Neuropsychotherapy

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What Is Neuropsychotherapy?

Definition

Neuropsychotherapy is a theoretically integrated approach that uses neuroscientific research to explain and guide psychotherapeutic practice. It draws on affective neuroscience, cognitive neuroscience, developmental psychology, and social neuroscience to inform how therapists conceptualize the mind and deliver interventions.

— Rossouw, 2014; Grawe, 2007

Core Pillars

- Affective Neuroscience
- Neuroplasticity
- Attachment Theory
- Psychological Needs

Grawe, K. (2007). Neuropsychotherapy: How the Neurosciences Inform Effective Psychotherapy. Lawrence Erlbaum. | Rossouw, P. (2014). Neuropsychotherapy: Theoretical underpinnings and clinical applications. Mediros.

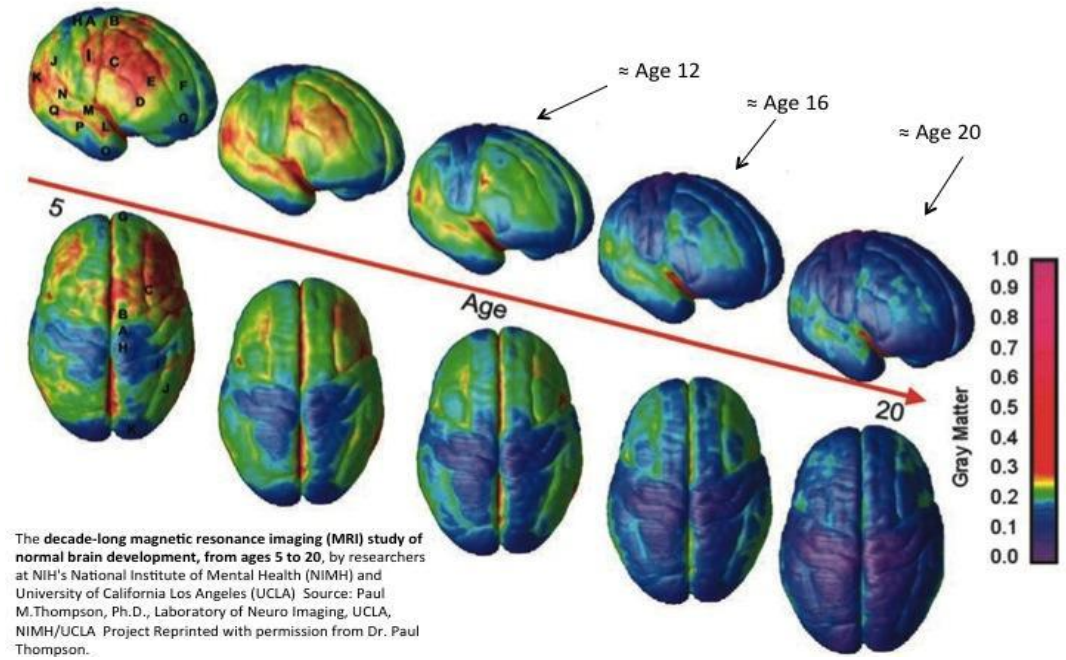
From the Decade of the Brain to Today

- "Decade of the brain"- 1990s
- Prompted rigorous reevaluation of underlying mechanisms
  - Ex. Freud's "death drive", nature of the unconscious, validation of ideal self
- Klaus Grawe- movement away from therapeutic models based on tradition rather than empirical validation
  - Neuropsychotherapy (2004)- Consistency Theory
  - Focus on scientifically based mechanisms of change
- "Systematic validation of biomarkers for independent clinical populations and integration with clinical data can augment their value for predicting psychotherapy outcomes."

Cammisuli, D. M., & Castelnuovo, G. (2023). Neuroscience-based psychotherapy: A position paper. Frontiers in psychology, 14, 1101044.

Stress, Maturation, and the Developing Brain

- The more complex and dispensable a system is to immediate survival, the later it develops
- Sensitive periods of development is triggered by intense neural activity initiated by an experience
- Stress Acceleration Model- experiences of toxic stress or trauma may lead to faster maturation of the neural circuits responsible for emotional processing



The **decade-long magnetic resonance imaging (MRI) study of normal brain development, from ages 5 to 20**, by researchers at NIH's National Institute of Mental Health (NIMH) and University of California Los Angeles (UCLA) Source: Paul M.Thompson, Ph.D., Laboratory of Neuro Imaging, UCLA, NIMH/UCLA Project Reprinted with permission from Dr. Paul Thompson.

Murphy, F., Nasa, A., Cullinane, D., Raajakesary, K., Gazzaz, A., Sooknarine, V., Haines, M., Roman, E., Kelly, L., O'Neill,A., Cannon, M., & Roddy, D. W. (2022). Childhood Trauma, the HPA Axis and Psychiatric Illnesses: A Targeted Literature Synthesis. Frontiers in psychiatry, 13, 748372. https://doi.org/10.3389/fpsyt.2022.748372

Neuroplasticity: The Biological Basis of Change

"Neurons that fire together, wire together"
— Hebb, 1949

Synaptic Plasticity

Long-term potentiation (LTP) & long-term depression (LTD) strengthen or weaken synaptic connections. Foundation of learning, memory, and therapeutic change.

Structural Plasticity

Neurogenesis in hippocampus (dentate gyrus), dendritic remodeling. Exercise, antidepressants, and psychotherapy increase BDNF — brain-derived neurotrophic factor.

Functional Reorganization

Activity-dependent changes in cortical maps. Trauma alters insula, ACC, PFC connectivity. Therapy restores functional integration (Siegel, 2012).

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Hebb, D.O. (1949). The Organization of Behavior. Wiley. | Siegel, D.J. (2012). The Developing Mind, 2nd Ed. Guilford. | Castrén, E. (2005). Is mood chemistry? Nature Reviews Neuroscience, 6, 241–246.

How Trauma Reshapes Memory

- Hippocampus – central part in long term memory formation
- Amygdala- emotion and survival responses
- Medial prefrontal cortex- inhibitory process
- The BDNF—which is related to synaptic plasticity—seems to be low in psychiatric disorders
- Change mechanism- restore memories with a different emotional level
- “The psychotherapeutic process promotes the possibility of associating old memories reactivated with new experiences of the present, thus soliciting a real behavioral change” p.3

Cammisuli, D. M., & Castelnuovo, G. (2023). Neuroscience-based psychotherapy: A position paper. Frontiers in psychology, 14, 1101044.

Disordered Memory in PTSD

"What is most likely unique to PTSD, compared to other psychological disorders, are the unusual and inconsistent memory phenomena centered on the event itself and the recruiting of a variety of dissociative responses." (p. 345)

Brewin, C. R., & Holmes, E. A. (2003). Psychological theories of posttraumatic stress disorder. Clinical psychology review, 23(3), 339-376.

Flashbacks and Fragmentation

- Bias toward enhanced recall of trauma-related material and difficulties in retrieving autobiographical memories of specific incidents
- Compared to normal autobiographical memory- flashbacks are dominated by sensory details though are often disjointed and fragmentary
- Flashbacks are a distinctive feature of PTSD

Brewin, C. R., & Holmes, E. A. (2003). Psychological theories of posttraumatic stress disorder. Clinical psychology review, 23(3), 339-376.

Dissociation and PTSD

- Mild dissociation is common under stress
- Common dissociative symptoms encountered in trauma-emotional numbing, derealization, depersonalization, and “out-of-body” experiences
- Peri-traumatic (during) dissociation has been found to be a good predictor of later PTSD

Brewin, C. R., & Holmes, E. A. (2003). Psychological theories of posttraumatic stress disorder. Clinical psychology review, 23(3), 339-376.

Beliefs Across Disciplines

Group Surveyed	Belief in Repressed Memories	Key Source
Cognitive Researchers	~10–15%	Patihis et al. (2014)
Clinical Psychologists	~50–60%	Patihis et al. (2014); Otgaar (2019)
General Public	~75–80%	Simons & Chabris (2011)

Cognitive vs. Somatic Models

Feature	Cognitive Perspective	Somatic Model
Primary Theory	Enhanced Consolidation: Stress hormones make memory more vivid and harder to forget.	Dissociative Amnesia: The brain "huts down during trauma; memories are hidden or stored as body sensations.
Mechanism	The "Biological Highlighter": High arousal creates an indelible memory trace.	Trauma is stored in the primitive brain (amygdala) but not the verbal brain.
On Amnesia	Extremely rare; usually due to physical TBI, drugs, or extreme childhood neglect (not "repression").	Common; Repression is a primary defense mechanism to survive overwhelming horror.
Focus of Therapy	Habituation: Facing the memory repeatedly until the "alarm" stops ringing (Exposure Therapy).	Somatic Release: Releasing the trapped energy in the body through yoga, EMDR, or movement.

Old vs. Updated Brain Models

Feature	Old Model: Triune Brain (c. 1960s)	Updated Model
Structure	Stacked, distinct layers (Reptile, Mammal, Human).	Highly integrated, overlapping functional networks.
Evolution	Sequential Additions: Newer structures superimposed on older ones.	Proportional Shifts: Analogous structures evolved in parallel across species.
Function	Linear Hierarchy: Logic (Cortex) can "mute" the lizard brain.	Bi-directional Integration: Emotion (e.g., PAG) and thought are fully intertwining processes.
Analogy	The "Onion" or "Layer Cake."	The "Traffic Map" or "Integrated Power Grid."

Theory and Mechanism (Porges, 1994)

1. Respiratory sinus arrhythmia (RSA), or changes in heart rate that typically synchronize with breathing, and neurogenic bradycardia, a sudden and extreme drop in heart rate, are mediated by different branches of the vagus nerve. RSA is regulated by the ventral branch and neurogenic bradycardia by the dorsal branch. These branches can operate independently of each other.

2. There is a phylogenetic hierarchy of the two main branches of the vagus, dorsal and ventral. The dorsal vagus is a vestigial relic of the reptilian brain and is responsible for neurogenic bradycardia.

3. The ventral vagal branch is a uniquely mammalian adaptation that allows mammals to detect novelty, actively engage with the environment, and socially communicate. It does this by withdrawing vagal tone, which has the effect of increasing heart rate. Dubbed by Porges the “smart vagus,” the ventral vagus is absent in other vertebrates such as fish, snakes, and birds.

Quoted from - Tang, S. S. (2021, August 14). R.I.P. Polyvagal theory. Medium. https://medium.com/@drshinshin/r-i-p-polyvagal-theory-897f935de675

Clinical Implications

- Individuals exposed to trauma may remain in a defensive state and need to have their VVC accessed to calm
- Use of “bottom-up approaches”
  - Acoustic protocols
  - Breath- and rhythm-based practices
  - Biofeedback and vagus nerve stimulation
  - Somatic and recreational therapies
- Polyvagal-informed care aims to restore automatic flexibility and enhance vagal functioning

Porges S. W. (2025). Polyvagal Theory: Current Status, Clinical Applications, and Future Directions. Clinical neuropsychiatry, 22(3), 169–184. https://doi.org/10.36131/cnfioritieditore20250301

Critiques and Counter-Evidence

- Neuroscience research has repeatedly found that the dorsal branch of the vagus nerve has little to no effect on heart rate
- There is debate on the validity of the claim that only mammals have a functioning VVC in the manner that Porges has claimed
- Various, more supported evidence explains the benefit of breathing exercises or somatic awareness that has been noted to be effective in clinical settings
- Evidence suggests that polyvagal theory is not a representative model of social-emotional functioning

Tang, S. S. (2021, August 14). R.I.P. Polyvagal theory. Medium. https://medium.com/@drshinshin/r-i-p-polyvagal-theory-897f935de675 Grossman, P. (2023). Fundamental challenges and likely refutations of the five basic premises of the polyvagal theory. Biological Psychology, 180, 108589. https://www.researchgate.net/post/After_30_years_of_polyvagal_hypotheses_is_there_any_direct_evidence_for_the_firs...

BOWLBY & AINSWORTH

Foundations of Attachment Theory

John Bowlby (1907–1990)

Evolutionary basis
Attachment is an innate biological drive ensuring proximity to caregivers for survival.

Internal Working Models
Mental representations of self and others formed in early relationships guide behaviour throughout life.

Phases of attachment
Pre-attachment → Attachment-in-the-making → Clear-cut → Goal-corrected partnership.

Mary Ainsworth (1913–1999)

Strange Situation (1969)
Lab paradigm measuring infant responses to separations/reunions with caregiver.

Three attachment styles
Secure — distress on separation; joy at reunion.

Anxious-Ambivalent — extreme distress, inconsolable.

Avoidant — minimal distress; ignores caregiver.

Disorganised (Main & Solomon, 1986)
Fourth style — fearful/frightening caregiver; no coherent strategy.

"The propensity to make intimate emotional bonds... is a basic component of human nature." — Bowlby, 1988

ATTACHMENT STYLES

The Two-Dimensional Model (Anxious × Avoidant)

SECURE

Low anxiety, low avoidance
Comfortable with closeness and autonomy. Positive model of self and others. Seeks support effectively under stress.

ANXIOUS / PREOCCUPIED

High anxiety, low avoidance
Hyperactivation of attachment system. Excessive worry about rejection; clingy, emotionally reactive in relationships.

DISMISSIVE-AVOIDANT

Low anxiety, high avoidance
Deactivation strategy. Compulsive self-reliance; suppresses attachment needs; uncomfortable with intimacy.

FEARFUL-AVOIDANT

High anxiety, high avoidance
Desires closeness but fears rejection. Negative model of self AND others. Highly dysregulated under stress.

THE CORE INSIGHT

Attachment Security Operates on Two Levels

TRAIT SECURITY

Relatively stable · Rooted in early experience

Your dispositional attachment style — the baseline pattern shaped by childhood caregiving. Relatively stable across time, but not fixed. Influenced by early internal working models (IWMs) of self and others.

→ Measured by the ECR scale (Brennan, Clark & Shaver, 1998)

STATE SECURITY

Momentary · Activatable · Responsive to context

Felt security in the moment — a regulatory state that can be primed, evoked, and cultivated. Even brief, subliminal cues (words like 'love', images of caring figures) measurably reduce anxiety and defensiveness.

→ Demonstrated in Mikulincer & Shaver's security priming experiments

Key finding: The attachment system remains open and responsive throughout the entire lifespan.

THE EVIDENCE QUESTION

Can Insecure Attachment Change?

A critical review of the evidence for attachment reorganisation in adulthood

Promising evidence · Important caveats · Cautious optimism

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THE BOTTOM LINE

Cautious Optimism — Not Confident Claims

WHAT THE EVIDENCE SUPPORTS

- Change in attachment-related functioning — how securely people behave, regulate emotion, and respond to threat — is reasonably well-evidenced.
- Significant relationships and therapy can produce meaningful shifts over time.
- Earned security is real: adults with difficult histories can achieve security-level functioning.

WHAT IT PROBABLY CANNOT DO

- Fully restructure deep Internal Working Models at a representational level — this is slower, harder, more partial, and less well-evidenced.
- Eliminate the sensitivity and reactivity installed by early insecure attachment.
- Produce fast or complete transformation — gains tend to be incremental.

The realistic goal: not eliminating insecure patterns, but developing earned resilience.

THE CASE FOR CHANGE

What the Evidence Supports

Longitudinal studies: change does occur naturally

The Minnesota Longitudinal Study found ~30–40% of people change attachment classifications between infancy and adulthood — driven by significant life events. Fraley's meta-analyses show moderate stability (r ≈ .39 over long spans) rather than fixed traits.

Security priming effects are robust and replicated

Mikulincer & Shaver's priming studies reliably show that brief security cues change cognition, emotion, and behaviour. The limitation: effects are transient. Whether repeated priming in therapy accumulates into trait-level change is a harder, less-answered question.

EFT has the strongest direct evidence

Emotionally Focused Therapy (EFT; Johnson) shows effect sizes of d ≈ 1.3 for couple distress, maintained at follow-up. Critically, some EFT studies have measured attachment security directly and found shifts toward security — this is the best clinical evidence available.

Earned Security is real and well-validated

Adults classified Earned-Secure on the AAI — difficult histories, yet coherent reflective narratives — show outcomes nearly identical to continuously-secure adults: better caregiving, mental health, and relationship resilience.

THE COMPLICATIONS

Why the Evidence Is More Modest Than It Sometimes Appears

Measurement is a serious problem

The AAI (narrative/state of mind) and ECR (self-report questionnaire) don't reliably agree — they measure related but distinct things. 'Change in attachment' means different things across studies, making comparisons unreliable.

Long-term follow-up data is sparse

Most studies have 1–2 year follow-up windows. Whether attachment shifts are maintained over 5–10 years, or whether people revert toward baseline patterns under stress, is largely unknown.

Most therapy studies don't measure attachment directly

The majority of RCTs measure symptoms (depression, relationship satisfaction) — not attachment classification itself. Inferring security changed because symptoms improved is a significant inferential leap.

Some apparent change may be measurement error

Studies using continuous measures (more sophisticated) show higher stability estimates than categorical ones. True IWM reorganisation may be rarer than longitudinal classification changes suggest.

Fearful-avoidant style is particularly resistant

Disorganised/fearful-avoidant clients — especially with unresolved trauma — show the least movement. The therapeutic relationship itself triggers the attachment system's fear, making progress slower and more fragile.

READING THE EVIDENCE CAREFULLY

A Three-Level Distinction

LEVEL 1

Attachment-Related Functioning

GOOD EVIDENCE

How securely someone behaves in relationships, regulates emotion, and responds to threat. This is genuinely changeable through therapy and significant relationships. EFT and MBT outcome data support this level of change robustly.

LEVEL 2

Earned Security

MODERATE EVIDENCE

Achieving security-level outcomes despite a difficult history — real and well-validated on the AAI. However, earned-secure individuals may be more vulnerable to regression under high attachment-relevant stress than continuously-secure adults.

LEVEL 3

Deep IWM Reorganisation

WEAK EVIDENCE

Structural change to Internal Working Models at a representational level — rewriting the underlying templates of self and other. Probably slower, more partial, and less complete than therapy literature often implies. Requires more repetition and time than childhood change.

THE REALISTIC CLINICAL GOAL

Earned Resilience, Not Transformation

The goal is not the elimination of insecure patterns — it is the development of earned resilience: awareness of one's patterns, capacity to recover from activation, and genuine experiences of felt security that gradually widen what feels possible in relationships.

Greater Awareness

Recognising one's own attachment patterns as they activate — the hypervigilance, the withdrawal, the protest — rather than being unconsciously governed by them. Insight does not rewrite IWMs but creates space between stimulus and response.

Faster Recovery

Even if activation still occurs under attachment-relevant stress, the window of dysregulation shortens. The nervous system learns to return to baseline more quickly — a real and meaningful gain even without full restructuring.

Expanded Relational Range

Accumulated experiences of felt security — in therapy, partnership, friendship — gradually widen what feels tolerable and possible in close relationships. Not a fixed new state, but a broadened repertoire.

WHERE THE FIELD NEEDS TO GO

Research Gaps & Future Directions

① Measure attachment directly in therapy trials

Most RCTs measure symptoms only. Future studies need pre/post attachment classification using both AAI and self-report measures to know whether attachment itself — not just distress — changes.

② Longer follow-up windows

1–2 year follow-up is insufficient. Studies need 5–10 year windows to determine whether gains are maintained under life stress, or whether regression toward baseline occurs.

③ Use continuous rather than categorical measures

Categorical attachment classification obscures gradual change. Continuous dimensional measures (ECR subscales, AAI coherence scales) are more sensitive to incremental shifts.

④ Honest acknowledgment in clinical training

The field needs to resist overclaiming. Therapy can produce meaningful functional change — but the literature has sometimes implied more complete 'security achievement' than the evidence supports.

The nervous system retains plasticity in adulthood — but change requires more effort, more repetition, and more time than change in childhood.

The Therapist as Attachment Figure (Bowlby, 1988; Mikulincer & Shaver)

For the attachment system to update, the therapist must reliably provide the same three ingredients Ainsworth identified as producing secure attachment in infancy:

1 AVAILABILITY

Consistent, predictable presence across sessions. The client's attachment system needs to experience the therapist as reliably there — not absent, distracted, or unpredictable. Ruptures must be acknowledged and repaired.

2 RESPONSIVENESS

Attuned, sensitive reactions to the client's emotional bids. This means tracking affect in real time, naming it, and responding in ways that feel seen — not interpreted past, minimised, or redirected prematurely.

3 NON-INTRUSIVENESS

Respecting the client's autonomy rather than overwhelming or directing. A secure base allows exploration — the therapist supports without controlling, which mirrors the optimal caregiving Ainsworth documented.

These are not merely therapeutic virtues — they are the precise relational conditions that update internal working models.

Clinical Models That Operationalise Security

Emotionally Focused Therapy (EFT)

Sue Johnson · strongest empirical base (d ≈ 1.3)

Identifies negative cycles

Pursue-withdraw and other patterns reframed as attachment protest — bids for connection gone wrong.

Accesses primary emotions

Reaches beneath reactive anger or withdrawal to the underlying fear of abandonment and longing for closeness.

Creates corrective emotional experiences

In-session moments where vulnerability is met with responsiveness — directly updating the IWM of the relationship.

Security Priming

- Guided imagery of a caring figure
- Recalling felt-safe memories
- Compassionate self-talk (overlap with CFT)

Compassion-Focused Therapy

Paul Gilbert's CFT uses an 'ideal nurturing figure' imagery exercise — functionally a security priming protocol. Activates the soothing/affiliation system, which directly maps onto the secure attachment state.

CORRECTIVE RELATIONAL EXPERIENCES

Disconfirming the Internal Working Model

Single events don't rewrite IWMs — but accumulated relational experiences gradually do.

ANXIOUS / PREOCCUPIED

Expects abandonment, inconsistency

Corrective experience:

Therapist maintains consistent presence through ruptures; returns reliably; doesn't withdraw when the client becomes demanding or clingy.

DISMISSIVE-AVOIDANT

Expects rejection when vulnerable

Corrective experience:

Therapist responds to rare disclosures of need with warmth, not discomfort or intrusion — making closeness feel survivable rather than threatening.

FEARFUL-AVOIDANT

Relationships as simultaneously needed and dangerous

Corrective experience:

Therapist remains regulated and non-retaliatory when client is most dysregulated — demonstrating that another person can be safe to need.

The Neuroscience of Bonding

- Attachment in first 3 years of life- synergy between hormones and neurochemical systems that impact brain structure and functionality
- The development of the right hemisphere and of the prefrontal cortex, orbitofrontal cortex, and limbic system is influenced by attachment relationship in childhood
- The awareness of the subcortical emotional system driving interpersonal communication between partners is a goal of neuroscience-based couple psychotherapy

Cammisuli, D. M., & Castelnuovo, G. (2023). Neuroscience-based psychotherapy: A position paper. Frontiers in psychology, 14, 1101044.

Mirror Neurons and Theory of Mind

- Mirror Neuron System- involved in interpersonal cognitions, suggesting that people perceive emotions in others by activating the same emotional response in themselves
- Theory of the Mind- metacognitive ability to infer another person's mental state from his/her experiences and behavior
- The client can discover themselves in the psychotherapist's mind during treatment and better hold their negative emotions
- Group psychotherapy supports empathic resonance among members able to strength attentional control over the limbic system reactivity
- "Dorsolateral prefrontal cortex strongly participates in the empathic response through emotion regulation and perspective taking, and such capacities are reflected by brain structural variations in psychotherapists"

Top-Down and Bottom-Up Regulation

- Prefrontal cortical regions provide “top-down” regulation over limbic regions
- Impact of and strengthening executive functioning
- Emotion focused techniques can provide “bottom-up” regulation
- While the Amygdala is important for learning what to be afraid of (Secondary Process), the actual feeling of terror and the behavior of fleeing comes from the PAG (Primary Process).

How Therapy Changes the Brain

- "Psychotherapy is an individualized yet comprehensive biological treatment; it does not target one receptor, one or two neurotransmitters, or single modulators; it taps into all the biological regulations underlying complex brain responses"
- "A most critical nexus for bridging psychotherapy and neuroscience is an understanding of the fundamental nature of primary or prototype emotions" (Watt, 2018)

Javanbakht A and Alberini CM (2019) Editorial: Neurobiological Models of Psychotherapy. Front. Behav. Neurosci. 13:144. doi: 10.3389/fnbeh.2019.00144

HOMEOSTASIS ↔ EMOTION ↔ COGNITION

"Cognition and emotion thus become deeply interpenetrating, hierarchically-positioned activities in which emotion provides the motivational foundations for all directed cognitive activity, while cognition allows for modulation, blending, and especially *adaptive inhibition* of prototype affective states." (Watt, 2018)

Watt, D. F. (2018). Psychotherapy in an age of neuroscience: Bridges to affective neuroscience. In *Revolutionary connections* (pp. 79-115). Routledge.

Foundations of Affective Neuroscience

- Emotions are extensions of homeostatic mechanisms and pain/ pleasure. ("feeling" of good or bad provides conditioning)
- Emotions are the "vital thread" that runs through the whole neural system
- Evidence suggests that the amygdala more involved in negative affect than positive, more involved in organism defense than in the organism attachment and social gratifications.
- A telencephalic correlator systems like the amygdala must depend on more primitive systems for a base of value

Watt, D. F. (2018). Psychotherapy in an age of neuroscience: Bridges to affective neuroscience. In Revolutionary connections (pp. 79-115). Routledge.

Three Complex Domains of CNS Function

- Three complex domains of CNS function
  - Organismic valuing process (emotions)
  - Allocation of the limited processing resource of consciousness (attention)
  - Organization of behaviour (executive function)
- Higher cognitive systems link ventral brain systems defining organismic value giving “emotional meaning” but emotion is not strictly a derivative of appraisal
- Provide the motivational foundation for all directed cognitive activity

Watt, D. F. (2018). Psychotherapy in an age of neuroscience: Bridges to affective neuroscience. In Revolutionary connections (pp. 79-115). Routledge.

Prototype Affective States

- Primitive emotions (like fear or play) are distributed
- Emotion circuits- dominant neuropeptidergic modulation
  - Not controlled neatly by one peptide but rather cluster
- Evolutionarily ancient (shared with all mammals)
- Non-reducible
- Foundation for all complex feelings

Watt, D. F. (2018). Psychotherapy in an age of neuroscience: Bridges to affective neuroscience. In Revolutionary connections (pp. 79-115). Routledge.

Affective Behavior	Distributed Neural Networks	Neuromodulators
Seeking and Exploratory Behavior	Ventral Tegmental Area (VTA) to more dorsolateral hypothalamic to periaqueductal gray (PAG), with diffuse mesolimbic and mesocortical "extensions." Nucleus accumbens as basal ganglia processor for emotional "habit" systems.	DA (+), glutamate (+), many neuropeptides including opioids, neurotensin, CCK
Rage – ("Affective Attack")	medial amygdala to bed nucleus of stria terminalis (BNST) to anterior and ventromedial and perifornical hypothalamic to more dorsal PAG	Substance P (+) (? Ach, glutamate (+) as nonspecific modulators?)
Fear	central & lateral amygdala to anterior and medial hypothalamic to more dorsal PAG to nucleus reticularis pontine caudalis	Glutamate (+) ACTH, and neuropeptides (DBI, CRF, CCK, alpha MSH, NPY)
Sexuality	BNST and corticomedial amygdala to preoptic and ventromedial hypothalamus to lateral and more ventral PAG	Steroids (+), vasopressin and oxytocin. LH-RH, CCK.
Nurturance/ maternal care	Anterior cingulate to bed nucleus of stria terminalis (BNST) to preoptic hypothalamic to VTA to more ventral PAG	Oxytocin (+), prolactin (+), dopamine, opioids (both + in mod. amounts)
Separation Distress/ Social Bonding	Anterior cingulate/anterior thalamus to BNST/ventral septum to midline & dorsomedial thalamus to dorsal preoptic hypothalamic to more dorsal PAG (close to circuits for physical pain)	Opioids (-/+) oxytocin (-/+), prolactin (-/+) CRF (+) for separation distress, ACh (-)
Play/Joy/ Social Affection	Parafascicular/centromedian thalamus, dorso-medial thalamus, posterior thalamus, projecting to more dorsal (? dorsomedial) PAG (septum inhibitory re: play, and role of other basal forebrain and hypothalamic systems is still not clear at all.)	Glutamate (+) Opioids (+ in modest amounts, - in large amounts), ACh (muscarinic +) ACh (nicotinic -) DA, NE and 5-HT all appear to be (-)

The Archaeology of Mind

Panksepp, J., & Biven, L. (2012). The Archaeology of Mind: Neuroevolutionary Origins of Human Emotions. W. W. Norton.

Basic emotional systems	Functions	Emergent emotions
SEEKING/ Expectancy System	General-purpose appetitive motivational system, 'granddaddy' of the emotional systems	Interest, frustration, craving
RAGE/Anger	Mediates anger, invigorates aggressive behaviors	Anger, irritability, contempt, hatred
FEAR/Anxiety	Fearfulness, heightened vigilance	Simple anxiety, worry, psychic trauma
LUST/Sexuality	Mediates sexual urges	Erotic feelings, jealousy
CARE/ Nurturance	Facilitates maternal bonding, adult pair bonding and non-reproductive social bonding	Nurturance, love, attraction
PANIC/ Separation	Seeking care through distress calls	Separation distress, sadness, guilt/shame, shyness, embarrassment
PLAY/Joy	Rough-and-tumble play	Joy, glee, happy playfulness

Seeking

- Underlies all kinds of approach behaviors
- It isn't about the "joy" of getting what you want. It’s about the "itch" of looking for it.
- Dopamine levels are actually highest before you get the reward
- Drives you toward a goal. It feels like enthusiasm, curiosity, or eagerness.
- Traditionally called “the Brain Reward System”
- Seeking system is calmed by obtaining what was desired, but it does not stay calm for long
- Pathology of the seeking system- ex. Addiction, depression, repetitive ritualistic behavior, delusions

Depression and the Seeking System

- Micro- Novelty
- Abstract Foraging
- Activate motor system
- Anticipation
- Play system

Rage

- Triggered by competition for resources
- ”It is emotional, impulsive, and deeply rooted in the brainstem
- “A key to recovering from pathological rage is to establish or re-establish a person’s capacity to form and sustain warm trusting relationships”
- Predatory aggression is part of the Seeking system
- Approach- Attack (moving toward the threat to stop it)

Fear

- Can be hypersensitized when we have ben frightened badly enough or for long enough
- Fear is always accompanied by an aroused autonomic nervous system
- Generated by a coherently operating primal brain running from the periaqueductal gray (PAG) to the amygdala and back
- If animals are exposed to stressors for too long, they begin to exhibit depressive symptoms
- Not every form of anxiety comes from the fear system

Panic and Grief

- Dark side of the human capacity for love and play
- “Separation-distress mechanisms of the mammalian brain are belief to open the gateways to human grief”
- Even mild forms of social exclusion is experienced as psychologically painful
- “Sting of social isolation appears to have arisen evolutionarily from brain systems that mediate the affective intensity of physical pain”
- Fear and Grief have overlap but can be distinguished on both anatomical and chemical grounds
- Those who suffer from panic attacks often have a history of childhood separation anxiety

Psychopathology of Grief

- "Imbalances in the Grief system play a pivotal role in a wide array of emotional disorders because so much mental illness is rooted in the incapacity to enjoy the security of warm interpersonal relationships" (p.341)
- Attachment - Research shows that secure attachment is specifically correlated with a more robust and better-connected OFC.

Lust

- Social engagement and survival of species
- Deeply intertwined with Care and Play
- Feeling more than need (like hunger)
- Lust system, just like all other social emotional systems, is strongly regulated by the feelings aroused by bodily feelings
- Males tend to have stronger Seeking and Rage urges, Females tend to have stronger Care and Panic/ Grief

Care

- Instinctual brain urges to nurture and bond
- Loving others provide the gift of a happy life
- Closely linked to Lust and Panic
- Maternal nurturing and oxytocin
- Inhibits the brain's distress signals
- Therapeutic bond- co-regulation by being calm and empathetic. Trigger's client's oxytocin and opioid systems
- Empathy- human version of the Care system

Play

- Located in subcortical region of the brain, just like all other basic emotional systems
- Dopamine increases Seeking but reduces Play
- Urge to play is not learned, its innate
- Gord Burghardt (2005)
  - Adaptive functions of play are not fully evident at the time play occurs
  - Play is spontaneous done for its own sake because its pleasurable
  - An exaggerated and incomplete form of adult activities
  - Exhibits many repetitive activities in variation
  - Animals must be well fed, comfortable for play to occur; stress reduces play

Applying Affective Neuroscience

- Viewing humans not as passive information-processing machines but as emotionally proactive creatures
- Hypothesis- pure cognitive benefits tend to slip away more readily than affective benefits
- Reframe feelings as affectively positive experiences
- Bring subcortical systems back into homeostatic balance