CHILDHOOD TRAUMA RESOURCES IN MITIGATION AT SENTENCING

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DISCLOSURES

Eunice Kennedy Shriver National Institute of Child Health and Human Development
L30 HD085275 (Gray); K12 HD043451 (Krousel-Wood)

BRAIN & BEHAVIOR RESEARCH FOUNDATION
Awarding NARSAD Grants
Young Investigator Program (Gray)

TULANE UNIVERSITY BIRCWH
BUILDING INTERDISCIPLINARY RESEARCH CAREERS IN WOMEN’S HEALTH

NIH National Institute of Environmental Health Sciences
R01 ES020447 (Theall)

NIH National Institute of Mental Health
R01 MH101533 (Scheeringa);
R01 MH65884 (Drury)

BOARD OF REGENTS STATE OF LOUISIANA
RCS Support Fund (Gray)
AND THANK YOU’S

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http://tulane.edu/som/bangl/index.cfm

Safe Schools NOLA
Pl: Dr. Stacy Overstreet
Safeschoolsnola.Tulane.edu
OBJECTIVES

1) What is trauma?
2) What is the prevalence of trauma?
3) How does trauma affect behavior?
4) How does trauma affect the body?
**WHAT IS TRAUMA?**

**Stress**
A change that disturbs the normal state of the mind and body that must be coped with.

- Can use knowledge and beliefs to deal with threat
- Manageable, can take control
- Can disengage, check out, find “relief”
- Temporary, recovery is quick
- A part of everyday experiences

**Trauma**
An overwhelming, unanticipated danger that leads to sense of loss of control and terror.

- Challenges core belief- “Life is not safe or organized”
- Feel loss of control
- Overwhelming, unrelenting, inescapable
- Often has long term effects
- Abnormal
“TOXIC STRESS”

**POSITIVE STRESS**
Mild/moderate and short-lived stress response necessary for healthy development

**TOLERABLE STRESS**
More severe stress response but limited in duration which allows for recovery

**TOXIC STRESS**
Extreme, frequent, or extended activation of the body’s stress response without the buffering presence of a supportive adult

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**Intense, prolonged, repeated and unaddressed**

**Social-emotional buffering, parental resilience, early detection, and/or effective intervention**
ADVERSE CHILDHOOD EXPERIENCES (ACES)

ADVERSE CHILDHOOD EXPERIENCES (ACES)

- 64% experienced at least one ACE.
- If you experienced one, you have an 87% chance of experiencing more.
- The more ACEs you experience, the more severe the negative outcomes may be.
ADVERSE CHILDHOOD EXPERIENCES (ACES)

**Behavior**
- 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
• **Trauma: ACES +…..**
  
  – Death of a loved one
  – Severe or prolonged physical illness
  – Removal from home/placement in foster care
  – Racism and systematic discrimination
  – Juvenile arrest or incarceration
  – Car accident, house fire, natural disaster
Nearly 80% of youth report at least one lifetime victimization by adults or peers (Finkelhor, Ormrod, Turner, 2012).
TRAUMA EXPOSURE AMONG NOLA YOUTH

- Sexual Assault: 3
- Accident: 13
- Abuse/Neglect: 13
- Domestic Violence: 18
- Hurricane Katrina: 22
- Affected by Homicide: 46
- Affected by Natural Death: 63
- Community Violence: 85

84% of youth report exposure to multiple traumas.

N = 315 students receiving services from Children's Bureau (Project Last) from 2013-15; slide from Dr. Stacy Overstreet
TRAUMA EXPOSURE AMONG NOLA YOUTH

N = 1286 youth participating in IWES’ Believe in Youth! NOLA! program in NOLA schools, community-based organizations, and faith-based organizations; slide from Dr. Stacy Overstreet

3 or more types of exposure: 55% report

- Forced Sexual Activity: 6
- Food/Housing Worries: 16
- Witnessed Homicide: 18
- Worry Not Being Loved: 30
- Domestic Violence: 38
- Witnessed Assault: 40
- Violence Worries: 52
- Affected by Homicide: 54
Unarmed black people were killed by police at 5x the rate of unarmed whites in 2015. Rates of unarmed people killed by police per million people in the United States.

Source: MappingPoliceViolence.org; US Census 2014

http://mappingpoliceviolence.org/unarmed/
BEYOND INDIVIDUAL TRAUMA EXPOSURE: COMMUNITY-LEVEL TRAUMA

<table>
<thead>
<tr>
<th></th>
<th>% Enrollment</th>
<th>% Suspended</th>
</tr>
</thead>
<tbody>
<tr>
<td>White</td>
<td>41%</td>
<td>28%</td>
</tr>
<tr>
<td>Black</td>
<td>19%</td>
<td>47%</td>
</tr>
</tbody>
</table>

Public Preschool Students
BEYOND INDIVIDUAL TRAUMA EXPOSURE: COMMUNITY-LEVEL TRAUMA

% Suspended

K-12 Students

- White Girls: 2%
- White Boys: 5%
- Black Girls: 10%
- Black Boys: 18%

6%
Despite a drop in overall arrest rates nationally, black youth are still twice as likely to be arrested as white youth.

Black students make up 16 percent of all public school students and 31 percent of all arrests.

Rovner, 2014
Youth in detention were 3X as likely as those in a national sample to have been exposed to multiple types of violence and traumatic events.

90% of youth in a Cook County, IL juvenile detention center reported past traumatic exposure.

In a national sample of adolescents, poly-victimization was the STRONGEST predictor of delinquency (more than age, gender, PTSD symptoms, alcohol and drug abuse)

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

Disrupted Neurodevelopment

Social, Emotional, and Cognitive Impairment

Adoption of Health-risk Behaviors

Disease, Disability, and Social Problems

Early Death

Services, support & resilience can change this life course

Death

Conception
HOW DOES TRAUMA IMPACT BEHAVIOR?

CHILDREN WHO EXPERIENCE TRAUMA ARE MORE LIKELY TO . . .

- Develop emotional and behavioral problems
  - Substance abuse
  - Aggression
  - Depression

Copeland et al., 2007

Figure. Effect of increasing trauma exposures on cumulative rates of psychiatric diagnoses by age 16 years.
HOW DOES TRAUMA IMPACT BEHAVIOR?

CHILDREN WHO EXPERIENCE TRAUMA ARE MORE LIKELY TO . . .

• Perform worse in school
  – Inability to concentrate
  – Flashbacks and preoccupation with the trauma
  – Avoidance of school and other places
TRAUMA EXPERIENCES TAKE A MEASURABLE TOLL ON ACADEMIC ACHIEVEMENT

- Decreased IQ and reading ability
- More suspensions and expulsions
- More days absent from school
- Lower GPA
- Decreased high-school graduation rates

SOURCES (left to right): Delany-Black et al., 2003; LAUSD survey, 2006; Hurt et al., 2001; Hurt et al., 2001; Grogger, 1997.

Slide courtesy of Bradley Stein, RAND Corporation
IMPACTS ARE EVIDENT EARLY & REQUIRE INTERVENTION

284 preschool children in New Orleans with trauma exposure (Scheeringa et al)

- 44% had PTSD
  - No difference in diagnosis or symptom number between trauma groups ($\chi^2 = 2.069$, df 2 p = 0.3554)
  - Single incident 38%
  - Domestic Violence 42%
  - Hurricane Katrina 48%

Longitudinally, these symptoms persist – 50% continued to meet diagnostic criteria, with both impairment and symptoms continuing even with community treatment (nonspecific supportive or other therapies)

DEVELOPMENTAL TRAJECTORY OF PSYCHIATRIC DISORDERS

Egger 2006 JAACAP; Merkingas 2014 Pediatrics
Lasting impact on range of outcomes
- “dose effect”
- Earlier exposure increased impact

Developmental differences

Modified by caregiving
- Key importance of early caregiver

Across human and animal studies
IMPACT OF EARLY TRAUMA

Stress exposure impacts behavior:
- Mental illness, substance abuse
- Poor academic performance
- Decreased language development
- Altered threat perception
- Altered attention
- Altered arousal

Stress exposure impacts biology:
- Cellular migration
- Neuronal cell death
- Synaptogenesis
- Neuronal connectivity
- HPA Axis functioning (Cortisol)
- Autonomic Nervous System (“Fight or Flight,” “Rest and Digest”)
- Epigenetic effects (Telomere length, myelination)
HOW DOES TRAUMA IMPACT THE BODY?

- Adverse early experience
- Caregiving
- Altered stress response systems
- Social environment
- Altered neurodevelopmental trajectories/circuits/synapses
- Altered behavioral, psychological, cognitive and health
WHAT ARE THOSE ADAPTATIONS?
Acute Stress Response

Thinking Brain

Hippocampus
Regulates memory and emotions.

Prefrontal Cortex
Thinking/logic/what to do/evaluation.

Amygdala
Turns on fight or flight, and stores memories of the event.

Survival Brain
Toxic Stress Effects
Toxic Stress Effects

Prefrontal Cortex
Thinking/logic/what to do/evaluation.

Hippocampus
Regulate memory and emotions.

Amygdala
Turns on fight or flight, and stores memories of the event.

Thinking Brain

Survival Brain
Toxic Stress Effects

Healthy Brain
This PET scan of the brain of a normal child shows regions of high (red) and low (blue and black) activity. At birth, only primitive structures such as the brain stem (center) are fully functional; in regions like the temporal lobes (top), early childhood experiences wire the circuits.

An Abused Brain
This PET scan of the brain of a Romanian Orphan, who was institutionalized shortly after birth, shows the effect of extreme deprivation in infancy. The temporal lobes (top), which regulate emotions and receive input from the senses, are nearly quiescent. Such children suffer emotional and cognitive problems.

SURVIVAL BRAIN IN THE CLASSROOM

Difficulty managing emotions
- Unpredictable emotional reactions.
- Easily frustrated, overwhelmed.
- Difficulty calming themselves.

Dissociation
- Spacing out, daydreaming.
- Not paying attention.

Difficulty managing behaviors
- Lack impulse control.
- Easily “set off.”

Problems with cognition
- Difficulty problem solving.
- Trouble thinking through consequences.
- Learning & memory problems.
Thinking Across Generations: Unique Contributions of Maternal Early Life and Prenatal Stress to Infant Physiology

Sarah A.O. Gray PhD, Christopher W. Jones BA, Katherine P. Theall PhD, Erin Glackin MA and Stacy S. Drury MD, PhD

Respiratory Sinus Arrhythmia (RSA): A parasympathetic marker

- Vagal tone, heart rate variability
- Linked with the normal variations in heart period that occur during respiration
- Measures parasympathetic activity through vagal control of heart
Moms reported during pregnancy on:

- **Adverse childhood experiences (ACEs)** during their first 18 years
  - 18% of sample “high” (≥4 ACEs).

- **Prenatal stress** using five indicators (pregnancy-related anxiety, chronic strain, stressful life events, perceived stress, and prenatal depression)
  - 21% of sample “high” (≥3 indicators elevated)
Babies respond physiologically to the Still Face

<table>
<thead>
<tr>
<th>Infant RSA</th>
<th>B (SE)</th>
<th>p value</th>
</tr>
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<tbody>
<tr>
<td>Intercept</td>
<td>3.22 (.89)</td>
<td>&lt;.001</td>
</tr>
<tr>
<td>Time</td>
<td>-0.48 (.13)</td>
<td>&lt;.001</td>
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<td>Time^2</td>
<td>0.07 (.03)</td>
<td>.05</td>
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<tr>
<td>Sex</td>
<td>0.03 (.09)</td>
<td>.75</td>
</tr>
<tr>
<td>Race</td>
<td>0.09 (.02)</td>
<td>.26</td>
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<tr>
<td>Prenatal stress</td>
<td>0.75 (.04)</td>
<td>.05</td>
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<tr>
<td>ACEs</td>
<td>-0.20 (.09)</td>
<td>.04</td>
</tr>
<tr>
<td>Gestational Age</td>
<td>-0.00 (.02)</td>
<td>.84</td>
</tr>
<tr>
<td>Maternal education</td>
<td>-0.02 (.03)</td>
<td>.55</td>
</tr>
<tr>
<td>Prenatal stress*time^2</td>
<td>-0.02 (.01)</td>
<td>.05</td>
</tr>
<tr>
<td>Prenatal stress*sex</td>
<td>-0.43 (.18)</td>
<td>.02</td>
</tr>
<tr>
<td>Time^2*sex</td>
<td>0.02 (.01)</td>
<td>.02</td>
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High maternal prenatal stress was associated with RSA across the SFP, but this varied over the course of the still face paradigm and varied by child sex.

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</table>
Figure 1: Female and male infants' InRSA during the still-face paradigm.

A) Female infants: Low stress (closed diamond) and high stress (open triangle) conditions.

B) Male infants: Low stress (closed diamond) and high stress (open triangle) conditions.

InRSA: Inception of Respiratory Sinus Arrhythmia

Mean ± SEM: Mean ± Standard Error of the Mean
High maternal ACEs was associated with lower RSA over the whole still face paradigm.
Telomeres

Early life adversity

DNA

Health

TELOMERES?
Telomeres: antennae/cellular allostasis

Integration of exogenous and endogenous signals

DNA replication

Altered cell fate

DNA damage response

Apoptosis

Senescence

Telomere shortening or lengthening

Alterations of telomeric chromatin organization

Psychological stress

Mitotic arrest

Oxidative stress

Genotoxic stress

Stress hormones

Various chemical and physical stresses

Transcriptional changes

Genome-wide chromatin remodelling

WHAT IS THE DATA?

**Diseases**
- Obesity
- Diabetes
- HIV
- Autism

**Environment**
- Institutional care
- Abuse and maltreatment
- Community disorder
- Family instability
- Lead
- Parental education
- Prenatal smoking
- Neighborhood violence*

**Biological**
- Race
- HPA/ANS reactivity
- Testosterone
- DHEA

**Transgenerational**
- Maternal Adverse childhood experience*
- Maternal obesity*

*in preparation/under review
New Orleans Stress Physiology and Children Study

- Community recruited African American children: age 4-16
- Examine the effect of multiple stressors on physiology
The Association of Telomere Length With Family Violence and Disruption

**Authors:** Stacy S. Drury, MD, PhD,a Emily Mabile,a Zoë H. Brett,a Kyle Esteves,a Edward Jones,a Elizabeth A. Shirtcliff, PhD,c and Katherine P. Theall, PhDb
TELOMERS AND NEIGHBORHOODS.

Theall et al, Social Science and Medicine 2013
**NEIGHBORHOOD EFFECTS: AGE 5-15**

<table>
<thead>
<tr>
<th>Community Violence and Telomeres, cortisol and behavior</th>
<th>Neighborhood exposure -</th>
<th>Total Crime per 1000</th>
<th>Domestic Violence Calls per 1000</th>
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</thead>
<tbody>
<tr>
<td></td>
<td>Outcomes</td>
<td>Beta (SE)</td>
<td>P-value</td>
</tr>
<tr>
<td></td>
<td>Telomere length (T/S ratio)</td>
<td>-1.43 (0.39)</td>
<td>0.0003</td>
</tr>
<tr>
<td></td>
<td>Cortisol recovery</td>
<td>0.22 (0.23)</td>
<td>0.081</td>
</tr>
<tr>
<td></td>
<td>Aggression and impulsivity</td>
<td>15.98 (4.37)</td>
<td>0.032</td>
</tr>
</tbody>
</table>

Theall et al. under review
Telomere length and early severe social deprivation: linking early adversity and cellular aging

SS Drury¹,², K Theall²,³, MM Gleason³, AT Smyke¹, I De Vivo³, JYY Wong³, NA Fox⁴, CH Zeanah¹ and CA Nelson⁵
TELOMERE LENGTH AT 12 AND HEALTH

1. In general, would you say your child's physical health is excellent, good, fair or poor? - HBQ-P - age 12 years
CORTISOL
CORTISOL

Fight or flight hormone
Designed to alert individual to threat
Dysregulated following trauma
Potentially “always on” or alternatively “never raises”
New Orleans Stress Physiology and Children Study

- Community recruited African American children: age 5-15
- Examine the effect of multiple stressors on telomere length
CORTISOL AND NEIGHBORHOOD VIOLENCE
NEIGHBORHOOD DOMESTIC VIOLENCE
WHAT ABOUT RESILIENCE?
Exposure to Early Stress & Trauma

- Mood Disorders
- Conduct Disorder
- Eating Disorders
- No psychopathology

“Multifinality”
Resilience is Relational
Bucharest Early Intervention Project
TREATMENT AND RSA

Resting RSA (ln(ms))

<table>
<thead>
<tr>
<th>Pretreatment</th>
<th>Post Treatment</th>
<th>Follow up</th>
</tr>
</thead>
<tbody>
<tr>
<td>Low RSA</td>
<td></td>
<td></td>
</tr>
<tr>
<td>High RSA</td>
<td></td>
<td></td>
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</table>

RSA Reactivity

<table>
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<th>Post Treatment</th>
<th>Follow up</th>
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<tr>
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<td></td>
</tr>
<tr>
<td>High RSA</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
Positive effects of early intervention

IQ
Expressive and receptive language
Height and weight
Stereotypies
Internalizing disorders
Expression of positive emotions
Attachment
Brain electrical activity- ERP, EEG
Epigenetic changes
BEHAVIOR AND THE BODY

Trauma affects behavior

Resilience is in behavior

Trauma affects the brain

Resilience is in the brain

Trauma affects the body

Resilience is in the body
We can...
- better understand how early stress and trauma impacts both behavior and body
- build effective interventions that can cut across domains

These markers can help us understand resilience.
RESOURCES

- Trauma Center at the Justice Resource Institute (traumacenter.org)
- Center on the Developing Child at Harvard (developingchild.Harvard.edu)
- National Child Traumatic Stress Network (nctsn.org): Trauma-Informed Legal Advocacy
- Centers for Disease Control: Violence Prevention (www.cdc.gov/violenceprevention/acestudy/index.html)
- ACES Too High (acestoohigh.com)
- Substance Abuse & Mental Health Services Administration Trauma-Informed Care Center (www.samhsa.gov/nctic/trauma-interventions)