The Neurobiology of Child Maltreatment: Developmental Trauma Disorder

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Case Vignette: Katy, age 5

- Foster placement, age 3½ due to neglect; substance abusing caregivers
- Disrupted foster home age 5 due to her behaviors
- Neglect by mother
- Neglect by familial caregivers
- Physical abuse
- Sexual abuse by mother, uncles, grandparents
- Witnessed suicide attempts (with knives) of grandparents
- Chaotic, violent home
Case Vignette: Katy, age 5

- Seemed “delayed”
- “Like little animal”
- “Meticulous” behaviors
- Excessive masturbation
- Self harming behaviors
- Eating & vomiting hair
- Play with bowel movements
- Aggressive to children
- Sleep problems
  - Nightmares
  - Resisting bedtime
- Affect dysregulation
- Triggers (e.g., knives)
- Zones out
- Flashbacks/abreactions?
- Post traumatic play
- Regression of previously learned skills
- Expressive language challenges
- Poor boundaries
- Poor attention
- Hyperactivity/impulsivity

Case Vignette: Katy, age 5

- Diagnosis by provider age 4:
  - OCD, extreme
  - Bipolar disorder
  - FAS
  - Developmental Delay (Mild MR)
  - Night terrors
  - Speech disturbance
- Medications prescribed:
  - Celexa
  - Trileptal
  - Clonidine
- RIP treatment suggested

- Diagnosis by COE age 5:
  - PTSD, complex w/dissociation
  - ADHD, combined
  - Sexual abuse of child
  - Neglect of child
  - Expressive Lang. Delay
- IQ in Low Average range
- Recommendations:
  - Parent-child therapy and education, play therapy, Speech and OT evals, tapered off Trileptal, Celexa, Clonidine; began Adderall, Tenex
If 20 million people were infected by a virus that caused anxiety, impulsivity, aggression, sleep problems, depression, respiratory and heart problems, vulnerability to substance abuse, antisocial and criminal behavior, retardation and school failure, we would consider it an urgent public health crisis. Yet, in the United States alone, there are more than 20 million abused, neglected and traumatized children vulnerable to these problems. Our society has yet to recognize this epidemic, let alone develop an immunization strategy.

Bruce D. Perry, M.D., Ph.D.
www.childtrauma.org

www.ACEstudy.org

Child maltreatment reports 1989-2004
We’re “neglecting the brain” at a most vulnerable developmental time…

Brain Growth

Newborn   6 Year old   Newborn   6 Year old
PET Scans Showing Increasing Brain Metabolic Activity: Birth to One Year of Age

Images: Harry Chugani
Science Vol 288, June 23, 2000

Slide modified from Frank Putnam, M.D. PCIT & Trauma presentation

Growth of Human Brain from birth to 20 years
Experience Alters Brain Development

- Childhood is a time for learning (languages, music, motor skills most easily acquired)
- Number of synapses increases dramatically after birth
- Environment-stimulated neuronal activity is critical for elaboration of synaptic territories and ‘proper’ connections

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 increase auditory-visual neuronal adaptation to altered visual input
“Attachment relationships are formative because they facilitate the development of the brain’s self-regulatory mechanism, which in turn allows the individual to perform effectively in society” (Fonagy & Target, 2002)

How does this develop?
RIGHT BRAIN TO RIGHT BRAIN ACTIVATION
(Schore, 2003)

Through *attunement*, *synchronicity*, and *interactive repair*, the caregiver plays a critical role.

The mother functions as a regulator of the socio-emotional environment during early stages of postnatal development... subtle emotional regulatory interactions are theorized to play a critical role during the establishment and maintenance of limbic system circuits (Ziabreva et al., *Journal of Neuroscience*, 2003).

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**Attachment Behaviors of Child**

- **Internal Working Model**
  - Anticipate future responsiveness

- **TRUST**
  - Relationships are safe and trustworthy
  - Lower arousal
  - Child bolsters
  - Affect Regulation
  - Normal Stress Response

- **Express Emotion or Behavior**
  - Crying
  - Reaching
  - Talking/Calling

- **Child’s Needs**
  - Need Met

- **Caregiver Responsive**
  - Relationships are predictable

Adapted from Ainsworth & Blehar (1991) and used with permission of Cambridge University Press.
“… in order to develop normally, a child requires progressively more complex joint activity with one or more adults who have an irrational emotional relationship with the child. Somebody’s got to be crazy about that kid. That’s number one. First, last, and always.”

Urie Bronfenbrenner

(as cited in the National Scientific Council on the Developing Child, Summer 2004, working paper #1)

Normal vs. Abused Brain

As cited by Felitti & Anda, 2003; source CDC
Healthy Attachment

- Affect regulation
- Interpersonal Relatedness
- Sense of self efficacy/worth

Maltreatment Cycle

Internal Working Model
Anticipate Future Harm
Hypervigilent or shut down

Child’s Needs

Fight
Flight
Freeze

Caregiver
unresponsive
abusive or
neglect

Express
Emotion or
Behavior

Crying
Reaching
Talking/Calling

Relationships are unsafe - Traumatized

Child feels
Out of control (Affect Dysregulation)
Chronic Stress

Relationships are unresponsive, unpredictable, dangerous, and/or chaotic
Maltreatment Alters the Normal Stress Response

FIGHT/FLIGHT
Sympathetic Preference
Hypervigilance, Reactive, Alarm Response, Under-Controlled Impulsive, aggressive.

RESPONSE FLEXIBILITY

FREEZE
Parasympathetic Preference
Dissociative, Disengaged, Camouflage Low heart rate, helplessness, minimizing Emotional expressions.
Normal Stress Response

- All affective energy mobilized in the limbic system (red).
- Higher Cortical areas less active (blue).

Survival Mode vs. Consultation Mode
What About Chronic Stress?

• The stress response continues to be active – uses all resources to stay alert (at the expense of using resources for other systems).
• The neurohormones released are good for short stress periods – but can become harmful when in the system for long periods of time.

Stress and the developing brain*

• Sustained or frequent activation of hormonal stress response systems (e.g., SAM; HPA) can have serious developmental consequences: can change the architecture of the brain (Lupien et al, 1998; McEwen & Sapolsky, 1995)

*All references as cited in the National Scientific Council on the Developing Child Working Paper #3; Summer 2005
Stress and the developing brain*

• Animal studies: high, sustained levels of CRH result in impairment of the hippocampus: leads to impairments in learning, memory, stress regulation (Brunson, et al., 2002).

• Animal offspring are more fearful and reactive to stress if:
  – Pregnant mothers experienced exceptionally high levels of stress during pregnancy
  – Poor maternal care during infancy
  – Inattentive maternal care

*All references as cited in the National Scientific Council on the Developing Child Working Paper #3; Summer 2005

Stress and the developing brain*

• Positive experiences after infancy in young animals have been shown to compensate to some degree for the negative behavioral consequences of prenatal stress and postnatal neglect. This compensation actually involves adaptive changes in both the architecture and the chemistry of the developing brain (Francis et al., 2002)

*All references as cited in the National Scientific Council on the Developing Child Working Paper #3; Summer 2005
Stress and the developing brain*

- Young children who are neglected or maltreated have abnormal patterns of cortisol production that can last even after the child has been moved to a safe and loving home. (Carrion et al, 2002; Gunnar et al, 2001; De Bellis et al., 1999)

*All references as cited in the National Scientific Council on the Developing Child Working Paper #3; Summer 2005

Childhood Maltreatment Trauma Alters Brain Development

- Smaller cerebellar volume in maltreated children and adolescents with PTSD (De Bellis & Kuchibhatla, 2006)

- Smaller intracranial, cerebral, & prefrontal cortex, prefrontal cortical white matter, and right temporal lobe volumes & areas of the corpus callosum and its subregions (2,4,5,6,7) (DeBellis et al, 2002)

- Trauma effects on the brain appear to be the greatest for boys (DeBellis et al, 2002)

- Volume decrease in Corpus Collosum correlates with: intrusive thoughts, avoidance, hyper arousal, and dissociation (DeBellis et al, 1999)
Developmental Trauma Disorder: Complex Knots in Complex Kids
Complex (Maltreatment) Trauma

• PTSD diagnosis does not capture:
  – the full range of developmental difficulties that children exposed to maltreatment, family violence, and other trauma experience
  – the interference with the formation of a secure attachment bond
  – loss of core capacities for self-regulation and interpersonal relatedness

Complex (Maltreatment) Trauma

• PTSD does not capture the developmental effects nor the complexity of chronic childhood trauma
  – Complex disruption of affect regulation
  – Disturbed attachment patterns
  – Rapid behavioral regressions/shifts in emotional states
  – Aggressive behaviors against self and others
  – Failures to achieve developmental competencies/chronic sense of ineffectiveness
  – Loss of bodily regulations in areas of sleep, food, self care
  – Somatic problems
  – Altered schemas of the world
Computer generated drawing by 54 year old adult survivor depicting abuse trauma (by father) at age 5.

SOMATIC Disturbance; Attachment Disturbance

Physically Abused Children See Anger Where Others See Fear

Graphic by: Seth Pollak, courtesy PNAS

PERCEPTUAL Disturbance
COGNITIVE, AFFECTIVE, ATTACHMENT, IDENTITY Disturbance

SEXUAL Disturbance / IDENTITY Disturbance
AFFECT REGULATION Disturbance
Developmental Trauma Disorder  

A. Exposure
B. Triggered pattern of repeated dysregulation in response to trauma cues
C. Persistently Altered Attributions and Expectancies
D. Functional Impairment

- Exposure
  - Multiple or chronic exposure to one or more forms of developmentally adverse interpersonal trauma (e.g., abandonment, betrayal, physical assaults, sexual assaults, threats to bodily integrity, coercive practices, emotional abuse, witnessing violence and death)
  - Subjective experience (e.g., rage, betrayal, fear, resignation, defeat, shame)
Developmental Trauma Disorder
van der Kolk, May 2005, Psychiatric Annals 35:5

• Triggered pattern of repeated dysregulation in response to trauma cues
  – Dysregulation (high or low) in presence of cues
    Changes persist and do not return to baseline; not reduced in intensity by conscious awareness
  – Affective
  – Somatic (e.g., physiological, motoric, medical)
  – Behavioral (e.g., re-enactment, cutting)
  – Cognitive (e.g., thinking that it is happening again, confusion, dissociation, depersonalization)
  – Relational (e.g., clinging, oppositional, distrustful, compliant)
  – Self-attribution (e.g., self hate, blame).

Developmental Trauma Disorder
van der Kolk, May 2005, Psychiatric Annals 35:5

• Persistently Altered Attributions and Expectancies
  – Negative self-attribution
  – Distrust of protective caretaker
  – Loss of expectancy of protection by others
  – Loss of trust in social agencies to protect
  – Lack of recourse to social justice/retribution
  – Inevitability of future victimization
Developmental Trauma Disorder

- **Functional Impairment**
  - Educational
  - Familial
  - Peer
  - Legal
  - Vocational

National Child Traumatic Stress Network

- **Core components in treating complex trauma**
  - Safety
  - Self-regulation
  - Self-reflective information processing
  - Traumatic experiences integration
  - Relational engagement
  - Positive affect enhancement

http://www.nctsn.org
### Table 1. Well-established* and Probably Efficacious** Interventions for Child Trauma

<table>
<thead>
<tr>
<th>Intervention</th>
<th>Age Group</th>
<th>Research Design</th>
<th>Main Findings</th>
</tr>
</thead>
<tbody>
<tr>
<td>Adapted CBT models for physical and sexual abuse</td>
<td>4-18 years</td>
<td>10 randomized trials</td>
<td>Improvement in child PTSD, depression, anxiety, behavioral problems, sexualized behavior, and feelings of shame &amp; mistrust.</td>
</tr>
<tr>
<td>(TF-CBT, AF-CBT, CBT for child traumatic grief)</td>
<td></td>
<td>4 quasi-experimental</td>
<td>- Decreased parental PTSD, depression and emotional distress about the child's abuse.</td>
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<td></td>
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<td>- Decreased parent use of physical discipline and parent anger problems.</td>
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<td></td>
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<td>- Decreased family conflict.</td>
</tr>
<tr>
<td>Parent-Child Interaction Therapy (PCIT)*</td>
<td>4-12 years</td>
<td>1 randomized trial</td>
<td>Decreased parent physical abuse.</td>
</tr>
<tr>
<td></td>
<td></td>
<td>4 quasi-experimental</td>
<td>- Reduced negative parent-child interactions.</td>
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<td></td>
<td></td>
<td></td>
<td>- Maintained effects at long term follow-up (3-6 years after treatment).</td>
</tr>
<tr>
<td>Child-Parent Psychotherapy for Family Violence*</td>
<td>Up to 5 years</td>
<td>4 randomized trials</td>
<td>Decreased PTSD symptoms and behavior problems.</td>
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<tr>
<td></td>
<td></td>
<td></td>
<td>- Decreased maternal avoidance.</td>
</tr>
<tr>
<td>Cognitive Behavioral Intervention for Trauma in</td>
<td>10-15 years</td>
<td>1 randomized trial</td>
<td>Improvement in PTSD and depressive symptoms.</td>
</tr>
<tr>
<td>&quot;Schools&quot;</td>
<td></td>
<td>1 quasi-experimental</td>
<td>- Maintained improvements at 6-month follow up.</td>
</tr>
<tr>
<td>Project 12-Ways/Safe Care for Child Neglect**</td>
<td>Young children</td>
<td>4 quasi-experimental</td>
<td>Improved skills in assertiveness and home management.</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>- Improved job skills.</td>
</tr>
</tbody>
</table>

*Meets criteria for “well-established” as defined by LoCasco, Elliott & Johnson, 1996. Efficacy results from at least two group-design studies in which the intervention was either superior to another intervention or equivalent to another evidence-based treatment. Treatment manuals preferred. Sample characteristics clearly specified.

**Meets criteria for “probably efficacious” as defined by LoCasco, Elliott & Johnson, 1996. Two studies showing superior results when compared to re-treatment control, or two group-design studies conducted by the same investigators. Treatment manuals preferred. Sample characteristics clearly specified.

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Evidence Supported Treatment for Attachment Problems

- **Circle of Security** (Cooper, Hoffman, Marvin, & Powell, 1998);
- **Psychotherapy with Infants and Young Children: Repairing the Effects of Stress and Trauma on Early Attachments** (2008), Alicia Lieberman and Patricia Van Horn (Child-Parent Psychotherapy (CPP))
- **Attachment Focused Family Therapy** (2007); Daniel A. Hughes
- **Attachment Focused Parenting** (2009); Daniel A. Hughes
Not Through Strength, But By Perseverance