A Primer on Memory Reconsolidation and its Psychotherapeutic Use as a Core Process of Profound Change

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Adapted for *The Neuropsychotherapist* from

Unlocking the Emotional Brain: Eliminating Symptoms at Their Roots Using Memory Reconsolidation

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Routledge, 2012

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Emotional learnings underlie and drive the vast majority of unwanted behaviors, emotions, thoughts and somatization addressed in psychotherapy. For example, consider a man in his early 40s suffering from pervasive social anxiety, who seeks relief in therapy. He is guided by the therapist to bring attention into what he is actually experiencing emotionally and somatically when among people, and for the first time in his life he becomes explicitly aware of expecting harsh rejection from others if he were to "say or do anything wrong." This previously non-conscious but fear-generating expectation had wordlessly defined the world of people for as long as he could remember. His emotional brain had learned this implicit model of how human beings respond from many, many frightening interactions with his explosively angry, rejecting father in childhood, plus a few sizable reinforcements by two schoolteachers, male and female.

His autobiographical memory and conscious narratives contained much about suffering his father's anger, but nothing about the generalized model that he carried into all social situations, so his social anxiety had been for him a mysterious affliction. With the shift from implicit to explicit knowing of what he had learned to expect, his anxiety now made deep sense to him as the emotion that naturally accompanied his living knowledge of how people respond. These learned constructs had never appeared in his conscious experience of anxiety. Such implicit constructs and models formed in emotional learning are well-defined, yet rarely show up in conscious experience themselves, much as a colored lens just in front of the eye is not itself visible.

A vast range of miseries is maintained by non-conscious emotional learnings, such as depression that is really the deeply forlorn state of having learned from cold, critical parents that one is unworthy of love. Being completely unaware of one's own most life-shaping learnings is remarkably commonplace. Unfading across the decades, emotional learnings display an inherent tenacity that is the bane of psychotherapists and their clients, yet this extraordinary durability appears to be a survival-positive result of natural selection, which crafted the brain such that any learning that occurs in the presence of strong emotion—such as core beliefs, constructs and coping tactics formed in the midst of childhood suffering—becomes locked into subcortical implicit memory circuits by special synapses (see for example LeDoux, Romanski & Xagoraris, 1989; McGaugh, 1989; McGaugh & Roozendaal, 2002; Roozendaal, McEwen, & Chattarji, 2009).

And it appeared that natural selection had not created a key for that synaptic lock. After more than 60 years of research on the extinction of acquired responses in animals and humans, neuroscientists had concluded by 1989 that the *consolidation* of a learning in emotional memory was a one-way street, making consolidated learnings indelible, unerasable, for the lifetime of the individual. Acquired emotional responses could certainly be suppressed temporarily in various ways, such as when an exposure procedure suppresses fear learnings through the process of extinction, or through methods of affective regulation (for example, teaching relaxation techniques to counteract anxiety or building up resources and positive thoughts to counteract depression). However, the research had shown that such counteractive measures do not actually dissolve or erase the original, problematic emotional learning (Bouton, 2004; Foa & McNally, 1996; Milner, Squire, & Kandel, 1998; Phelps, Delgado, Nearing, & LeDoux, 2004). Rather, they only create a second, preferred learning that competes against and can regulate or override an unwanted response under ideal conditions, but usually not for long under real-life conditions. Relapses are almost inevitable, particularly in new or stressful situations. No wonder therapists and clients often feel they are struggling against some unrelenting but invisible force.

Indelibility implied that despite their limitations, counteractive methods were the only possible psychotherapeutic strategy for reducing symptoms based in emotional memory. Their extreme durability makes negative emotional learnings one

of the biggest causes of suffering in human life, and it seemed we were forever stuck with them.

The reconsolidation breakthrough

From 1997 to 2000, however, a major breakthrough occurred in our understanding of how emotional memory works. Several studies by neuroscientists showed that the brain does come equipped with a key to those locked synapses after all (Nader, Schafe, & LeDoux, 2000; Przybyslawski, Roullet, & Sara, 1999; Przybyslawski & Sara, 1997; Roullet & Sara, 1998; Sara, 2000; Sekiguchi, Yamada, & Suzuki, 1997). Working with animals, researchers had reactivated a target emotional learning and then found that its locked neural circuit had temporarily shifted back into an unlocked, de-consolidated, labile, destabilized or plastic state, which allowed the learning to be completely nullified, along with behavioral responses it had been driving. The labile circuit soon consolidates once again, returning it to a locked condition, which is why researchers named this newly discovered type of neuroplasticity *memory reconsolidation*. (The term "reconsolidation" is used by neuroscientists in two ways, however. It can denote the relocking of synapses in the final step of the natural process of synaptic unlocking and relocking, but it can also refer to the overall process of unlocking, revising and then relocking the synapses encoding a specific memory. The intended meaning is usually clear from the context.)

The pivotal research that guides use of reconsolidation in psychotherapy came when Argentinian neuroscientists Pedreira, Pérez-Cuesta and Maldonado (2004) showed that memory reactivation alone was not sufficient for unlocking the synapses encoding a target learning. They identified a critical experience, described below, that is required in addition to the experience of reactivation in order to unlock a target learning. This full map of the brain's built-in process for unlocking an emotional learning, allowing new learning to fundamentally unlearn, rewrite and eliminate it during the labile period, is of momentous significance for the psychotherapy field.

It's now clear that the consolidation of emotional memory is not, as had been believed for a century, a one-time, final process, and that emotional learnings are not indelible. Rather, neural circuits encoding an emotional learning can be returned to a de-consolidated state, allowing erasure by new learnings before a relocking—or recon-

Table 1
Symptoms observed dispelled by the reconsolidation process as carried out in Coherence Therapy*

Symptoms Dispelled	
Aggressive behavior	Food/eating/weight problems
Agoraphobia	Grief and bereavement problems
Alcohol abuse	Guilt
Anger and rage	Hallucinations
Anxiety	Inaction
Attachment-pattern behaviors & distress	Indecision
Attention deficit problems	Low self-worth
Codependency	Panic attacks
Complex trauma symptomology	Perfectionism
Compulsive behaviors of many kinds	Post-traumatic symptoms
Couples' problems of conflict/communication/closeness	Procrastination
	Psychogenic/psychosomatic pain
Depression	Sexual problems
Family and child problems	Underachieving
Fidgeting	Voice and speaking problems

*An online bibliography of published case examples indexed by symptom is available at http://www.coherencetherapy.org/files/ct-case-index.pdf

solidation—takes place. Counteracting and regulating unwanted acquired responses is *not* the best one can do because emotional learnings can be dissolved, not just suppressed. (There are, however, certain clinical situations, including severe crises and emergencies, in which use of counteractive methods remains primary.)

Neuroscientists have also shown that after a learned emotional response has been eliminated through the reconsolidation process, the individual still remembers the experiences in which the response was acquired—as well as the fact of having had the response—but the emotional response itself is no longer re-evoked by remembering those experiences. This finding that *autobiographical* memory is not impaired by erasure of a piece of emotional memory reflects the well established anatomical separateness of different types of memory, which allows erasure of a specific emotional learning stored in an emotional implicit memory network without affecting the contents of autobiographical, narrative memory stored in a neocortical, explicit memory network.

The critical sequence of experiences identified by Pedreira et al. was subsequently confirmed by many other studies (see listing in Ecker, Ticic & Hulley, 2012). The use of this sequence with human subjects can be seen in controlled studies that eliminated operant conditioning in infants (Galluccio, 2005), classical fear conditioning (Schiller, Monfils, Raio, Johnson, LeDoux & Phelps, 2010), and cue-triggered heroin cravings (Xue et al., 2012).

Psychotherapists in the early 1990's had identified the same sequence of critical experiences, culling it from many observations of profound change events in therapy, that is, events resulting in permanent cessation of a longstanding emotional response and associated symptoms (Ecker & Hulley, 1996, 2000a, 2000b). Ecker and Hulley developed the sequence into a therapeutic methodology (now known as Coherence Therapy, formerly Depth Oriented Brief Therapy) and have observed its effectiveness for dispelling a wide range of symptoms and problems at their emotional roots (see Table 1). That this methodology was capable of dissolving acquired, implicit emotional schemas was later fortuitously corroborated by reconsolidation research.

It is clear, though, that no single school of psychotherapy "owns" the process that induces memory reconsolidation because it is a universal process, inherent in the brain. We believe this process is often carried out in quite a few psychotherapies of transformational change (see Table 2), even though in most of these the steps of the reconsolidation process are not explicitly identified within the therapy system's own set of concepts, terms and methods. However, carrying out the steps of the process *knowingly* can significantly increase a practitioner's frequency of achieving powerful therapeutic results, as we have seen in the course of many years of training work.

Memory reconsolidation is the only known form of neuroplasticity capable of deleting an emotional learning, so we may infer that the requisite steps must have taken place whenever therapy of any kind yields a lasting disappearance of a longstanding response pattern. With clear knowledge of the brain's own rules for deleting emotional learnings through mem-

Table 2
Some of the focused, experiential, in-depth psychotherapies that are congenial to fulfilling the therapeutic reconsolidation process

Psychotherapy
Accelerated Experiential Dynamic Psychotherapy (AEDP)
Coherence Therapy* (formerly Depth Oriented Brief Therapy*)
Eye Movement Desensitization and Reprocessing (EMDR)*
Emotion-Focused Therapy (EFT)*
Focusing-Oriented Psychotherapy
Gestalt Therapy
Hakomi
Internal Family Systems Therapy (IFS)
Interpersonal Neurobiology (IPNB)*
Neuro-Linguistic Programming (NLP)
Traumatic Incident Reduction (TIR)

* Therapies for which reconsolidation has been cited as mechanism of change in publications by founders or leading exponents (see text)

Memory reconsolidation is the only known form of neuroplasticity capable of deleting an emotional learning

ory reconsolidation, therapists no longer have to rely largely on speculative theory, intuition or luck for facilitating powerful, liberating shifts.

Neuroscientists verify erasure of an emotional learning by observing these distinctive markers of change:

- *Non-reactivation:* A specific emotional reaction abruptly and lastingly can no longer be reactivated by cues and triggers that formerly did so or by other stressful situations.
- *Symptom cessation:* Symptoms of behavior, emotion, somatics or thought that were expressions of that emotional reaction also disappear permanently.
- *Effortless permanence:* Non-recurrence of the emotional reaction and symptoms continues without counteractive or preventative measures of any kind.

In therapy too, these are the all-important markers of transformational change—the ideal result of therapy—as distinct from incremental change through counteractive methods that compete against, but do not actually eliminate, the emotional roots of the person's symptoms. (For more extensive discussion of counteractive versus transformational change, see Toomey & Ecker, 2009.) According to current neuroscience, whenever these markers are observed and firmly established in clinical work, erasure via reconsolidation is a valid inference. On the basis of that logic, proponents of several psychotherapies of transformational change have inferred that reconsolidation must be the neurobiological mechanism of change induced by their methods: Coherence Therapy (Ecker, 2006, 2008; Ecker & Hulley, 2011; Ecker & Toomey, 2008), Emotion-Focused Therapy or EFT (Greenberg, 2010, 2012), exposure with acupoint tapping (Feinstein, 2010), Eye Movement Desensitization and Reprocessing or EMDR (Solomon & Shapiro, 2008), Interpersonal Neurobiology or IPNB (Badenoch, 2011), and psychoanalytic therapy (Gorman & Roose, 2011). In addition, the demonstrated effectiveness of an imaginal reenactment protocol for dispelling post-traumatic symptoms has been attributed to reconsolidation (Högberg, Nardo, Hällström & Pagani, 2011).

How Reconsolidation Works

Reconsolidation has been demonstrated with nematodes, honeybees, snails, sea slugs, fish, crabs, chicks, mice, rats and humans, for a wide range of different types of emotional learning and memory as well as for non-emotional memory, such as motor memory and semantic (factual) memory, corresponding to memory networks in many different anatomical regions of the brain (reviewed in Nader & Einarsson, 2010). For clinical purposes, however, we are concerned mainly with emotional memory, so our discussion of reconsolidation is focused in that area. Happily, it isn't necessary for therapists to consider details of brain anatomy because the sequence of experiences that launches reconsolidation is the same for all regions and types of memory studied.

Requirements for de-consolidation: reactivation plus mismatch. As noted above, researchers' early inference that memory reactivation alone destabilizes a memory's neural circuits was overturned in 2004 by the demonstration, in an animal study, that in order for de-consolidation to occur, a critical additional experience must take place while the memory is still reac-

tivated (Pedreira et al., 2004). This second experience consists of perceptions that vividly mismatch—that is, deviate saliently from—what the reactivated target memory expects and predicts about how the world functions. Many subsequent studies also have demonstrated this requirement of mismatch for inducing de-consolidation (summarized by Ecker et al., 2012). Interestingly, the mismatch can be either a full contradiction and disconfirmation of the target memory or a novel, salient variation relative to the target memory.

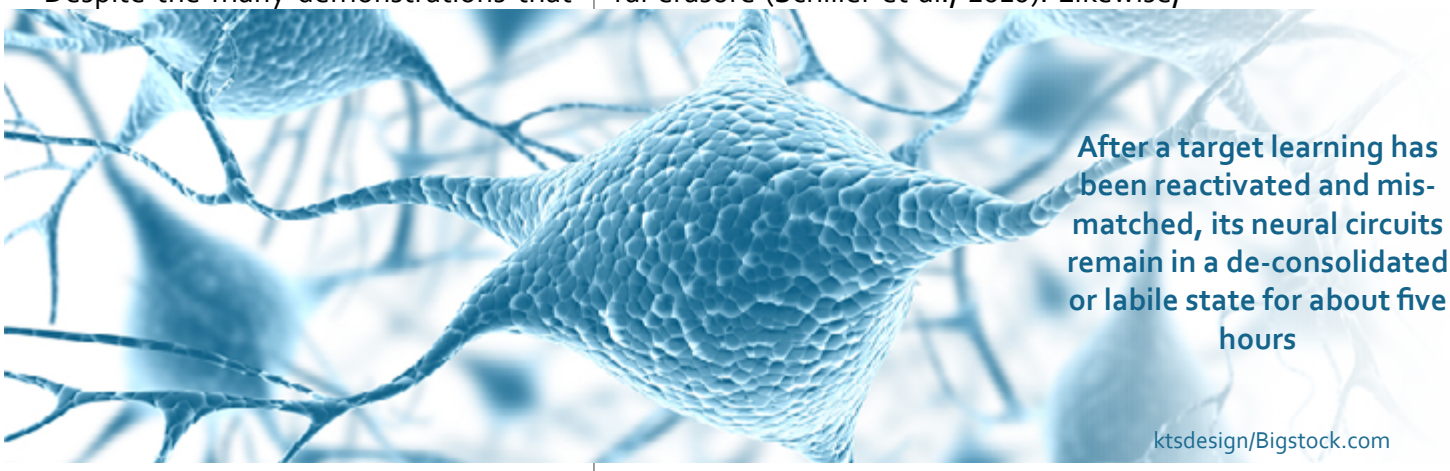
If the target memory is reactivated by familiar cues but not concurrently mismatched, synapses do not unlock and reconsolidation is not induced (e.g., Cammarota, Bevilaqua, Medina & Izquierdo, 2004; Hernandez & Kelley, 2004; Mileusnic, Lancashire & Rose, 2005).

In an article reviewing the research, Lee (2009, p. 417) wrote, "It is not simply that memory reactivation must differ in some manner to conditioning.... Instead, reconsolidation is triggered by a violation of expectation based upon prior learning, whether such a violation is qualitative (the outcome not occurring at all) or quantitative (the magnitude of the outcome not being fully predicted)." Lee proposed that "the existence of a prediction error signal [from some brain region] might be a crucial pre-requisite for reconsolidation to be triggered" (p. 419).

Despite the many demonstrations that reactivation alone does not induce reconsolidation, the early, premature conclusion that an emotional memory unlocks with every reactivation continues to be promulgated by science journalists and even some neuroscientists. They appear to be unaware of the well-established mismatch requirement, which may reflect the not uncommon time lag for widespread recognition of all findings in any rapidly emerging, complex field.

Reconsolidation window. After a target learning has been reactivated and mismatched, its neural circuits remain in a de-consolidated or labile state for about five hours, as demonstrated by a variety of animal and human studies (Duvarci & Nader, 2004; Pedreira, Pérez-Cuesta & Maldonado, 2002; Pedreira & Maldonado, 2003; Schiller et al., 2010; Walker, Brakefield, Hobson & Stickgold, 2003). It is during this "reconsolidation window" that the target learning is directly revisable by new learning and can be radically unlearned and, as a result, no longer exist in emotional memory (without impairing autobiographical memory). After five hours the labile neural circuits naturally reconsolidate and can no longer be altered by new learning, until reactivation and mismatch experiences are again created.

Precision of erasure. When a de-consolidated memory is unlearned and erased, erasure is limited to precisely the reactivated target learning, without impairing other closely linked emotional learnings that have not been directly reactivated. This was shown both in an animal study using chemically induced erasure (Debiec, Doyère, Nader, & LeDoux, 2006) and in a human study using endogenous, behavioral erasure (Schiller et al., 2010). Likewise, Kindt, Soeter, and Vervliet (2009) demonstrated in a human study that erasure of a learned fear did not impair autobiographical memory of the experiences in which subjects had acquired the conditioned fear response.



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Reconsolidation versus extinction. Researchers have shown that reconsolidation and extinction are neurologically distinct processes (Duvarci & Nader, 2004; Duvarci, Mamou, & Nader, 2006) and that they can occur either entirely independently of each other or simultaneously with a complex interaction. As noted earlier, it's well established that extinction training forms a separate learning in a physically separate memory system from that of the target learning, and that the extinction learning competes against, but does not unlearn or replace, the target learning. In contrast, reconsolidation allows a new learning to act upon the target learning directly, erasing it if the new learning contradicts and disconfirms the original learning.

Some studies have used a protocol identical to extinction training during the reconsolidation window to create the new learning that contradicts and erases the target learning (e.g., Monfils, Cowansage, Klan & LeDoux, 2009; Quirk et al., 2010; Schiller et al., 2010; Xue et al., 2012). Robust, long-lasting erasure is observed to result, so it is apparent that the *neurological* effect created by this special use of "extinction training" is not extinction (the creation of a separate, competing learning) but rather erasure via reconsolidation (the updating of the target learning by the contradictory learning). If, however, the same protocol is applied after the window has closed, only extinction results. Thus a particular behavioral learning procedure can have quite different neurological effects and behavioral consequences depending on whether or not it is carried out during the reconsolidation window. "Reconsolidation cannot be reduced down to facilitated extinction" was the conclusion of the study by Duvarci and Nader (2004, p. 9269). When the procedure traditionally termed "extinction training" is applied during the reconsolidation window and the result is unambiguously not extinction, the procedure in that instance could more appropriately be labeled "memory update training" rather than "extinction training" to avoid conceptual errors and confusion. Indeed, the beauty of the reconsolidation window is that during that window, to unlearn is to erase.

However, the century-old, deeply familiar label of "extinction" has tenaciously stuck with this protocol even in the situation just described where it does not produce extinction. Researchers (and science journalists) typically refer to this procedure as, for example, "extinction-induced erasure," "extinction training during reconsolidation," the "memory retrieval-extinction procedure," and "erasing fear memories with extinction training." We describe this potentially misleading situation here so that our readers may be spared some unnecessary confusion. The extinction training protocol is well suited to research requirements because of its simple, well-defined structured, but it is only one of a potentially unlimited number of forms in which new learning may occur during the reconsolidation window.

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Mismatch/unlock. With reactivation occurring, create an experience that is significantly at variance with the target learning's model and expectations of how the world functions

Utilizing memory reconsolidation in psychotherapy

Summarizing the discussion above, we now know, from both reconsolidation research and clinical observations, that the behavioral process of transformational change of an existing emotional learning—following the brain's rules for unlearning and erasing a target learning—consists of these three steps:

1. **Reactivate.** Re-trigger/re-evoke the target knowledge by presenting salient cues or contexts from the original learning.
2. **Mismatch/unlock.** With reactivation occurring, create an experience that is significantly at variance with the target learning's model and expectations of how the world functions. This step unlocks synapses and renders memory circuits labile, i.e., susceptible to being updated by new learning.
3. **Erase or revise via new learning.** During a window of about five hours before synapses have relocked, create a new learning experience that contradicts (for erasing) or supplements (for revising) the labile target knowledge. (This new learning experience may be the same as or different from the experience used for mismatch in step 2; if it is the same, step 3 consists of repetitions of step 2.)

After this three-step sequence, researchers also conduct an erasure verification step consisting of behavioral tests that determine whether the markers of erasure, listed above, are observed. We refer to this as step V (for verification) and carry it out in therapy also.

Steps 1-2-3 above, which we call the *transformation sequence*, appears to have the potential for a significant enhancement of the practice of psychotherapy, because it is the brain's built-in core process for transformational change of acquired responses. Importantly, this sequence is a series of experiences defined without reference to specific techniques for bringing about those experiences. This means that in its application to psychotherapy, it can be carried out by therapists using their own choices of experiential techniques from a range of possibilities that may well be limited only by the inventiveness of therapists. The erasure sequence is a theory-independent, universal meta-process, and as such it can richly foster integration within the psychotherapy field. In *Unlocking the Emotional Brain* we examine case studies from five different experiential psychotherapies with methods that differ greatly from one another—AEDP, Coherence Therapy, EMDR, EFT and IPNB—and we show that all three steps of the transformation sequence are detectable in the implementation of each therapy and appear to be responsible for the effectiveness of each in bringing about transformational change (Ecker et al., 2012). This sequence, therefore, may serve as a cross-platform map and shared language with which practitioners, researchers and clinical teachers and trainers can understand and communicate about diverse psychotherapies in a unified, meaningful manner.

Dwell with us for a moment on the "new learning" that serves to rewrite and erase the target learning in step 3 above. Quite differing forms of new learning have been


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used in the many research studies of endogenous reconsolidation. For clinical use, what is clear is that the new learning must feel decisively *real* to the person based on his or her own living experience. In other words, it must be experiential learning as distinct from conceptual, intellectual learning, though it may be accompanied by the latter. It is often extremely useful to guide new learning experiences in imagination, taking advantage of the fact that the emotional brain hardly distinguishes between imaginally and physically enacted experiences (as demonstrated empirically by, for example, Kreiman, Koch & Fried, 2000).

Carrying out each step of the transformation sequence requires detailed knowledge of the target emotional learning, but a psychotherapist is of course initially completely in the dark about that with each new client. Neuroscientists, in contrast, know all details of the target learning because in a reconsolidation study they first create the emotional learning to be erased. Instilling that learning in subjects occurs on day 1 of any given lab study. Then, on day 2, they make use of their knowledge of the target learning in every step of the three-step process of erasure—reactivation of the target learning; creation of an experience of mismatch of the target learning; and creation of an experience of new learning that contradicts and rewrites (and thereby erases the content of) the target learning. Researchers could not carry out these crucial three steps for erasure if they did not know the specific content of the target learning.

It follows, then, that in therapy some preparational steps are necessary in order to gain access to the ingredients needed for following the recipe of the transformation sequence. The ingredients that have to be gathered by the therapist from the client are accurate knowledge of (A) the specific symptoms to be dispelled, (B) the specific emotional learnings generating those symptoms, and (C) experiences that vividly contradict those emotional learnings. As soon as those three items are in hand, the transformation sequence is then carried out.

As a rule, the emotional learnings maintaining a therapy client's symptoms are not conscious at the start of therapy, and they are areas of deep vulnerability and some complexity. *Retrieving* them into explicit awareness for step B typically constitutes the majority of the therapeutic work. Various psychotherapies (see Table 2) have developed specialized, focused methods for this in-depth retrieval work, and often it can be carried out in just a few sessions—and sometimes in only one or two sessions—though of course the number of sessions increases commensurate with the complexity and severity of the case.

On the basis of knowing the specific makeup of the client's retrieved, underlying learning, the therapist then begins step C, the task of *finding* a vivid, contradictory experience to be used both for mismatch in step 2 of the transformation sequence and for new learning in step 3. Finding mismatch material means finding living knowledge from the client's own experience or creating a new experience that contradicts the target learning. Either can serve as knowledge that contradicts, rewrites and eradicates the target learning.

Thus in the clinical situation, a preparatory process consisting of the following three steps is needed initially in order to carry out the transformation sequence identified in reconsolidation research:

A. Symptom identification. Actively clarify with the client *what* to regard as

the presenting symptom(s)—the specific behaviors, somatics, emotions, and/or thoughts that the client wants to eliminate—and *when* they happen, that is, the percepts and contexts that evoke or intensify them. This information is needed for embarking upon step B efficiently.

B. Retrieval of target learning. Retrieve into explicit awareness, as a visceral emotional experience, the details of the emotional learning or schema underlying and driving the presenting symptom. Knowledge of this material in turn allows the therapist to carry out step C, identification of disconfirming knowledge.

C. Identification of disconfirming knowledge. Identify a vivid experience (past or present) that can serve as living knowledge that is fundamentally incompatible with the model of reality in the target emotional learning retrieved in step B, such that both cannot possibly be true. The disconfirming material may or may not be appealing to the client as being more "positive" or preferred; what matters is that it be mutually exclusive, ontologically, with the target learning. It may be already part of the client's personal knowledge or may be created by a new experience. It will be used to carry out step 2 of the erasure sequence—the mismatch that destabilizes the target learning.

By systematically seeing to the fulfillment of the seven steps, A-B-C-1-2-3-V, therapists can bring about liberating therapeutic shifts with optimum efficiency and consistency. We refer to the full seven-step sequence as the *therapeutic reconsolidation process* (see Table 3).

Case illustration

Our example of the man with social anxiety can illustrate how the process unfolds, though here only a brief sketch is possible. (For detailed case studies, see Ecker et al., 2012.) The therapist in this case was a practitioner of Coherence Therapy, which has a methodology that explicitly guides steps A-B-C-1-2-3-V (Ecker & Hulley, 2011).

The man initially described his problem as feeling tense, anxious, tight and held-back whenever he was among people, with a long list of unhappy results in his life. This was enough of step A, symptom identification, to begin step B, the retrieval of the coherent emotional learnings that were necessitating his anxiety around people. Revisiting a specific recent instance, the therapist said, "Some part of you seems to know something about how it isn't safe around people. You're aware of feeling tightly held back from expressing yourself, so see if you can let this part of you that knows and feels the jeopardy finish this sentence, without pre-thinking it: 'I better not just say whatever's on my mind here, because if I did—.'" What arose spontaneously to finish the sentence wasn't words; it was the image of his father spewing anger. The therapist asked, "Was it with him that you learned it wasn't safe to express yourself?" He then described a childhood riddled with bullets of harsh, piercing anger from his father. Dad would bellow, for example, "How can you be so *stupid*!" over even the smallest of mistakes. By the end

Table 3
Steps of Process for Clinical Application of Memory Reconsolidation

Therapeutic Reconsolidation Process	
I. Accessing sequence (preparation)	A. Symptom identification B. Retrieval of target learning (symptom-requiring schema) C. Identification of disconfirming knowledge
II. Transformation sequence	1. Reactivation of symptom-requiring schema (B) 2. Activation of disconfirming knowledge (C), mismatching symptom-requiring schema (B) 3. Repetitions of (B)-(C) pairing
III. Verification	V. Observations of: --Emotional non-reactivation --Symptom cessation --Effortless permanence

of his first session, with the therapist's facilitation the client was lucidly feeling and verbalizing his previously non-conscious knowledge that "If my own dad hates me and rejects me for doing or saying anything wrong, then everyone else will too, because I'm too stupid to be accepted or loved, and that's terrifying for me, and my only safety is in holding everything back and staying as unnoticed and invisible as I possibly can."

Once retrieved from implicit to explicit knowing, this material may seem obvious, but it was very new and emotional for this man to face and feel it. The therapist wrote those words on an index card and handed it to him for daily reading between sessions—a task of integration of this newly discovered emotional schema, or what is called the *emotional truth of the symptom* in Coherence Therapy, into everyday, conscious awareness.

Emotional learning consists of much more than stored memory of the "raw data" of what one's senses were registering and what emotions one was experiencing during an original experience. Also learned—in implicit memory—is a constructed *mental model*, or schema, of how the world functions, which is the individual's abstracting and generalizing of the raw data of perception and emotion (Held, Vosgerau & Knauff, 2006; Siegel, 1999). This model is created and stored with no awareness of doing so. It does not exist in words, but is no less well-defined or coherent for that. The emotional brain thereafter actively uses this model or schema for self-protectively *anticipating* similar experiences in the future and recognizing them instantly when, according to the model or schema, they appear to be occurring. Emotional memory converts the past into an expectation of the future, without our awareness, and that is both a blessing and a curse. It is a blessing because we rely daily on emotional implicit memory to navigate deftly through all sorts of situations without having to go through the slow, labor-intensive process of figuring out, conceptually and verbally, what to do; we simply know what to do and we know it quickly. It is easy to take for granted the efficiency and speed with which we access and are guided by a vast library of implicit knowings. Yet our emotional implicit memory is also a curse because it makes the worst experiences in our past persist as felt emotional realities in the present.


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The man initially described his problem as feeling tense, anxious, tight and held-back whenever he was among people, with a long list of unhappy results in his life.

This was enough of step A, symptom identification, to begin step B, the retrieval of the coherent emotional learnings that were necessitating his anxiety around people.

The therapist, familiar now with the specific make-up of the client's symptom-generating emotional learning, could begin step C next, the search for contradictory, disconfirming knowledge. This man's implicit learning with Dad had generalized to all other people, as is often the case. So, early in the second session, the therapist said, "I wonder if we could find any experiences you've had where you made a mistake that was visible to the other person, but he or she *didn't* respond in an angry, rejecting way like Dad would do. Which of those experiences really stand out, in your life?" The man remembered a few and mentioned them in a detached, off-hand manner. With that information completing the A-B-C preparatory work, the therapist could now carry out the 1-2-3 process of reconsolidation and transformational change, as follows.

The therapist began, "Let's review now, for a few minutes, the whole range of your experiences with making mistakes—and it would be good if you could allow the *feelings* of what we'll revisit, along with the ide-

as." With a somewhat softer, slower voice the therapist then led step 1, the reactivation of the target learning, by saying, "On one side is all those many times when dad became so angry and rejecting over some mistake you made, and that was so painful and so scary for you, and you really expected, ever after, that most everyone else would also reject you harshly for any mistake, as though it was apparent to everyone that you are too stupid to be accepted or loved. Can you feel that expectation in your body?" The man, who was gazing at the floor as he allowed the experience being guided, simply nodded.

The therapist then rolled seamlessly into step 2, the mismatch by contradictory living knowledge, by saying, with a slight pause after each sentence, "Ok. And on the other side, what you actually have experienced is all sorts of people who remain *friendly and relaxed* when they see that you've made a mistake. The *store clerk* was friendly and relaxed when you returned the book because you'd bought the wrong one. Your *co-worker* was friendly and relaxed just last week about your mistake of sending him the May figures when he had asked for the April figures. Your *twelfth grade teacher* was friendly and relaxed about the mistake you made about the structure of the final paper. Your *college advisor* was friendly and relaxed about your mistake over the materials he needed from you. All these people have been so *different* from Dad."

This completed step 2, the mismatch that juxtaposed his expectation of harsh rejection side-by-side with his clear experiences of non-rejection for making a mistake. He had never before held those experiences next to each other, in the same field of awareness. According to reconsolidation research, that juxtaposition, with each of the two experiences feeling very real while also feeling that both cannot possibly be true, is what accomplishes the neurological marvel of unlocking the synapses of the target learning.

The therapist now asked, "What are you feeling?" The man said he was feeling "sort of surprised, and sort of relieved." This was an initial indication that he had experienced the juxtaposition in the intended manner.


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For step 3—the new learning that will rewrite and replace the target learning—Coherence Therapy simply repeats the same juxtaposition experience from step 2 several more times during the rest of the session. This can be done as a structured technique of reguiding or in a more naturalistic manner by simply expressing empathy for or interest in the juxtaposition experience itself—for example, by saying, "I'm wondering, how is it for you to be in touch with both sides like this—your deep old expectation that most everyone will react harshly like Dad to any mistake, and your own observations again and again that most people *don't* react like Dad to a mistake you've made, and instead they stay friendly and relaxed? How is it for you to be in touch with both?" That natural query guides the client once again to bring attention to and to feel both at once, for a repetition of the juxtaposition experience. Then, in the course of continuing to debrief the experience, the therapist can easily find more opportunities to yet again guide the client's attention to resample the juxtaposition. After some three or four repetitions, the 1-2-3 transformation sequence is complete.

The therapist again prepared an index card for daily reading, this time with

The completion of step 2:

The mismatch that juxtaposed his expectation of harsh rejection side-by-side with his clear experiences of non-rejection for making a mistake.

He had never before held those experiences next to each other, in the same field of awareness.

words that would keep recreating the juxtaposition experience: "I really expect that my saying or doing something wrong will mean to *everybody* what it always meant to Dad—that I deserve angry rejection for being so stupid—and yet, look at all these people who stayed friendly and kind and *didn't* react like Dad."

The next session began with the therapist asking how it had been to stay in touch with what was on the card and how his anxiety had been. He explained that in both his weekly group meeting at work and at a friend's birthday party he had felt only a "mild edginess that's maybe about normal" and was able to participate, if somewhat awkwardly, in conversation, instead of being silenced by anxiety. The absence of his symptoms in these two situations that formerly triggered them were key markers that began to accomplish step V, verification of erasure of the target learning, his generalization to all people of Dad's responses.

Dissolution of the target learning isn't always the end of the therapeutic process, however, because the unlearning of a model in one area can have direct ripple effects on models in other important areas of personal meaning, with emotional consequences that need to be resolved. This kind of process was indicated when the client added, "But it wasn't exactly a walk in the park like I thought at first it would be because, well, if everybody *isn't* like Dad—if most people *aren't* like that—now Dad looks really mean. Now I feel like I have this cruel father, and I've been pretty agitated about that." The next several sessions moved through the man's feelings of anger, a need for accountability from his father, and grieving, all of which arose from his shifted perception of his father.

Clinical experience has shown us that when significant emotional issues emerge in response to erasure, it is the resolution of these emotional issues that allows erasure to hold. In other words, in the domain of the complex emotional learnings created by humans, an existing model of reality is allowed to dissolve, or not, depending on whether the emotional results feel tolerable to the person both consciously and unconsciously. Successful erasure is not purely a bottom-up, mechanistic or neurological process, but rather is governed in a more top-down manner by the personal meanings and feelings involved.

As a short, basic illustration, our case example was free of various types of complication that develop with some clients at any of the steps A-B-C-1-2-3-V. (For more complex case studies showing such complications, see Ecker et al. (2012).) Yet even this simple vignette indicates how the therapeutic reconsolidation process differs in some fundamental ways from how therapy is usually done. Throughout the process, the therapist guided the client to be as fully as possible *in touch* with the underlying material causing all the trouble, rather than to oppose it, get away from it, interrupt it, override it. The therapist also empathized equally with both sides of the juxtaposition and did not indicate one side as being more valid than the other—because for the therapist to take sides would be to foreclose the emotional brain's own process of determining what to regard as false, and would set up a counteractive process that only suppresses the target learning rather than a transformational process that dissolves it.

The Emotional Coherence Framework

The convergence of neurobiological and clinical knowledge described above allows us to assemble a unified account of:

- *Emotional learning and memory*, with emphasis on its adaptive, coherent nature and the specific content and structure of symptom-generating emotional implicit learnings
- *The unlearning and deletion of emotional implicit knowledge* through the sequence of experiences required by the brain for memory reconsolidation
- *The therapeutic reconsolidation process*, which is the entire set of steps needed for putting into practice the required sequence of experiences in psychotherapy sessions

We call this unified body of knowledge

the Emotional Coherence Framework, and in our own clinical practices we have seen its value for facilitating liberating therapeutic breakthroughs consistently.

New learning always creates new neural circuits, but transformational change occurs only when new learning radically unlearns, unwires and replaces an existing learning, rather than merely forming alongside existing learning and competitively regulating it. The use of new learning to erase an existing, unwanted learning is precisely what the therapeutic reconsolidation process achieves. It consists of steps that guide therapy yet allow an extremely broad range of techniques to be used for guiding the key experiences, so a therapist's individual style of working continues to have great scope of expression. It involves richly experiential work that utilizes a therapist's skills of emotional attunement and focuses the placement of empathy so as to cooperate closely with the brain's rules for accessing and dissolving the emotional learnings at the root of the clients' presenting symptoms. Major, longstanding symptoms, entrenched negative reactions, insecure attachment patterns, unconscious core schemas, and emotional wounds can cease as soon as their very basis—a cluster of particular emotional learnings—no longer exists.

When a person in therapy retrieves his or her emotional learnings into awareness experientially, these learnings are always found to be both specific and completely coherent: they fully make sense in light of actual life experiences and are adaptive in how they embody the individual's efforts to avoid harm and ensure well-being. In the clinical field there is already much recognition of the importance of coherence in an individual's conscious narratives of life experience. That, however, is neocortical coherence. The emphasis in the Emotional Coherence Framework is on the coherence of the emotional brain—subcortical and right-brain coherence, the coherence that is intrinsic to implicit emotional learnings and, when retrieved into conscious awareness, creates new autobiographical coherence most meaningfully and authentically.

The emotional brain's implicit yet highly


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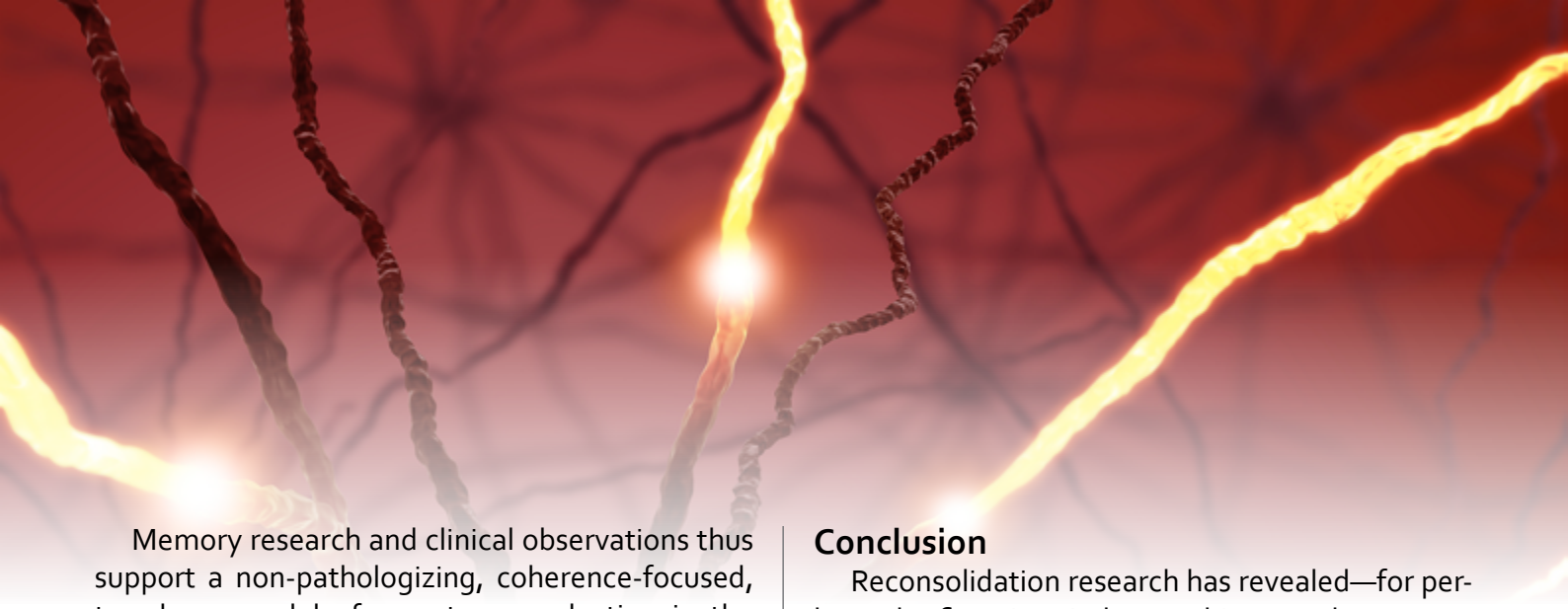
specific meaning-making and modeling of the world is innate and begins very early in life. For example, infants three months old form expectational models of contingency and respond according to these models (DeCasper & Carstens, 1981), and 18-month-old children can form mental models of other people as wanting things that differ from what they themselves want and will give the other what he or she wants (Repacholi & Gopnik, 1997), and can form models that distinguish between intentional and accidental actions (Olineck & Poulin-Dubois, 2005).

The timeless persistence of underlying, symptom-generating learnings across decades of life, long after the original circumstances that induced their formation have ceased to exist, is often taken as meaning that they are "maladaptive" and that the symptoms they produce signify a "dysregulation" of emotional brain networks. The emotional brain—particularly the subcortical emotional brain or limbic system—is likewise often described as "primitive" and "irrational." However, these pathologizing and pejorative terms prove to be fundamentally at odds with what research has revealed about the inherent durability of emotional learning and its astute, experience-driven modeling (discussed at length in Toomey & Ecker, 2007). The faithful retriggering of one's early learnings is, in fact, exactly what natural selection crafted the brain's emotional learning centers to do, not a faulty condition of disorder or dysregulation—unless one is prepared to say that it is a dysregulation of evolution itself, not of the individual.



Memory research and clinical observations thus support a non-pathologizing, coherence-focused, top-down model of symptom production in the wide range of cases where symptoms are generated by emotional implicit memory. This is the central perspective of the Emotional Coherence Framework. Some symptoms have causes other than learning and memory, of course, such as the genomic causes of autism spectrum conditions or the biochemical causes of hypothyroidism-induced depression. Viewing symptom production as dysregulation may be accurate in such cases.

The tenet that a person's unwanted moods, behaviors, thoughts or somatization may be generated by unconscious emotional learnings or conditioning has figured in many forms of psychotherapy since Freud's day, but the approach within the Emotional Coherence Framework is new, firstly, in guiding swift and accurate retrieval of those emotional learnings, bringing them experientially into direct awareness, and, secondly, in its non-theoretically-based, research-corroborated methodology for prompt dissolution of those retrieved learnings at their emotional and neural roots through memory reconsolidation.

Conclusion

Reconsolidation research has revealed—for perhaps the first time in human history—the process that commutes the life sentence of problematic emotional learning. The seven-step therapeutic reconsolidation process represents the direct translation of this research to psychotherapy in technique-independent and theory-independent terms. It is a map of the facilitation of the brain's built-in process for dissolving existing, operative emotional learnings, and it stands outside of all particular systems and schools of psychotherapy. Beyond enhancing the effectiveness of individual therapists, the therapeutic reconsolidation process has rich ramifications for the psychotherapy field that include a unified understanding of diverse therapies of transformational change, clarification of when insecure attachment learnings are, or are not, involved in a given client's problem, and a serious challenge to nonspecific common factors theory by identifying the role of specific factors in transformational change (see Ecker et al., 2012). What fertile ground for the emerging field of neuropsychotherapy!

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Cite this article:

Ecker, B., Ticic, R., & Hulley, L., (2013). A Primer on memory reconsolidation and its psychotherapeutic use as a core process of profound change. *The Neuropsychotherapist*. 1, 82-99. http://dx.doi.org/10.12744/tnpt(1)082-099