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## The Neuroscience of Transformation: A Potent Leap for Humanity

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The discovery of a neurobiological phenomenon, which many are labelling *memory reconsolidation* (MR), is on the verge of provoking paradigm shifting implications for mental wellbeing and for social transformation. While the discovery has since been validated in several studies, knowledge of MR outside of the study of molecular neurobiology still remains obscure and has yet to be integrated in the major schools of psychotherapy and psychology. The application of MR enables practitioners to create the conditions for the complete cessation of unwanted symptoms and enable the enduring changes that are desired, in weeks and months rather than years. A large-scale integration of MR into therapy could act as a seed for a significant leap in the effectiveness and efficiency of developmental, therapeutic and transformational interventions. This essay provides a high-level explanation of the *neuroscience of transformation* and a case example of a transformative breakthrough.

**Keywords:** memory reconsolidation, neurobiology, plasticity, therapy, transformation.

*“We’re in a time that calls for a humanistic (r)evolution, which requires us to care with extraordinary sensitivity in a world that is in pain and teetering on the precipice”.*

This was the message in the invitation to a gathering of accomplished psychologists and psychotherapists. It speaks to the complexity of our time and to the impact that an increasingly complex world is having on all of our lives. The theme of that conference, which took place in 2015, has been engulfing both fields as questions about the efficacy of psychotherapies and the validity of psychological theories stirs-up another stubborn question that has hung heavy for decades [1]: *is there really a science of psychology?* It is an important question since, even after a century of psychotherapy, the patient doesn’t seem to be getting much better. However, in their quest for acceptance, these fields may be heading towards a precipice of a different kind.

In the search for consensus about what constitutes psychotherapy’s theoretical, empirical and practical core, there’s a danger that if no consensus is reached, regulators, in their preference for standardization and medicalization [2], may overlook the very *human* complexities which require tending to with *‘extraordinary sensitivity’*. While that debate continues on, in another corner, some very clever molecular neuroscientists have been carrying out painstaking and groundbreaking experiments on the memory of neurons.

It’s often said that the human brain is the most complex object in the known universe. It has around 100 billion neurons, roughly the same number of stars in the milky way, and 10 quadrillion connections (that’s the number ten followed by fifteen zeros), and if we used our best brain-imaging technology, it would take dozens of our most advanced microscopes, working around the clock, thousands of years just to collect the data required to map out the wiring of the nervous system with synapse-level detail [3]. Needless to

say, any new insights into the actual workings of this complex apparatus are bound to offer breakthroughs for humanity.

In the early 2000s researchers for the first time were able to identify and demonstrate the molecular mechanisms of the brain which re-appraise emotional memories and transform their emotional tone [4, 5], a process which some researchers are calling *memory reconsolidation*. They initially demonstrated eliminating the fear-conditioning in animals which, after distressing experiences, had become consolidated in the central nervous system, the amygdala and hippocampus. Memory reconsolidation has since been shown in humans. These scientists are fundamentally changing how we think about long-term memory (LTM) and the perceptions and emotional tones which are stored alongside them; it was previously believed that memory went from our immediate experience to then be consolidated and saved for the long-term, and that 'consolidation' made the memory, including its emotional-tone, more or less unchangeable.

For decades therapists, coaches and counselors have found themselves frustrated by their clients' seemingly intractable problems. One common source of frustration are the elusive forces behind their clients' unwanted, long-term feelings and behaviors, where even a deep understanding of the history around those unwanted states does not translate into any real shift on an emotional level for long-term change [6]. With the insights on memory reconsolidation, practitioners, rather than just working on the management of symptoms, can now help their clients eliminate the causes of unwanted conditioning, feelings and behaviors to enable transformational growth as well as permanent healing. So what really makes this kind of transformational change possible? To understand that, we need to cover some of the basics of human memory.

Psychology and neuroscience have divided memory into a few broad categories. We'll be focusing on just two: declarative memory and nondeclarative memory, often referred to as explicit and implicit memory respectively. Declarative, or *explicit* memory, since it has a conscious element, is perhaps the most familiar. It is made up of other forms of memory which store facts (semantic memory) and events (autobiographical and episodic memories). A fact like 'London is the capital of the United Kingdom' and an event such as a prior trip around the city are examples of semantic and autobiographical memory, respectively. Nondeclarative, or *implicit* memories do not have such a conscious element and cannot be consciously brought into awareness. However, they are extremely important and, in the context of *transformation*, especially because implicit memories often combine with declarative memories to add degrees of salience, meaning and emotional value which often have a powerful influence on the nervous system, as well as perception and behavior.

Implicit memory includes non-verbal components like conditioning, body-based habits, automatic emotion-based responses and value-based priming, i.e. implicit memory can be behavioral, emotional, perceptual, or somatosensory, and is often felt in the body. For example, an experienced driver does not need to explicitly remember each of the activities involved in driving a car. Similarly, someone traumatized by a car accident also does not explicitly need to conjure up memories of the incident to be overwhelmed by panic every time they think of stepping into a car; the emotions occur automatically without conscious recall. Both are examples of implicit memory. The driving example is remembered as a body-based procedure and habit (procedural memory). The trauma example is remembered as an emotion-based response to some stimulus (emotional memory), in this case it's the thought of riding in a car. However, nonconscious emotional conditionings, even memories with intense emotions, aren't always the result of dramatic events. Any persistent experience, negative or positive, given enough intensity, can also shape our implicit memory and emotional responses for years, even a lifetime [7].

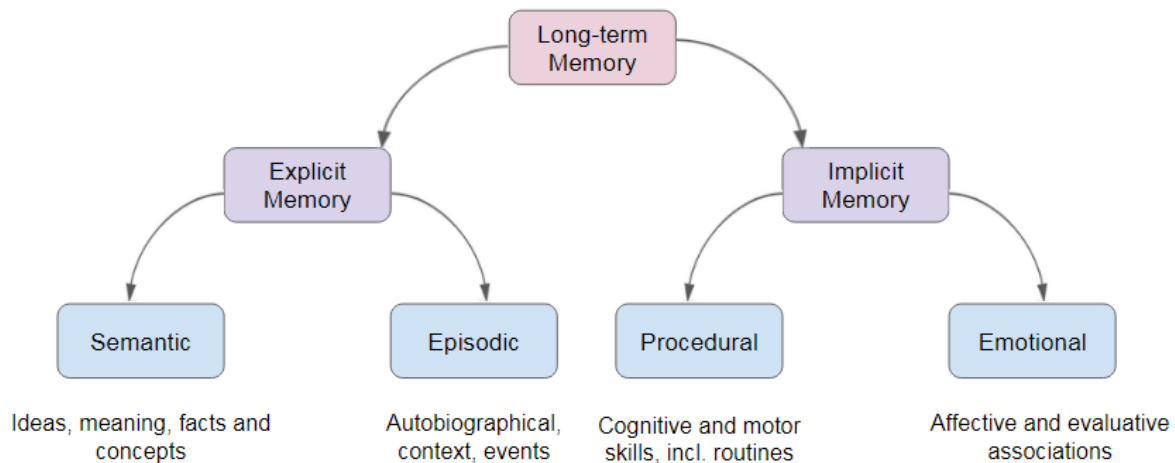


Figure 1. The structure of long-term memory.

Emotions play a key role in the learning processes of our central nervous system [8], which includes the brain. Some events and experiences are given more value than others while others are given little to no value by the same innate processes. During such learning experiences, perceptions and emotions are combined with the nervous systems' physiological and chemical responses to create, update and condition long-term adaptation. These kinds of experiences mobilize long-term synaptic plasticity, a process which encodes explicit and implicit memories as well as their emotional tones into long-term memory (LTM), impressions which can last a lifetime. Memory reconsolidation, the focus of this essay, occurs when existing long-term memories are retrieved, re-encoded and restored back into LTM [8] after being changed in some way. Whereas short-term memory (STM) is transient and only stores information for less than a minute before it starts to dissipate, and thus needs to be rehearsed, LTM requires the induction of long-term synaptic *plasticity* in order to change the signal transmissions and change the strength of connections between neurons, indefinitely. The encoding of STM only involves the modification of preexisting proteins and changes in the strength of preexisting synaptic connections, whereas the encoding of LTM requires the synthesis of new proteins and the growth of new connections [9].

The induction of long-term synaptic plasticity also involves changes to gene expression and regulation, both activation and repression [10]. In short, molecular neuroscience is now demonstrating profound insights around why and how adverse experiences can change us, not just in our feelings, beliefs and behaviors, but also on the levels of neurobiology and physiology, both integral aspects of the nervous system. Yet, the science of memory and neuroplasticity does have good news for us, too.

Just as profoundly negative experiences tend to induce epigenetic and psychological changes, profoundly meaningful experiences can also mobilize the same molecular and neuronal mechanisms for healing, transformation and growth. A transformational approach to developmental practices such as therapy and coaching that effectively apply the neuroscience of memory reconsolidation can influence significant change in very short timeframes. This is true regardless of the category of the conditioning, whether arising from traumatic or distressing experiences, whether related to childhood attachment issues, or related to intergenerational, cultural or developmental issues, or to any other challenging events and experiences from the past or present, whether actual or perceived. The scope for application is so vast because such a transformational approach is informed by the most fundamental building block of human development: the neurobiology. An understanding of the types of memory, and how they are accessed,

can help practitioners identify the root of all types of nonconscious conditionings that give rise to unwanted patterns of thinking, feeling and behaving. This cellular level of our neurobiology is also the place from which all such conditioning can be reconstituted for deep, stable and enduring change.

*Transformational* change through memory reconsolidation occurs through the central nervous system (CNS), the processing center of the entire body. The CNS, largely through the brain, strongly influences patterns of thoughts, feelings, behaviors and motivations. It is where our ongoing experience is integrated and made sense of. The CNS also sends messages to the peripheral nervous system (PNS) that branches out of it and is responsible for mobilizing bodily functions related to various states such as stress (fight-flight-freeze) and renewal (rest and digest). Our responses depend in a large part on the appraisals and signals from the brain, which are informed by our long-term explicit and implicit memories.

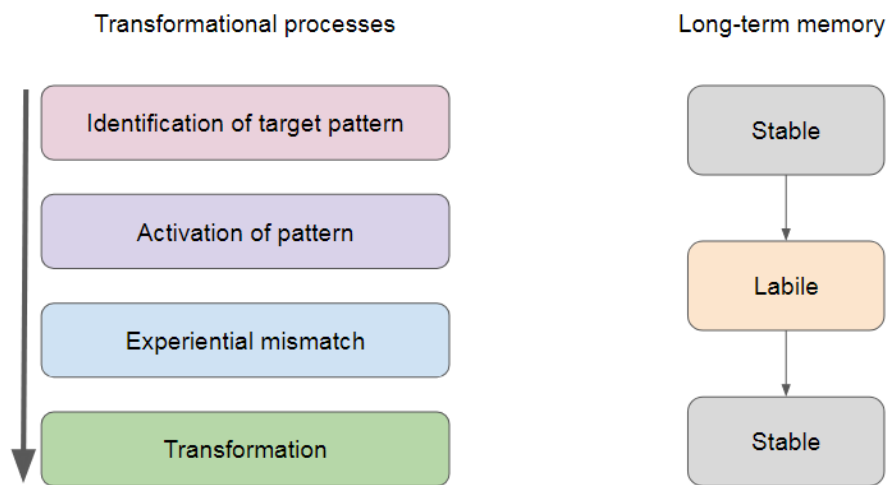


Figure 2. Meta-process for reconsolidation and transformation (adapted from Ecker et al., 2012)

For instance, if someone's past experiences have conditioned their neuronal circuits with certain implicit and explicit memories such that, under certain conditions, they induce perceptions which in turn spark thoughts, emotions and bodily reactions associated with the feeling of inferiority. Now, imagine if a practitioner with knowledge of memory reconsolidation creates the empathic and meaningful experience necessary [11] for this individual's unwanted perceptions and emotional responses, including the associated neuronal circuits, to be accessed, unlocked and reconstituted in long-term memory in such a way which causes the recurring *feeling* of inferiority to cease. Healing and change would take place in that very moment. Moreover, because automatic emotional responses are linked with autobiographical memories of particular past events and with learned rules and assumptions of how to interpret similar situations, memory reconsolidation effectively leads to the transformation of all memory structures [12], a process sometimes known as *adaptive learning*.

An understanding of the integrated nature of emotional, autobiographical/episodic and semantic memory offers practitioners multiple entry-points for engaging their clients and their respective challenges.

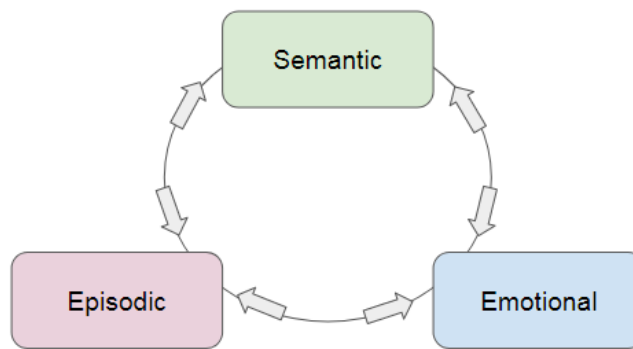


Figure 3. An integrated model of memory (Lane et al., 2014)

### A Case Example

To illustrate an example of such healing and transformational change and how underlying emotional learnings are unlearned, take 40 year-old Emma who began her first session by saying, “I feel like I need to fall apart. I know I have been repressing things for years”. 18 months earlier she had been having suicidal thoughts and, just recently out of work, her situation had raised old anxieties about not knowing what to do with her life and feeling that she was wasting it.

She had been single for six years even though she had wanted to be in a relationship. Nothing in her outer life gave any obvious clues as to the causes of this issue. She had done well in her career, she was financially secure, physically healthy and also very attractive. Yet, she found herself avoiding social situations even though she enjoyed spending time with friends. What was hidden, even to herself, were recurring moods of hopelessness and of unworthiness which would compel her to distract herself through binge-watching Netflix. Even though such distractions would take her mind away from underlying anxieties, they would then bring on feelings of guilt and a sense that she was wasting her life. Though her problem seemed confusing and intractable to her, her anxiety felt very familiar. The long-standing hopelessness had also resulted in a sense of inferiority, negative self-talk, downplaying her accomplishments and feeling inhibited in social situations. Having explored her challenge and some of the symptomatic issues, we co-created the conditions for transformation in which she felt supported, that was safe enough for repressed feelings to have a space in which to emerge and met with sensitivity.

As we engaged in conversation and explored beneath the surface of her conscious awareness, she touched on a painful feeling which bubbled-up as an overwhelming sadness about being inherently insignificant. Here was the old, long-term, implicit memory which had been influencing her life as the background of her experience over several decades and was responsible for many of her unwanted behaviors. Having the support of a safe space, it was possible for her to consciously hold her experience without becoming overwhelmed or shutting-down. This allowed her, perhaps for the first time, to fully experience the painful feelings which were being repressed. We were in the process of creating the profoundly meaningful and transformative experience that is required for memory reconsolidation.

Later in the session Emma was able to acknowledge several events and experiences from her past, especially childhood, where she had felt deeply distressed by the actions of others and which had left her with underlying feelings of worthlessness. As well as guiding Emma in fully experiencing the

feelings from past memories, I also created the conditions in which she had several moments of insight which directly and strikingly contrasted the feelings of worthlessness. However, rather than opposing her feelings, these moments of insight were embodied experiences in which we compassionately included the unwanted feelings while also transcending them. This invocation of mismatching knowledge activated the central nervous system and its function to accommodate the contrasting exceptions that had just been encountered. This event would also activate memory reconsolidation and, in turn, Emma's memories would shed the disempowering emotions associated with worthlessness.

In the week immediately following the session Emma reported back to me, feeling delighted with how her experience of life had shifted in pleasant and remarkable ways. She was experiencing an effortless sense of lightness and joy. She found herself making more eye contact with people and smiling more. She was enjoying initiating conversations with strangers without being overwhelmed by nerves, and was pleasantly surprised by her spontaneous interactions with others. It was perhaps a newfound sense of openness and self-acceptance that explained her observation: "things have taken a 180 degree turn. I've actually been leaning into life". Oh, and after striking up a conversation with a fellow jogger on her usual route, she began to date again.

As moving and impactful as such experiences are for persons engaged in transformational work, there are other implications which are also worth noting.

Consistent and effective ways of accessing the nervous systems innate capacity for *responsive adaptation* and transformation would mean that enduring change and deep healing would no longer be an elusive, hit-and-miss affair; there'd be a profound release from the causes of the client's problem in significantly fewer sessions. Transformational interventions would mean that the practitioners could put aside the many theories of psychology and be fully present to the client in order to elicit the unwanted and redundant adaptations, including trauma conditioning, so that limiting ways of being can be reconstituted through memory reconsolidation. Knowledge and application of the neuroscience of transformation would mean that a wide-range of techniques could be adapted to harness the *universal* processes of neuroplasticity, adaptive learning and memory reconsolidation.

A large-scale integration of MR into therapy would also plant the seed for a significant leap in the effectiveness of therapeutic interventions. Democratizing the *neuroscience of transformation* could mean that dormant human potentials can be more readily realized to enable individuals to lead more fulfilling, healthier and productive lives. Interventions such as coaching would also benefit from MR by becoming more effective at developing leaders and their capacities to work with the ever increasing complexity of our fast, evolving world.

As the opening quote to the article noted, perhaps it's time for a humanistic (r)evolution.

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