The Biology of Trauma: Reconceptualizing Child Traumatic Stress

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It has been said, 'time heals all wounds.' I do not agree. The wounds remain. In time, the mind, protecting its sanity, covers them with scar tissue and the pain lessens. But it is never gone.

~ Rose Kennedy
Primary Topics of Seminar

- Traumatic Stress Theories
- Developmental Theory
- Neuroscience of Traumatic Stress
- Attachment Theory
Stress Response Theory

M.J. Horowitz

1. Initial response is an outcry at realization of event
2. Assimilate new ‘trauma-related information’ with previous knowledge
3. Information overload
4. Psychological defense mechanisms develop to avoid traumatic memories and ‘pace’ information processing
5. The need to reconcile ‘new’ with ‘old’ information results in traumatic memories emerging into consciousness via flashbacks, intrusive thoughts, nightmares.
Theory of Shattered Assumptions

Janoff-Bulman (1992)

1. The world is benevolent
   - Others generally tend to treat us with regard

2. The world is meaningful
   - Outcomes are generally predictable based on “reliable rules and principles”

3. The self is worthy
   - I am “personally good, moral, and well-meaning”

Bolton and Hill (1996)

1. Self is sufficiently competent to act

2. World is sufficiently predictable

3. World provides sufficient satisfaction of needs
Theory of Shattered Assumptions

Components not addressed:

- Pre-trauma negative assumptions of self and world
- Why those with positive pre-trauma assumptions appear to rebound more quickly

Main Strengths:

- Identifies and acknowledges schema change
- Social and interpersonal context for assisting or blocking schema change process
- Emphasis on possibility of posttraumatic growth
Repeated exposure to spontaneous traumatic memories is sufficient to extinguish associations of fear and anxiety.

Extinction fails if person attempts to avoid or block out memories

Avoidance is reinforced by the reduction of fear, maintaining PTSD
Information about traumatic event must be integrated with wider memory system

Difficulty with integration is attributed to traumatic memory itself (not to conflicting psychological beliefs or assumptions).

Early theories grounded in fear conditioning and phobic responding
Emotional Processing


• Rigid pre-trauma views and PTSD vulnerability
• Negative appraisals of responses and behaviors

**Exposure treatment mechanisms:**

- Repeated reliving and habituation
- Avoidance prevention
- Safety information from therapeutic rehearsal
- Isolation of traumatic memory
- Experience of self and courage
- Better appraisal of evidence/less negative evaluations
- Generation of organization to the memory/integration
Verbally Accessible Memory (VAM) system

- VAM memories of trauma are of personal context of past, present, and future.
- Contain information person has attended to before, during, and after the traumatic event.
- Only hold what has been consciously attended to.
- Accompanying emotions include those experienced during trauma and those resulting from post trauma appraisal of event.
Dual Representation Theory

Situationally Accessible Memory (SAM) system

- Information in SAM from extensive lower level sensory processing of traumatic scene
- Occurred too quickly to be recorded in VAM system
- Primarily unconscious
- Body memories (heart rate, pain, temperature, etc.)
- Flashback’s rooted in SAM (involuntary and situational based) – more emotional and detailed memories than VAM system memories
- Emotions associated with SAM system memories are “primary emotions” experienced during the traumatic event
Cognitive Model
(Ehlers and Clark)

- Relevant Negative Appraisals – influenced by thought processes during the trauma and past beliefs and experiences
- Future anxieties stemming from past trauma
- Traumatic memory not integrated into autobiographical memory
- Data-driven vs conceptual processing
- Maladaptive behavioral strategies
- Maladaptive cognitive styles
Complex Trauma

Judith Herman, 1992

- Multiple traumatic experiences
- Interpersonal components
- Chronic, on-going and long-term

Difference between PTSD and Complex trauma:

- PTSD: a survivor might express they no longer feel like themselves.
- Complex trauma: a survivor might express they cannot recall ever having a self and/or might not feel ‘human’.
What is Posttraumatic Stress Disorder?

**American Psychological Association:**

PTSD, or post-traumatic stress disorder, is an anxiety problem that develops in some people after extremely traumatic events, such as combat, crime, an accident or natural disaster.

**Canadian Psychological Association:**

Post-traumatic stress disorder is a psychological reaction that can manifest itself after a traumatic event and which has been present for at least one month.

A person who develops post-traumatic stress disorder will display three types of symptoms:

- Continually reliving the traumatic event during the day or at night.
- Avoidance - conscious or involuntary - of any trauma reminder.
- Hyperarousal in the absence of any imminent risk.

**Mayo Clinic:**

Post-traumatic stress disorder (PTSD) is a mental health condition that's triggered by a terrifying event. Symptoms may include flashbacks, nightmares and severe anxiety, as well as uncontrollable thoughts about the event.
• Early multiple, chronic and prolonged developmentally adverse traumatic events
• Often interpersonal in nature
• Often from within a caregiving system, including physical, sexual, and emotional abuse and neglect
• Compromised neurodevelopment; decreased integration of sensory, emotional and cognitive systems into cohesive whole
Dynamic Developmental Theory

- See pdf image
- Nature vs. Nurture
- Sensitive periods for ‘organization’ and ‘disruption’
- Non-linear time continuum
- Sequential and spontaneous developmental mechanisms
- Epigenetic expression
- Malleability (i.e., plasticity)
Interdisciplinary contemporary science

Pro’s – integration

CAUTION – continued extrapolation
By show of hands, how many of you see her spinning clockwise?

If you see her turning ‘clockwise’, you are using your right brain.

If you see her turning ‘counter-clockwise’, you are using your left brain.

Most of us can see one way or another. It is possible to see her switch between directions...with lots and lots of focus!

Hint: try using peripheral vision.

Counter clockwise?  Both????
Upside Down or Right Side Up?

1965 Ivo Kohler
Blind Spot

Everyone has one…

When we don’t have all of the information, our brain simply fills in the blank…
Neurobiology

Three Major Sections of the Brain

Limbic System

- Emotional regulation.
- Works with prefrontal cortex and brain stem.

Prefrontal Cortex

“Thoughts”, problem-solving, planning, organizing, time management, and contemplation, among other things.

Brain Stem

“Reptilian Brain”

- Heart rate, breathing, blood pressure, appetite, temperature, etc.
- Integrates with emotions and thoughts to adjust internal responses
- Major role in traumatic stress
Mind

Prefrontal Cortex

Brain Stem

Limbic System
Homeostasis vs. Allostasis

**Homeostasis**
Standard operating process stays within strict boundaries (e.g., body temperature)

**Allostasis**
Process of making special adjustments of those boundaries according to the broader needs of the organism (e.g., stress)

*Allostatic Load = Total cost of these adjustments (e.g., lifetime chronic stress impact on overall health)*

(Cacioppo & Patrick, 2008)
“PTSD develops following exposure to events that overwhelm the individual’s capacity to re-establish homeostasis. Instead of returning to baseline, there is a progressive kindling of the individual’s stress response...even minor reminders of the trauma may precipitate a full-blown neuroendocrine stress reaction.”

(van der kolk, 2003)
Neurotransmitters

- Chemicals that tell the brain what to think, feel, and do.
  - Serotonin
  - Dopamine
  - Epinephrine (adrenalin)
  - Norepinephrine
  - Oxytocin
  - Vasopressin
Oxytocin

- Bonding chemical & social regulator
- “chemical of calm” *(Cacioppo & Patrick, 2008)*
- Functions as both a neurotransmitter and hormone
- Can reduce stress, increase pain tolerance, reduce distractibility
Can too much Cortisol harm the body?  

**What is Cortisol?**

- **Cortisol** (stress hormone)
- **Cortisol protects the body:**
  - Proper glucose metabolism
  - Regulation of blood pressure
  - Insulin release for blood sugar maintenance
  - Immune function
  - Inflammatory response

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<th>Can too much Cortisol harm the body?</th>
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<td>With extreme and consistently <strong>high</strong> stress levels, the body experiences:</td>
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<tr>
<td>• Impaired memory and thought processes</td>
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<td>• Widespread cell death</td>
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<td>• Decreased developmental capacity</td>
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<td>• Physical ailments such as:</td>
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<td>✦ Suppressed thyroid function</td>
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<td>✦ Blood sugar imbalances</td>
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<td>✦ Higher blood pressure</td>
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<td>✦ Lowered immunity</td>
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Brain structures, systems, and mechanisms and their role in traumatic stress

- Diencephalon
- HPA-Axis
- Amygdala
- Hippocampus
- Mirror Neurons
Diencephalon

**Thalamus (sensory)**
- Visual, auditory, & somatosensory systems
- Rhythmic patterns
- Attention

**Hypothalamus**
- Neurohormones release
- Fight/flight/freeze,
- Some behavioral regulation

**Epithalamus**
- Connect the limbic system to other parts of the brain
- Secretion of melatonin
- Regulation of emotions
HPA – Axis: Hypothalamus

- Connects the nervous system to the endocrine system via pituitary gland
- Responsible for ANS metabolic responses (hunger, thirst, temp., fatigue, sleep)
- Produces and secretes vasopressin and corticotropin-releasing hormone
- Regulates pituitary and adrenal gland
HPA – Axis: Pituitary

Secretes hormones to regulate homeostasis and stimulate additional endocrine glands.

Under control of the hypothalamus.
Part of the endocrine system

**Adrenal Cortex**: cortisol, aldosterone, androgens

**Medulla**: epinephrine, norepinephrine
Trauma Center: The Mighty Amygdala

The amygdala houses *all* unconscious traumatic memories and is where “fight/flight/freeze” is decided.

The amygdala signals the rest of the body to respond through high levels of cortisol and other neurotransmitters/neurohormones.
Hippocampus

- Consolidates information from short-term memory to long-term memory
- Closely tied to olfactory bulb (smell)
- Spatial coding
Trauma and the Developing Brain

- Decreased brain volume in traumatized brain
- Decreased hippocampal volume in traumatized brain
Trauma or sustained high stress in childhood damages the corpus callosum, which connects the left brain from the right brain.

Disconnection can result in unknown and reactionary emotional states, depression and anxiety disorders, and memory limitations (to name a few).
This morning I sat and wrote. Because I had to. Because it felt like the only way I could function was to kindly escort noisy thoughts, words, and pictures onto the relative safety of the page. Anyone else have this?

It's new for me. Strange.

~Laurel Anderson Mueller
Childhood Neglect Association with Reduced Corpus Callosum Area

Purpose of study: examine relative contributions of neglect, physical abuse, sexual abuse, PTSD, psychiatric illness, and gender to the development of corpus callosum size
Results

- Neglect associated with a 13% reduction in total adjusted CC area
  - 15%-18% reduction in size of regions 3, 4, 5, & 7

- Physical abuse associated with a 12% reduction in region 6

- Sexual abuse associated with a 17% reduction in region 4

- Gender differences in region 4 for sexual abuse associations
  - hippocampal myelination development and gender

Teicher, Dumont, Ito, Vaituzis, Giedd, & Andersen, 2004
Early traumatic experience rather than psychiatric illness associated with reduced corpus callosum size.

Teicher, Dumont, Ito, Vaituzis, Giedd, & Andersen, 2004
Attachment

Infant Attachment Classifications

- Secure
- Avoidant
- Resistant or Ambivalent
- Disorganized or Disoriented
Adult Attachment Classifications

- Secure/Autonomous
- Dismissing
- Preoccupied
- Unresolved/Disorganized
Adult Attachment Classifications

Secure/Autonomous

- Balanced perspective
- Not overly idealizing
- Autobiographical narrative easily accessed (knowledge & details)
- Overall high coherence
- Able to reflect with ease in discussing the past objectively
- Able to see parents as influential in development
- Free to live in the present
- Able to enjoy and modulate high levels of emotion
Adult Attachment Classifications

Dismissing

- Lack interpersonal connections
- Often insist don’t recall childhood
- Incoherent
- Excessively brief
- Minimal quality/quantity of reflection of others mental states
- Sense of self is fundamentally separate from that of the parent
Adult Attachment Classifications

Preoccupied

- Past emerges into the present
- Easy access to abundant memories of childhood, which infer past experiences with parents still actively and profoundly influence present-day life
- Concerns parent might not be able to meet their needs
- Powerful wish for closeness/disabling fear of losing it
- Emotional turmoil around attachment-related issue’s
- New relationships viewed as inconsistent and unreliable
- Emotional connection is desired but inconsistently achieved in their minds
5 Elements of Secure Attachment

Contingency
- Perception of child’s signals
- Make sense of what the signals mean to the child
- Timely & effective response

Reflective Dialogue
- Enables ‘mindsight’ to develop

Repair after ‘rupture’
- Contingency cannot occur all the time

Emotional Communication
- Sharing and amplification of positive emotions
- Sharing and soothing of negative emotions

Coherent Narratives

Daniel Siegel, 2003
Adult Attachment Classifications

Unresolved/Disorganized

- Present tense used to describe past events – disorientation
- Incomplete sentences with prolonged pauses – cognitive disorganization
- Incoherent content
- Abrupt shifts in states of mind
- Unresolved traumatic experiences or unresolved grief can be uncovered through disorganization of narrative flow

Daniel Siegel, 1999
Concluding thoughts…

Questions?

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