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Memory Reconsolidation, Emotional Arousal and the Neuroscience of Enduring Change: Implications for Psychoanalysis


fulbrightaustria


Sigm. Freud
MUSEUM


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npsa

Lecture #12
Course Review
The Place of Psychoanalysis

- A summary of the "greatest hits" from this lecture series: the Internal Working Model (IWM), the Implicit Process of Relational Knowing (IPRK), memory reconsolidation (MR), the role of sleep in MR, computational mechanisms (PP/AI), defenses and deficits, transformation of intolerable to tolerable emotion, new understanding and new experiences
- The place of psychoanalysis in relation to other modalities
- What I've learned from teaching this course

Freud's Dream:
A Brain-Based Understanding of Mind

"Biology is truly a land of unlimited possibilities. We may expect it to give us the most surprising information and we cannot guess what answers it will return in a few dozen years to the questions we have put to it." [Freud, 1920, p. 60]

The Importance of Empirical Research

- The purpose of this course has been to put psychoanalysis (psa) and psychodynamic psychotherapy (pdt) on a stronger empirical footing based on neuroscience
- Needed because Psa rejected empirical research for many years
- In fact, many *classic* psychoanalytic claims can't be falsified
- Insurance companies and consumers now demand it
- CBT is now dominant and psa is in decline
- Although it is now known that PDT is effective, the mechanisms of change need to be demonstrated to show *why* it works and to create a working model of change that can be updated as new knowledge becomes available

First Description of Memory Reconsolidation
A Letter from Freud to Fliess in 1896

letter 52[4]

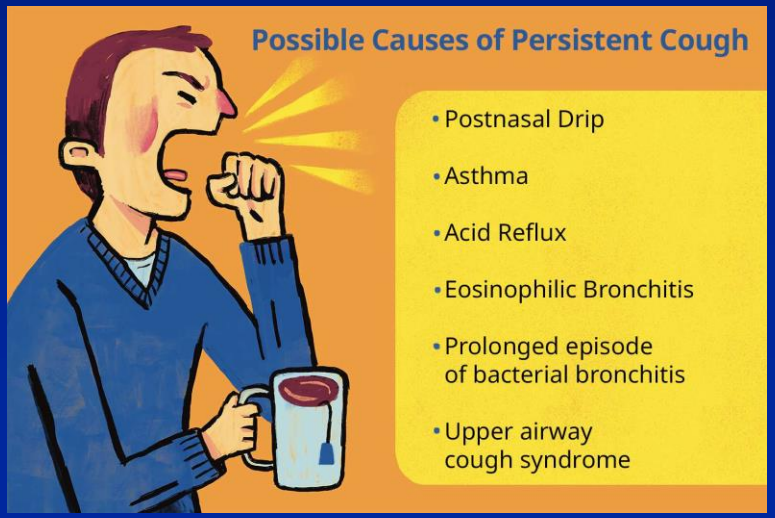
. . . As you know, I am working on the assumption that our psychical mechanism has come into being by a process of stratification: the material present in the form of memory traces being subjected from time to time to a *rearrangement* in accordance with fresh circumstances – to a *retranscription*. Thus what is essentially new about my theory is the thesis that memory is present not once but several times over, that it is laid down in various kinds of indications. I postulated a similar kind of rearrangement some time ago (*Aphasia*) for the paths leading from the periphery [of the body to the cortex].[5] I cannot say how many of these registrations there are: at least three, probably more. This is shown in the following schematic picture [Fig. 7], which assumes that the different

"Patients suffer from reminscences."
Freud, 1909

Memory: It's Not Just for Recalling the Past; It's a Guide to the Future

- Memory is adaptive because it keeps a record of what did and didn't work in the past
- The key benefit is that it serves as a guide to similar situations in the future
- In fact, the brain is constantly making predictions about what is happening now and likely to happen in the near future based on these memories
- Having some capacity to update memories in light of changing circumstances can optimize adaptive flexibility -- but changes must be made prudently.

Psychiatric Nosology is Based on Symptoms and Behavior, Not Etiology or Mechanisms: The Example of Cough



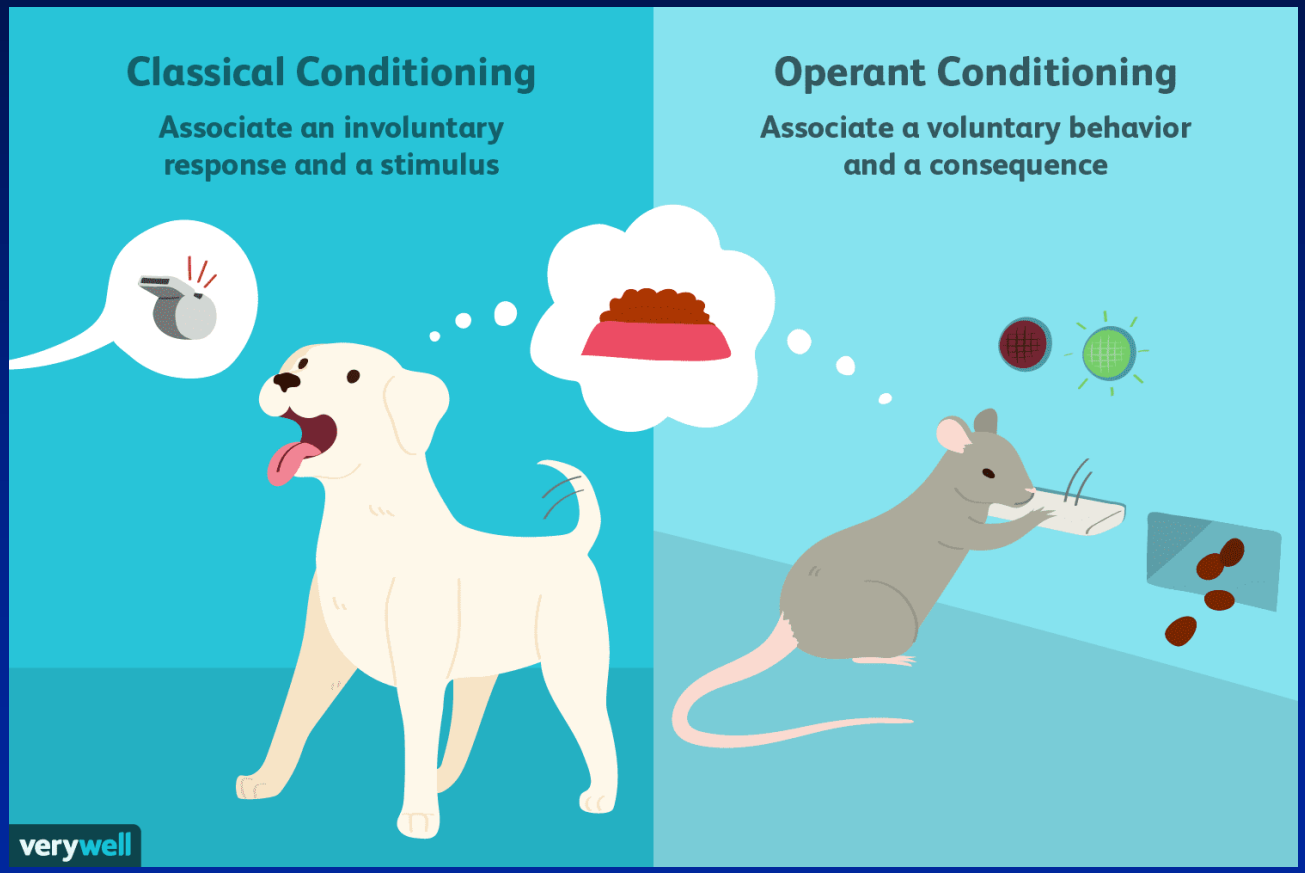
- Cough is an observable symptom with many different etiologies
- So is “depression” or “anxiety”
- Specific disorders are defined by a list of symptoms
- Successful treatment conventionally defined as symptom reduction
- PDT and Psa aspire to get at the root cause of symptoms
- Symptoms arise when the usual pattern of adaptation fails

Cognitive-Behavioral Therapy

- Currently the most popular method of psychotherapy
- CBT focuses on reducing symptoms or maladaptive behavior
- Focuses on what maintains symptoms, not their origin
- Patterns in social relationships (IWM) are not a major focus
- Treats emotion as a symptom, not a mechanism of change
- Inhibiting symptoms (exposure therapy/extinction) and learning alternative behaviors are a primary focus
- Memory reconsolidation (MR) doesn't fit with CBT very well
- Enduring change in CBT for depression is about 30% at 2 yrs: 50% initial response; 30-40% relapse rate at 2 yrs

Classical Conditioning (stimulus) vs. Operant Conditioning (response)

CS-US Pairing



Reward value of actions

Pavlov, 1897

Skinner, 1937

Mowrer's 2-Factor Model of Avoidance Learning (1947)

- Consider the example of an assault in a parking lot
- Conditioning pairs parking lot and assault, and thus fear
- Given that classical conditioning leads to extinction unless pairing repeated, how can CC explain clinical anxiety?
- Operant conditioning includes positive reinforcement and negative reinforcement
- Negative reinforcement: avoiding something negative (which is a relief) is reinforcing
- e.g. Avoidance of parking lot where assault occurred reinforces the CS (parking lot) – US (assault) association
- The combination of the two can explain clinical anxiety

Recurrent Maladaptive Patterns (RMPs)

- RMPs are foundational in psychoanalysis (Psa) and psychodynamic psychotherapy (PDT)
- They are patterns of behavior that aim to meet needs while avoiding intolerable distress
- As such, negative reinforcement plays a role in their persistence, and avoidance limits adaptation
- They are what we are trying to treat
- RMPs are ubiquitous but not recognized by other psychotherapy modalities as important targets of intervention
- Psa and PDT therefore offer something of unique value

Biological Psychology 154 (2020) 107925

Contents lists available at ScienceDirect

Biological Psychology

journal homepage: www.elsevier.com/locate/biopsycho

Review

The evolution and development of the uniquely human capacity for emotional awareness: A synthesis of comparative anatomical, cognitive, neurocomputational, and evolutionary psychological perspectives

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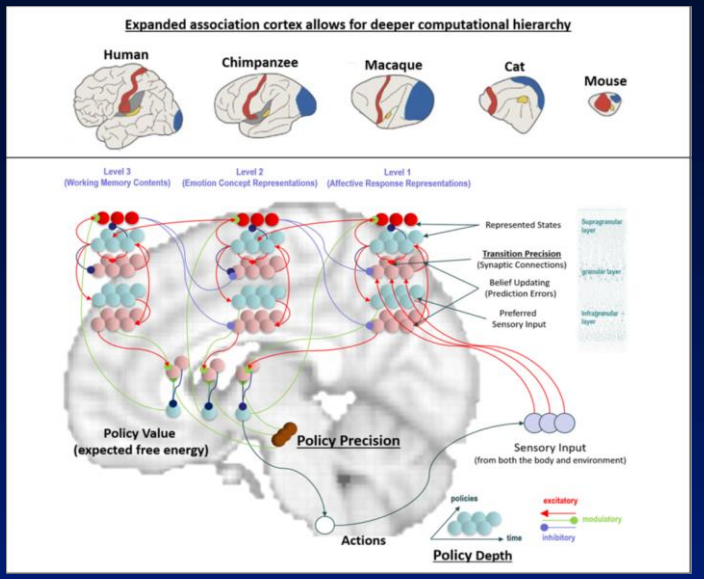


- Disproportionate cortical expansion during human evolution reflects additional hierarchical levels of computational processing, allowing representation of multi-modal regularities over longer timescales
- These representations make possible abstract concept learning, internal simulation of distal future outcomes and expanded working memory capacity
- Definition of schema: superordinate knowledge structures that reflect *abstracted commonalities* across multiple experiences, exerting powerful influences over how events are perceived, interpreted, and remembered" (Gilboa & Marlatte, 2017)
- The IWM of the social world is a schematic memory that was created by abstracting commonalities across interpersonal emotional experiences
- The capacity to form an IWM of the social world is uniquely human

Int J Psychoanal 2007;**88**:843–60
10.1516/ijpa.2007.843

The foundational level of psychodynamic meaning:

Implicit process in relation to conflict, defense and the dynamic unconscious

BOSTON CHANGE PROCESS STUDY GROUP (BCPSG)[1]

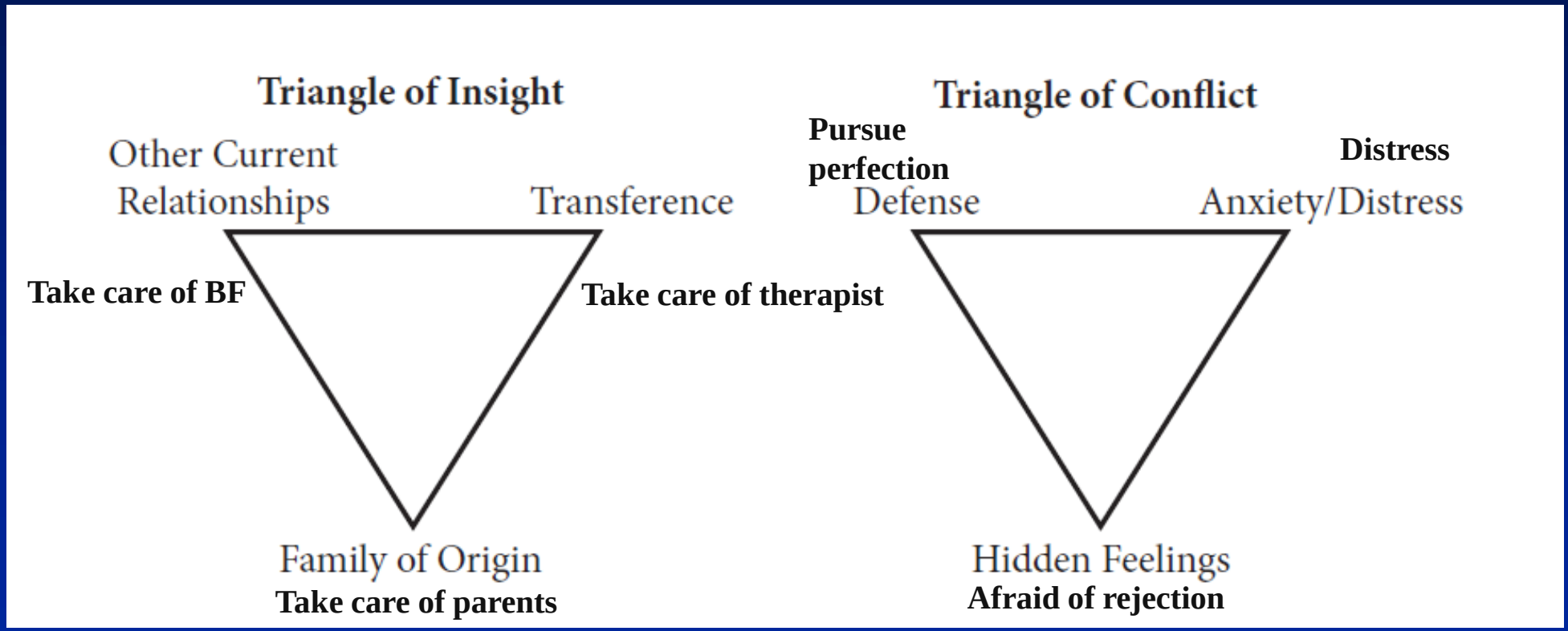
How can we take advantage of newer insights from “relational” psychodynamics in which the “intersubjective emotional field” is the focus of the therapy?

Implicit Process of Relational Knowing (IPRK) Is the Operational Expression of the Internal Working Model In Action

- Lived experience is represented at the implicit level
- Implicit process of relational knowing: what is expected regarding what other people will say and do, how you will feel, how you are expected to behave, how events typically unfold, etc.
- This is the Internal Working Model in action in real time
- This view is consistent with implicit emotion as continuously active in the background guiding behavior
- The lived experience of interaction with other people is where development occurs and where change happens
- Concepts of conflict, defense and fantasy are abstractions that are higher level constructs that are superimposed upon the more basic implicit (automatic) level of lived experience

Boston Change Process Study Group. International Journal of Psychoanalysis, 2007.

Karl Menninger's Triangle of Conflict (Intrapersonal) and Triangle of Insight (Interpersonal)



The Critical Importance of Interpersonal Processes in Psychodynamic Psychotherapy

- The problems start in the context of relationships
- People seek help because they are having problems in interpersonal contexts (social and occupational)
- The problems get resolved in interaction with the therapist
- Working with affect and creating corrective emotional experiences is the key to successful treatment

Hanna Levenson. Time-Limited Dynamic Therapy: A Guide to Clinical Practice. Basic Books. 1995

BEHAVIORAL AND BRAIN SCIENCES (2015), Page 1 of 64
doi:10.1017/S0140525X14000041

Memory reconsolidation, emotional arousal, and the process of change in psychotherapy: New insights from brain science

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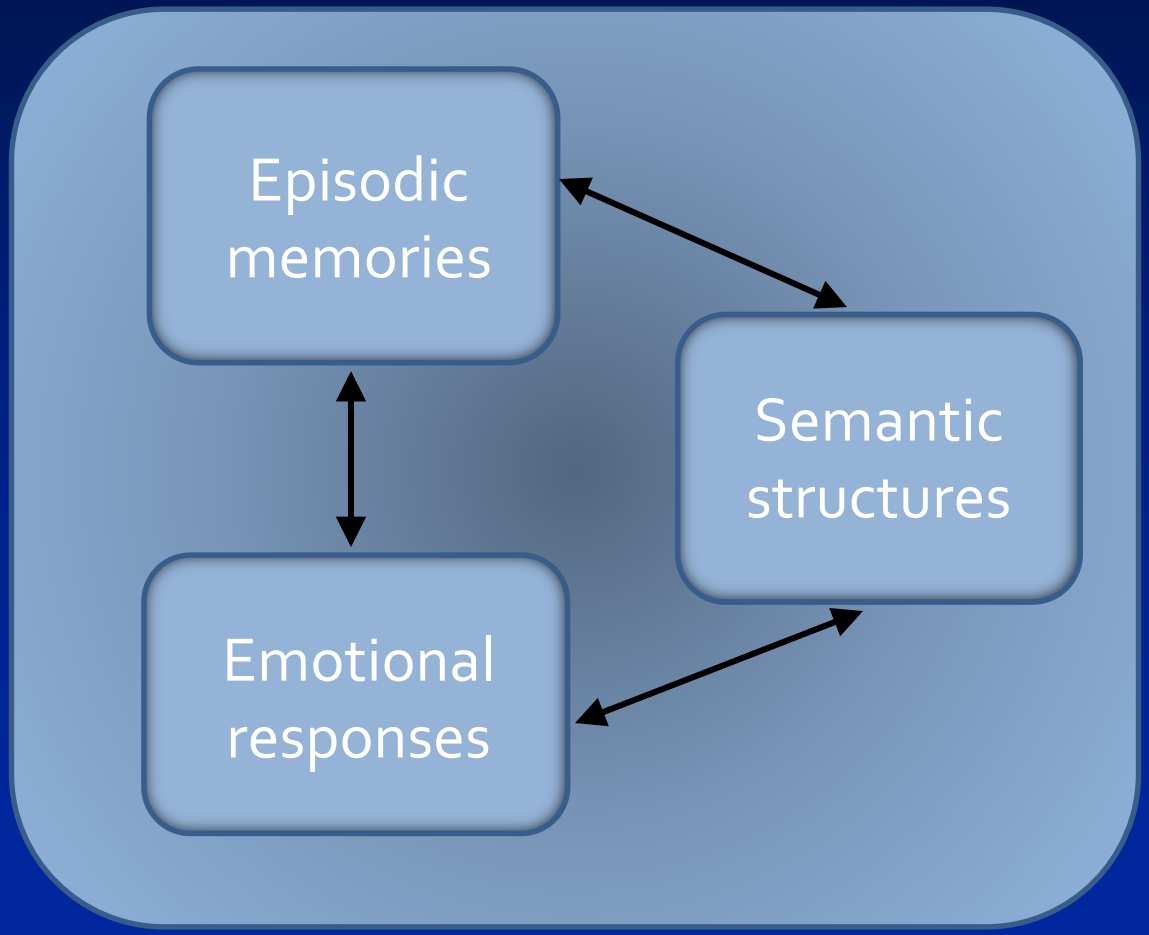
Lane, R. D., Ryan, L., Nadel, L., & Greenberg, L. (2015). Memory reconsolidation, emotional arousal, and the process of change in psychotherapy: New insights from brain science. *Behavioral and Brain Sciences*, *38*, 1-19.

Three Essential Ingredients for Enduring Change in Psychotherapy

- Activate old memories and old feelings (with or without awareness of their connection to the past)
- Concurrently engage new emotional experiences that change old memories through reconsolidation
- Reinforce the strength of new memories and their semantic structures by practicing new ways of behaving and experiencing the world in a variety of contexts

Integrated Memory Model



It is impossible to activate one without the others.

- Personal experiences
- Generalized knowledge
- Arousal, action, feeling

Emotional Arousal Enhances Memory Encoding

- Synaptic plasticity, which is the molecular basis basis for encoding memories, is enhanced by the neurotransmitters and hormones (e.g. norepinephrine, cortisol) that are activated by emotional arousal
- Identifying / tagging what is important to remember is a foundational principle of memory functioning
- The brain cannot possibly retain all of the information that comes in during the day – nor would it want to

Schwabe L, Joëls M, Roozendaal B, Wolf OT, & Oitzl MS. Stress effects on memory: An update and integration. *Neuroscience & Biobehavioral Reviews.* 2012; 36:1740-1749

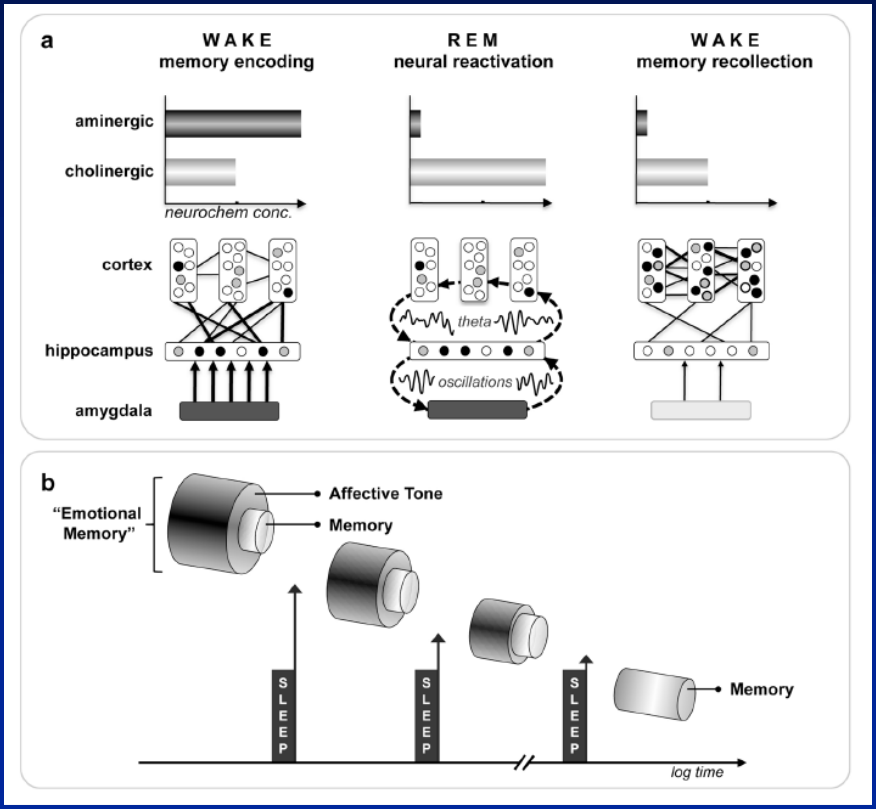
The Appraisal Component of Emotion Determines *the Content* of Updating

- The arousal component of emotion facilitates encoding
- The appraisal component determines *what* is encoded and determines future predictions, critical to social perception
- A corrective emotional experience (CEE) in therapy has both components
- This means that CEEs directly change future construals without the need for explicit interpretation or conscious understanding

Memory Reconsolidation Requires Sleep

- Memory systems are reorganized during sleep into consistent patterns (schemas)
- This reorganization involves integrating the new with the old, consistent with reconsolidation
- Sleep preferentially selects what is relevant to a person
- That's what emotion is – a system for determining personal relevance and responding as needed
- Conclusion: the way the brain sorts and saves information during sleep roughly approximates the proposed mechanism for enduring change in psychotherapy (new emotional experiences update previous schemas)

"Overnight Therapy"
Sleep to Forget and Sleep to Remember
Why You *Usually* Feel Better in the Morning



- Coordinated encoding of hippocampal-bound information within cortical modules, facilitated by the amygdala, modulated by high aminergic concentrations

- During REM, same structures are reactivated by synchronous theta oscillations throughout these networks, supporting ability to reprocess previously learned emotional responses

Walker, M. P., & van Der Helm, E. (2009). Overnight therapy? The role of sleep in emotional brain processing. *Psychological bulletin*, *135*(5), 731.

"Overnight Therapy"
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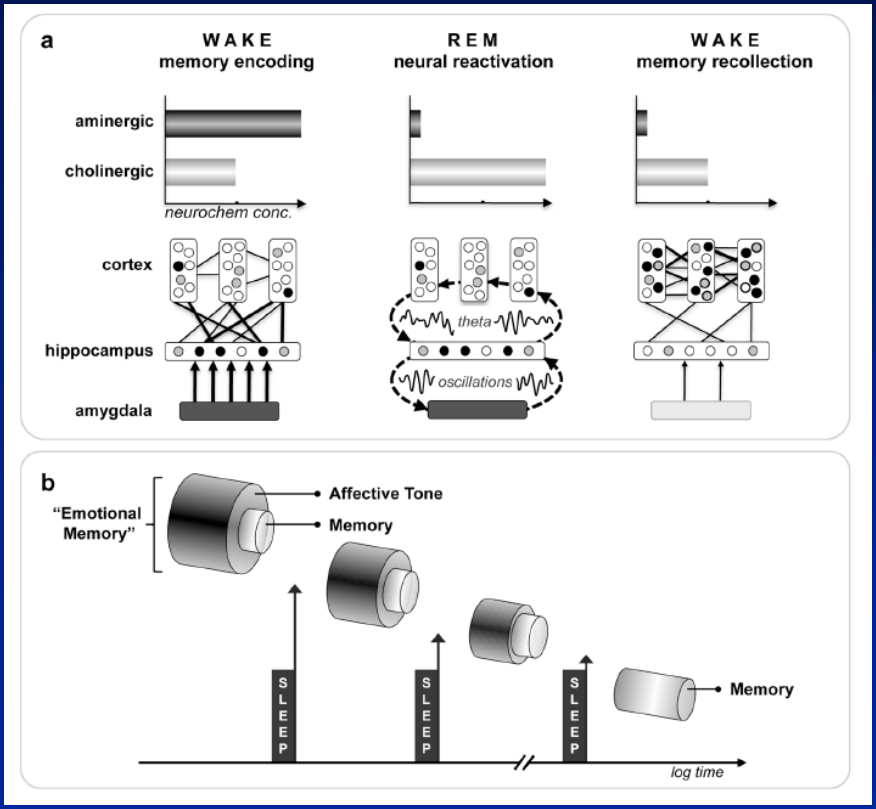
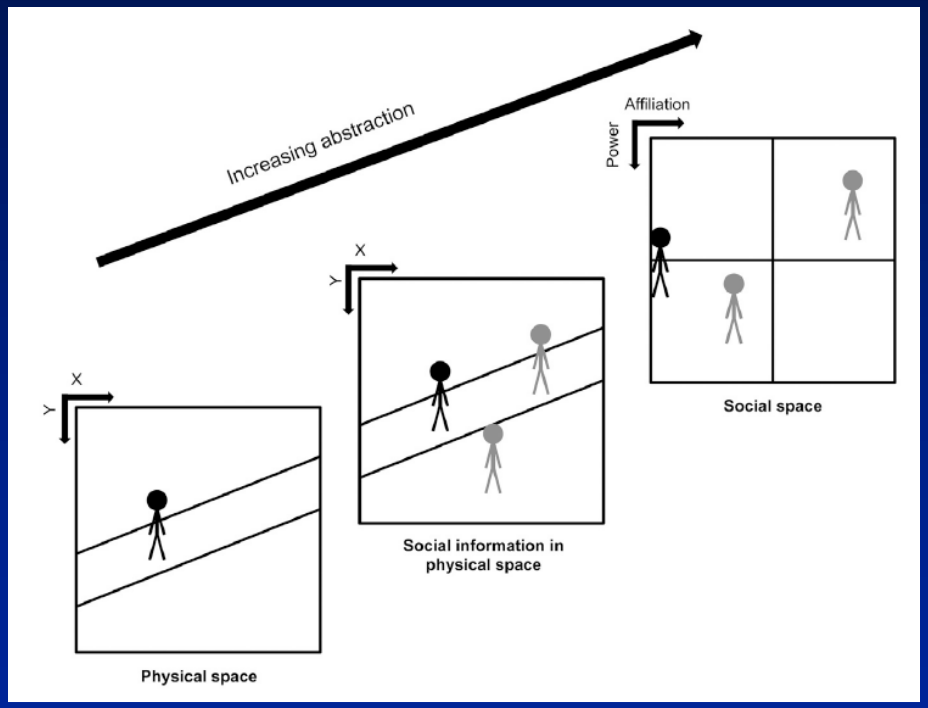
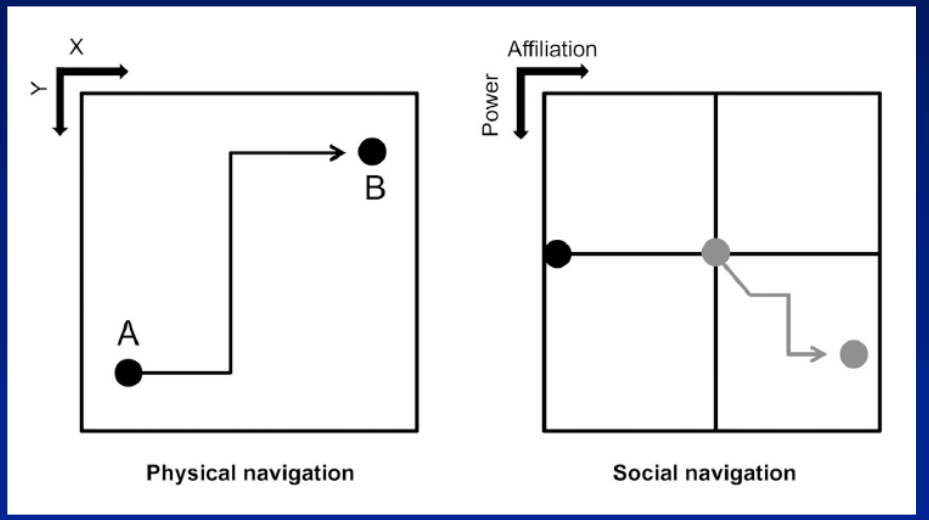


- The neurochemical milieu of REM has changed, resulting in depotentiation of affective tone and progressive neocortical consolidation of the information
- Stronger cortico-cortical connections support integration into previously acquired autobiographical experience, aiding assimilation of the affective event with past knowledge, which may contribute to the experience of dreams

Walker, M. P., & van Der Helm, E. (2009). Overnight therapy? The role of sleep in emotional brain processing. *Psychological bulletin*, *135*(5), 731.

The Hippocampus Tracks Spatial Relationships Concretely *and* Conceptually





Schafer, M., & Schiller, D. (2018). Navigating social space. *Neuron*, *100*(2), 476-489.

- Overfitting occurs when a statistical model fits a training data set exactly but can't generalize to a different data set
- All Deep Neural Networks (DNNs) face the issue of overfitting
- This ubiquitous problem in DNNs is often solved by experimenters via "noise injections" in the form of noisy or corrupted inputs
- This paper argues that the brain faces a similar challenge of overfitting, and that nightly dreams evolved to combat the brain's overfitting during its daily learning
- Dreams are a biological mechanism for increasing generalizability
- Sleep loss, specifically dream loss, leads to an overfitted brain that can still memorize and learn but fails to generalize appropriately

Hoel, E. (2021). The overfitted brain: Dreams evolved to assist generalization. *Patterns*, *2*(5), 100244.

The IWM and RMPs Can be Understood From A Computational Perspective

- Computational neuroscience is the leading model for understanding how the brain processes information
- Understanding the mind based on fundamental principles of brain function increases the likelihood that newer psychological conceptualizations will have enduring value
- RMPs and their treatment can be reconceptualized in these terms
- Putting Psa and PDT on a stronger empirical footing may ensure their survival and potentially reinvigorate their standing in the mental health field

Emotional Distress Is An Expression of Prediction Error

- The IWM is a set of predictions in social situations
- In computational terms, predictions = priors
- The brain is always seeking to minimize prediction errors (PEs)
  (minimizing expected free energy)
- Distress in social contexts can be understood as PE
- Emotional responses are activated by an automatic
  (usually unconscious) evaluation of the extent to which
  needs, goals or values are being met or not met in interaction
  with the environment at that moment
- The set point for that evaluation is a prediction of experience
- A deviation from that set point activates an emotional response
- Distress indicates that needs are not being met at that moment,
  i.e. distress is an expression of prediction error

How Computational Neuroscience is Helpful In Explaining RMPs and the Need for More Emotion Processing to Update the IWM

- PE can be minimized in one of two ways: update the priors, or change the sensory input so that expectations are accurate
- Updating priors in this context is not easy; it means changing the IWM (a schematic memory built up over time)
- Updating the prior requires updating it based on PE, which means attending to and working with PE (distress)
- RMPs can be understood to arise as an expression of the second option: taking actions to ensure that predictions are met (AI)
- By repeating the usual behavioral patterns (the RMP) and ignoring the distress that it generates, which is familiar, PE is minimized
- Successful psychotherapy involves updating the prior (IWM) by incorporating the information provided by PE (distress) – identifying the associated needs and finding ways to meet them

What Keeps the RMP in Place? Why is Painful Emotion Avoided?

Possible contributing factors

- It is unpleasant; prefer to avoid unless attending to it necessary
- Don't think emotions have value
- Don't know that bodily sensations at the time are due to emotion
- Don't know the source of an emotional experience
- Certain emotions are forbidden to express or even experience
- Need another person to make sense of one's own experience
- Need the support of another person to help tolerate the painful emotion
- Need to have faith that another person can be helpful
- Need to feel confident that one can survive if the worst happens,
  e.g., if getting in touch with emotion and taking action based on an understanding of what one needs results in the feared response, i.e., need to transform intolerable into tolerable emotion

The Need for Emotional Growth in the Context of Recurrent Maladaptive Patterns

- A recurrent maladaptive pattern arises and persists because of the need to avoid intolerable emotional distress
- Defenses are deployed automatically because it is sensed that to consciously experience the emotion or conflict would be overwhelming
- When inflexible avoidance strategies don't work well distress is experienced, which brings people in for treatment
- The pattern is persistent and thus recurrent because there is a limitation in processing capacity making avoidance necessary
- As such, although defenses (avoidance strategies) are present and need to be overcome, to make behavior and adaptation more flexible, a certain kind of emotional growth is needed
- Defenses will remain active as long as skill limitations/deficits persist

Integrating Defense and Deficit Accounts of Reduced Emotional Awareness

- Psychodynamics fundamentally refers to the influence of unconscious mechanisms on behavior
- Something can be unconscious because it is actively kept out of awareness; this is defense
- The other option is that mental contents fail to reach conscious awareness due to a deficit (e.g. failure to construct)
- Thesis 1: The nature of defense may be based on whether something has been previously mentally represented (constructed) or not
- Thesis 2: For immature defenses, defense (motivated avoidance) & deficit (impaired mental representation) may be inseparable
- Thesis 3: Defenses are more likely when deficits are present

Defense vs. Deficit

Defense

Unearthing buried treasure
Previously mentally represented
Actively hiding something old
Bringing it to the surface

Skill / Deficit

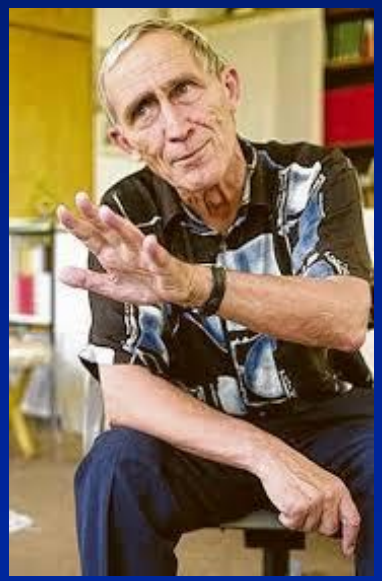
Finishing something incomplete
Not previously mentally represented
Formulating something new
Bringing it to a higher level

Working with Trauma in Psychotherapy

- Victims often know what happened but not how it affected them emotionally
- Emotional experiences need to be formulated for the first time – titrated to what is tolerable
- Discussion of past experiences incorporates new information – safety, empathy, support
- New context permits the experience of new emotions, experiencing feelings (anger, guilt, longing) for the first time that had previously been intolerable and unformulated

"Psychoanalysis is more than the creation of a *narrative*, it is the active construction of a new way of *experiencing* self with other."

Fonagy P. Memory and therapeutic action. IJP (1999)
Psychoanalytic Therapy Principles and Practice (2021)



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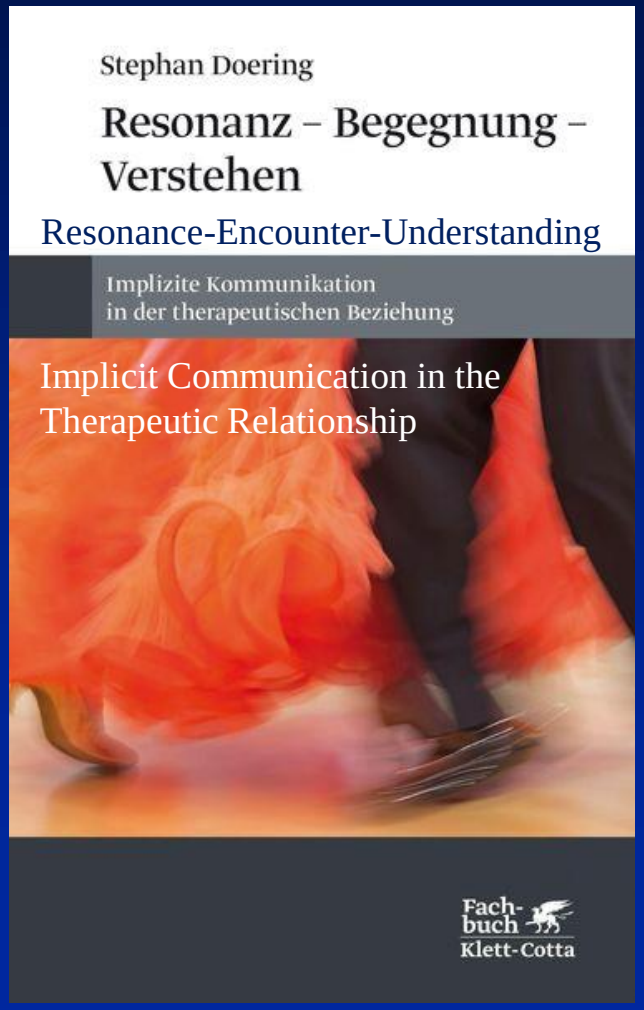
The Client's Somatic Memories and The Bodily Experience of the Therapist



- When abuse, neglect or trauma occur in the preverbal period, somatic memories are created that can't be recalled or put into words
- Bodily resonance between therapist and client enable the therapist to access these client experiences
- Projective identification, enactments, action tendencies, mirror neurons, therapist fantasies, physiological synchrony, olfactory stimuli, emotional contagion are mechanisms of communication
- Therapist contains the arousal and reflects upon its meaning, which informs empathic statements
- Attunement and concomitant implicit messages can be regulatory and transformative of client distress

New Experiences, New Understanding or Both?

- If we are seeking enduring change, a goal of therapy is to change the internal working model of social relationships
- Insight consists of understanding what the internal working model is, but understanding alone doesn't change the working model
- Talking about emotions – without experiencing and expressing them – does not change the emotional elements of the schematic memory
- New emotional experiences *update* the internal working model and thus change how future situations are construed and responded to e.g. instead of anticipated ridicule, shame and rejection the therapist responds with compassion, empathy and acceptance
- The implicit emotional messages inherent in an interpretation may matter more than the words used to promote insight
- Insight likely extends the gains achieved from new experiences

Corrective Emotional Relationship

- Retains primary focus on the transference as the focal point of therapeutic interaction in psychoanalysis
- Bypasses conceptual baggage of CEEs
- Focuses on schematic memories corresponding to the RMP rather than episodic memories of specific events (CEE)
- Captures and highlights abundant, relevant implicit as well as explicit emotional processes in the therapeutic interaction
- Provides repeated emotional responses and experiences inconsistent with expectation while old memories and old feelings (transference) are activated, entirely consistent with how MR works
- Makes possible the transformation of schematic memories that are older, stronger and more differentiated

Comparison of Classic vs. Integrative (Emotion-Focused) Approaches to PDT

Variable	Solms/Classic	Lane/Integrative
Prediction Error	Procedure/ Defense	Emotional experience to be constructed
Context of work	Must be in transference	Either transference or other relationships
Focus	Resolving conflict	Transforming intolerable emotion
Method	Interpretation	Corrective emotional experiences
Reconsolidation	Not possible (procedural memory)	Possible (schematic memory)

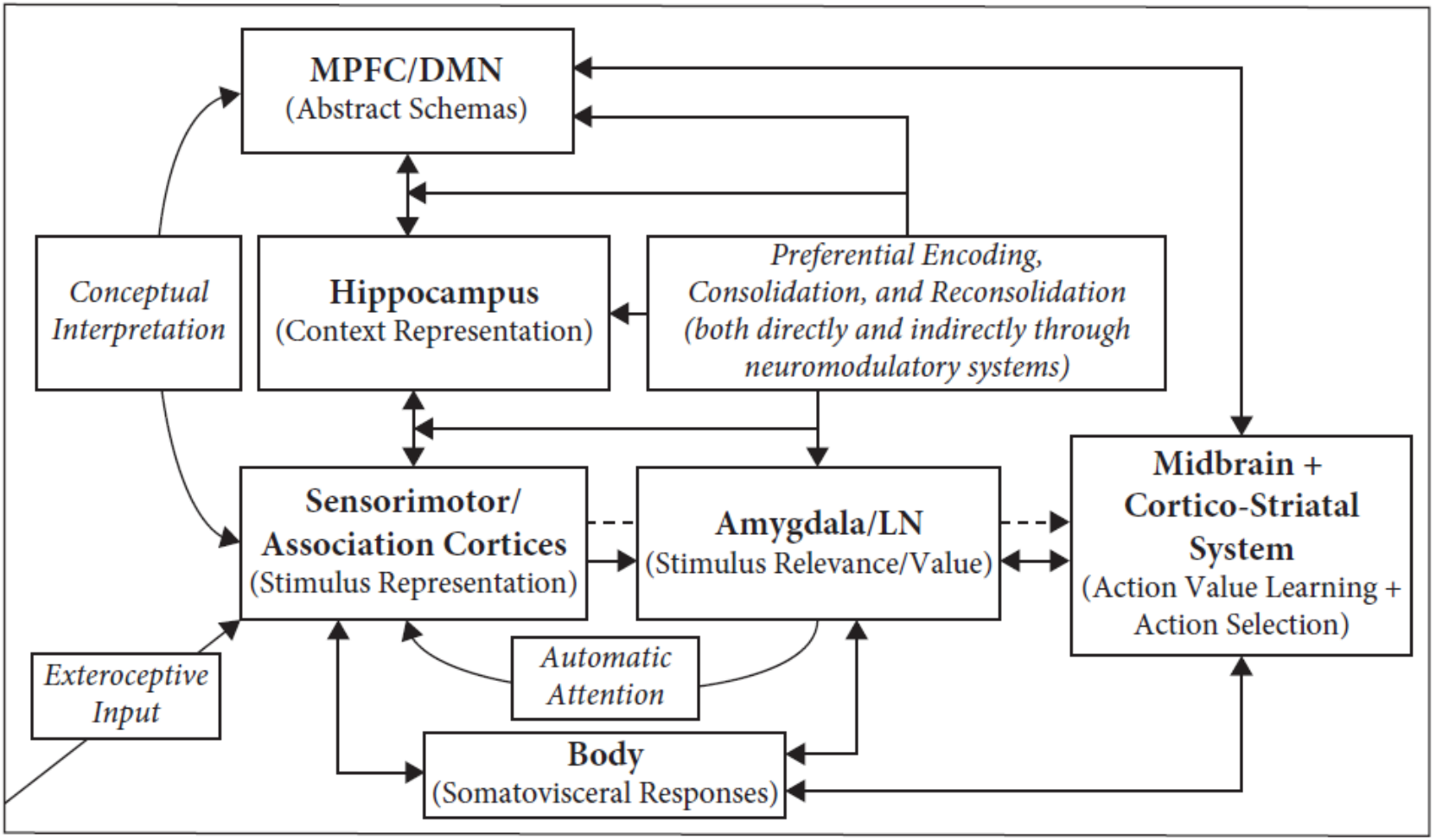
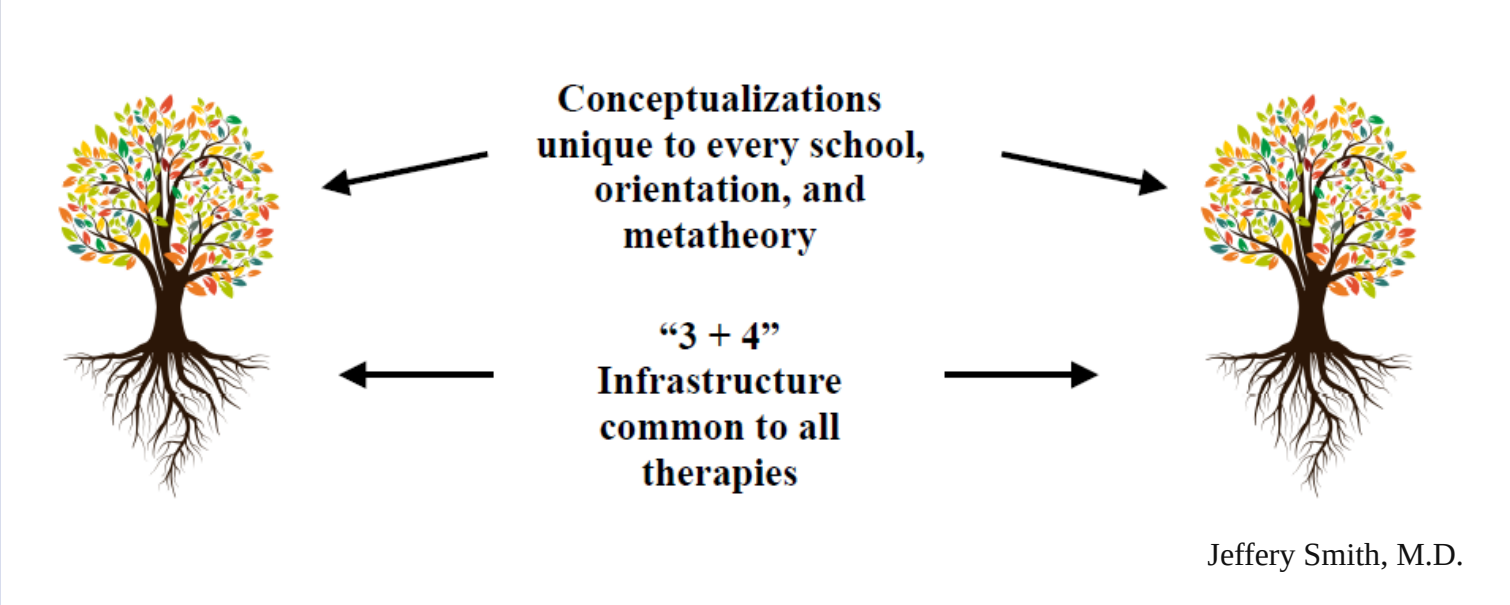


Figure 16.1 A model of the cognitive, emotional, and neural basis of the memory processes proposed to play a role in successful psychotherapeutic change.

Lane RD, Smith R, Nadel L. Neuroscience of enduring change and psychotherapy: Summary, conclusions and suggestions for future research.In Neuroscience of Enduring Change: Implications for Psychotherapy (Eds: Lane RD, Nadel L). Oxford University Press 2020, pp. 433-468.

Defining the Fundamental Mechanisms of Change Across Psychotherapy Modalities



<u>3 Final Pathways</u>

New Learning (outcompetes) Extinction (suppresses)

Memory Reconsolidation (updates)

<u>3 Key Steps</u>

Reactivate

Revise

Reinforce

<u>4 Facilitating Factors</u>

Arousal regulation

Motivation

Safety

Relationship

MR May Contribute to the Unification of the Fragmented Field of Psychotherapy

- Coherence Therapy
- Emotion Focused Therapy
- Accelerated Experiential Dynamic Psychotherapy
- Schema Therapy
- Rescripting Therapy
- EMDR
- Psychedelic/Psycholytic Therapy
- Propranolol-Assisted MR
- Psychodynamic Psychotherapy
- Psychoanalysis

What If Psychotherapy Practice Were Based on MR Principles?

- The reconsolidation window stays open for 4-6 hours after the session; arousal (e.g. exercise or stress) after a session can tag what came before; nap/sleep can "lock in" change
- Issues to consider
  - Retreat-style interventions
  - Duration of sessions
  - Frequency of sessions
  - Timing of sessions
  - Post session activities
  - Napping
  - No meds that alter REM (SSRI, SNRI, TCA, BZ)

Psychotherapy May Be Like An Automobile

- There are hundreds of makes and models
- Some are faster and some are slower
- Some people are city drivers; others want “off road”
- Some want electric vehicles and others know and like gas
- The number of core operational mechanisms (e.g. electric or internal combustion) is limited
- All help you to get where you want to go
- It matters what your goals are:
  - People are not all starting from the same place
  - People are not all going to the same place

Modalities Differ In the Contexts They Aim To Address

- Behavior/exposure therapy: specifically identifiable situations that elicit the maladaptive response
- CBT or EFT: symptomatic syndromes that are temporary disturbances in emotional responses (e.g. clinical depression) that are not situation-specific
- Psychodynamic (insight-oriented): enduring trait characteristics that are not temporary and not situation-specific (transcending space and time)

Lane, R. D., Ryan, L., Nadel, L., & Greenberg, L. (2015). Memory reconsolidation, emotional arousal, and the process of change in psychotherapy: New insights from brain science. *Behavioral and Brain Sciences*, *38,* 1-19.

Updated Indications for Psychoanalysis

- Personality disorders (not situation-specific or state-dependent)
- Other treatments didn't work
- Other treatments not desired
- Time Limited Dynamic Therapy - PDT – Psa continuum
- All involve:
  - a recurrent maladaptive pattern
  - updating implicit learning with contradictory information
  - transforming intolerable into tolerable distress
  - applying transformative experiences in Tx to external world
- More intensive / longer duration needed with early trauma/ lack of epistemic trust/ primitive defenses/ mentalization deficits

Freud's Model of Change in 1895 Was A Good Start

1) trauma memories and their associated affects that remained unconscious were the problem (the source of the symptoms or dysfunction);
2) the analyst's job was to facilitate overcoming the patient's resistance to enable recall of the memory and affect;
3) the curative aspect was to experience and express the affect that had been pent up (assuming that catharsis was the mechanism of cure).

We now understand this to be Step 1 in the 3-Step Process

Freud Was A Pioneer Whose Work Has Been Extended Because We've Learned So Much Since 1939

- unconscious – ubiquitous in cognition and emotion
- affect – relational, not just autonomous individual drives
- defense – any thought, behavior or emotion can serve an avoidance function; he didn't include his own concept of agnosia to capture deficits in mental representation
- transference – predictive processing is ubiquitous
- childhood development – focused on psychosexual development and the Oedipus complex; missed pre-Oedipal period and the role of early mother-child interactions
- memory reconsolidation – broad role in childhood dev/treatment
- dreams – didn't know about REM/info processing during sleep

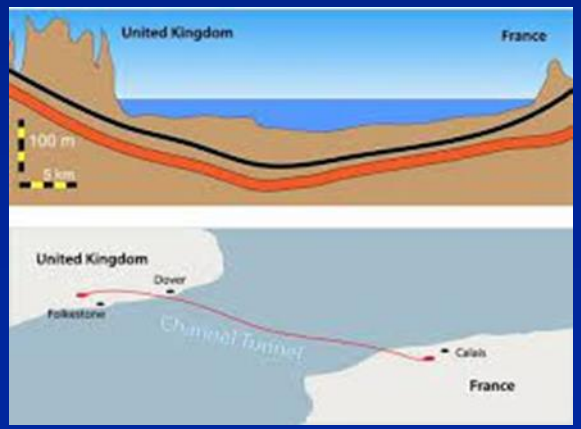
What I've Learned: My Conclusions from the Course

- PDT and Psa unblock and restore healthy development of the IWM by transforming intolerable into tolerable emotion
- During sleep new self-relevant (i.e. emotionally significant) information from the previous day is saved and integrated; this process is likely universal in the animal kingdom
- CBT is fundamentally different re: goals, focus, mechanisms
- Primitive defenses and lack of mental representation of emotion are inseparable
- Understanding how intolerable emotion gets transformed into tolerable emotion is an important new clinical research area

What I've Learned: My Conclusions from the Course

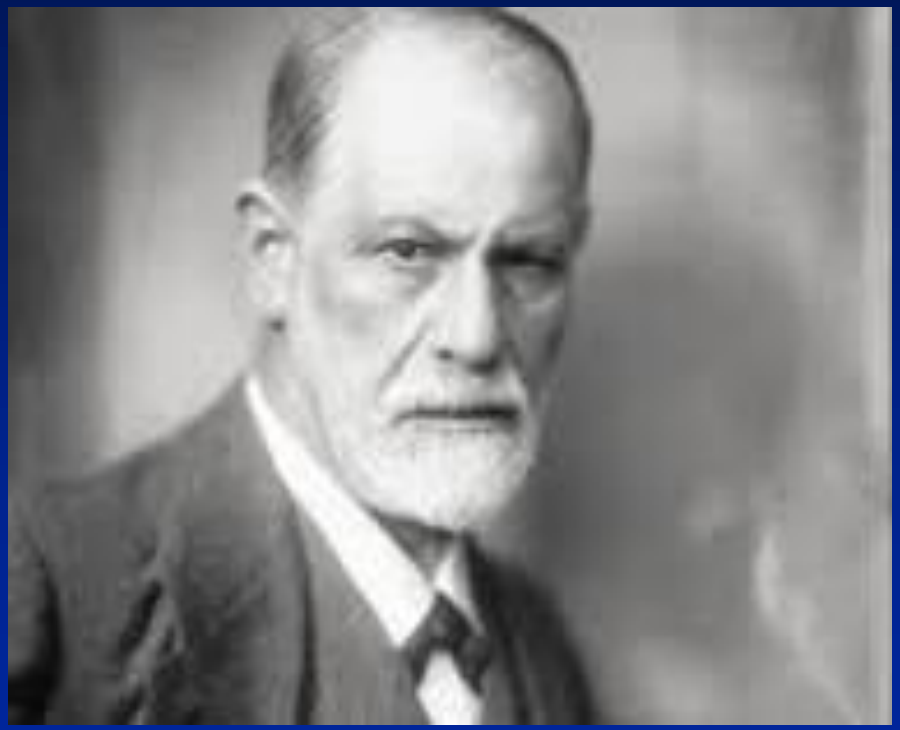
- The current perspective aligns with the Relational School within psychoanalysis, but bolsters it with a neuroscientific infrastructure: memory reconsolidation, a constructivist approach to emotion, and computational mechanisms (predictive processing and active inference)
- PDT/Psychoanalysis are indicated for the treatment of personality disorders or if other treatments aren't tolerated or fail
- The hippocampus may be where the IWM is encoded and updated in interaction with the amygdala and medial PFC
- Psychoanalysis and neuroscience align as a function of which concepts and findings are selected from each domain

Benefits of the Convergence of Psychoanalysis and Neuroscience



- Puts psychoanalysis on a stronger empirical footing, reformulating core ideas in an empirically tractable manner
- Can reduce the complexity of teaching psychodynamic perspectives
- Suggests the need for greater focus on activating and transforming emotion whenever possible – in all transference relationships – with the therapist as well as others

How Would Freud Feel About This New Perspective?



Future Events

- June 27, 2023 (20:15): Vienna Psychoanalytic Society
  Advances in the neuroscience of memory and emotion and their implications for enduring change in psychoanalysis (How to make psychoanalysis more affective and effective)
- June 29, 2023 (19:00): Sigmund Freud Museum, Vienna
  The corrective emotional relationship: New perspectives on the change process. Panel discussion with Hanna Levenson, Stephan Doering and Richard Lane
- 2024/2025: Special issue on “Psychoanalysis and Affect Science” in the Journal of the American Psychoanalytic Association (Guest editors Stephan Doering and Richard Lane)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Thanks to all of you!