The Impact of Trauma, Neglect, and FASD on the Developing Brain

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November 25th, 2010

AGENDA

- Early brain development
- The relational brain
- Toxic stress and its impact on brain development
- Trauma and neglect
- FASD and brain development
- Interventions

Brain Development – A Few Facts

- 100 billion neurons – galaxy
- 10,000 connections on each neuron
- 1 billion connections
- Phenomenal growth during the first five years

- The brain is the "most complex structure, natural or artificial, on earth". (Green et al., 1998)
Brain Development – A few facts

- Brain – most undifferentiated organ at birth
- Growth – 50%, 80%, 90%
- Use of glucose – 2 X’s that of an adult brain
- “bottom-up” organization
- “use it or lose it”; “pruning”

Brain Growth in the Early Months

newborn 1 month 3 months 6 months

“Thinking Brain”, Executive Funct., Abstract Thought

Emotional Regulation

Posture, Balance Coordination, Learning

Arousal
Sensitive Periods

- Sensitive periods – A time during development when the environment can have maximal impact.
- Experiences can CHANGE the adult brain; Experiences ORGANIZE the infant’s brain
- Double-edged sword – opportunity/vulnerability
  - The Three Bears – “just right”
  - “Over-pruning”

The Importance of Environmental Experiences

- Experience-dependent
  - Multi-lingual infants
  - Monkey faces
  - Romanian orphanages
  - Hart and Risley study
“There is no such thing as a baby, there is only a baby and someone”

WINNICOTT

The importance of relationships on brain development

- Experiences early in life may be particularly crucial in organizing the way the structures of the brain develop.
- “Social brain”
  - Human connections shape neural connections.
  - Infant’s early environment is solely comprised of relationships.
- Impact development of brain and learning; if attachment/relationship needs are not met, learning impacted.

How does early caregiver-infant interaction help with modulating arousal?

- Young infants do not have the capacity to regulate their own level of arousal
  - Frontal lobes
- Babies can experience stress but are dependent on caregiver to manage stress.
- Highly reactive in infancy; quality caregiving
- Caregiver-infant interaction supports self-regulation.
  - Sensitive caregiver modulates infant’s arousal by calming the infant; restoring them to a tolerable mental state; how does this happen?
What happens when caregivers aren’t available?

- Caregiver’s negative affect and/or unavailability create a state of stress.
- Chronic or toxic stress – increased cortisol; “hardwires” maladaptive stress response system.
- LT impact of cortisol – “environmental toxin” - stress response system, brain, health

Hypothalamic-Pituitary-Adrenocortical (HPA) Axis

Toxic Stress

- Effects on the Brain
  - Hippocampal damage – memory, learning, stress reg.
  - Chronic Amygdala activation impairs prefrontal cortex resulting in problems with behavioural and emotional regulation
  - Reductions in Corpus Callosum
  - Delayed cognitive development and head growth
  - Prefrontal cortex –
    - Increased Dopamine – inattention, hypervigilance, problems in learning
    - Deficits in executive functioning, abstract thinking
The Effects of Traumatic Experiences on Infants and Young Children

- Common finding – increased risk for sleeping, feeding, elimination, anxiety, mood, attentional regulation, and language development issues

- ACE study

The Effects of Traumatic Experiences on Infants and Young Children

- Research
  - Bruce Perry
  - Western Psychiatric Institute study
- Facial expressions
- Most vulnerable - Hippocampus, amygdala, corpus callosum, cerebral cortex
- Cautions
How neglect is stressful to a young child

- "experienced" threat vs. actual threat
- Hidden trauma – related to caregiver’s unavailability and/or interactive dysregulation
- Physiological evidence
- Child’s evaluation of coping resources – attachment relationship

Maternal Depression

- Form of neglect – Mother – emotionally unavailable, inconsistent, unresponsive, or intrusive – desynchronized dyad
- Experience-dependent – increase negative affect, “pruning” positive approach
- Increased risk for “regulation” issues – sleep disorders, feeding problems, modulating arousal
- Research
  - Fields (1998)
  - Ashman (2002)
  - Cohn and Tronick (1983); Tronick (1996)
  - Not the diagnosis alone!

Brain development in the prenatally exposed child

"It is the CNS dysfunction caused by prenatal alcohol exposure, rather than facial dysmorphology or growth issues that creates the most serious consequences for the affected individual" (Olson et al., 1998)

- Brain structures (less common effects)
  - Disorganized cell migration; deficient myelination
  - Microcephaly
  - Corpus callosum
  - Basal ganglia
  - Cerebellum
  - Hippocampus
Nurse-Family Partnerships (David Olds)

- Trained nurses provide home-visits to high risk, first time mothers – pregnancy until age two
- Targets poor birth outcomes, child abuse and neglect, improved economic sufficiency
- Promotes sensitive, responsive and engaged caregiving
- 15 year f-up – mothers 48% less likely to abuse and neglect; nurses more beneficial effects than paraprofessionals
Parent-Child Relationship Therapy

- Modified Interaction Guidance
- Watch, Wait and Wonder
- Circle of Security
- Parent-Child Interaction Therapy

Brain-Behavior Based Paradigm (Henry et al., 2007)

Neurosequential Model of Therapeutics (Bruce Perry)

- Clinical work informed by neuroscience; no specific techniques
- Developmental history – timing, nature and severity of challenges
  - "developmental load"
  - Relational history
- Brain mapping
  - Interventions – brain stem, limbic, cortical