Neurodevelopment & Primary Relationships
Mitigating the PMAD Impact
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Attachment & Neurodevelopment

Human Brain Complexity
- 84 billion neurons
- Each has 10,000 synaptic connections
- Electrical impulses through synapses: 10 to the 1-million possible on/off combinations
- Human brain is the most complex thing in the known universe

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Neurons that Fire Together Wire Together

“CAT”

Experiences Shape the Brain

- Humans are born with very underdeveloped brains: relatively few interconnections among neurons
- Adaptive feature given complexity of human experiences
- Evolved in context of complex social network
- Plasticity:
  - Capacity to adapt to environment
  - Capacity to change over time

Brain Development

<table>
<thead>
<tr>
<th>Age</th>
<th>Brain Size Relative to Adult Brain</th>
</tr>
</thead>
<tbody>
<tr>
<td>Birth</td>
<td>10%</td>
</tr>
<tr>
<td>1-year</td>
<td>20%</td>
</tr>
<tr>
<td>3-year</td>
<td>30%</td>
</tr>
<tr>
<td>5-year</td>
<td>40%</td>
</tr>
<tr>
<td>10-year</td>
<td>50%</td>
</tr>
<tr>
<td>Adult</td>
<td>100%</td>
</tr>
</tbody>
</table>
Sequential Neurodevelopment

- Brain organizes from the bottom up and inside out
- Evolutionary sequence: the most complex (human) areas of the brain develop last
- Lower areas of brain must be well organized for complex areas of brain to function optimally
- Brain is most malleable in early childhood = great opportunity and great vulnerability.

Use-Dependent Development

- Patterned, repetitive activity reinforces formation of brain circuits
- The most used areas of the brain are the most developed
- Must occur at specific times for systems to function optimally
Integration

- Linkage of differentiated parts in which both the differences and the connection are honored - harmony
- Whole is greater than the sum of its parts
- Integration is the natural push of mental life to create well-being
- Interpersonal Integration = creation of “we”

Neurological Integration

- Self-regulation by linking differentiated parts of brain
  - Emotional processing
  - Cognitive processing
  - Sensory processing
  - Physiological regulation
- Integrative fibers in brain: axons
- Integrative regions: Ex. hippocampus, prefrontal cortex

“For the infant and young child, attachment relationships are the major environmental factors that shape brain development during its period of maximal growth... Human connections create neuronal connections.” Dan Siegel
Attachment

- Infant attachment behaviors promote proximity to caregivers for protection from danger
- Caregiver’s attuned response to attachment behaviors leads to greater autonomy
- Secure base: trust that world is safe and needs will be met, explore world in healthy way
- Nature of attachment to parent becomes working model of relationships and sense of self in world

4 S’s of Attachment

- Safe: protect from harm
- Seen: seeing baby’s subjective experience enables us to meet their needs
- Soothe: mutual regulation – immature brain depends on adult to help ease distress
- Secure: over-all feeling of security

Attachment Styles

- Secure: “good enough” parenting
- Insecure Avoidant: associated with parental withdrawal / emotional dismissiveness
- Insecure Ambivalent: associated with parental preoccupation / intrusiveness
- Disorganized: complex developmental trauma
Relationships & Brain Development

- Early relationships are the fundamental organizing experiences for neural networks
- Human brain is “shaped by evolution to be exquisitely sensitive to the people who surrounded it.”

Secure Attachment Creates Brain Structure

- Emotional availability
- Attunement
- Serve and return (reciprocal) interactions
- Synaptic Connection & Integration

Ideal Relational Environment

- Attunement:
  - Presence
  - Empathy
  - Accurate reading of baby
- Mutual Regulation:
  - Reciprocity
  - Contingent communication / predictability over time
- Rupture and Repair:
  - Mostly “micro” ruptures and immediate repairs

Breathe
PMADs & Attachment Disruption

- Attunement
  - Decrease in maternal sensitivity and responsiveness
  - Decreased engagement in face to face play
- Mutual Regulation:
  - Decreased interactive coordination / mutual regulation
  - Increase in negative affect of infant
- Rupture and Repair:
  - Decreased frequency of repair
  - Increased time between rupture and repair

Maternal depression at 2-months predicts insecure attachment at 1-year

Highly disengaged or intrusive mothering styles are linked to disorganized attachment
Relationships & Brain Development

- Early relationships are the fundamental organizing experiences for neural networks
- Small, frequent negative interactions / failures to repair have cumulative effect as patterns of interaction shape brain structure

Manageable Stress

**Positive Stress**
- Brief increases in heart rate and mild elevations in hormone levels
- Presence of supportive adults facilitates self-regulation

**Tolerable Stress**
- More severe and longer-lasting, activates the body’s alert systems to a greater degree
- Time-limited and/or buffered by relationships with adults who help the child adapt

Toxic Stress

**Complex Developmental Trauma**
- Strong, frequent, and/or prolonged adversity: prolonged hyper-arousal
- Without adequate adult support
- Disrupts development of brain architecture
Toxic Stress and the Brain

- Less able to shut down stress response
- Higher resting stress hormone levels
- Inhibits growth
- Creates changes in brain architecture: impacts learning and memory

Toxic Stress and the Brain

- Smaller hippocampus (stress response cycle, learning, memory)
- Smaller left hemisphere (concrete thinking, problem solving)
- Increased limbic irritability (emotional dysregulation)
- Amygdala over activity (hyper-vigilance)

Supporting Mom & Baby
Mindful Approaches to Dyadic Intervention
Mindfulness

Mindfulness-Based CBT
- Nonjudgmental, present-moment awareness
- Capacity to recognize felt sensations and emotional states
- Capacity to pause and reduce reactivity
- Capacity to bring attention to moment rather than stories of past or future
- Increased acceptance of self and other

Mindfulness & Attachment
- Mindfulness promotes Internal Integration
- Attachment to self with compassion and kindness
- Attachment promotes Interpersonal Integration
- Attachment to other with compassion and kindness
Mindfulness & Attachment

- Mindfulness develops the same areas of brain as secure attachment
  - Indices of well-being are identical
- Secure attachment correlates to mindfulness traits in adults
  
  Mindfulness-based interventions provide the opportunity to simultaneously promote maternal wellbeing while enhancing attachment status

Promote Maternal Efficacy

- Create space for mothering
- Focus on what is working in dyad
- Focus on positive trajectory
- Focus on positive efforts
- Be conscious of misattunement
  - Ex: Mother’s shame-based negative filter
  - Ex: Therapist triggers

Promote Maternal Self-Regulation

- Respite
- Social Support
- Exercise
- Deep breathing
- Mindfulness tools
- CBT tools
- IPP tools
Promote Dyadic Mutual Regulation

- Utilize rhythm
- Provide gentle developmental guidance
- Speak for baby / Wonder for mother
- Observe baby cues with mother
- Model and support repair
- Define and access unique protective factors

Promote Shared Positive Experiences

- Routine quality time
- Face to face interactions
- Follow baby’s lead
- Promote attuned, contingent communication
- Mirroring / Imitating
- “I Love You Rituals” (Bailey)

Cultivating Mindfulness

- Deep breathing
  - Use the rhythm of our body to regulate
  - Pause to notice what we are thinking and feeling
- Awareness
  - Do we want to be thinking in this way?
  - Can we choose to shift where we focus our attention?

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Cultivating Mindfulness

- **Grounding**
  - Bring attention to the bottoms of our feet or to navel as we breathe.
- **“I see… hear… feel”**
  - Focus on neutral or positive things around us
- **Mantras**
  - Match breath to the rhythm of your favorite soothing word or sentence

Self Reflection

- **Practitioner mindful awareness**
  - Implicit memories and triggers
  - Counter-transference
  - Moment by moment emotional reactivity
- **Seek reflective consultation**
- **Journal / art / movement**