating that carriers of at least one 5-HTTLPR short allele are more sensitive to childhood environment adversity than carriers of the LL-genotype. The results support prior findings of association between ADHD and 5-HTTLPR LL-genotype and adverse childhood environment, and they underline the need for further investigation of gene by environment interaction with respect to ADHD.

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Keywords: Interaction; Gene; Environment; ADHD; 5HTTLPR; Serotonin



ORIGINAL ARTICLE

Early life stress induces attention-deficit hyperactivity disorder (ADHD)-like behavioral and brain metabolic dysfunctions: functional imaging of methylphenidate treatment in a novel rodent model

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Taken together our study revealed that ELS as environmental challenge induces metabolic hypoactivity in brain pathways mediating attentiveness, which are paralleled by behavioral traits reminiscent of human ADHD. These dysfunctions are due to dopaminergic dysfunctions as they are ameliorated by MP treatment. Our results underline the importance to consider an adverse childhood environment as an important factor in the etiology of ADHD-like behavioral abnormalities.

Did you know?

Research shows that **childhood trauma** stands in the way of academic success for millions of children, especially those in **underserved communities**

Unaddressed, exposure to trauma has a high correlation with:

- Low literacy
- High dropout rates
- Repeating grades
- Low achievement
- School-to-prison pipeline

Peter P., et al. v. Compton Unified School District, et al. is a landmark, first-of-its kind class action complaint addressing a widespread, yet often ignored, public health crisis in America: **the adverse impact of childhood trauma on learning**. This case has been filed in Los Angeles by Public Counsel and Irell & Manella LLP on behalf of a class of students and teachers and demands that Compton Unified School District incorporate proven practices that address trauma—in the same way public schools have adapted and evolved in past decades to help students who experience physical or other barriers to learning.



Click on Image to View Video Testimonies

Trauma-sensitive school districts across the nation are beginning to address trauma successfully, and when they do, **the benefits to kids, to families, and to the community are extraordinary.**

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People with bipolar disorder more than twice as likely to have suffered childhood adversity

The University of Manchester News, 10/14/2016



University of Manchester study which looked at more than thirty years of research into bipolar, found that people with the disorder are 2.63 times more likely to have suffered emotional, physical or sexual abuse as children than the general population.

In the study the researchers identified 19 studies from hundreds published between 1980 and 2014 which gathered data from millions of patient records, interviews and assessments.

By applying rigorous statistical analysis to the data, the researchers compared the likelihood of people with and without bipolar disorder having adverse childhood experiences, such as physical, emotional and sexual abuse. The findings revealed a strong link between these events and subsequent diagnosis.

RESEARCH ARTICLE

Open Access

Type and timing of adverse childhood experiences differentially affect severity of PTSD, dissociative and depressive symptoms in adult inpatients



Inga Schalinski^{1*}, Martin H. Teicher^{2,3}, Daniel Nischk⁴, Eva Hinderer⁴, Oliver Müller⁴ and Brigitte Rockstroh¹

RESEARCH ARTICLE

The 'Maltreatment and Abuse Chronology of Exposure' (MACE) Scale for the Retrospective Assessment of Abuse and Neglect During Development

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OPEN ACCESS

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Data Availability Statement: All relevant data are within the paper and its Supporting Information files.

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Competing Interests: The authors have declared that no competing interests exist.

Abstract

There is increasing interest in childhood maltreatment as a potent stimulus that may alter trajectories of brain development, induce epigenetic modifications and enhance risk for medical and psychiatric disorders. Although a number of useful scales exist for retrospective assessment of abuse and neglect they have significant limitations. Moreover, they fail to provide detailed information on timing of exposure, which is critical for delineation of sensitive periods. The Maltreatment and Abuse Chronology of Exposure (MACE) scale was developed in a sample of 1051 participants using item response theory to gauge severity of exposure to ten types of maltreatment (emotional neglect, non-verbal emotional abuse, parental physical maltreatment, parental verbal abuse, peer emotional abuse, peer physical bullying, physical neglect, sexual abuse, witnessing interparental violence and witnessing violence to siblings) during each year of childhood. Items included in the subscales had acceptable psychometric properties based on infit and outfit mean square statistics, and each subscale passed Anderson's Likelihood ratio test. The MACE provides an overall severity score and multiplicity score (number of types of maltreatment experienced) with excellent test-retest reliability. Each type of maltreatment showed good reliability as did severity of exposure across each year of childhood. MACE Severity correlated 0.738 with Childhood Trauma Questionnaire (CTQ) score and MACE Multiplicity correlated 0.698 with the Adverse Childhood Experiences scale (ACE). However, MACE accounted for 2.00- and 2.07-fold more of the variance, on average, in psychiatric symptom ratings than CTQ or ACE, respectively, based on variance decomposition. Different types of maltreatment had distinct and often unique developmental patterns. The 52-item MACE, a simpler Maltreatment Abuse and Exposure Scale (MAES) that only assesses overall exposure and the original test instrument (MACE-X) with several additional items plus spreadsheets and R code for scoring are provided to facilitate use and to spur further development.

First Name: _____

Rater: _____

Subject/Family's ID: _____

Date: _____

Yale-Vermont Adversity in Childhood Scale (Y-VACS)

Hudziak, J.J. & Kaufman, J. (2014)

ADULT SELF-REPORT (ASR) OF CHILDHOOD EXPERIENCES

Instructions: People encounter a variety of different stressful experiences. For each of the following questions, please note in the Frequency column whether the experience happened to you as a child or adolescent, and if it happened more than one time. If these experiences did happen, please record in the Severity column how severe you think they were. The first questions focus on natural disasters, community, and health-related experiences.

Frequency:

0 = Never

1 = One time

2 = More than once

Severity:

1 = Mild or Suspected

2 = Moderate

3 = Severe

Frequency	Natural Disasters, Community, and Health-Related Experiences	[Record ages when events occurred]	Severity
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Adverse Childhood Experiences International Questionnaire (ACE-IQ)

Adverse Childhood Experiences (ACE) refer to some of the most intensive and frequently occurring sources of stress that children may suffer early in life. Such experiences include multiple types of abuse; neglect; violence between parents or caregivers; other kinds of serious household dysfunction such as alcohol and substance abuse; and peer, community and collective violence.

It has been shown that considerable and prolonged stress in childhood has life-long consequences for a person's health and well-being. It can disrupt early brain development and compromise functioning of the nervous and immune systems. In addition because of the behaviours adopted by some people who have faced ACEs, such stress can lead to serious problems such as alcoholism, depression, eating disorders, unsafe sex, HIV/AIDS, heart disease, cancer, and other chronic diseases.

The ACE International Questionnaire (ACE-IQ) is intended to measure ACEs in all countries, and the association between them and risk behaviours in later life. ACE-IQ is designed for administration to people aged 18 years and older. Questions cover family dysfunction; physical, sexual and emotional abuse and neglect by

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Adverse Childhood Experiences

Expanding the Concept of Adversity



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Megan H. Bair-Merritt, MD, MSCE, Martha Davis, MSS, Mary Harkins-Schwarz, MPH,
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Introduction: Current knowledge of Adverse Childhood Experiences (ACEs) relies on data predominantly collected from white, middle- / upper-middle-class participants and focuses on experiences within the home. Using a more socioeconomically and racially diverse urban population, Conventional and Expanded (community-level) ACEs were measured to help understand whether Conventional ACEs alone can sufficiently measure adversity, particularly among various subgroups.

Methods: Participants from a previous large, representative, community-based health survey in Southeast Pennsylvania who were aged ≥ 18 years were contacted between November 2012 and January 2013 to complete another phone survey measuring ACEs. Ordinal logistic regression models were used to test associations between Conventional and Expanded ACEs scores and demographic characteristics. Analysis was conducted in 2013 and 2014.

Results: Of 1,784 respondents, 72.9% had at least one Conventional ACE, 63.4% at least one Expanded ACE, and 49.3% experienced both. A total of 13.9% experienced only Expanded ACEs and would have gone unrecognized if only Conventional ACEs were assessed. Certain demographic characteristics were associated with higher risk for Conventional ACEs but were not predictive of Expanded ACEs, and vice versa. Few adversities were associated with both Conventional and Expanded ACEs.

Conclusions: To more accurately represent the level of adversity experienced across various sociodemographic groups, these data support extending the Conventional ACEs measure.
(Am J Prev Med 2015;49(3):354–361) © 2015 American Journal of Preventive Medicine

Demographic Characteristics for Childhood Stress and Urban Poverty: The Impact of ACEs on Health

2015 Midwest Regional Summit on Adverse Childhood Experiences:
Building Partnerships Across Generations for Healthy Futures
Chicago, Illinois
Thursday March 12th, 2015

Roy Wade, Jr. MD, PhD, MPH
Instructor of Pediatrics
Children's Hospital of Philadelphia


* $p < 0.05$; ** $p < 0.01$; *** $p < 0.001$

The Philadelphia ACE Study

A collaborative, led by the Institute for Safe Families (ISF), to develop and implement research, practice, and policies in urban pediatric settings based on the Adverse Childhood Experiences (ACE) study.



The Philadelphia ACE Task Force

- Formed by ISF in April 2012
 - Partnership between practitioners, public health leaders, and funders
 - Objectives
 - Build on original ACE findings to understand the potential impact of additional urban stressors
 - Develop policies, practices, and research within urban pediatric settings
 - Disseminate knowledge to the local community
 - Population-level study of ACEs in Philadelphia
- 

Survey Methods

- Survey was completed as a follow up to the Southeastern Pennsylvania Household Health Survey (SEPA HHS).
 - Survey of over 13,000 children and adults in Southeastern Pennsylvania
 - Comprehensive survey on a broad range of topics
- Philadelphia ACE Survey re-contacted original SEPA HHS Philadelphia respondents who were 18 years or older
- Telephone survey (landline and cell phones)
- Completed by trained male and female interviewers
- Interviews were conducted in English and Spanish
- Interviewed 1,784 Philadelphia adults age 18 and older
- Response rate 67.1%

Philadelphia ACE Study Questions

Conventional ACEs	Expanded ACEs
Physical Abuse	Witnessing Violence
Emotional Abuse	Living in Unsafe Neighborhoods
Sexual Abuse	Experiencing Racism
Emotional Neglect	Living in Foster Care
Physical Neglect	Experiencing Bullying
Domestic Violence	
Household Substance Abuse	
Incarcerated Care Provider	
Mental Illness in the Home	

Demographic Characteristics for Philadelphia Adults with Four or More ACEs

Demographics		Respondents (N = 1,784)
Sex**	Male	58.2%
	Female	41.8%
Race***	Black	48.6%
	White	34.0%
Poverty Level***	Below 150% of poverty guidelines	68.2%
	Above 150% of poverty guidelines	31.8%

*p<0.05; **p<0.01; ***p<0.001

Traditional ACEs are More Prevalent in an Urban Setting

	Philadelphia ACE Study (N = 1,784)	Kaiser ACE Study (N = 17,337)
Emotional abuse	33.2%	10.6%
Physical abuse	35.0%	28.3%
Sexual abuse	16.2%	20.7%
Physical neglect	19.1%	14.8%
Emotional neglect	7.7%	9.9%
Substance abusing household member	34.8%	26.9%
Mentally ill household member	24.1%	19.4%
Witnessed domestic violence	17.9%	12.7%
Household member in prison	12.9%	4.7%

Prevalence of Expanded ACEs

Expanded ACE Indicators	Respondents (N = 1,784)
Witnessed violence	40.5%
Felt discrimination	34.5%
Adverse neighborhood experience	27.3%
Bullied	7.9%
Lived in foster care	2.5%

ACE Scale Can Be Improved by Adding Additional Adversities to the Measure

Original

- Emotional abuse
- Physical abuse
- Sexual abuse
- Physical neglect
- Emotional neglect
- Mother treated violently
- Household substance abuse
- Household mental illness
- Incarcerated household member
- Parental separation or divorce

Additional Adversities

- Property victimization
- Peer victimization
- Exposure to community violence
- Socioeconomic status
- Someone close had a bad accident or illness
- Below-average grades
- Parents always arguing
- No good friends

Screening for Adverse Childhood Experiences (ACEs) in an Integrated Pediatric Care Model

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ABSTRACT

Adverse childhood experiences (ACEs) are stressful or traumatic events that place children at risk of negative health, mental health, and behavioral outcomes. The Center for Youth Wellness (CYW), working in partnership with the Bayview Child Health Center (BCHC), pioneered ACE screening for children and adolescents. This article describes the theoretical framework and rationale for ACE screening in a primary care pediatric setting, introduces the CYW Adverse Childhood Experiences Questionnaire (CYW ACE-Q), and describes the BCHC-CYW Integrated Pediatric Care Model aimed at addressing the effects of ACEs and toxic stress. Considerations for the implementation of ACE screening are also reviewed.

TABLE 1. The Center for Youth Wellness Adverse Childhood Experiences Questionnaire (CYW ACE-Q)

Screening tool	Description	Section One	Section Two	Age range	Completed by
CYW ACE-Q Child	17-item instrument, 2 sections, 2–5 minutes to complete	Original ACEs (1–10)	7 additional ACEs (foster care, bullying, parent/guardian death, separation due to deportation/immigration, serious medical procedure/illness, violence in neighborhood, discrimination)	Children birth to 12 years old	Parent/caregiver on behalf of child
CYW ACE-Q Teen	19-item instrument, 2 sections, 2–5 minutes to complete	Original ACEs (1–10)	9 additional ACEs (foster care, bullying, parent/guardian death, separation due to deportation/immigration, serious medical procedure/illness, violence in neighborhood, discrimination, youth intimate partner violence, youth arrest/incarceration)	Youth 13 to 19 years old	Parent/caregiver on behalf of teen
CYW ACE-Q Teen Self-Report	19-item instrument, 2 sections, 2–5 minutes to complete	Original 10 ACEs (1–10)	9 additional ACEs (foster care, bullying, parent/guardian death, separation due to deportation/immigration, serious medical procedure/illness, violence in neighborhood, discrimination, youth intimate partner violence, youth arrest/incarceration)	Youth 13 to 19 years old	Youth (self-report)

Adverse Childhood Experiences and Adult Well-Being in a Low-income, Urban Cohort

Alison Giovanelli, MA, Arthur J. Reynolds, PhD, Christina F. Mondì, BA, Suh-Ruu Ou, PhD

abstract

OBJECTIVE: This study tests the association between adverse childhood experiences (ACEs) and multidimensional well-being in early adulthood for a low-income, urban cohort, and whether a preschool preventive intervention moderates this association.

METHODS: Follow-up data were analyzed for 1202 low-income, minority participants in the Chicago Longitudinal Study, a prospective investigation of the impact of early experiences on life-course well-being. Born between 1979 and 1980 in high-poverty neighborhoods, individuals retrospectively reported ACEs from birth to adolescence, except in cases of child abuse and neglect.

RESULTS: Nearly two-thirds of the study sample experienced ≥ 1 ACEs by age 18. After controlling for demographic factors and early intervention status, individuals reporting ACEs were significantly more likely to exhibit poor outcomes than those with no ACEs. Those with ≥ 4 ACEs had significantly reduced likelihood of high school graduation (odds ratio [OR] = 0.37; $P < .001$), increased risk for depression (OR = 3.9; $P < .001$), health compromising behaviors (OR = 4.5; $P < .001$), juvenile arrest (OR = 3.1; $P < .001$), and felony charges (OR = 2.8; $P < .001$). They were also less likely to hold skilled jobs (OR = 0.50; $P = .001$) and to go further in school even for adversity measured by age 5.

CONCLUSIONS: ACEs consistently predicted a diverse set of adult outcomes in a high-risk, economically disadvantaged sample. Effective and widely available preventive interventions are needed to counteract the long-term consequences of ACEs.

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Child Abuse & Neglect



Adverse childhood experiences (ACE) and health-risk behaviors among adults in a developing country setting[☆]

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ABSTRACT

Objective: This study aimed to examine the association among adverse childhood experiences, health-risk behaviors, and chronic disease conditions in adult life.

Study population: One thousand and sixty-eight (1,068) males and females aged 35 years and older, and residing in selected urban communities in Metro Manila participated in the cross-sectional survey.

Methods: A pretested local version of the Adverse Childhood Experiences Questionnaires developed by the Centers for Disease Control and Prevention, USA, was used. Data were collected through self-administration of the questionnaire. Prevalence and estimates of odds ratio were computed to obtain a measure of association among variables. Logistic regression analysis was employed to adjust for the potential confounding effects of age, sex, and socio-economic status.

Results: The results indicated that 75% of the respondents had at least 1 exposure to adverse childhood experiences. Nine percent had experienced 4 or more types of abuse and household dysfunctions. The most commonly reported types of negative childhood events were psychological/emotional abuse, physical neglect, and psychological neglect of basic needs. Majority of respondents claimed to have experienced living with an alcoholic or problem drinker and where there was domestic violence. Health-risk behavior consequences were mostly in the form of smoking, alcohol use, and risky sexual behavior. The general trend shows that there was a relatively strong graded relationship between number of adverse childhood experiences, health-risk behaviors, and poor health.

Conclusion: This study provided evidence that child maltreatment is a public health problem even in poorer environments. Prevention and early intervention of child maltreatment were recommended to reduce the prevalence of health-risk behavior and morbidity in later life.

Table 5

Prevalence and adjusted relative odds of health-risk behaviors by number of adverse childhood exposures, Philippines, 2007.

Health-risk behavior		Number of adverse childhood exposures				
		None (n = 286)	1 (n = 264)	2 (n = 201)	3 (n = 148)	≥4 (n = 169)
Current smoker	Prevalence, %	26.9	25.0	27.9	35.1	40.8
	OR (95% CI) ^a	1.0 (referent)	1.0 (0.7–1.5)	1.1 (0.7–1.8)	1.3 (0.8–2.1)	1.7 (1.1–2.7)
Early smoking initiation	Prevalence, %	7.0	10.2	10.5	17.6	20.1
	OR (95% CI) ^a	1.0 (referent)	1.8 (0.9–3.3)	2.0 (1.0–4.0)	2.7 (1.4–5.2)	3.7 (1.9–6.9)
Current alcohol use	Prevalence, %	31.8	31.1	38.3	44.6	43.8
	OR (95% CI) ^a	1.0 (referent)	1.2 (0.8–1.9)	2.0 (1.3–3.2)	1.8 (1.1–2.9)	1.8 (1.1–2.9)
Driving drunk	Prevalence, %	5.2	4.5	5.0	8.8	5.3
	OR (95% CI) ^a	1.0 (referent)	1.1 (0.5–2.5)	1.3 (0.5–3.0)	1.9 (0.9–4.4)	1.0 (0.4–2.6)
Illicit drug use	Prevalence, %	4.5	6.8	17.4	14.2	24.9
	OR (95% CI) ^a	1.0 (referent)	1.8 (0.9–3.9)	5.7 (2.8–11.6)	3.4 (1.6–7.3)	7.0 (3.5–14.2)
Early sex	Prevalence, %	4.2	10.6	9.5	13.5	13.0
	OR (95% CI) ^a	1.0 (referent)	2.9 (1.4–5.9)	2.7 (1.3–5.9)	3.5 (1.7–7.5)	3.4 (1.6–7.2)
Multiple partners, ≥3	Prevalence, %	26.2	26.9	32.3	38.5	50.3
	OR (95% CI) ^a	1.0 (referent)	1.3 (0.9–2.0)	1.9 (1.2–2.9)	1.9 (1.2–3.0)	3.6 (2.3–5.7)
Early pregnancy ^b	Prevalence, %	7.3	11.7	14.8	19.7	14.5
	OR (95% CI) ^a	1.0 (referent)	1.5 (0.7–3.5)	2.0 (0.8–4.6)	2.5 (1.0–6.4)	1.7 (0.7–4.3)
Unintended 1st pregnancy ^b	Prevalence, %	24.3	28.3	50.0	34.4	48.7
	OR (95% CI) ^a	1.0 (referent)	1.2 (0.7–2.1)	2.8 (1.6–4.8)	1.7 (0.9–3.3)	3.1 (1.7–5.8)
Weight ≥ 170 lbs	Prevalence, %	12.2	10.2	6.5	12.2	12.4
	OR (95% CI) ^a	1.0 (referent)	1.0 (0.6–1.7)	0.6 (0.3–1.2)	1.1 (0.6–2.0)	1.1 (0.6–2.0)
Suicide attempt	Prevalence, %	0.0	1.1	5.5	7.4	9.5
	OR (95% CI) ^a		1.0 (referent)	10.5 (2.9–38.5)	18.3 (4.9–67.5)	24.1 (6.7–86.5)

OR, odds ratio; CI, confidence interval.

^a Adjusted for age, gender, education, SES.^b Among 533 women.

Adversity in childhood: how the past defines the future



Kate Morris/Photofest.com

For the 1998 ACE Study see
Am J Prev Med 1998; **14**: 245–58

For the Welsh ACE reports see
<http://www.wales.nhs.uk/sitesplus/888/page/88517>

For more on the Flying Start programme see <http://gov.wales/topics/people-and-communities/people/children-and-young-people/parenting-support-guidance/help/flyingstart/?lang=en>

Nearly two decades ago, the Adverse Childhood Experiences (ACE) Study broke new ground, showing a strong relationship between ACEs and health-risk behaviour and disease in adulthood. The findings of this large-scale study have been affirmed by smaller local studies across the world. On Nov 1, Public Health Wales published the last of three reports from a study on the effects on ACEs on the health and wellbeing of adults in Wales. This report focuses on the relationship between ACEs and chronic disease. More than 2000 adults aged 18–69 years answered questions on their experiences of maltreatment and household dysfunction as children and on their health as adults, including diagnoses of chronic diseases and frequency of doctor or hospital visits.

Almost half of those surveyed had experienced at least one ACE, with 14% of respondents having experienced four ACEs or more. In this high-risk population, the rate of adults diagnosed with chronic diseases was more than twice as high as that of adults with no ACEs, and more than four times higher for type 2 diabetes. With the two

previous reports showing a strong relationship between ACEs and low mental wellbeing and harmful behaviours, the study presents a troubling picture of poor health and premature mortality in a vulnerable population.

The Welsh ACE study adds to a growing body of research untangling the link between ACEs and long-term health consequences. The real benefit, however, of a local study is its ability to provide tangible solutions. One of the aims of this study was to understand which communities in Wales are most affected by ACEs to effectively direct existing support services—an aim that could be shared by any country. As a country struggling with loss of industry and the resulting poverty, the approach taken in Wales could be applicable to other transitioning countries in similar straits. With programmes such as Flying Start already in place to tackle child poverty and the political manoeuvrability of devolution, Wales is well placed to act on the results of this study quickly and efficiently—and in doing so, provide an example to other communities or countries wishing to do the same. ■ *The Lancet*

RESEARCH REPORT
"Stress Determinations in Developing Caribbean nation"

Funded by:
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Program

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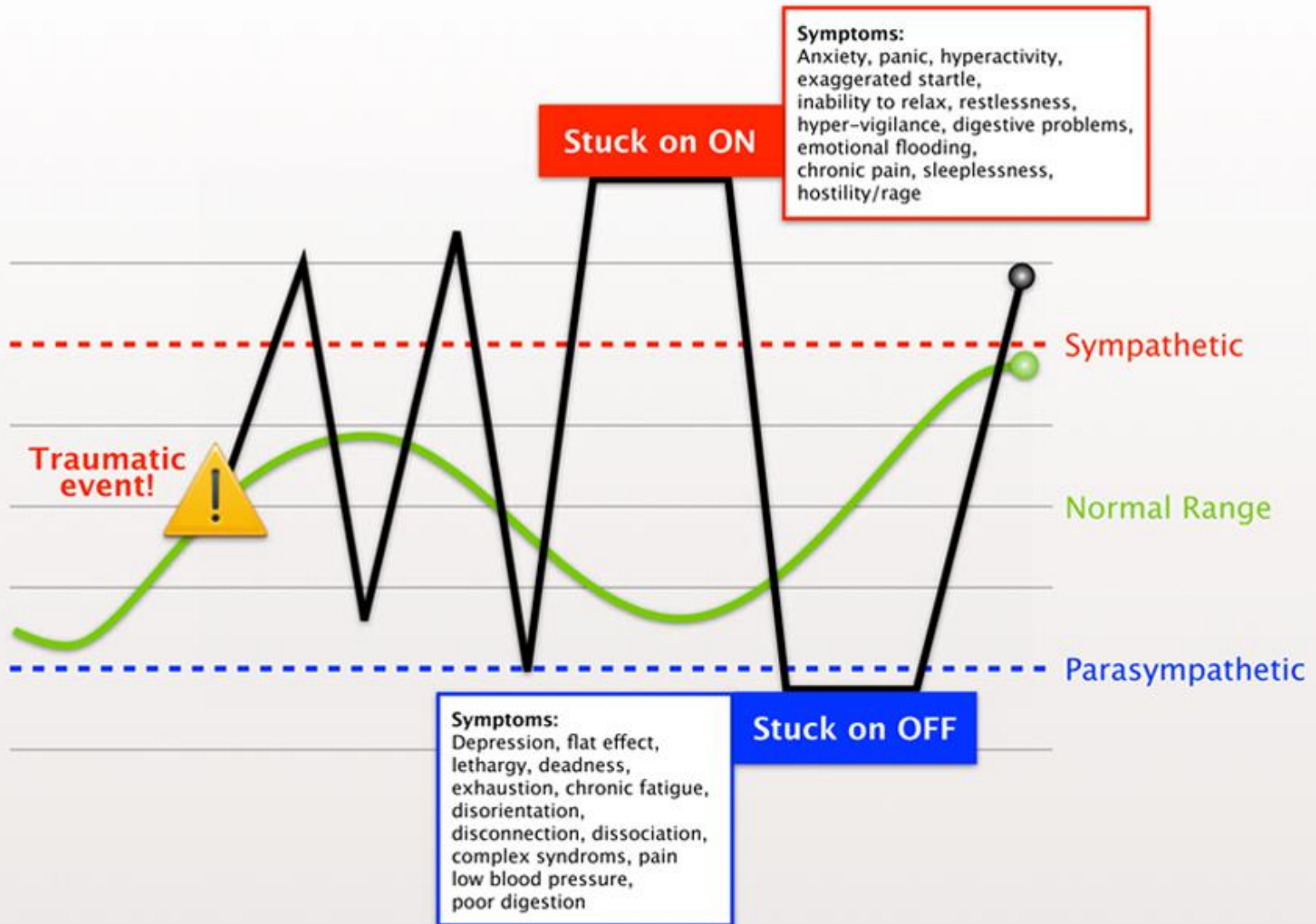
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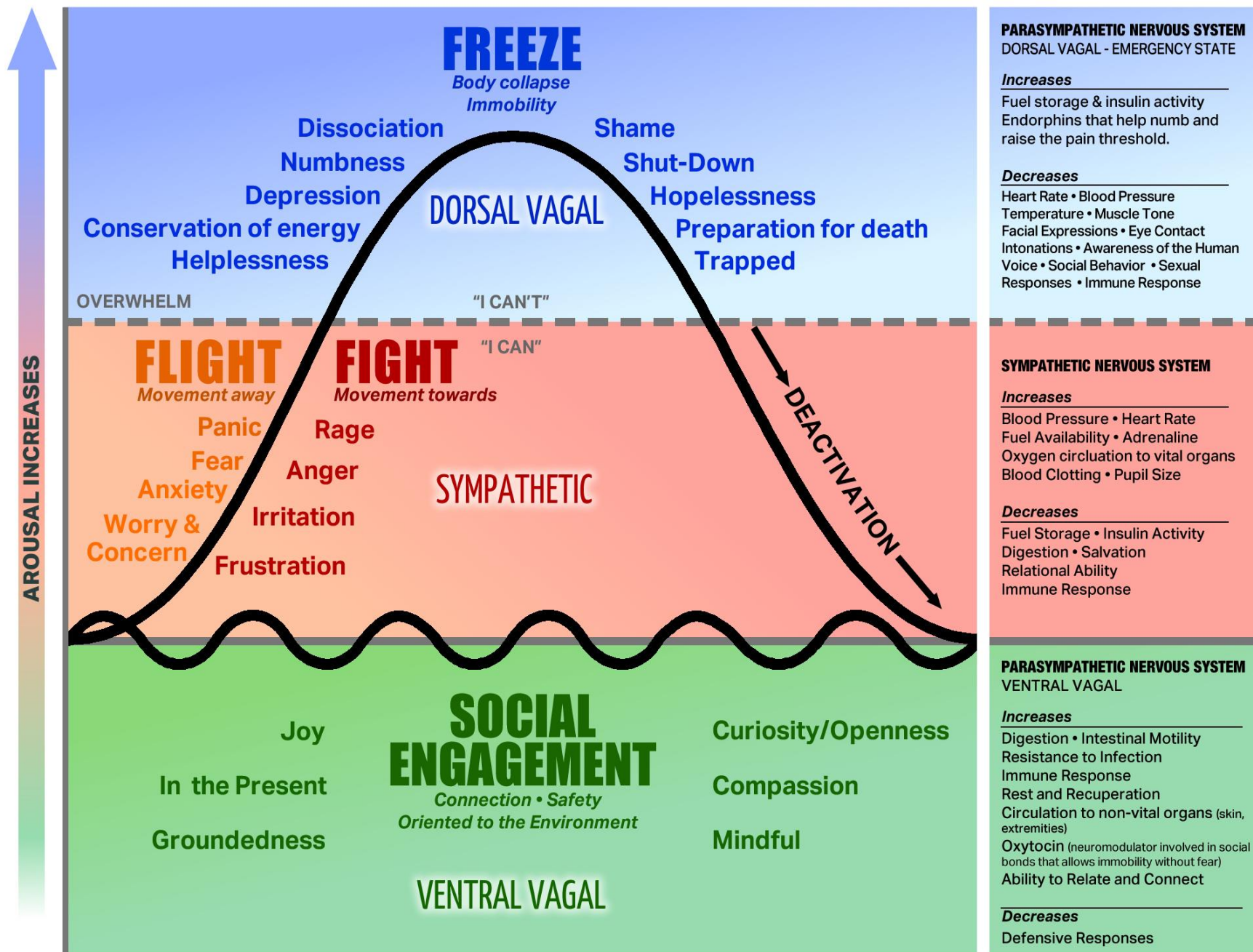
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Symptoms of Un-Discharged Traumatic Stress





Acting out

- **External defense**
 - Anger
 - Violence towards others
 - Truancy
 - Criminal acts



Acting in

- **Internal defense**
 - Denial, repression
 - Substance use
 - Eating Disorders
 - Violence to self
 - Dissociation



The Impact of ACEs Start Early

ACEs increase the risk of:

- Childhood obesity
- Early age at first intercourse
- Teen pregnancy
- Bullying
- Dating violence
- Fighting and carrying a weapon to school
- Early initiation of tobacco use
- Early initiation of drug abuse
- Early initiation of alcohol use
- Self-mutilation and suicide

Anda et al, 2002; Anda et al, 1999; Boynton-Jarrett et al, 2010; Dube et al, 2006; Dube et al, 2003; Duke et al, 2010; Hillis et al, 2001; Miller et al, 2011

**Table 1. Child's Response to Trauma:
Bodily Functions**

SYMPTOM(S)	FUNCTION	CENTRAL CAUSE
<ul style="list-style-type: none"> • Difficulty falling asleep • Difficulty staying asleep • Nightmares 	Sleeping	Stimulation of reticular activating system
<ul style="list-style-type: none"> • Rapid eating • Lack of satiety • Food hoarding • Loss of appetite • Other eating disorders 	Eating	Inhibition of satiety center, anxiety
<ul style="list-style-type: none"> • Constipation • Encopresis • Enuresis 	Toileting	Increased sympathetic tone, increased catecholamines

**Table 2. Child's Response to Trauma:
Misunderstood Causes**

RESPONSE	MORE COMMON IN	MISUNDERSTOOD CAUSE
<ul style="list-style-type: none"> • Detachment • Numbing • Compliance • Fantasy 	<ul style="list-style-type: none"> • Females • Young children • Children with ongoing trauma/pain • Children unable to defend themselves 	<ul style="list-style-type: none"> • Depression • ADHD inattentive type • Developmental delay
<ul style="list-style-type: none"> • Hypervigilance • Aggression • Anxiety • Exaggerated response 	<ul style="list-style-type: none"> • Males • Older children • Witnesses to violence • People able to fight or flee 	<ul style="list-style-type: none"> • ADHD • ODD • Conduct disorder • Bipolar disorder • Anger management difficulties

Abbreviations: ADHD, attention-deficit/hyperactivity disorder;

ODD, oppositional defiant disorder.

Table 3. Child's Response to Trauma: Development and Learning

AGE	EFFECT ON WORKING MEMORY	EFFECT ON INHIBITORY CONTROL	EFFECT ON COGNITIVE FLEXIBILITY
Infant / toddler / pre-schooler	Difficulty acquiring developmental milestones	<ul style="list-style-type: none"> • Frequent severe tantrums • Aggressive with other children 	<ul style="list-style-type: none"> • Easily frustrated • Difficulty with transitions
School-aged child	<ul style="list-style-type: none"> • 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	<ul style="list-style-type: none"> • Organizational difficulties • Can look like learning problems or ADHD
Adolescent	<ul style="list-style-type: none"> • Difficulty keeping up with material as academics advance • Trouble keeping school work and home life organized • Confabulation increasingly interpreted by others as integrity issue 	<ul style="list-style-type: none"> • 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: eg, driving, functioning in workforce

Trauma Symptoms: Infants and Toddlers

- Pattern A: Withdraws, rejects affection, stops exploring environment, lacks trust in others, appears "unattached", gaze aversion, preoccupation with objects, sensory blocking
- Pattern B: Clingy, anxious, sleep disturbances, toileting problems, temper tantrums, regressed, disorganized, rages/aggression, crying irritability, sensory reactivity, separation anxiety
- *Other findings*: poor verbal skills, memory problems, poor appetite, weight loss, FTT, digestive problems
- Based largely on behavioral observation and reaction to sensory input

**Trauma:
Impact on Children and
Opportunities for Healing**

Ally Burr-Harris, Ph.D.

Trauma Symptoms: Preschool

- Regressive behaviors
- Separation fears
- Eating and sleeping disturbances
- Physical aches and pains
- Crying/irritability
- Appearing "frozen" or moving aimlessly
- Perseverative, ritualistic play
- Reenactment of trauma themes
- Fearful avoidance and phobic reactions
- New fears, new aggression
- Magical thinking related to trauma
- Poor concentration, difficulty learning
- Behavior problems (e.g., tantrums)
- New sensory reactivity
- Delay in skill development

**Trauma:
Impact on Children and
Opportunities for Healing**

Ally Burr-Harris, Ph.D.

Trauma Symptoms: Elementary School-Age

- Sadness, crying
- Irritability, aggression
- Nightmares
- Abuse themes in play/art/conversation
- School avoidance
- Behavior/academic problems
- Physical complaints
- Concentration problems
- Regressive behavior
- Eating/sleeping changes
- Attention-seeking behavior
- Withdrawal

**Trauma:
Impact on Children and
Opportunities for Healing**

Ally Burr-Harris, Ph.D.

Trauma Symptoms: Adolescence

- ☐ Similar to adult response to trauma
- ☐ Feelings of shame / guilt
- ☐ Increased risk-taking behaviors
- ☐ Withdrawal from peers / family
- ☐ Pseudomature behaviors
- ☐ Substance abuse
- ☐ Delinquent behaviors
- ☐ Change in school performance
- ☐ Self-destructive behaviors

Trauma:
Impact on Children and
Opportunities for Healing

Ally Burr-Harris, Ph.D.

By adolescence, children seek relief through:

- Drinking alcohol
- Smoking tobacco
- Sexual promiscuity
- Using drugs
- Overeating/eating disorders
- Delinquent behavior

COMMON BEHAVIOURAL PROBLEMS IN CHILDREN WITH TRAUMA

Difficulties with regulation	A state of hyperarousal or dissociation due to children misreading cues and being quickly triggered into a fear response. This often presents as aggression and disobedience or being withdrawn and dreamy. This also impacts children's ability to know which information is important to pay attention to and which is not.
Impaired cognitive capacities	Reduced cognitive abilities due to neglect and/or hyperarousal, or difficulty concentrating. Difficulties in problem solving and organising narrative materials.
Developmental delays	<p>Delays in language, social skills and motor skills – which impact directly on learning, comprehension and expression.</p> <p>When children have grown up with violence they may have been restricted in play and exploration and subject to excessive control. They may have an inability to understand cause and effect and to see themselves as capable of achieving goals.</p>
Peer relationships	Difficulties with managing strong feelings and the consequent social problems with peers and adults. With a distorted sense of self due to violence or neglect a child can have problems in taking another child's perspective and developing empathy.
Difficulties in relationships with adults	Severe disruptions to attachment that make it difficult for children to form trusting relationships with adults. Children may be 'indiscriminate' appearing to make strong connections to strangers. However these behaviours are usually designed to seek safety for the child. On the other hand children may be suspicious, rejecting and independent, resisting attempts to form a bond.

COMMON BEHAVIOURAL PROBLEMS IN CHILDREN WITH TRAUMA

Anxiety, fear	Instability and disruption to living and care arrangements that contribute to a sense of fear and uncertainty. New situations, unpredictability, changes in routine, educator or environment can all increase a child's anxious preoccupation with threat.
Eating, sleeping, toileting	Problems with eating are common in children with chronic neglect – gorging or hoarding food, problems swallowing or chewing, throwing up. Children show disturbed sleep patterns and may become hyperaroused at sleep time. This may be due to night-time being associated with danger, fewer distractions and more intrusive thoughts or feelings, and/or an underdeveloped capacity to regulate sleep. Bedwetting and other toileting problems are also common.
Self-soothing strategies	Children may have problems with self-soothing and resort to 'bizarre' or regressed behaviours. These can include rocking, scratching or biting themselves (such as picking at sores or biting lips), head banging, chanting.
Executive functions of goal-setting, planning and anticipating consequences	Children may have an internalised sense of self that expects failure, does not foresee a hopeful future and has difficulty making and carrying out plans. All of these are important to formal learning.

Sources: Perry 2001, pp.6-8; Cole et al. 2005; Child Trauma Academy 2006; Downey 2007.

Literature Review —

a trauma-sensitive approach
for children aged 0-8 years

Funded by the Australian Government Department of Families, Community Services and Indigenous Affairs



Strategies for Relationship-based Practices with Primary School Children and Families

Understand the child's chronological age and development age may be at odds

Understand the 'good intention of the child even if behaviour may not be ideal'

Notice things the child does well and build on these

Set and maintain appropriate boundaries.

View discipline as a 'learning moment as opposed to a punitive moment'

Provide consequences, not punishment

Use praise and acknowledge good choices and behaviours

Always be 'Bigger, Stronger, Wiser and Kind'

Practice 'time in'

Partner with parents and earn their trust

Be mindful of the risk of shaming experiences

Keeping parents informed

Welcome parental involvement and create opportunities for this to occur

Be respectful of parents, carers and family

Become culturally informed and sensitive

Use liaison workers and cultural consultants to engage indigenous families and get to know them

Provide opportunities to repair relationships

Provide opportunities to repair relationships

Source: adapted from Downey 2007; Cole et al. 2005; Cooper et al. 2000, Foundation House 2011.

Literature Review —

a trauma-sensitive approach
for children aged 0-8 years

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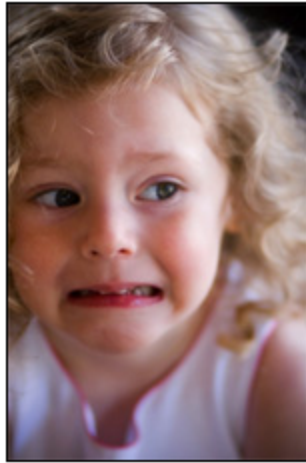
Infants
(birth to 3 years)

- Eating disturbance
- Sleep disturbances
- Somatic complaints
- Clingy/separation anxiety
- Feeling helpless/passive
- Irritable/difficult to soothe
- Constricted play, exploration, mood
- Repetitive/post-traumatic play
- Developmental regression
- General fearfulness/new fears
- Easily startled
- Language delay
- Aggressive behavior
- Sexualized behavior
- Talking about the traumatic event and reacting to reminders/trauma triggers



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Young children
(3 to 6)

- Avoidant, anxious, clingy
- General fearfulness/new fears
- Helplessness, passive, low frustration
- Restless, impulsive, hyperactive
- Physical symptoms (headache, etc.)
- Difficulty identifying what is bothering them
- Inattention, difficulty problem solving
- Daydreaming or dissociation
- Irritability
- Aggressive behavior
- Sexualized behavior
- Loss of recent developmental achievements
- Repetitive/ post-traumatic play
- Talking about the traumatic event and reacting to reminders/trauma triggers
- Sadness/depression
- Poor peer relationships and social problems (controlling/over permissive)



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Based on National Child Traumatic Stress Network's (NCTSN) White Paper (2003), Complex Trauma in Children and Adolescents, the table below identifies each domain of development and possible signs of disruption or impairment. Again, it is essential to consider the young child's developmental age and stage, specific developmental tasks, and caregiving context.

Domain of Development	Signs of Disruption or Impairment
Attachment	<ul style="list-style-type: none">• Difficulty trusting others• Uncertain about the reliability/predictability of others• Interpersonal difficulty• Social isolation• Difficulty seeking help• Clingy, difficulty with separations
Physical	<ul style="list-style-type: none">• Sensorimotor development problems• Hypersensitivity to physical contact• Somatization• Increased medical problems• Problems with coordination and balance



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Affect Regulation

- Problems with emotional regulation
- Easily upset and/or difficulty calming
- Difficulty describing emotions and internal experiences
- Difficulty knowing and describing internal states
- Problems with communicating needs

Behavioral Control

- Poor impulse control
- Self-destructive behavior
- Aggressive behavior
- Oppositional behavior
- Excessive compliance
- Sleep disturbance
- Eating disorders
- Reenactment of traumatic event/past
- Pathological self-soothing practices



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Cognition

- Difficulty paying attention
- Lack of sustained curiosity
- Problems processing information
- Problems focusing on/completing tasks
- Difficulty planning and anticipating consequences
- Learning difficulties, developmental delays
- Problems with language development

Self-Concept

- Lack of continuous/predictable sense of self
- Poor sense of separateness
- Disturbance of body image
- Low self-esteem
- Shame and guilt



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Preschool Children	Elementary School Children	Middle and High School Children
<ul style="list-style-type: none"> • Feel helpless and uncertain • Fear of being separated from their parent/caregiver • Cry and/or scream a lot • Eat poorly and lose weight • Return to bedwetting • Return to using baby talk • Develop new fears • Have nightmares • Recreate the trauma through play • Are not developing to the next growth stage • Have changes in behavior • Ask questions about death 	<ul style="list-style-type: none"> • Become anxious and fearful • Worry about their own or others' safety • Become clingy with a teacher or a parent • Feel guilt or shame • Tell others about the traumatic event again and again • Become upset if they get a small bump or bruise • Have a hard time concentrating • Experience numbness • Have fears that the event will happen again • Have difficulties sleeping • Show changes in school performance • Become easily startled 	<ul style="list-style-type: none"> • Feel depressed and alone • Discuss the traumatic events in detail • Develop eating disorders and self-harming behaviors such as cutting • Start using or abusing alcohol or drugs • Become sexually active • Feel like they're going crazy • Feel different from everyone else • Take too many risks • Have sleep disturbances • Don't want to go places that remind them of the event • Say they have no feeling about the event • Show changes in behavior

Diagram recreated from the [Understanding Trauma](#) webpage within NCTSN's Resources for Parents and Caregivers website.

Young Children (5 and younger)

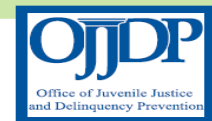
Young children's reactions are strongly influenced by their caregivers' reactions. Children in this age range who are exposed to violence may:

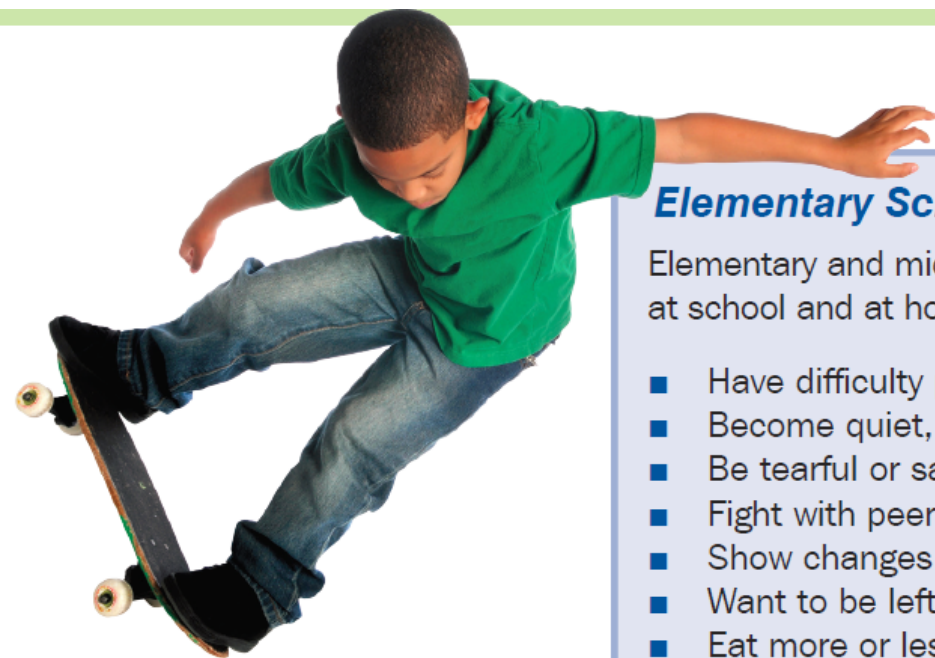
- Be irritable, fussy or have difficulty calming down
- Become easily startled
- Resort to behaviors common to when they were younger (for example, thumb sucking, bed wetting, or fear of the dark)
- Have frequent tantrums
- Cling to caregivers
- Experience changes in level of activity
- Repeat events over and over in play or conversation



Trauma-Informed Care for Children Exposed to Violence

Tips for Staff and Advocates Working With Children:





Elementary School-Age Children (6–12 years)

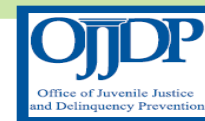
Elementary and middle school children exposed to violence may show problems at school and at home. They may

- Have difficulty paying attention
- Become quiet, upset, and withdrawn
- Be tearful or sad and talk about scary feelings and ideas
- Fight with peers or adults
- Show changes in school performance
- Want to be left alone
- Eat more or less than usual
- Get into trouble at home or at school



Trauma-Informed Care for Children Exposed to Violence

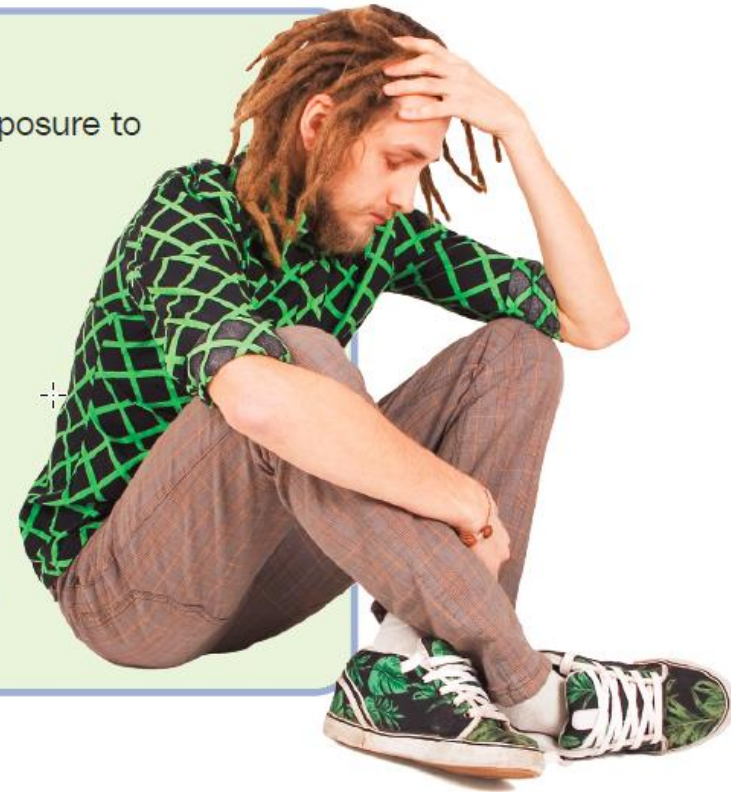
Tips for Staff and Advocates Working With Children:



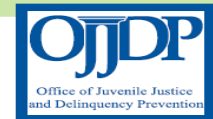
Teenagers (13–18 years)

Older children may exhibit the most behavioral changes as a result of exposure to violence. Depending on their circumstances, teenagers may:

- Talk about the event constantly or deny that it happened
- Refuse to follow rules or talk back with greater frequency
- Complain of being tired all the time
- Engage in risky behaviors
- Sleep more or less than usual
- Demonstrate increase in aggressive behavior
- Want to be left alone, not want to spend time with friends
- Experience frequent nightmares
- Use drugs or alcohol, run away from home, or get into trouble with the law



Trauma-Informed Care for Children Exposed to Violence
Tips for Staff and Advocates Working With Children:



Box 1

Types of poverty experienced by children who enter foster care

Financial poverty: Parents unemployed, underemployed, food insecurity, limited access to health care

Poverty of social supports: Families often from poor neighborhoods, limited community resources, single parent families, lack of extended family

Poverty of parenting skills: Parents with mental illness (46%), active substance abuse (48%), cognitive impairment (10%), parents with history of maltreatment, parenting chaotic and unpredictable

Poverty of education: Little stimulation at home, inadequate daycare and early education options, limited support with school work, inadequate attention to possible special education needs, frequent school changes

Poverty of safety: Exposure to violence (84%), including homes with domestic violence, neighborhoods violent with criminal activity common, schools unsafe

Foster Care and Healing from Complex Childhood Trauma

Heather Forkey, MD^{a,*}, Moira Szilagyi, MD, PhD^b

Pediatr Clin N Am 61 (2014) 1059–1072

<http://dx.doi.org/10.1016/j.pcl.2014.06.015>

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Foster Youth Education Outcomes

- 80% repeat a grade by the 3rd grade
- Only 21% of foster youth are proficient in English Language Arts by 11th grade and only 5% in Math
- Less than 60% of foster youth graduate high school
- Less than 3% obtain a higher education degree
- Within 2 years of aging out of foster care, more than 50% are **homeless, incarcerated or on welfare**

See Barrat, V. X., & Berliner, B. (2013). The Invisible Achievement Gap, Part 1: Education Outcomes of Students in Foster Care in California's Public Schools. San Francisco: WestEd., available at https://www.wested.org/wp-content/files_mf/1400283692Invisible_Achievement_Gap_Full_Report.pdf

Box 2

Stressors for children in foster care

Changes in placement

Separation from parents, neighborhoods, siblings, friends, and extended family

Change of caseworkers, therapists, and health care providers

Change of school, daycare, church/house of worship

Unrealistic goals on the part of the court or child welfare

Promises the biologic parent cannot keep (ie, promises child will be home soon when timeline is determined by court)

Expectations of foster/kinship parents

Vague and difficult to understand timelines for reunification (ie, "when mom is better")

Capricious nature of changes and decisions

Foster Care and Healing from Complex Childhood Trauma

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What Can Foster Youth Assume?

- Safety?
- That a consistent adult will love and care for them?
- Ability to control outcomes in their life? I
- Motivations of adults?
- Their own essential goodness?
- Ownership of their bodies?
- Control over their own thoughts and actions?

Changing the Question:

From “What is wrong with you?” to “What is going on? How are you feeling?”

Behavior	Feeling it is Masking
Oppositional Behavior	Fear of Rejection/Abandonment
Outbursts	Overwhelmed
Anger	Hurt
Depression	Lack of Self Worth
Withdrawal/Absences	Avoidance of Emotions
Argumentativeness	Testing Relationship
Escalation	Triggered Trauma Memories
Defiance of Authority	Need for Control

Trauma-Specific Anticipatory Guidance

WHAT YOU WILL SEE	WHY IT OCCURS	HOW FAMILY CAN RESPOND
<p>Traumatized children will respond to anything they think is a threat more quickly and more forcefully than other children.</p> <p>Traumatized children are more likely to misread facial and non-verbal cues and think there is a threat where none is intended.</p>	<p>Areas of the brain responsible for recognizing and responding to threat are turned on. This is called hypertrophied.</p> <p>Brain does not recognize that this new situation does not contain the same threats.</p>	<p>Do not take these behaviors personally.</p> <p>Helping the child understand your facial expression or the tone of your voice will help lessen the chance of the child's behavior escalating in situations that otherwise do not seem threatening.</p>
<p>Traumatized children need to be redirected or behavior may start to escalate.</p>	<p>Responding with aggression will trigger the child's brain back into threat mode.</p> <p>Logic centers shut down, fight, flight, or hide response takes over.</p>	<p>Avoid yelling and aggression.</p> <p>Lower the tone and intensity of your voice.</p> <p>Come down to the child's eye level, gently take hold the child's hand, and use simple, direct words. Give directions without using strong emotions.</p>
<p>Children don't always know how to say what they are feeling. It can be hard for them to find words. Often they are not told that how they feel is okay.</p>	<p>Emotion and language centers are not well connected. Memory centers to hold words are blocked.</p>	<p>Tell the child it is okay to feel the way she feels and to show emotion.</p> <p>Give the child words to label her emotions.</p>
<p>Traumatized children do not have the skills for self-regulation or for calming down once upset.</p>	<p>Children have had to constantly be watchful for danger. Parts of the brain that keep us alert stay turned on, but the parts of their brains used for self-regulation and calming have not grown with the child.</p>	<p>Develop breathing techniques, relaxation skills, or exercises that the child can do when getting upset. Praise the child for expressing feelings or calming down.</p> <p>Guide the child at first, then just remind the child to use his skills when you start to see the child getting upset.</p>
<p>Traumatized children will challenge the caretaker, often in ways that threaten placement.</p>	<p>Children come with negative beliefs and expectations about themselves (worthless, powerless) and about the caregiver (unreliable, rejecting).</p> <p>Children often reenact or recreate old relationships with new people. They do this to get the same reactions in caretakers that they experienced with other adults because these lead to familiar reactions.</p> <p>These patterns helped the child survive in the past, prove negative beliefs, help the child vent frustration, and give the child some sense of mastery.</p>	<p>Give messages that say the child is safe, wanted, capable, and worthwhile and that you as the caretaker are available, reliable, and responsive.</p> <p>Praise even neutral behavior.</p> <p>Be aware of your own emotional responses to the child's behavior.</p> <p>Correct when necessary in a calm unemotional tone.</p> <p>Repeat, repeat, repeat.</p> <p>Do not take these behaviors personally.</p>

Adverse Childhood Experience and Adolescent Well-being: Do Protective Factors Matter?

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Abstract Studies have found traumatic experiences in childhood to have lasting effects across the lifecourse. These adverse childhood experiences (ACEs) include a variety of types of trauma, including psychological, physical or sexual abuse; living in poverty; violence in the home; living with a substance abuser; living with a mentally ill or suicidal person; or living with someone who is or has been imprisoned. Long-term effects among adults have been found in previous studies; but there is limited research on the association between ACEs and adolescent development and even less on potential protective factors to mediate these associations. Utilizing the U.S. 2011–2012 National Survey of Children's Health, this study examines both the prevalence of ACEs in a nationally representative sample of 12–17 year old adolescents and the cross-sectional relationship between experiencing ACEs and multiple measures of well-being. Potential protective factors are then examined in a mediation model. Results indicate that the more ACEs adolescents experience, the less likely they are to enjoy high levels of well-being. Many factors partially mediate this association, including residing in a safe neighborhood, attending a safe school, and parental monitoring of friends and activities. We conclude that measures of adverse childhood experiences (ACEs) represent an important construct for indicator systems; in addition, these findings indicate that measures of protective factors represent important components of indication systems.

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The Effects of Poverty on Childhood Brain Development: The Mediating Effect of Caregiving and Stressful Life Events

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THE IMPACT OF EARLY LIFE TRAUMA ON HEALTH AND DISEASE



The Hidden
Epidemic

CAMBRIDGE
Medicine

SCARED SICK

The ROLE of
CHILDHOOD TRAUMA
in ADULT DISEASE

ROBIN
KARR-MORSE

with

MEREDITH
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Donna Jackson Nakazawa

CHILDHOOD DISRUPTED

How Your Biography
Becomes Your Biology,
and How You Can Heal



"A truly important gift
of understanding—
illuminates the
heartbreaking costs of
childhood trauma and,
like good medicine, offers
the promising science of
healing and prevention."
—JACK KORNFIELD, PhD, author
of *A Path with Heart*