Intergenerational ACE Transmission and Continuum

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Change the First Five Years and You Change Everything
Phenomenal Brain Growth

A baby’s brain doubles in size in first year.

By age 3, a child’s brain is already 80% of its adult volume.

Newborn 6 year old

A baby’s brain doubles in size in first year.
Neural Synapses over the Lifespan

700 New Neural Connections per Second in Early Brain
Human Brain Development
Neural Connections for Different Functions Develop Sequentially

Sensory Pathways (Vision, Hearing)
Language
Higher Cognitive Function

FIRST YEAR

Birth (Months) (Years)

Brain Development is Dependent on Environmental Stimulation

Environmental input is essential for elaboration of synaptic territories and ‘proper’ connections. Early Brain especially ready to form circuitry for senses, language, motor skills, music, and relating...
Experience Alters Brain Development

Hubel & Wiesel (kittens) – visual input important for proper segregation of fibers & visual function

Kemperman (mice) – enriched environments increased brain size and ability to learn new tasks

Knudsen (barn owls) – enriched environments increased auditory-visual neuronal adaptation to altered visual input
What **FIRES** together **WIRES** together
Healthy Attachment: Normal Stress Response

**Child’s Needs**

Express Emotion or Behavior

Crying, Reaching, Talking, Calling

**TRUST**

Relationships are safe and trustworthy

Lower arousal

Child bolsters affect regulation

Normal Stress Response

**Need Met Caregiver Responsive**

Responsive

Relationships are predictable

Internal Working Model

Anticipate future responsiveness
Healthy Attachment

- Affect (emotion) regulation
- Interpersonal relatedness
- Sense of self efficacy/worth
- Better physical health
- Better cognitive abilities
VROOM
You can do this

Parenting is a great joy as well as a big responsibility. Like many new parents, you may have heard that a child’s early years are important, but you may not know exactly what to do to make the most of this special time. Research tells us there are four simple things you can start doing right now that will help your child be ready for success in kindergarten and beyond. Take a look inside to learn more...

A new baby is like the beginning of all things—wonder, hope, a dream of possibilities. - Eda LeShan
Toxic Stress Negatively Changes Brains
Three Levels of Stress Response

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

Tolerable
Serious, temporary stress responses, buffered by supportive relationships.

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

Source: Center on the Developing Child at Harvard University
Sources of Toxic Stress in Young Children

U.S. Children Ages 2-5 (per 1,000)

- Maltreatment: 75
- Parental Substance Abuse: 98
- Postpartum Depression: 130

Source: Finkelhor et al. (2005)  
Source: SAMHSA (2002)  
Source: O-Hara & Swain (1996)
Toxic Stress is the key intergenerational transmitter of social and health disparities

The Adverse Childhood Experiences (ACE) Study

www.ACESTUDY.org

17,000 commercial insurance holders surveyed (1995-1997)
Adverse Childhood Experiences (ACE) Study: surveyed >17,000 middle-class adults

Dr. Felitti – Kaiser Permanente

Dr. Anda – Center for Disease Control and Prevention

Adverse HEALTH Outcomes

Poor SOCIAL OUTCOMES

Adverse MENTAL HEALTH Outcomes
Mechanisms by which ACEs Influence Health & Wellbeing Throughout the Lifespan

- Early Death
- Disease, Disability, & Social Problems
- Adoption of Health Risk Behaviors
- Social, Emotional, and Cognitive Impairment
- Disrupted Neurodevelopment
- Adverse Childhood Experiences

Graphic Courtesy of Rob Anda, MD, MS
Adverse Childhood Experiences are Common
(www.acesstudy.org)

<table>
<thead>
<tr>
<th>Abuse</th>
<th>% of sample</th>
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<tbody>
<tr>
<td>Psychological</td>
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<tr>
<td>Physical</td>
<td>28%</td>
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<tr>
<td>Sexual</td>
<td>21%</td>
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<tr>
<th>Neglect</th>
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<tr>
<td>Emotional</td>
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<td>Physical</td>
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<table>
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<th>Household dysfunction</th>
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<tr>
<td>Substance Abuse</td>
<td>27%</td>
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<tr>
<td>Parental Sep/Divorce - Absence</td>
<td>23%</td>
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<tr>
<td>Mental Illness</td>
<td>17%</td>
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<tr>
<td>Battered Mother</td>
<td>13%</td>
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<tr>
<td>Incarceration</td>
<td>6%</td>
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ACE Study Findings Affect over 60% of middle class adults and predict:

<table>
<thead>
<tr>
<th>Health-risk Behaviors</th>
<th>Disease and Injury</th>
<th>Mental health and Well-being</th>
<th>Job Problems</th>
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</thead>
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<tr>
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<td>STDs, including HIV</td>
<td>Depression</td>
<td>Absenteeism/Lost time from work</td>
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<td>Alcohol abuse</td>
<td>Gynecological problems</td>
<td>PTSD</td>
<td>Impaired productivity</td>
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<tr>
<td>Illicit/injected drug use</td>
<td>Heart disease</td>
<td>Aggression</td>
<td>Financial Problems</td>
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<td>Smoking</td>
<td>Diabetes</td>
<td>Anxiety</td>
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<tr>
<td>Inactivity</td>
<td>Stroke</td>
<td>Somatic complaints</td>
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<tr>
<td>Obesity</td>
<td>Cancer</td>
<td>Attempted suicide</td>
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<tr>
<td></td>
<td>Suicide</td>
<td>Teen Pregnancy</td>
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<tr>
<td></td>
<td>COPD</td>
<td>Anxiety</td>
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ACE Score = RISK
A Few ACE Score Examples

- **ACE score of 4 or higher:**
  - 7 times more likely to be alcoholic
  - 6 times more likely to have sex by age 15
  - 2 times more likely to be diagnosed with cancer
  - 4 times more likely to have emphysema

- **ACE score of 6 or higher:**
  - 30 times more likely to attempt suicide
  - 20 year shortening of life span
ACEs Predict Top 10 Mortality Risk Factors:

- Smoking
- Severe obesity
- Physical inactivity
- Depression
- Suicide attempts
- Alcoholism
- Illicit drug use
- Injected drug use
- 50+ sexual partners
- Sexually transmitted diseases
What **FIRES** together **WIRES** together
Unhealthy Attachment: Abnormal Stress Response

Internal Working Model
Anticipate Future Harm
Hyper vigilant or shut down

Relationships are unsafe - Traumatized

Child feels Out of control
(Affect Dysregulation)

Chronic Stress

Caregiver unresponsive
abusive or neglect

Child’s Needs

Express Emotion or Behavior

Crying Reaching Talking/Calling

Fight
Flight
Freeze

Relationships are unresponsive, unpredictable, dangerous, and/or chaotic
Persistent Stress Changes Brain Architecture

Normal

Typical neuron—many connections

Toxic stress

Damaged neuron—fewer connections

Prefrontal Cortex and Hippocampus

Sources: Radley et al. (2004)
Bock et al. (2005)
What happens?

Amygdala:
activates the stress response
*Toxic stress*: enlargement

Prefrontal cortex:
usually a check to the amygdala
*Toxic stress*: loss of neurons, less able to function

Hippocampus:
major role in memory and mood
*Toxic stress*: impairment in understanding and emotion
Three Core Concepts in Early Development

3
Toxic Stress Derails Healthy Development

NATIONAL SCIENTIFIC COUNCIL ON THE DEVELOPING CHILD
Center on the Developing Child HARVARD UNIVERSITY
Normal vs. Neglected Brain

As cited by Felitti & Anda, 2003; source CDC
Extreme Neglect Diminishes Brain Power

Institutionalized

3-5 Hz

6-9 Hz

10-18 Hz

Never Institutionalized

Bucharest Early Intervention Program: BEIP
(Sheridan, Fox, Zeanah, McLaughlin, & Nelson, 2012)

Orphanage children:
- Ages under 31 months to 54 months
- Followed up to age 11 years

Initial Assessments:
- Low IQs
- Poor Attachment
- Global Developmental Delays
- Emotional Problems
On MRI, 11 year old children with histories of any institutional rearing (e.g., deprivation) when they were young (birth - 4) had significantly smaller gray matter volumes in the cortex of the brain than never-institutionalized children, even if they had been placed in foster care.
MRI studies show significant and positive brain differences in children in foster care for 6-9 years vs. those who stayed in institutions.

With just 2 years of good care, between ages 31 and 54 months, extremely deprived orphans had increased brain growth and significant IQ increase (but still lower than never institutionalized age mates).
Poverty is Neurotoxic

Exposure to Toxins
Poor Nutrition
Prenatal Drug Use
Low Social Status

Toxic Stress
Violence
Maternal depression
Poverty and Vocabulary

By age 4, children of caregivers receiving welfare heard 32 million fewer words than children raised in “professional families”

(Hart & Risley, 1995)
Brain Builders
Until now, these persistent trauma effects were “hidden” from the view of both neuroscientists and public health researchers.

This is no longer the case. In fact, with this information, comes the responsibility to use it.

Dr. Robert Anda, Adverse Childhood Experiences (ACE) Study
Recommendations to Prevent and Respond to Toxic Stress from the CDC

- Safe
- Stable
- Nurturing

Relationships and Environments
What Can We Do About ACES?

• Raise Awareness and Commitment to Support Safe, Stable, Nurturing Relationships and Environments and Prevent Child Maltreatment

• Use Data to Inform Solutions

• Create the Context for Healthy Children and Families through Norms Change and Programs

• Create the Context for Healthy Children and Families through Policies
What Can We Do About ACES?

- Home visiting
- Parent coaching
- Good childcare
- High quality early education programs
- Solid pediatric care
- Income-related programs
- Mental health services
- Mentors
- Community Centers/activities
- Faith-based partnerships
Policy: Message for Community Stakeholders

Building Adult Capabilities to Improve Child Outcomes
A THEORY OF CHANGE
FIGURE 3:
RATES OF RETURN TO HUMAN CAPITAL INVESTMENT AT DIFFERENT AGES:
RETURN TO AN EXTRA DOLLAR AT VARIOUS AGES

SOURCE: JAMES HECKMAN, “INVESTING IN DISADVANTAGED YOUNG CHILDREN IS GOOD ECONOMICS AND GOOD PUBLIC POLICY.” STATEMENT PRESENTED TO THE JOINT ECONOMIC COMMITTEE OF THE UNITED STATES CONGRESS. 110TH CONGRESS, FIRST SESSION, JUNE 27, 2007. REPRINTED WITH PERMISSION.
Brain's Capacity to Change

Spending on Programs to "Change the Brain"

Age

Mental Health

Juvenile Justice

Headstart

Public Education

Substance Abuse Tx

Source: Bruce D. Perry Lecture at http://lfcc.on.ca/mccain/perry8.html
Brain Development is most prolific and foundational in earliest years.

Toxic Stress disrupts brain development and inhibits synaptic growth.

Safe, stable, nurturing relationships & environments promote optimal brain development and synaptic growth.

Less costly /more effective to create healthy conditions for early development than to fix problems later.
QUESTIONS?
Social Emotional Buffering is the primary factor distinguishing level of toxic stress

Andy Garner, MD, COPACFH

Think Attachment!
Supportive Relationships Restore Disrupted Stress Response

- Therapeutic Foster Care (Parents trained in providing responsive relationships)
- Typical Range
- Standard Foster Care

Morning Cortisol Levels vs. Months in Foster Care

- Omni Visions, Inc.
Evidence-based Interventions for Neglect

Attachment and Bio-Behavioral Catch-Up (ABC Intervention)

Multi-Dimensional Foster Care
Evidence Based Treatment for Attachment Problems

“Child-Parent Psychotherapy”

Read more on nctsn.org
Evidence-Informed Treatment; intensely caregiver involved: all ages

**ARC Model:**
Attachment, Self-Regulation, and Competency

Read more on www.nctsn.org
Trust-Based Relational Intervention (TBRI)