Trauma and the Brain

Presented by:

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The Neuroscience of Trauma
March 31, 2014
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Starting with the Breath…
Anchored and Available

Two Step Process
- Focusing on the Anterior Cingulate
  Inward attention through the central axis
- Breathing into resonance
  Outward into the bowl of receptivity

“Perhaps the biggest misunderstanding about trauma is the emphasis on the direct damage or injury caused by traumatic events. The more important impact on life is caused by trauma’s ability to disconnect a person from his or her resourceful states of being.”
Robert Schwatz
Tools for Transforming Trauma (2002)

What is Trauma
- The word trauma comes from the Greek word titrosko meaning wound
- Trauma is an overwhelming demand placed upon the physiological human system that results in a profound sense of vulnerability and/or loss of control. (Robert Macy)
  - Perception is more important than reality.
  - Neuroception (detection without awareness) precedes perception.

Circumscribed Trauma
- Simple/Acute Trauma – single event that leaves the client in a traumatic state; the impact of isolated traumatic incidents that tend to produce discrete conditioned behavioral and biological responses to the reminder of the trauma.
- The therapeutic challenge is to support return to the routine of daily living after the disruption of a traumatic event

Complex Trauma
- Chronic/Complex – includes developmental factors such as impact to attachment resulting in ongoing intrusion at various levels; recurring traumatization that has pervasive effects on neurological development.
- The therapeutic challenge is to support establishment of a pattern of effective living that has never been attained
The Triangle of Wellbeing

- **Brain stem**: regulation of internal homeostasis
  - Housekeeping, non-relational, instinctive response
- **Limbic system**: maintaining the balance between internal world and external reality
  - Somatic and emotional experience, imprint of trauma sits here
- **Neocortex**: analyzing and interacting with the external world
  - Intellectual, rational, problem solving

Our Triune Brains

Siegel's Hand Model

Brain Stem

The "housekeeper"
The "bodyguard"
The Limbic Region
• Limbic means border in Latin
• Limbic system functions as center for processing:
  – Social information
  – Evaluation of meaning
  – Activation of arousal
  – Coordination of body response
• Limbic system makes survival decisions by placing weight on exteroception and interoception
• Limbic system responds to unwanted, unexpected, unpredictable

Amygdala
• Smoke detector of the brain
• “Better safe than sorry”
• “Once bitten, twice shy”
• Without context; a somatosensory photograph (body sensation, emotion, behavioral impulse, wordless perception, fragments of images)

Hippocampus
• File cabinet of the brain
• Why remember it if you’re not going to survive it.
• Gives events a beginning, a middle, and an end

Cortex
• Foresight
• Hindsight
• Insight

The Corpus Callosum
• The bridge between the left and right hemispheres
• When within a neuroception of safety, the bridge is closed and both sides are connected
• When outside a neuroception of safety, the bridge is up and communication between the left and right sides of the brain is not possible

The Bilateral Brain
Left Hemisphere (CEO)  Right Hemisphere (survival)
• Later to develop
• Literal
• Language
• Logical
• Lists
• Linear
• At birth
• Non-verbal
• Imagery
• Metaphor
• Integrated body map
• Holistic
Left Hemisphere
- Deliberate, conscious, analytical search strategies
- Creates a closed loop
- Adding pieces to a sequence

Right Hemisphere
- Subjective experience of insight, unconscious arrival at novel solution that emerges into awareness suddenly
- Out of focus coming into focus

Memory

Explicit Memory
- Requires conscious awareness and focal attention for encoding
- Semantic (factual), episodic (autobiographical)
- Hippocampal processing needed for storage
- Online 18 months - two years of age
- Sequencing – beginning, middle, end

Implicit Memory
- Non-conscious encoding and processing
- No time/date stamp
- Act, feel, imagine without recognition of the influence of past experience on present reality
- Embodied anticipation created to rapidly assess and determine what’s next
- “Remember the future” – anticipating not planning

Encoding

Overwhelming intensity, explicit encoding impaired, blocked retrieval
Moderate to high intensity, labeled important by limbic system, more easily remembered
Little intensity, unimportant, hard to recall

Neuroplasticity...
Connections are continuously created throughout the lifespan...
Human Connections Shape Neural Connections
By the Numbers

- 86,000,000,000 – 100,000,000,000 neurons
- $1 - $100...32 years
- 2,000,000 miles
- 10,000 synaptic potentials
- One million billion (?) possibilities

Neural Networks

- Hebb's Axiom (Donald Hebb, 1949) neurons that fire together at one time will tend to fire together in the future
- Or said another way...neurons that fire together wire together
- And...neurons that fire apart wire apart

- Where attention goes, neurons fire
- And where neurons fire, they can rewire
- Networks are strengthened and pruned in an experience dependent process
- Epigenetics: The brain is an open, living system capable of responding and adapting to the environment...experience matters!

The Paradox of Plasticity

- Plasticity has both positive and negative outcomes
- Gives rise to both more flexible and rigid behaviors
- Plasticity is competitive

Mirror Neurons

When seeing is doing...
When seeing is feeling...

The Neurophysiology of Trauma
Response to Traumatic Experience

Traumatic Event

- Emotional
- Somatic
- Behavioral

Trauma’s Impact

Chaos
Reactive

Rigidity
Reactive

Integration…Mental Health

Receptive…monitor and modify

Receptive…track and transform

Autonomic Nervous System

- Sympathetic is a system of mobilization, activated by exteroception, deals with external challenges
- Parasympathetic modulated by interoception, promotes growth and restoration
  Compassion naturally arises when we can balance our autonomic nervous system

Polyvagal Theory

Three circuits provide adaptive response to: safe, dangerous, life-threatening
Pre-determined hierarchy of response

- Parasympathetic: dorsal vagal
  LIFE THREAT freeze, immobilize, dissociate, collapse
- Sympathetic: DANGER flight fight
- Parasympathetic: ventral vagal
  SAFE engage

We are built to move between safe and danger (ventral vagal and sympathetic). Rest – Mobilization – Rest
...along a continuum of intensity...

Flow between is managed by the vagal brake
If too intense, we move into a state of hyperarousal
If hyperarousal is not resolved, we then move into a state of shutdown – immobilization.

1. Window of Tolerance - Social Engagement
   - **Hyperarousal Zone – Sympathetic Response**
     - Overwhelm, panic, impulsivity, hypervigilence, defensiveness, feel unsafe, reactive, racing thoughts
     - Activation exceeds capacity to integrate
   - **Optimal Arousal Zone – Window of Tolerance**
     - Parasympathetic Ventral Vagal Response
     - Social engagement system, neural nets open to change

2. Hyperarousal – Mobilization
   - Insufficient activation to integrate

3. Hypoarousal – Immobilization
   - **Hypoarousal Zone – Parasympathetic Dorsal Vagal Response**
     - Numb, dead, passive, no feelings, can’t think, disconnected, shut down
     - Insufficient activation to integrate

We humans are biased toward Ventral vagal regulation

- Attachment
- Integration

2014 Maine/New Hampshire Victim Assistance Academy - Trauma and the Brain