Neuroscience and Environmental Factors: Is It Nature or Nurture?

Trauma, Poverty, and the Brain

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Bringing the Science of Neuroscience and Behavior to Rehabilitation

The intersection of adolescent development and the criminal justice system is creating the recipe for a national crisis: criminal offending peaks in the teenage years, bringing adolescents into direct contact with a U.S. juvenile justice system ill-suited for their healthy development. Fourteen states have no minimum age for trying adolescents as adults and some set the minimum ages as young as 10 years old. The U.S. National Institute of Corrections estimates that nearly 250,000 youth under the age of 18 end up in the adult criminal justice system every year. Incarcerated youth, particularly when imprisoned with adults, are at a heightened risk of experiencing physical and sexual assault, undergoing long-term solitary confinement, and developing major mental disorders with little access to treatment. These experiences are occurring at a time when the brain is still wiring itself to its environment; yet, given the current realities of the juvenile justice system, the implication is that our legal system is actually helping to compromise brain development, enhancing the frequencies of behavior that it is designed to diminish.

The Center for Law Brain and Behavior
Massachusetts General Hospital

Hippocampus
Amygdala
Stress Response and Allostatic Load

Fear is evolutionarily useful
LeDoux, 1996

but... Dysregulated Fear leads to Phobia, Panic, and PTSD

- Single or repeated exposure to **extremely traumatic** situations

- Characteristic symptoms of PTSD
  - Increased **anxiety** / hypervigilance
  - Declarative **memory** alterations
  - Problems in sleep and concentration
  - **Flashbacks**
  - Inability to inhibit **fear**
Symptoms of Posttraumatic Stress

- Intrusions (Flashbacks, Nightmares)
- Avoidance (avoid places, people, won’t leave the house)
- Negative alterations in mood and cognition (Depression symptoms, poor concentration)
- Alterations in arousal and activity (Startle easy, more jumpy, can’t sleep)

*Always feel afraid, can’t feel Safe*
GENES

ENVIRONMENT

TRAUMA

Child Abuse

Trauma Related Disorders (PTSD, Depression, Anxiety)

NEUROBIOLOGICAL INTERMEDIATE PHENOTYPES (startle / imaging)
PTSD in Soldiers and Veterans

... and in Civilians

Koenen, Richards, Galea

Grady Memorial Hospital
Civilian PTSD Symptoms and Risk for Involvement in the Criminal Justice System

Sachiko Donley, BA, Leah Habib, MD, Tanja Jovanovic, PhD, Asante Kamkwalala, BS, Mark Evces, PhD, Glenn Egan, PhD, Bekh Bradley, PhD, and Kerry J. Ressler, MD, PhD

Posttraumatic stress disorder (PTSD) has received considerable attention with regard to the ongoing wars in Iraq and Afghanistan. In studies of veterans, behavioral sequelae of PTSD can include hostile and violent behavior. Rates of PTSD found in impoverished, high-risk urban populations within U.S. inner cities are as high as in returning veterans. The objective of this study was to determine whether civilian PTSD is associated with increased risk of incarceration and charges related to violence in a low-income, urban population. Participants (n = 4,113) recruited from Grady Memorial Hospital in Atlanta, Georgia, completed self-report measures assessing history of trauma, PTSD symptoms, and incarceration. Both trauma exposure and civilian PTSD remained strongly associated with increased risk of involvement in the criminal justice system and charges of a violent offense, even after adjustment for sex, age, race, education, employment, income, and substance abuse in a regression model. Trauma and PTSD have important implications for public safety and recidivism.

Civilian PTSD Symptoms and Risk for Involvement in the Criminal Justice System

Table 1  Demographics

<table>
<thead>
<tr>
<th></th>
<th>Total (N = 4,113)</th>
<th>PTSD (n = 1,265)</th>
<th>Non-PTSD (n = 2,848)</th>
<th>( \chi^2 )</th>
</tr>
</thead>
<tbody>
<tr>
<td>Sex, n (%)</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Female</td>
<td>2,794 (67.9)</td>
<td>875 (69.2)</td>
<td>1,919 (67.4)</td>
<td>1.29</td>
</tr>
<tr>
<td>Male</td>
<td>1,319 (32.1)</td>
<td>390 (30.8)</td>
<td>929 (32.6)</td>
<td></td>
</tr>
<tr>
<td>Race, n (%)</td>
<td></td>
<td></td>
<td></td>
<td>16.55*</td>
</tr>
<tr>
<td>African American or black</td>
<td>3,811 (93.1)</td>
<td>1,147 (91.5)</td>
<td>2,664 (93.8)</td>
<td></td>
</tr>
<tr>
<td>Latino</td>
<td>30 (0.7)</td>
<td>9 (0.7)</td>
<td>21 (0.7)</td>
<td></td>
</tr>
<tr>
<td>Asian</td>
<td>7 (0.2)</td>
<td>1 (0.1)</td>
<td>6 (0.2)</td>
<td></td>
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<tr>
<td>Caucasian or white</td>
<td>150 (3.7)</td>
<td>62 (4.9)</td>
<td>88 (3.1)</td>
<td></td>
</tr>
<tr>
<td>Mixed</td>
<td>57 (1.4)</td>
<td>26 (2.1)</td>
<td>31 (1.1)</td>
<td></td>
</tr>
<tr>
<td>Other</td>
<td>39 (1.0)</td>
<td>9 (0.7)</td>
<td>30 (1.1)</td>
<td></td>
</tr>
<tr>
<td>Highest degree, n (%)</td>
<td></td>
<td></td>
<td></td>
<td>54.77†</td>
</tr>
<tr>
<td>Less than high school</td>
<td>979 (23.9)</td>
<td>335 (26.7)</td>
<td>644 (22.7)</td>
<td></td>
</tr>
<tr>
<td>High school or equivalent</td>
<td>1,745 (42.7)</td>
<td>510 (40.7)</td>
<td>1,235 (43.5)</td>
<td></td>
</tr>
<tr>
<td>Some college</td>
<td>1,037 (25.4)</td>
<td>336 (26.8)</td>
<td>701 (24.7)</td>
<td></td>
</tr>
<tr>
<td>College or higher</td>
<td>331 (8.1)</td>
<td>73 (5.8)</td>
<td>258 (9.1)</td>
<td></td>
</tr>
<tr>
<td>Employed, n (%)</td>
<td></td>
<td></td>
<td></td>
<td>34.33†</td>
</tr>
<tr>
<td>No</td>
<td>2,825 (69.1)</td>
<td>946 (75.4)</td>
<td>1,879 (66.3)</td>
<td></td>
</tr>
<tr>
<td>Yes</td>
<td>1,265 (30.9)</td>
<td>308 (24.6)</td>
<td>957 (33.7)</td>
<td></td>
</tr>
<tr>
<td>Household monthly income, n (%)</td>
<td></td>
<td></td>
<td></td>
<td>32.64†</td>
</tr>
<tr>
<td>&lt;$249</td>
<td>1,036 (26.1)</td>
<td>377 (31.1)</td>
<td>659 (23.9)</td>
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</tr>
<tr>
<td>$250–$999</td>
<td>1,475 (37.2)</td>
<td>445 (36.6)</td>
<td>1,039 (37.4)</td>
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</tr>
<tr>
<td>$1,000–$2,000</td>
<td>996 (25.1)</td>
<td>283 (23.3)</td>
<td>713 (25.9)</td>
<td></td>
</tr>
<tr>
<td>≥$2,001</td>
<td>461 (11.6)</td>
<td>109 (9.0)</td>
<td>352 (12.8)</td>
<td></td>
</tr>
<tr>
<td>Past alcohol and/or drug problems, n (%)</td>
<td></td>
<td></td>
<td></td>
<td>141.11†</td>
</tr>
<tr>
<td>No</td>
<td>2,933 (72.3)</td>
<td>742 (59.7)</td>
<td>2,191 (77.8)</td>
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</tr>
<tr>
<td>Yes</td>
<td>1,126 (27.7)</td>
<td>501 (40.3)</td>
<td>625 (22.2)</td>
<td></td>
</tr>
</tbody>
</table>

* \( p < .05 \).
† \( p < .001 \).
Civilian PTSD Symptoms and Risk for Involvement in the Criminal Justice System

Table 2: Association of Incarceration With Civilian PTSD

<table>
<thead>
<tr>
<th>Condition</th>
<th>Total</th>
<th>PTSD</th>
<th>Non-PTSD</th>
<th>$\chi^2$</th>
</tr>
</thead>
<tbody>
<tr>
<td>Arrested, n (%)</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>No</td>
<td>1,749 (44.6)</td>
<td>425 (34.9)</td>
<td>1,324 (49.0)</td>
<td>67.78*</td>
</tr>
<tr>
<td>Yes</td>
<td>2,170 (55.4)</td>
<td>793 (65.1)</td>
<td>1,377 (51.0)</td>
<td></td>
</tr>
<tr>
<td>Jailed, n (%)</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>No</td>
<td>1,868 (48.0)</td>
<td>465 (38.4)</td>
<td>1,403 (52.3)</td>
<td>64.88*</td>
</tr>
<tr>
<td>Yes</td>
<td>2,024 (52.0)</td>
<td>746 (61.6)</td>
<td>1,278 (47.7)</td>
<td></td>
</tr>
<tr>
<td>Imprisoned, n (%)</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>No</td>
<td>3,382 (87.1)</td>
<td>1,002 (83.3)</td>
<td>2,380 (88.8)</td>
<td>22.77*</td>
</tr>
<tr>
<td>Yes</td>
<td>500 (12.9)</td>
<td>201 (16.7)</td>
<td>299 (11.2)</td>
<td></td>
</tr>
<tr>
<td>Charge involving violence, n (%)</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>No</td>
<td>3,084 (79.9)</td>
<td>878 (73.1)</td>
<td>2,206 (82.9)</td>
<td>49.36*</td>
</tr>
<tr>
<td>Yes</td>
<td>778 (20.1)</td>
<td>323 (26.9)</td>
<td>455 (17.1)</td>
<td></td>
</tr>
</tbody>
</table>

* $p < .001$.

Table 4: Association of History of Incarceration With Trauma

<table>
<thead>
<tr>
<th>Condition</th>
<th>Childhood Trauma, M (SD)</th>
<th>Adult Trauma, M (SD)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Arrested</td>
<td></td>
<td></td>
</tr>
<tr>
<td>No</td>
<td>37.72 (15.12)</td>
<td>3.09 (2.74)</td>
</tr>
<tr>
<td>Yes</td>
<td>43.26 (18.20)</td>
<td>4.98 (3.16)</td>
</tr>
<tr>
<td>$F = 119.89^*$</td>
<td>$F = 443.84^*$</td>
<td></td>
</tr>
<tr>
<td>Jailed</td>
<td></td>
<td></td>
</tr>
<tr>
<td>No</td>
<td>37.98 (15.35)</td>
<td>3.18 (2.79)</td>
</tr>
<tr>
<td>Yes</td>
<td>43.57 (18.30)</td>
<td>5.03 (3.15)</td>
</tr>
<tr>
<td>$F = 121.85^*$</td>
<td>$F = 421.50^*$</td>
<td></td>
</tr>
<tr>
<td>Imprisoned</td>
<td></td>
<td></td>
</tr>
<tr>
<td>No</td>
<td>40.33 (16.96)</td>
<td>3.87 (3.01)</td>
</tr>
<tr>
<td>Yes</td>
<td>43.96 (18.07)</td>
<td>5.85 (3.33)</td>
</tr>
<tr>
<td>$F = 21.92^*$</td>
<td>$F = 201.54^*$</td>
<td></td>
</tr>
<tr>
<td>Charge involving violence</td>
<td></td>
<td></td>
</tr>
<tr>
<td>No</td>
<td>39.14 (15.87)</td>
<td>3.78 (3.02)</td>
</tr>
<tr>
<td>Yes</td>
<td>47.41 (20.01)</td>
<td>5.56 (3.16)</td>
</tr>
<tr>
<td>$F = 168.65^*$</td>
<td>$F = 230.25^*$</td>
<td></td>
</tr>
</tbody>
</table>

Data are expressed as the mean (SD).

* $p < .001$. 
Summary: PTSD symptoms were associated with significantly more charges of a violent offense, even after controlling for sex, race, education, income, substance abuse, and trauma history. – Treating PTSD matters.
High rates of lifetime dependence:

39% alcohol
34.1% cocaine
6.2% heroin/opiates
44.8% marijuana

N=587
61% Female
91% African American
Resilience characteristics mitigate tendency for harmful alcohol and illicit drug use in adults with a history of childhood abuse: A cross-sectional study of 2024 inner-city men and women

Aliza P. Wingo$^{a,b}$, Kerry J. Ressler$^{b,c}$, Bekh Bradley$^{a,b,*}$

We found that resilience characteristics mitigated tendency for lifetime alcohol use problems both as a main effect ($\beta = -0.11; p = 0.0014$) and an interaction with severity of childhood abuse ($\beta = -0.06; p = 0.0115$) after trauma severity, age, and sex were controlled for. Similarly, resilience reduced lifetime illicit drug use both as a main effect ($\beta = -0.03; p = 0.0008$) and as an interaction with severity of childhood abuse ($\beta = -0.01; p = 0.0256$) after trauma load, age, and sex were adjusted for.
Symptom Provocation Paradigms: Classic PTSD
PTSD is associated with:

- decreased Cognitive / executive control / fear inhibition
- increased emotional / defensive / aggressive responding
Classic PTSD: Neurobiological Patterns

Classic THREAT RESPONSE

ventromedial Prefrontal Cortex (vmPFC)

vmPFC Inhibits Amygdala

Amygdala

Slide credit Scott Kilgore, PhD
Classic PTSD: Neurobiological Patterns

Amygdala is Poorly Inhibited by vmPFC

ventromedial Prefrontal Cortex (vmPFC)

Amygdala

Slide credit Scott Kilgore, PhD
Classic PTSD: Neurobiological Patterns

- **vmPFC**: hypoactive
- **Amygdala**: hyperactive
- **Insula**: hyperactive

Hopper et al., 2007

Lanius, et al., 2010; Lanius et al., 2016; Pitman et al., 2012
Shared Circuits between Stress, Addiction, and Fear

The same brain regions involved in fear are involved in excitement and addiction.

George & Koob, *PNAS*, 2013

Binge/Intoxication
Withdrawal/Negative Emotion
Preoccupation/Craving

C Seger, *Front Systems Neuros*, 2013
Case example (8622) “Risk”

- Ms. 8622 is a 33 y/o AA female. From the age of six, she has sustained severe physical and emotional abuse by her father and repeated sexual abuse by her step brother. She has significant symptoms of PTSD.

Case example (8543) “Resilience”

- Ms. 8543 is a 25 y/o AA female. Until the age of 7, she lived with her mother and father, who were addicted to crack cocaine. She witnessed a number of violent fights between her parents. At age 8 she moved in with her grandmother. But while still living with her parents, she was exposed to a lot of neighborhood violence. As a 7 y/o, she survived a shootout between neighbors and dropped to the floor in the living room, trying to protect herself and her siblings from shots that came through the windows. She met current PTSD for this trauma.
Overview of Grady Trauma Project

• N≈ 8,000
• 40% of sample report household monthly incomes of $500 or less and only 10% report household monthly incomes over $2000
• ~50% know someone who was murdered
• ~2/3 have been attacked
• ~2/3 have experienced sexual assault
• ~2/3 have experienced child abuse
High Rates of Trauma Exposure

- 35% Natural Disaster
- 30% Witnessed Family Member Attacked with Weapon
- 43% Witnessed Stranger Attacked with Weapon
- 42% Physical Assault (no weapon)
- 27% Physical assault (no weapon, Romantic Relationship)

Males | Females
Trauma Exposure Occurs in the Context of Other “Stressful Life Events”/Persistent Stressors

- % Lived in Unsafe Neighborhood: Last Year 33%, Ever 56%
- % Friend or Family Member Murdered: Last Year 11%, Ever 40%
- % Family Member/Significant Other in Incarceration: Last Year 31%, Ever 50%
- % Not Enough $ to Feed Family: Last Year 30%, Ever 46%
Exposure to multiple types of trauma is the rule rather than the exception

First trauma exposure often occurs in childhood or adolescence

- None: 13.6%
- One type: 13.9%
- 2 or 3 types: 35.4%
- 4 or more types: 37.1%

- No trauma:<19: 48%
- 1 Trauma:<19: 39%
- More than 1 trauma:<19: 13%
Trauma Exposures Often Include Childhood Abuse and Other Types of Family Violence

- % Childhood Physical Abuse: 19 (male), 19 (female)
- % Childhood Emotional Abuse: 24 (male), 28 (female)
- % Witnessing Violence between caregivers: 27 (male), 30 (female)
- % Sexual Abuse before 13: 13 (male), 25 (female)
- % Sexual Abuse 14-17: 4 (male), 17 (female)
High Rates of Trauma Exposure in School Age Children

- 8% Seen Accident
- 12% Natural Disaster
- 10% Animal Attack
- 47% Seen/Heard Abuse/Assault Outside Family
- 52% Seen Family Member Arrested
The Human Amygdala and Fear

Etkin & Wager, 2007
**PANIC ATTACK:**

"All of a sudden I felt dizzy, my legs gave out on me, and I couldn't catch a breath. It felt like someone was choking me. I could feel my heart was beating too fast and I was terrified I was dying. I knew I had to get away before I lost it."

<table>
<thead>
<tr>
<th>Symptom</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Increased heart rate</td>
<td></td>
</tr>
<tr>
<td>Chills, hotflushes</td>
<td></td>
</tr>
<tr>
<td>Nausea / abdominal distress</td>
<td></td>
</tr>
<tr>
<td>Shortness of breath</td>
<td></td>
</tr>
<tr>
<td>Expressions of fear</td>
<td></td>
</tr>
<tr>
<td>Chest discomfort</td>
<td></td>
</tr>
<tr>
<td>Sweating</td>
<td></td>
</tr>
<tr>
<td>Lightheadedness / faint</td>
<td></td>
</tr>
<tr>
<td>Choking sensation</td>
<td></td>
</tr>
<tr>
<td>Fear of dying / losing control</td>
<td></td>
</tr>
</tbody>
</table>

**PANIC ATTACK = ‘Fear Attack’ in Fear-related Disorders**

- Panic Disorder
- Simple Phobia
- Social Phobia (Agoraphobia)
- Posttraumatic Stress Disorder
- Acute Stress Disorder
The Fear Response is a Hardwired Process involving the Amygdala

**Fear / Panic Symptoms:**
- Lateral hypothalamus → heart rate, blood pressure
- Dorsal vagal N. → bradycardia, ulcers
- Parabrachial N. → panting, respiratory distress
- Basal forebrain → arousal, vigilance, attention
- Retic. Pontis Caudalis → increased **startle response**
- Central Gray Area → freezing, social interaction
- Paraventricular N. → corticosteroid release

**Learning**
- Amygdala

**Expression**
- LA
- CeA
- Basolateral
Summary: Neurogenetic approaches, using convergent human and mouse genetics, is beginning to support an underlying genetic architecture of the intermediate neural phenotypes related to PTSD and stress-related disorders.
Genetics Influence the Stress-Response Feedback Loop

- **FKBP5** gene plays a key role in trauma-associated stress hormone dysregulation.
- Role in feedback loop is to inhibit further activation of the stress response system.
GTP: FKBP5 genotype interacts with level of Child abuse to predict level of Adult PTSD Symptoms

Binder et al., JAMA, March, 2008
N=762
Hippocampal Volume Reduction in PTSD


J Douglas Bremner, MD, Emory University
Hippocampal activation and structural differences in FKBP5 risk allele carriers: Trauma and Genetic risk combine to decrease size and function of brain regions involved in Resilience.

Fani et al., 2013, *JAMA Psychiatry*

FKBP5 Genotype and Structural Integrity of Posterior Cingulum

Fani et al., 2013, *Neuropsychopharm.*

White...Hariri, 2012

*Genes, Brain and Behavior*
Cortisol and stress axis involvement in development of emotional 'Critical Period' during development?

Rat model of developmental trauma and development of fear responses

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**Good memories of bad events in infancy**


**Sufficiently Supportive Development:** A dynamic amygdala-dependent emotional circuit

---

**Dual circuitry for odor–shock conditioning during infancy: Corticosterone switches between fear and attraction via amygdala**

Moricseau, et al., J Neuroosci, 2006

**Child abuse combined with biological risk factors:** An amygdala-dependent emotional circuit that is always 'primed' for stress responsiveness?
Sufficiently Supportive Development: A dynamic amygdala-dependent emotional circuit

Child abuse combined with biological risk factors: An amygdala-dependent emotional circuit that is always ‘primed’ for stress responsiveness?

In the presence of adult trauma, a higher risk for PTSD?
Neural Circuits are Wired in a Bottom-Up Sequence

Sensory Pathways (Vision, Hearing)

Language

Higher Cognitive Function

Significant Adversity Impairs Development in the First Three Years

Source: Barth et al. (2008)
Emotion Recognition and Childhood Abuse

  - Compared non-abused, physically abused and neglected 3-5 year olds on emotion discrimination task
  - Neglected children less able to differentiate negative emotions
  - Abused children over-identified anger (non-abused tended to under-identified anger)
Being able to focus, hold, and work with information in mind, filter distractions, and switch gears is like having an air traffic control system at a busy airport to manage the arrivals and departures of dozens of planes on multiple runways.

In the brain, this air traffic control mechanism is called executive functioning, a group of skills that helps us to focus on multiple streams of information at the same time, and revise plans as necessary.
Trauma Impairs Development of Executive Function and ‘Top-Down’ Regulation

A range of tests measuring different forms of executive function skills indicates that they begin to develop shortly after birth, with ages 3 to 5 providing a window of opportunity for dramatic growth in these skills. Growth continues throughout adolescence and early adulthood; proficiency begins to decline in later life.

Impact of Repeated Exposure to Trauma and Stress Over Course of Development

- The psychiatric diagnostic system does not have a single diagnostic category that accounts for the symptoms associated with this complex trauma exposure and related developmental disruption.

- Some psychiatric diagnoses, however, are significantly more common among children who have been exposed to complex trauma.
  - Attention Deficit Hyperactivity Disorder (ADHD)
  - Oppositional Defiant Disorder (ODD)
  - Mood Disorders
  - Conduct Disorder
  - Substance Use Disorders

![Graph showing PSS score for different types of childhood abuse](image)
Case example (8543) “Resilience”

• Ms. 8543 is a 25 y/o AA female. Until the age of 7, she lived with her mother and father, who were addicted to crack cocaine. She witnessed a number of violent fights between her parents. At age 8 she moved in with her grandmother. But while still living with her parents, she was exposed to a lot of neighborhood violence. As a 7 y/o, she survived a shootout between neighbors and dropped to the floor in the living room, trying to protect herself and her siblings from shots that came through the windows. She met current PTSD for this trauma. Ms. 8543 now has a 5 y/o son and a 6 y/o daughter.

Case example (8622) “Risk”

• Ms. 8622 is a 33 y/o AA female. From the age of six, she has sustained severe physical and emotional abuse by her father and repeated sexual abuse by her step brother. She has significant symptoms of PTSD. She has 4 children. Her 8 y/o stays with her mother, and the other children stay with her. She sounded annoyed by her own children ("my kids aggravate me") and is looking forward to having them stay with her mother for the summer.
Grady Trauma Project

Parents & Children Program
Startle in Children of Abused Mothers
Children of abused mothers startle more in the dark

- Children of mothers with high levels of abuse have higher dark-enhanced startle than children of mothers with low levels of childhood physical abuse.

- Children’s dark-enhanced startle positively correlated with their self-reported anxiety symptoms $r=0.55$, $p<0.03$

Jovanovic, et al. (2011) *J Child Psychology & Psychiatry*
Case examples
Case example (8622) “Risk”

- Ms. 8622 is a 33 y/o AA female. From the age of six, she has sustained severe physical and emotional abuse by her father and repeated sexual abuse by her step brother. She has significant symptoms of PTSD. She has 4 children. Her 8 y/o stays with her mother, and the other children stay with her. She sounded annoyed by her own children ("my kids aggravate me") and is looking forward to having them stay with her mother for the summer. She described her relationship with her 15 y/o daughter as "she can't stand me", her 16 y/o son as "iffy", her 9 y/o as "he loves me" and her 8 y/o as “he doesn't know me”. Having met her with her 9 y/o son, I was surprised by her lack of warmth toward him.

Case example (8543) “Resilience”

- Ms. 8543 is a 25 y/o AA female. Until the age of 7, she lived with her mother and father, who were addicted to crack cocaine. She witnessed a number of violent fights between her parents. At age 8 she moved in with her grandmother. But while still living with her parents, she was exposed to a lot of neighborhood violence. As a 7 y/o, she survived a shootout between neighbors and dropped to the floor in the living room, trying to protect herself and her siblings from shots that came through the windows. She met current PTSD for this trauma. Ms. 8543 now has a 5 y/o son and a 6 y/o daughter. She was inspired by her daughter’s strong interest in reading. She wants to be a role model for her children and is enrolled in a program to get her GED. Upon completing the GED program, Ms. 8543 hopes to do work in child advocacy.
Zip Code Data, Trauma Exposure and PTSD Symptoms (n=1300)
Neighborhood Disorder, Community Cohesion, and PTSD (controlling for trauma exposure)
Bringing the Science of Neuroscience and Behavior to Rehabilitation

What can be done?

One Example: Emotion Regulation Training in Juvenile Systems

The juvenile justice system was founded on the belief in the unique rehabilitation potential of youth; however, this vision is unlikely to be realized without an emphasis on mental health and behavioral therapy. In light of this, the Massachusetts Department of Youth Services (DYS) has adapted dialectical behavioral therapy (DBT) for juvenile justice populations. It provides incarcerated youth with the tools to focus on emotion regulation, distress tolerance, and behavioral management. With DYS, we will develop a unique research project

The Center for Law Brain and Behavior
Massachusetts General Hospital
Emotion Skills Training
example: DBT (Dialectical Behavior Therapy), CBT, etc.
Improves ‘Top-Down’ Regulation of emotional responding by cortical (Thinking) processes
Enhances Resilience / Flexibility
Classic PTSD: Neurobiological Patterns

Classic THREAT RESPONSE

- Amygdala
- ventromedial Prefrontal Cortex (vmPFC)

DBT / CBT increases vmPFC regulation of amygdala

vmPFC Inhibits Amygdala

Slide credit Scott Kilgore, PhD
Neuroscience and Environmental Factors:
Trauma, Poverty, and the Brain
- Biology (genetics, the brain, etc) interacts with the environment for a healthy developing brain
- Trauma in childhood is the largest risk for all psychiatric disorders
- PTSD is Prevalent: More in our inner-cities than in the military
- PTSD is associated with increased risk for substance abuse, and decreased functionality (e.g. ability to work)
- PTSD is associated with increased risk for violence – thus the cycle – importance of a Medical Model Approach
- PTSD can be TREATED!

Bringing Science to Improved Rehabilitation
- Examples of emotion skills training / DBT in juvenile system among other evidence-based PTSD treatments
- Diversion systems, mental health courts, awareness of possibility for rehabilitation
The Grady Trauma Project

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