Prenatal Substance Exposures and the Developing Child: Implications for Early Intervention Providers

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Empty Your Cup

Addiction
- Women have a history of sexual abuse and complex trauma
- Long term family history of neglect and abuse (trauma)
- Foster Care System
- Medical Illness
- Gender bias in treatment
- Inpatient vs Outpatient Treatment and Recidivism
The Attachment Process

Synchronous interactions

Attachment relationship

Security, optimal development, and socialization

Attuned Parent-Child Interaction Builds the Right Hemisphere

Research has shown that the right hemisphere is dominant for:

- Attachment functions
- Self-regulation and survival

Just as the left brain communicates its states to other left brains via conscious linguistic behaviors, so the right brain nonverbally communicates its unconscious states to other right brains that are tuned to receive these communications
Adult Attachment as it Affects the Attachment of the Child

- A parent’s coherent autobiographical narrative is the best predictor of secure attachment with their child
- Interpersonal neurobiology—the non-verbal aspects of the way a parent relates to her child
- Importance of parental reflective functioning (work of Arieta Slade)

The parent’s internal working model of attachment is based on his/her early experiences along with particular infant development characteristics.

At Risk Biological Parents

- Parents have experienced high rates of maltreatment and trauma since childhood
- Significant rates of substance abuse and mental illness in the family of origin
- Experienced multiple discontinuities of caregivers since an early age
- High rates of psychological symptoms
- Compromised health status
- Low levels of education
- Experience domestic violence
At Risk Biological Parents

- Acknowledge substance abuse, mental and physical illness and parenting are not compatible
- If using drugs, are in early recovery, or taking medications and receiving treatments themselves; they may have impaired ability to read their child’s cues and regulate their own behavior which leads to difficulty in helping the baby learn to self-regulate
- “I want to give my kids the childhood I didn’t have.”
- If fathers are depressed –more long term outcomes as there is no role model for coping and successful outcomes with the environment.

Foster Parents

- Often have some of the same issues as the biological parents and thus the same needs
- Multiple foster care placements
- Parent education and support – reframing the child’s behavior
- Importance of play
- Parent-child/dyadic relationship based interventions
- Assess the foster parent’s internal working model of caregiving
- Post adoption depression

ACE Study Design

- Chronic diseases tend to cluster
- Scientific gaps…origins of risk factors
- Disease, disability, and early mortality are not randomly distributed
- What influences precede the development of them?
- Development of prevention programs
ACE Ratings

- Abuse: Emotional, Physical, Sexual
- Neglect: Emotional, Physical
- Household Dysfunction: Mother was treated violently, Household substance abuse, Household mental illness, Parental separation or divorce, Incarcerated household member

ACES

- ACES are common
  - 2/3 of study participants had at least one ACE
  - More than 1/5 reported 3 or more ACES

Adverse events:
- Recurrent and severe physical abuse (11%)
- Recurrent and severe emotional abuse (11%)
- Contact sexual abuse (22%)
- Growing up in a household with:
  - An alcoholic or drug-user (25%)
  - A member being imprisoned (3%)
  - A mentally ill, depressed, or institutionalized member (19%)
  - The mother being treated violently (12%)
  - Both biological parents not being present (22%)

ACES Study Results

As the ACES score increases, risk for the following increases in a dose-dependent fashion:

- Alcoholism and alcohol abuse
- Chronic obstructive pulmonary disease (COPD)
- Depression
- Fetal death
- Health-related quality of life
- Illicit drug use
- Ischemic heart disease (IHD)
- Early initiation of sexual activity
- Liver disease
- Risk for intimate partner violence
- Multiple sexual partners
- Sexually transmitted diseases (STDs)
- Smoking
- Suicide attempts
- Unintended pregnancies
- Early initiation of smoking
- Adolescent pregnancy
Protective Factors
- Being raised in a stable, nurturing home
- Few foster care placements
- Did not experience sexual or physical abuse
- Did not witness domestic violence
- Limited prenatal substance exposure in utero
- Diagnosis before the age of 6
- Received early intervention services.

Identifying the Pieces of a Complex Puzzle
- Multiple risk factors:
  - Premature birth (PTSD & Depression)
  - Prenatal substance exposures
  - HIV
  - Multiple losses
  - Placement disruptions
  - History of abuse, neglect, witness to violence
  - Environmental Exposures-toxins, stress, diet, trauma
domestic violence
  - Familial mental health histories
Pre- and Post-natal Brain Development: The Impact of PSE’s, Toxins, Stress, and Trauma

Timing and Brain Development

- Insults in the first 6 months
  - Affect gross brain structure
  - Affect neurons and connections in the brain

- Insults after the first 6 months
  - More subtle damage
  - Changes in mylenization
  - Changes in connections between neurons

Bottom to Top Organization
From simple to complex:

- All Sensory Input
- Brain-stem
- Diencephalon
- Limbic
- Neocortex

- Abstract Thought
- Concrete Thought
- Executive Function
- Attachment
- Sexual Behavior
- Emotional
- Regulation
- Motor Regulation
- Motivation
- Arousal
- Sleep
- BP / Heart Rate
- Respiratory Drive
- Body Temperature

Perry, 2006
Brain Damage from Prenatal Alcohol Exposure

PSE: Impact on Brain Development

- Gross anatomy of the brain impacted
  - Prefrontal Cortex (cognition/executive functioning)
  - Hippocampus (memory)
  - Corpus callosum (integrating information)
  - Limbic system (emotions)
  - Basal ganglia (motor coordination)
- Formation of nerve cells
- Connections between nerve cells (neurotransmitters)
- Brain metabolism

Corpus Callosum

- Connects the two brain hemispheres
- Is often damaged by prenatal alcohol exposure/traumatic stress exposure
- Allows the left side to communicate with the right side
- Necessary for connecting language with emotion
- Necessary for optimal memory function
- Essential for learning consolidation
Nerve Cell Connections

Neuron Communication

Neurotransmitters

Presynaptic Neuron

Postsynaptic Neuron

Synapse
Depleted functioning dopamine receptors

Memory Functioning
- Encoding/retrieval deficits = inconsistent memory
- Combination of deficits in prefrontal cortex and limbic system

Fetal Alcohol Spectrum Disorders (FASD)
- Diagnoses
  - Fetal Alcohol Syndrome (FAS)
  - Fetal Alcohol Syndrome with Normal Growth (FAS-ng)
  - Alcohol Related Neurodevelopmental Disorder (ARND)
  - Alcohol Related Brain Damage
- Previous terminology—FAE
Fetal Alcohol Spectrum Disorders

- FAS
  - Criteria:
    - Growth problems
    - Central nervous system (CNS) dysfunction
    - Specific triad of facial dysmorphology

- ARND
  - Criteria:
    - Documented history of prenatal exposure to alcohol
    - Central nervous system (CNS) dysfunction (three of more)
Children's Research Triangle

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PSE Opiate Exposure: At risk for neurodevelopmental impairments

- 7% of children born to opiate addicted parents develop neurological deficits; if NAS incidence of developmental problems increases
- Microcephaly
- Cerebral Palsy
- Mental Retardation
- Associated with more severe NAS and seizure disorders
- Neuroimaging study with small N (10) showing smaller brain volume, decreased thickness in the cortical mantle-especially left hemisphere-more changes in the anterior cingulate and left lateral orbitofrontal cortex, smaller amygdala, putamen, and pallidum

HIV

- Cognitive impairments: prematurity, CMV, etc. Medications cannot change the neurological damage and developmental delays;
- PSE: nicotine, alcohol, and marijuana
- Functional developmental difficulties
- Bereavement-loss-depression
- Stigma & Poverty
- Positive Mother-child relationship has been found to be a long term protective factor
**FVS: Fetal Valproate Acid Syndrome**

- Intrauterine exposure to Depakote
- Newborn period: often symptoms of withdrawal-jittery, feeding problems, irritable, low tone, trigonocephaly, CHD, joint laxity
- Same facial features as FAS
- Histories of recurrent ear infections, motor delays, speech and language delays, cognitive delays, mild to moderate MR, and increase rate of ASD and ADHD

**Stress and Exposure to Toxins**

- Maternal stress in pregnancy- fussy babies, difficulties with crying, feeding, sleeping-self-regulation problems; ongoing-maternal anxiety disorders, attachment disorders
- Depression in pregnancy and post-partum depression-Infant EEG, infant depression, self-regulation issues and attachment disorders
- Maternal infections-TORCH, Zika, lead to birth defects, neonatal illness, microcephaly, long term cognitive impairments
- Nutrition of mother-diet, folic acid, vitamins, probiotics, omega 3, GMO foods-eat organic, breast feed first year of life, gluten, artificial sweeteners-aspartane, MSG, refined sugar (cancer, supresses brain derived neutrophic factor-low levels of this found in depression and schizophrenia, inflammation)

- Quality of air: Preterm births 2.7 million/year-5-8% up to 15-18% in some countries related to air pollution; also concern about internal environment-secondary smoke exposure, cooking fumes/smoke, lack of ventilation-use of air filters
- BPA's:BPA and BPS are endocrine disrupting chemicals, responsible for hypertension, structural changes to your brain, pre-term birth and diabetes; research now shows both are able to cross the placental barrier; chemicals used to replace BPA carry the same risks to health as they are nearly identical, increasing healthcare costs and obesity rates-use of glass containers, glass baby bottles, food jars, water, etc.
Impact of Early Abuse/Neglect

- Do we remember experiences prior to 3 yrs?
- Developmental “amnesia” prior to 3 yrs?
  - Restructuring of memory and cognitive functions around 3 years
  - Resulted in view that infants do not “remember”

Multiple Streams of Recall

- Young children actually more vulnerable to traumatic stress
- Multiple memories
  - Tactile, visual, auditory, emotional, social, etc
  - Majority of stored memory templates from early childhood
  - Majority nonverbal, non-cognitive
  - Neural organization altered (i.e., touch = pain, fear)
  - Fear, pain, unpredictability = damaged relational templates

Early Trauma

- In general, the earlier the trauma...
  - More pervasive problems in regulation
  - Generalized increase in autonomic nervous system + cue specific reactivity
- Delays in cognitive, language, motor, social development
  - Due to trauma-induced alterations in other domains
Child neglect delays the development of cortically based networks that inhibit and channel intense emotions and impulses (medial amygdala, cingulate, and septal nuclei in the first 3 years of life)
Effects of Chronic Trauma on the Developing Brain

- Brain changes in response to experience
- Pathogenic caregiving=
  - Changes in stress/fear response
  - Neurophysiological changes
    - Brainstem catecholamine systems
    - Limbic areas
    - Neuroendocrine
    - Cortical systems

Childhood trauma generates extremely intense limbic activity that can lead to an over-perception of threat & aggressive impulses

Caught between Amygdala and a Hard Place

Post-trauma, Amygdala-based Fear Network
Combined Effects of Chronic Trauma & Neglect

Frontal cortex: weakened capacity for impulse control (Bad breaks)

Limbic area: Intensified emotions & impulses (Stuck accelerator)

ADAPTATION

Threat, (real or perceived)

Arousal Continuum

1) NOREPINEPHRINE
2) DOPAMINE
3) GABA

Dissociative Continuum

1) OPIOID PEPTIDES
2) SEROTONIN
3) DOPAMINE

(Perry B. 1995)

Window of Tolerance

The Freeze or Surrender Responses

Hypo-arousal

Normal window of tolerance

Numb, robotic, non-reactive, Daydreaming
Window of Tolerance

Hyper-arousal

Normal window of tolerance

Freezing

Hypoarousal

Window of Tolerance

Optimal Arousal

"Window of Tolerance"

Arousal Regulation

Hyper-Arousal

Optimal Arousal

Hypo-Arousal

PPT by Cheryl Pratt 3/2/18
The Acute Response to Threat

<table>
<thead>
<tr>
<th>Hyperarousal Continuum</th>
<th>Rest</th>
<th>Vigilance</th>
<th>Resistance (crying)</th>
<th>Defiance</th>
<th>Aggression</th>
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<tr>
<td>Dissociative Continuum</td>
<td>Rest</td>
<td>Avoidance</td>
<td>Compliance (robotic/detached)</td>
<td>Dissociation (fetal rocking)</td>
<td>Painting</td>
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<td>Regulating Brain Region</td>
<td>NEOCORTEX (Cortex)</td>
<td>CORTEX (Limbic)</td>
<td>LIMBIC (Midbrain)</td>
<td>MIDBRAIN (Brainstem)</td>
<td>BRAINSTEM (Autonomic)</td>
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<tr>
<td>Cognitive Style</td>
<td>Abstract</td>
<td>Concrete</td>
<td>Emotional</td>
<td>Reactive</td>
<td>Reflexive</td>
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<tr>
<td>Internal State</td>
<td>CALM</td>
<td>AROUSAL</td>
<td>ALARM</td>
<td>FEAR</td>
<td>TERROR</td>
</tr>
</tbody>
</table>

Bruce Perry, 2004

Symptoms of Trauma

- Birth to 2: Unusual clinginess, tantrums that do not stop within a few minutes, Easily startled, Terrified responses to sights and sounds related to what happened, Aggressive behaviors, Sleep problems/nightmares
- Ages 3-5: Difficulty focusing on learning, Acting out in social situations, Stomaches and headaches, Unusual clinginess, Bedwetting, Disruptive behaviors, High level of anger and excessive temper, Sleep problems/nightmares
Mediating Factors

- Presence or absence of attuned, consistent attachment figure
- Nature of trauma
- Perpetrator of abuse/neglect
- Frequency/intensity
- Point in child's development
- Child variables (IQ, disposition, etc.)

Protective Factors
Primary Difficulties in 0-5 Children with many risk factors

- Difficulties with Self-Regulation: Arousal, Orientation
- Sleeping Difficulties
- Sensory Processing Problems
- Postural Tone and Motor Skills Difficulties
- Feeding Problems and Speech and Language Delays and Impairments
- Cognitive Delays and Impairments
- Difficulty Forming Attachments
- Behavior Problems
- Social and Emotional Dysfunction

Self-Regulation

The capacity to modulate mood, self-calm, delay gratification and tolerate transitions in activity

Neuroception

- Describes how neural circuits distinguish whether situations or people are safe, dangerous, or life threatening; subconscious system
- Dr. Steven Porges Polyvagal theory: describes 3 developmental stages of autonomic system development-immobilization, mobilization and social communication/engagement (Vagal nerve)
- H. Als Model Synactive Model of preterm development-ANS system on line 27 weeks gestation; integration with motor system between 27-32 weeks gestation; between 32 and 37 weeks gestation motor integration occurs with full state ability by 37 weeks gestation; attensional/interactive abilities by 40 weeks gestation
- Trauma: fight/fright/freeze -- vagal break
- Faulty neuroception leads to dysregulation and may lead to psychiatric disorders including autism, schizophrenia, anxiety disorders, depression and RAD
### Interoception: The Eighth Sensory System
- Receptors throughout the body that allows you to feel sensation
- Body states/feelings are connected to emotions which leads to actions and positive actions when this system is working right
- Self-regulation is completely dependent on our interoceptive sense, we learn to identify/label our emotions from this sense
- Interoception is clearly linked to self-awareness, problem solving, flexible thinking, perspective thinking, flexible thinking, intuitive social skills, overall health and well being
- Deficits in interoception posited to play a role in children with self-regulatory problems (for e.g., trauma, etc.), autism, and later mental health problems (e.g., Personality trait alexythymia)

### Self-Regulation
- Self-Regulation determines:
  - state regulation, habituation, and reflex development
  - sleep states
  - ability to self-sooth and self-calm
  - modulation of affect
  - attention
  - tolerance of transitions
  - ability to delay gratification

### Sensory Processing
The capacity of the central nervous system to integrate information from the various senses to enable the person to interact with the world
Sensory Processing

An inability to process information received through the senses

The brain cannot analyze, organize, connect or interpret sensory messages

Child cannot respond to sensory information to behave in a meaningful, consistent way

Sensations include touch, movement, body positions, sights, sounds, smells and tastes

Sensory Processing Difficulties in the PSE Young Child

Postural Tone and Motor Skills Difficulties

- Hypertonic/Hypotonic
- Cerebral Palsy
- Gait Deficits
- Motor Planning Problems-Apraxia
- Fine Motor/Visual Motor
Feeding Problems and Speech and Language Delays and Impairments

- Feeding problems due to postural tone, oral motor and oral sensory problems
- Hearing deficits
- Language production and concept development
- Speech articulation/Apraxia
- Auditory filtering and processing problems

Cognitive Impairments

- Delays in the development of object permanence, object association, following directions, sequencing, and other concept formation
- Information processing-auditory processing, etc.
- Inconsistent abilities
- Global Developmental Delays

Cognitive Difficulties

- Impact of prematurity, SGA, poor prenatal nutrition, fetal distress/HIE, severe NAS, seizure disorders, living with substance abusing parents, trauma experiences, witnessing domestic violence, foster care, SES and level of maternal education; at risk for academic problems
- School age performance associated with parental factors
Attachment and Behavioral Problems

- Attachment problems: neglect, abuse, multiple placements lead to parent-child relational problems, RAD, Disinhibited Social Engagement Disorder, PTSD, etc.
- Delayed and atypical social-emotional development
- Increased activity level
- Impulsivity
- Decreased attention
- Low frustration tolerance
- Social judgment difficulties
- Disorganized
- Inflexible
- Poor self-esteem
- Aggression/Anger/Explosive behavior

Behavioral Challenges

- Difficulty interpreting social cues (verbal and nonverbal).
- Difficulty understanding consequences of behavior.
- Delayed development of empathy and/or very “needy”
- Multiple episodes of dysregulated behaviors
- Prolonged temper tantrums
- Aggressive behaviors-biting, hitting, kicking, etc.

Emotional Dysregulation

- Increased risk for secondary mood disorders
- Depression
- Anxiety
- Extreme mood swings
- Low self-esteem
Shame and Low-Self Esteem

- Internalize feelings of rejection and feelings of being unwanted & unloved.
- Feelings of inadequacy
- Always in trouble due to behavioral problems
- Poor academics

THANK YOU!
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