Neurology of Attachment: 
_Wiring for Self-Care & Empathy_

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The Developing Social Brain
Overview

• Early attachment
  – Biological and environmental influences
• Neurobiology and need fulfillment
• Types of attachment
• Substance use as a problematic replacement behavior
• Aggression as a primitive response to abandonment
• Neuroplasticity, targeted interventions, and change
Attachment & Social Synapse

• **Attachment** - An enduring emotional tie to a special person, characterized by a tendency to seek and maintain closeness, especially during times of stress. (Bowlby)

• **Social Synapse** - Defined as ‘the space between us’
  - Much communication is automatic and happens beyond our conscious awareness (Cozolino, 2006)
  - “…the brain is structured with an innate capacity to transcend the boundaries of...its own body in integrating itself with...the world of other brains”
    - Daniel Siegel
Need Fulfillment & Mental Health

• Basic Needs to be met to maintain mental well-being:
  We are wired to crave a sense of...
  – Orientation, Control, Coherence - Safety, certainty & predictability in our environments
  – Attachment - Belonging & community
  – Pleasure - Enjoyment
  – Self-Esteem Enhancement - Mastery & self-worth

• “There is a strong correlation between motivational incongruence and mental disorders.” (Grawe, 2007)
Memory & Motivation

- **Implicit memory** occurs beyond conscious awareness and can’t be verbalized.

- **Explicit memory** we are aware of and can be verbalized. It engages working memory, facilitates new learning and is vital to psychotherapy because it can lead to change in the implicit memory system.

- The effects of early attachment are ‘wired’ into early implicit memory and influence our relationships for the rest of our lives.
Evolution and Attachment

• Survival of the species depends on attachment
• Neurological development of positive attachment between child and caregiver depends on the flow of information across the social synapse
• Much of the brain’s functioning depends on preconscious ‘fight-or-flight’ mechanisms
• Management of fear and anxiety are core components of developing attachments relationships and personality

(Cozolino, 2006)
The Developing Brain

- Brainstem reflexes and limbic activity organize much of early experience.
- The limbic system is involved with emotion, learning, memory, and mediating approach/avoidance responses.
- The developing cerebral cortex gradually takes on more control in establishing neural circuitry and synchronous patterns of firing (Cozolino, 2006).
- The hippocampus is the primary road to explicit memory and isn’t ‘hard wired’ until 3y/o.
- The growing child’s brain adapts or ‘wires’ itself to the child’s environment and stores memories in implicit memory.
- Is the environment generally safe, structured, predictable, and caring? Or chaotic, stressful, unpredictable or abusive? Or a randomized mix?
Wiring Process

- Combinations of activated neurons involved in specific functions that encode our abilities, emotions, memories and are modified by experience are called *Enstantiations*.
- Long Term Potentiation (LTP) leads to the creation of neural pathways.
- Emotional networks are integrated with sensory and motor systems and approach/avoidance behaviors become deeply rooted in early experience due to *genetic transcription (experience dependent process)*.
- Good parenting leads to a healthy environment which stimulates neuroplastic processes, strengthens attachments, and promotes survival.
- Effective parental resonance behaviors and emotional attunement build the portable sense of security in the child.
“That which fires together, wires together.”

- **Hebbs Principle**: When presynaptic and postsynaptic neurons are activated repeatedly, the strength of transmission between them grows.

- Patterns are created when some neurons are activated and others are inhibited. Neural inhibition is necessary for the creation of order. Each function is linked to many areas in the brain and the establishment of well-ordered neural circuits.
Key Developmental Periods

- Primary Emotions can be seen in the first month of life: joy, distress, disgust, fear, and sadness
- Secondary Emotions evidenced within the first 3 years of life: embarrassment, envy, and empathy (Feinberg, 2009)
- The adolescent brain (12-18y/o) undergoes disorganization and reorganization, losing overall gray matter (neurons) and increasing white matter (myelinated fibers) connecting neural networks.
Anatomy of the Social Brain

- **Amygdala**: The ‘radar’; associated with fear, attachment, early memory and emotion

- **Hippocampus**: Organizes explicit memory & conscious learning with amygdala, cerebral cortex, & other structures

- **Hypothalamus**: Translates social interactions into body processes via hypothalamus-pituitary-adrenal (HPA) axis

- **Prefrontal Cortex**: Executive region of the brain which receives highly processed information from other regions
Anatomy of the Social Brain (cont’d)

- **Orbital Medial Prefrontal Cortex (OMPFC)**: is at the apex of the systems of the social brain. Functions as a member of the limbic system and prefrontal cortex.
- **Somatosensory Cortex**: Processes info about bodily experiences.
- **Cingulate Cortex**: Begins to be active in the 2nd month of life; associates visceral, motor, tactile, autonomic and emotional input—leads to emotional bonding/development of empathy.
- **Insula Cortex**: Described as the “limbic integration cortex”; connects limbic structures with frontal, parietal and temporal lobes.
Facial Expressions & Mirror Neurons

- Fusiform Face Area: Region of the occipital lobe dedicating to identifying faces and reading expressions.
- The amygdala gets involved if emotion is present and can pair stimuli and fear response ahead of conscious awareness.
- Superior Temporal Sulcus (STS) contains “mirror neurons”. We learn by watching and have a visceral-emotional experience “allowing us to know others from the inside out” (Cozolino, 2006).
- For insecurely attached and abused individuals, “mirror systems are employed to defend instead of cooperate; attachment schemas are used as battle plans instead of ways of connecting” (Cozolino, 2006).
- The dopamine reward system in the ventral striatum is involved with social motivation, reward, and positive attention.
- This same reward system is also involved with addiction or when a relationship with a substance is formed.
Laterality and Balance

• Left Hemisphere: leads in semantic/language-based and conscious processing
• Right Hemisphere: control of emotion, bodily experience, and autonomic processes. Far more connections with subcortical regions
• Similar to Freud’s unconscious; right hemisphere functions develop earlier, are guided by emotional and physical reactions, and nonlinear processing allows for multiple realities
• Right brain organizes and stores early experiences that emerge in later relationships when we are under stress
• Linking up of right hemispheres happens through eye contact, facial expressions, soothing/caring, and exciting behaviors
• Sensitive caregivers move in and out of attunement; joining separating and reuniting in predictable ways promotes psychobiological regulation
• Vygotsky’s ‘zone of proximal development’ (ZPD): to be appropriately near and provide ‘scaffolding’ in the form of the correct caregiver supports (Vygotsky, 1962)
Cingulate Cortex

- Cingulate cortex provides the basic circuitry for the evolution of communication, cooperation, and empathy
- Emotional and attentional processing are integrated; caretaking requires sustained attention to needs of significant others
- Physical & emotional pain are intertwined; healthy intimate relationships lead to better cardiovascular health, immunological functioning, and resistance to stress
Spindle Cells

- Spindle cells in cingulate cortex provide the neural connectivity necessary for self-control and sustained attention to difficult problems.
- Very important from interpersonal neurobiology perspective because they are experience-dependent and relate to our capacity for empathy.
- Early neglect, stress, and trauma may negatively impact development and organization of spindle cells; altering lifelong cognitive and emotional functioning.
- The resulting anxiety & insecurity leads to the triggering of the Hypothalamic-Pituitary-Adrenal (HPA) axis; the fight/flight response.
Executive Functions (EF) and Right Brain Bias

- PFC under functions with poor attachment
- Individuals may default to quick visceral responses to perceived threats; ‘hot’ executive functions
- Difficulty accessing ‘cool’ EF; strategic, organized problem-solving (especially when alcohol is involved)
- Early memories are stored more in right brain (non-language based) regions; preconscious associations
- Impaired EF may contribute to reduced ability to self-monitor & regulate impulses...
- Resulting in impulsive reactions to perceived abandonment

(Giancola, Godlaski, and Roth)
Abused children are primed to perceive threat and anticipate pain, adaptations that may be helpful in abusive environments but produce long-term problems with stress and anxiety.

- Eamon McCrory (University College London): “For them to detect early cues that might signal danger is adaptive. It allows them to react, to try and avoid the danger...a very similar neural signature characterizes quite a few anxiety disorders.”

- Distinct activation patterns in the anterior insula and right amygdala, parts of the brain involved in processing threat and pain. Similar patterns have been measured in soldiers who have seen combat.

- Depression in people who were abused as children is difficult to treat, but understanding the neurological implications can guide treatment and increase the likelihood of positive outcomes (Campbell/KidsPeace).
Attachment Styles

- **Secure**: Internalized sense of safety and trust leads to a rational balance between approach and avoidance. Results from secure, attuned parents.

- **Insecure - 2 types**
  - **Avoidant**: Proximity seeking is futile or dangerous; dismissive or negative model of others and positive model of self. Results from dismissive parents.
  - **Anxious**: Threats aren’t managed well autonomously and others are sought for support, yet experienced as unreliable. Results from preoccupied parents.

- **Fearful/Disorganized**: Unresolved attachment leads to both avoidant and anxious traits. Results from disorganized, abusive or frightening parenting.

- **Insecurely-avoidant** individuals can have difficulty trusting and be aggressive and hostile. There is a focus on the inner world of the self and a struggle to empathize with the world of others.
Batterer Typology: Attachment DV Link
(Don Dutton)

Non-Clinical Group

- Secure = 60%
- Dismissing = 25%
- Preoccupied = 10%
- Disorganized = 5%

DV Population

- Dismissing = 40%
- Preoccupied = 30%
- Disorganized = 30%
Addiction & Attachment

- Craving due to addiction results in intense activation of anterior cingulate and decreased activation of frontal lobes
- Reward circuits are flooded with dopamine
- Endorphins are endogenous opioids that reduce pain and lead to a sense of well-being and elation
- Endogenous opioids shape early bonding by promoting a portable sense of security from internalized caregivers
- Drugs/Opioids (heroin) impair the brain’s production of dopamine
- MacLean: Addicts develop intimate relationships with drugs that have a lot in common with ‘real’ intimate relationships
Beware the Reward System

- Escape threats and move toward pleasure
- Dopamine is the key neurotransmitter of reward-receptor activity in the Ventral Tegmental Area (VTA).
- Mesolimbic reward center makes use of Incentive Salience Circuitry (ISC)
- The more reward is sought the more compulsive behavior is rewarded- dopamine released, neural pathway strengthened.
- The hippocampus, prefrontal cortex and entire limbic system are well-endowed with dopaminergic neurons.
- Memory is strengthened through pleasure. If an event is viewed as important to need fulfillment it fills up our entire conscious awareness.
- The “pleasure center” doesn’t react differently whether we are feeding an addiction or achieving a long-term goal.

(Aamodt & Wang, 2008)
“Why can’t they just stop?”

• Our brains suffer from a reward distinction blindness (drug-induced vs. real-life)

• The effect of substance induced rewards can be 5x more powerful than natural rewards

• Mesolimbic reward center gets hijacked & we call this addiction

• Lack of Pre-Frontal Cortex involvement (executive functions)

• Power of Habit: “Wanting evolves into an obsessive craving that forces our brains into autopilot”

• Addiction pathways become open to other bad habits
Resetting the Circuits

• Attachment shapes the brain with the 3 R’s
  – Relating, Regulation of Affect, and Resilience

• Resonance Circuit- Brain structures are coordinated to produce interpersonal resonance, attunement, and empathy which actives neurons in the limbic regions and pre-frontal cortex. (Siegel, 2003)

• New pathways ‘fire together and wire together’ when new thoughts and behaviors are consistently repeated

• Insight is secondary to behavior change!

• Implicit pathways are reached through explicit processes and will be inhibited when a healthy resonance circuit is strengthened.
Putting It Together

• Therapist exhibiting effective scaffolding & resonance behaviors; corrective attunement & accountability
• Avoid shaming and a problem-saturated dialogue
• Set the stage to maximize motivation
• Expectation of sobriety - break out of the haze to set the stage for new pathways
• Emphasize somatic self-awareness
• Focus on repetition of key concepts and behavior change
• Reward progress emphasize the need for maintenance of change
  – “the powerful shaping experiences of childhood can be modified through subsequent personal relationships, psychotherapy, and self-awareness” (Siegel & Hartzel, 2003)
Notable Quotes

• “A person who has been punished is not thereby simply less inclined to behave in a given way; at best, he learns how to avoid punishment.”
  — B.F. Skinner, *Beyond Freedom and Dignity*

• “To paraphrase several sages: Nobody can think and hit someone at the same time.”
  — Susan Sontag, *Regarding the Pain of Others*