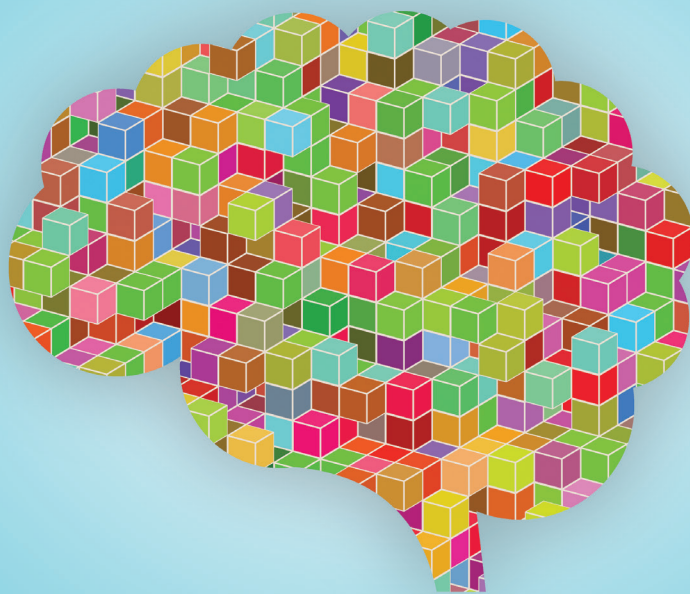


NEUROSCIENCE OF ENDURING CHANGE

Implications for Psychotherapy



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OXFORD

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Erasing Problematic Emotional Learnings

Psychotherapeutic Use of Memory Reconsolidation Research

Bruce Ecker

Introduction

Memory reconsolidation (MR) is the brain's innate mechanism for updating what was previously learned and is now carried in memory. It has been detected in a wide range of species, from nematodes to humans, and for many different types of memory (Lee, 2009; Nader & Einarsson, 2010). Updating a particular learning means changing its strength and/or its specific content, even to the degree of full unlearning and nullification, often termed "erasure" by neuroscientists (Agren et al., 2012; Clem & Schiller, 2016; Kindt, Soeter, & Vervliet, 2009).

Erasure denotes the permanent disappearance of all effects of the target learning on behavior and state of mind. In psychotherapy, erasure of an unwanted emotional learning is experienced as a liberating, transformational change. For example, after erasure of the learned expectation, "All people will respond to my every mistake as Dad did, with rage and disgust at how stupid I am," a therapy client no longer feels that expectation or its accompanying, derivative emotion of social anxiety, and the behavioral symptoms that it had been generating self-protectively, such as inhibited speech and isolation, cease promptly. Those changes then persist permanently and effortlessly.

The overall importance of MR for psychotherapy is determined by the extent to which the cause of therapy clients' problems and symptoms is memory (i.e., learnings acquired through experience, including implicit learnings). If sudden nullification of a particular emotional learning brings immediate, permanent cessation of a symptom, and this is observed in many cases, it is reasonable to conclude that memory was the cause of those symptoms. Table 11.1 lists symptoms that I or colleagues have seen eliminated in that way.

Of course, there are problematic conditions not based in memory, such as Asperger's syndrome, and not all of the symptoms listed in Table 11.1 are *always* based in memory, but the source of symptom production in the great majority

Table 11.1 Clinical Symptoms Observed to be Eliminated by Nullifying Specific Emotional Learnings Through 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	Indecision
Attachment-based behaviors and distress	Low self-worth, self-devaluing
Attention deficit problems	Panic attacks
Co-dependency	Perfectionism
Complex trauma symptomology	Post-traumatic symptoms
Compulsive behaviors of many kinds	Procrastination / Inaction
Couples' problems of conflict / communication / closeness	Psychogenic / psychosomatic pain
Depression	Sexual problems
Family and child problems	Shame
Fidgeting	Underachieving
	Voice / speaking / singing problems

Note: A bibliography of published Coherence Therapy case examples, indexed by symptom, is available at <https://bit.ly/2tKXdyX>.

of clinical cases proves to be implicit learning that was entirely adaptive in intent but has toxic concomitants. Based on all current knowledge, MR appears to be always responsible for transformational change in any acquired pattern, as discussed in the following text. Thus, the importance of MR for psychotherapy is not easily overstated. Knowledge of MR clarifies both the process and the underlying mechanism of change.

This chapter addresses (a) MR research findings and how they translate directly into a therapeutic methodology of transformational change applicable to diverse clients and symptoms, (b) a case example demonstrating that methodology, (c) how this chapter's account of MR in psychotherapy agrees and disagrees with the account delineated by Lane, Ryan, Nadel, and Greenberg (2015) and (d) implications for psychotherapy unification, specific versus common factors, the corrective experience paradigm, and further research.

Reconsolidation Research Findings

Reconsolidation neuroscience is extensive (Clem & Schiller, 2016; Lee, 2009; Lee, Nader & Schiller, 2017; Reichelt & Lee, 2013). This section reviews the clinically most relevant aspects.

How a Target Learning Is Destabilized

Learnings become encoded into long-term memory through a complex neural process known as consolidation (McGaugh, (2000). By the late 1990s, nearly a century of extinction studies had achieved at best a temporary suppression of a consolidated learning, with no evidence of reversing the consolidated state or fundamentally unlearning and erasing a target learning (Bouton, 2004). Based on a variety of tests and observations, researchers believed consolidation to be a permanent state that made a memory indelible for a lifetime (LeDoux, Romanski, & Xagoraris, 1989).

That long-standing model was disconfirmed by a few animal studies published by neuroscientists from 1997 to 2000 (Riccio, Millin, & Bogart, 2006). Those studies showed that for several hours after reactivating a consolidated memory (such as the learned expectation of an electric shock occurring after an audio tone), the memory could be erased by administering a chemical agent known to prevent a new, nonconsolidated learning from ever consolidating. Erasure by such an agent indicated that following reactivation, the consolidated memory's neural encoding had gone into a deconsolidated or labile, destabilized condition. However, at 6 hours after reactivation, the chemical agent had no effect on the learned expectation, indicating that by then, memory restabilization or reconsolidation had occurred. Erasure was possible only during that "reconsolidation window."

The authors of these early studies interpreted their observations to mean that it was reactivation that had caused the memory's encoding to deconsolidate, allowing erasure. The notion that every reactivation of a memory induces destabilization and reconsolidation quickly achieved canonical status throughout the neuroscience field, as well as in science journalism.

That model had years of entrenchment when, in 2004, Pedreira, Pérez-Cuesta, and Maldonado (2004) showed that reactivation alone did not produce destabilization. Rather, destabilization was induced only by reactivation of the target learning plus an additional experience of a "mismatch" between what the reactivated learning expects and what is actually perceived. In hindsight, it is apparent that the critical mismatch experience was present in the procedures of the earlier studies but was unnoticed (Ecker, 2015a). The brain's requirement of an experience of mismatch, also known as prediction error, was subsequently confirmed by at least 30 other studies (listed at <https://bit.ly/2b8IbJH> and by Ecker, 2018).

Across those numerous studies, procedures for creating a mismatch experience and inducing destabilization have varied greatly, making it clear that what matters to the brain is the subjective experience of violation of expectation, not the particular procedure that produces that experience. Several review articles have focused specifically on studies showing the critical role of mismatch/prediction error (see Ecker, 2018, for quotes).

However, even as post–Pedreira et al. (2004) confirmations of the mismatch requirement accumulated, the erroneous inference that memories reconsolidate after every reactivation continued to be promulgated for over a decade by many neuroscience researchers. This lag has caused much misunderstanding and even some misinterpretation of experimental results (Ecker, 2015a).

The updating function of MR is apparent in that destabilization occurs only if updating is needed, that is, only if an experience of discrepancy and surprise (violation of expectation) accompanies reactivation of an existing learning or schema. Numerous studies have contributed to an understanding of the “boundary conditions” of memory destabilization, that is, the range of reactivation and post-reactivation conditions that result in memory destabilization for learnings of various types, structures, ages, and strengths (for reviews, see Auber, Tedesco, Jones, Monfils, & Chiamulera, 2013; Elsey & Kindt, 2017a). In several studies, target learnings created by various reinforcement schedules or timing patterns were tested for destabilization by candidate mismatch experiences of various designs (Alfei et al., 2015; Jarome et al., 2012; Merlo, Milton, Goozée, Theobald, & Everitt, 2014; Schroyens, Beckers, & Kindt, 2017; Sevenster, Beckers, & Kindt, 2013). These studies collectively demonstrate what I have defined as the principle of *mismatch relativity* (Ecker, 2015a, 2018): The mismatch properties of any reactivation and post-reactivation procedure can be accurately evaluated only by analyzing in detail how the procedure’s content and structure compare to the content and structure of the target learning at the time of the reactivation procedure. It is the content and structure of the target learning that determine which experiences register as mismatch/prediction error and with what strength. Thus, in both laboratory research and psychotherapy, reliably designing effective mismatch experiences depends completely upon knowing the detailed content and structure of the target learning.

Mismatch analysis can be a subtle and elusive matter. Even researchers who are aware of the mismatch requirement sometimes do not recognize the mismatch(es) created by their experimental procedure (see Ecker, 2015a, for discussion and examples). In addition, the observed effects of various experimental parameters, such as a 10-minute delay after reactivation or greater memory age or strength, can be accounted for completely as merely being mismatch relativity effects rather than inherent properties of the destabilization and reconsolidation processes, as researchers have regarded them to be (Ecker, 2018).

How a Target Learning Is Erased

Destabilized target learnings have been erased by researchers in two different ways (Agren, 2014; Reichelt & Lee, 2013): pharmacological blockade of the cellular and molecular processes necessary for restabilization (reconsolidation) to occur and behavioral counterlearning that updates (rewrites) the target learning.

Pharmacological blockade disrupts the neurophysiological reconsolidation process itself. The target learning is prevented from reconsolidating and becomes nonresponsive after 24 hours.

In contrast, erasure through counterlearning (behavioral updating) disrupts only the *content* of the target learning, not the reconsolidation process itself. The target learning reconsolidates, but with profoundly changed content. (If the target learning is not first mismatched and deconsolidated prior to the counterlearning experience, the counterlearning then is separately encoded and only competes with and at best unstably regulates the target learning, as in extinction, rather than fundamentally rewriting and erasing the target learning; see Ecker, 2015a, 2018.)

Erasure produces distinctive, verifiable markers: complete absence of both the affective and behavioral expressions of the target learning in all situations where its cues are presented and permanent persistence of those cessations with no preventive measures applied. MR is the brain's only known type of neuroplasticity that can produce those effects. Therefore, on the basis of observing those markers, researchers conclude that counterlearning during the reconsolidation window drives unlearning that nullifies the labile target learning and replaces it with the counterlearning (Clem & Schiller, 2016). Erasure produced in this way can be regarded as behavioral memory interference (Robertson, 2012) at the maximum possible degree of effectiveness.

It is widely recognized that, as Soeter and Kindt (2011) stated, “obviously, a behavioral procedure will be preferred over pharmacological manipulations provided that similar effects can be obtained” (p. 358). When both laboratory studies and the clinical observations indicated in Table 11.1 are taken into account, it is apparent that erasure by behavioral updating has decisively the greater range of applicability. Studies have also found that behavioral updating induces erasure in more memory networks than does pharmacological blockade, as reviewed by Ecker (2018). Furthermore, in psychotherapeutic application, behavioral erasure through counterlearning is true unlearning in which a core theme of emotional distress is resolved and replaced by new living knowledge that has high value for well-being, as shown in the case example that follows. Pharmacological erasure, in contrast, does not consist of unlearning, so, even when it eliminates a symptom, it does not directly advance psychological growth. Therefore, the remainder of this chapter focuses on psychotherapeutic use of the endogenous process of erasure, behavioral updating.

Translation of Reconsolidation Research into Psychotherapeutic Methodology

Myriad diverse procedures have been used in laboratory demonstrations of memory destabilization and erasure. I have proposed (Ecker, 2018) that the

optimal translation of this extensive body of research into clinical application is guided by this question: *What is the clinically most broadly applicable methodology of behavioral erasure that is directly and entirely dictated and defined by reconsolidation research?* To answer that question, I further suggested (Ecker, 2018) that because the behavioral erasure of a target learning is an entirely experience-driven process, the entire process can be defined by its specific component experiences, as distinct from the laboratory procedures used to induce those experiences. Laboratory procedures are designed to be effective only for the particular target learning created in the respective experimental study. As previously noted, it is the specific make-up of the target learning that determines which experiences do, and which do not, function effectively as mismatch and counterlearning experiences. The ecological validity of laboratory protocols (their applicability beyond the experimental conditions) is too low for general clinical application.

Thus, the implications of laboratory MR studies for clinical translation are best recognized by understanding the studies primarily in terms of subjective experiences induced, rather than in terms of procedures followed, but the latter viewpoint has characterized the rapidly growing literature on clinical translation (Beckers & Kindt, 2017; Dunbar & Taylor, 2017; Elsey & Kindt, 2017b; Krawczyk, Fernández, Pedreira, & Boccia, 2017; Kroes, Schiller, LeDoux, & Phelps, 2015; Nader, Hardt, & Lanius, 2013; Treanor, Brown, Rissman, & Craske, 2017).

The subjective experiences viewpoint is already incorporated in the previous discussion of research: To achieve behavioral erasure of a target learning, the experiences required by the brain are target learning reactivation, mismatch, and counterlearning. Reactivation and mismatch experiences destabilize the target learning, and then counterlearning experiences function as unlearning experiences that disconfirm and nullify the target learning and update its neural encoding accordingly. Verification of erasure then consists of observing the three previously defined markers: non-reactivation, symptom cessation, and effortless permanence.

The tripartite sequence of reactivation, mismatch, and counterlearning experiences in laboratory studies I have termed the *empirically confirmed process of erasure* (ECPE; Ecker, 2018). It is a completely nontheoretical, empirically identified core methodology, widely permissive regarding procedures, for directly applying in psychotherapy the research on endogenous, behavioral erasure via MR.

Thus the optimal and most versatile methodology of MR for transformational therapeutic change consists of using each therapy client's unique target learning as the absolute basis for tailoring effective experiences of reactivation, mismatch, and counterlearning, unconstrained by any preconceived procedural

protocol and freely utilizing any suitable therapeutic techniques. That methodology replicates the ECPE in therapy sessions. The necessity of designing the requisite three ECPE experiences according to the specific composition of the target learning is one of the most important findings of reconsolidation research. By facilitating the ECPE in that open-ended and eclectic manner on the technique level, its range of clinical applicability can encompass the entire universe of implicit emotional learnings and the vast range of symptoms they generate.

However, pragmatically the ECPE cannot immediately be carried out at the start of therapy, as a rule. Certain preparatory steps are necessary, and they are defined by the following considerations.

Laboratory researchers possess detailed knowledge of the target learning because they create it in the first place. In contrast, at the start of psychotherapy with a new client, the therapist has no knowledge of the person's underlying emotional learnings, and even the client's manifested symptoms (unwanted behaviors, states of mind, and/or somatic disturbances) must be learned by the therapist. Furthermore, underlying emotional learnings are not inferable even when symptoms have become well identified, because the emotional learning history of each person is unique, and different individuals have different implicit schemas and memories manifesting the same diagnostic category of symptom (Ecker, 2018; Ecker, Ticic, & Hulley, 2012).

Therefore, for reliably efficient facilitation of the ECPE across clients presenting diverse symptoms, clinical methodology pragmatically begins with the following steps that I and colleagues have delineated (Ecker, 2011; Ecker et al., 2012; Ecker, Ticic, & Hulley, 2013a):

- A. Elicit specific descriptions of the symptom(s) to be dispelled.
- B. Evoke into awareness experientially and thoroughly verbalize the underlying emotional learning that necessitates and generates the symptom(s).
- C. Find how the client can have an experience that contradicts the emotional learning found in Step B.

Steps A, B, and C bring into ready accessibility the ingredients needed for immediately facilitating the ECPE's three experiences of

1. Reactivation;
2. Mismatch; and
3. Counterlearning.

After completing the ECPE, the therapist then begins seeking verification of erasure (Step V, for verification) in the form of observations of the markers of erasedelinedated previously.

Table 11.2 lists that seven-step clinical methodology, ABC-123-V, which Ecker (2011) introduced and proposed as being a universal map of therapeutic process for applying MR research to produce transformational change and which Ecker et al. (2012) named the *therapeutic reconsolidation process* (TRP). The universality of this methodology consists of its applicability to all unwanted behaviors, states of mind, and somatic disturbances maintained by implicit learning, its open access to all clinicians without dictating any particular clinical methods or theoretical orientation, and its hypothesized occurrence whenever transformational change is observed.

Expanded description of the TRP's seven steps follows. The TRP, like the ECPE within it, is a nontheoretical, empirically based meta-methodology of experiences, not behavioral procedures. Clinicians are free to fulfill the steps of the TRP using the concrete methods and techniques in which they have training and which they deem most suitable for a particular client. I and colleagues have proposed (Ecker, 2018; Ecker et al., 2012) that any thoroughly examinable psychotherapy sessions that have produced the markers of erasure (transformational change) can be shown to have carried out at least TRP Steps 1-2-3 (the ECPE), even if those steps occurred in an implicit, embedded manner and the experience created by each of those steps was not recognized or labeled by therapist or client. Numerous confirmations of TRP detection in cases of transformational change from many different therapy systems have been published; an online list of these TRP confirmations is maintained at <https://bit.ly/15Z00HQ>.

Table 11.2 The Therapeutic Reconsolidation Process, Proposed as a Universal Template that Translates Reconsolidation Research for Facilitating Transformational Therapeutic Change

Therapeutic Reconsolidation Process	
Preparation phase	<ul style="list-style-type: none"> A. Symptom identification B. Retrieval of memory contents generating symptom (target emotional learning/mental model/schema) C. Identification of contrary, disconfirming knowledge or experience
Erasure sequence (ECPE)	<ul style="list-style-type: none"> 1. Reactivation of target learning 2. Destabilization of target learning: Activation of contrary knowledge mismatches target schema 3. Nullification of target learning: A few repetitions of mismatch for counterlearning during remainder of session
Verification phase	<ul style="list-style-type: none"> V. Verification of target learning erasure: <ul style="list-style-type: none"> • Symptom cessation • Non-reactivation of target learning • Effortless permanence

The hypothesis that transformational change is always due to the TRP has significant implications for psychotherapy unification and integration, discussed in the following text.

The remainder of this section provides expanded description of the TRP's seven steps, which are then demonstrated in a case example later in the chapter.

TRP Step A, *symptom identification*, consists of actively engaging the client in recognizing and labeling the specific behaviors, emotions, moods, urges, thoughts, and somatic symptoms that the client regards as the problem, as well as identifying *when* these unwanted experiences happen, that is, the situations and perceptions that evoke or intensify them. This specific information on *what* and *when*, gathered in Step A, is the essential basis for then carrying out Step B effectively. Symptom identification often is accomplished adequately within the first session but can require several sessions with some clients.

TRP Step B, *retrieval of target learning*, is an experiential process of eliciting into explicit awareness the normally implicit, nonconscious emotional learning and memory maintaining the symptom(s) identified in Step A. Any suitable experiential methods are used for this retrieval work. The client is guided to verbalize the newly conscious material while affectively and somatically feeling it, and in that way recognizes its specific make-up accurately and develops metacognitive awareness of it as his or her own emotional truth. Integrating these knowings and feelings into routine daily awareness completes Step B.

The retrieved, symptom-generating material may consist of episodic memory (the subjective experience of specific past events, including affective and somatic elements) and/or semantic memory (schema-structured, generalized knowings and rules regarding a certain type of situation, including mental models, attributed meanings, if/then expectations, self's vulnerability to a specific type of suffering, expected behavior of others/self/world, and necessary self-protective tactics and roles). More extensive accounts of these types of memory and their roles in symptom production are indicated in the references (Ecker, 2018; Ecker et al., 2012; Lane et al., 2015; Ryan, Hoscheidt, & Nadel, 2008).

Retrieval of a symptom-generating emotional schema may entail the client feeling significant vulnerability and dysphoric emotion and therefore requires much skill on the part of the therapist, who must pace the process workably for the client's tolerances and provide empathetic accompaniment necessary for the client's sense of safety and trust. The required number of sessions depends on the complexity and emotional intensity of the material.

The target of change is not the symptom(s) identified in TRP Step A, but rather the symptom-necessitating learning(s) revealed in Step B. Symptoms cease when their underlying emotional learnings/schemas are disconfirmed, unlearned and nullified. Step B brings the crucial schema(s) into awareness, but they are not disconfirmed and nullified until subsequent TRP Steps C-1-2-3 also take place.

TRP Step C, *identification of disconfirming knowledge*, consists of finding past or present experience(s) in which the client has direct, living knowledge that specifically contradicts the target learnings and memories retrieved in Step B. Specificity of disconfirmation is critically important for consistently achieving successful nullification of the underlying target material. The needed contrary knowing can be found either in the client's *already-existing knowledge* from past experiences, or it can be *created by a new experience* that occurs during or between therapy sessions. Each of those two main sources of contrary knowing has several subtypes, and all can be accessed through a wide variety of techniques mapped out by Ecker (2016) and Ecker and Hulley (2017). Step C consists of finding where and how the client can access such disconfirming knowledge. Accomplishing Step C can require a few minutes or a few sessions, depending mainly on the breadth of the therapist's repertoire of Step C techniques.

As soon as the therapist sees how to access definite contradictory knowledge, Step C is done, and the therapist proceeds to guide TRP Steps 1-2-3, the erasure sequence (ECPE). Moving through Steps 1-2-3 requires only minutes, whereas the preparation phase, Steps A-B-C, may have required several sessions or more.

TRP Step 1, *reactivation of target learning*, consists of cueing the client to return to experiencing the symptom-generating schema and/or memory retrieved in Step B, including the affective and somatic aspects of this material. The client feels empathetically accompanied by the therapist while subjectively inhabiting the particular self-state created by the reactivated schema or memory.

TRP Step 2, *activation of contradictory knowing, mismatching the target learning*, consists of guiding an initial experience of the contrary knowledge or experience that was found in Step C, while the target schema or memory is reactivated from Step 1. Combining the reactivated target learning and a contradictory knowledge is what reconsolidation researchers term a memory mismatch or prediction error experience and is termed a *juxtaposition experience* in coherence therapy (Ecker, 2016; Ecker et al., 2012; Ecker & Hulley, 2017). It is this mismatch that destabilizes the neural ensemble encoding the target learning.

Mismatch can also be accomplished by mere novelty. Possibly, reactivation plus perceiving the therapist's accompaniment might suffice. However, contradiction (which occurs in the simple form of non-reinforcement in most laboratory studies) is an extremely reliable mismatch for triggering destabilization, because it is both a strong violation of expectation and highly relevant to the target learning, so the need for updating is maximized. Given that the contradictory experience must be activated in Step 3 for counterlearning, it is efficient to use it also for mismatch in Step 2.

TRP Step 3, *counterlearning by a few repetitions of the disconfirming juxtaposition*, consists of guiding the client two or three more times to attend to both experiences: what the target learning knows and expects and what the contrary

knowledge knows and expects. The repetition of that juxtaposition accomplishes the disconfirmation, unlearning, and nullification/erasure of the target learning. The compelling realness and urgency of the target learning wither, and it ceases to drive symptom production. That is demonstrated in the case example in the following text. Based on MR research and extensive clinical observations, Ecker and colleagues (Ecker et al., 2012, 2013a, 2013b; Ecker and Toomey, 2008) have proposed that the juxtaposition experience created in TRP Steps 2 and 3 is the critical experience required for schema nullification and transformational change in psychotherapy.

TRP Step V, *verification of erasure of target memory material*, consists of observing and documenting the markers of erasure: unambiguous reports from the client that the initially identified symptomatic behavior and/or state of mind and/or somatic disturbance has ceased to occur in all situations where it had been occurring; the affective self-state or compelling emotional “spell” created by the reactivated target schema no longer occurs in response to any cues or contexts that previously evoked it; and those changes persist effortlessly under all circumstances, without relapse and without any effort taken to maintain them. Verification of erasure is conclusive only with persistence of the markers over at least many months and in all real-life situations that formerly triggered symptom production.

The TRP, consisting of the seven steps ABC-123-V, although simple in its conceptual essence, is complex and subtle in its overall clinical implementation across therapy clients who differ widely in personality, tolerance for emotional experience, extent and depth of suppressed emotional distress, readiness to trust the therapist, and other variables. The steps of the TRP are evident in a large number of published case examples of therapies of transformational change (for online listings, see <https://bit.ly/2tKXdyX> and <https://bit.ly/15Z00HQ>). As a rule, the TRP steps occur in an embedded, implicit manner and are not identified in therapies’ maps of methodology (Ecker et al., 2012), so they are not saliently apparent to the TRP novice. The exception is coherence therapy (Ecker et al., 2012; Ecker & Hulley, 2016, 2017; Ecker & Toomey, 2008) co-developed by the author and Laurel Hulley. It consists explicitly of the same steps as in the TRP, so case examples of coherence therapy tend to be useful for TRP demonstration and instruction.

Therapeutic Reconsolidation Process Case Example

The following coherence therapy case example is highly condensed, especially for the first two steps of symptom identification (TRP Step A) and schema retrieval (TRP Step B). My main purpose here is to provide a concrete illustration

of finding contradictory knowledge (TRP Step C) and then carrying out the erasure sequence (TRP Steps 1-2-3, the direct application of MR research). (For numerous coherence therapy case studies with TRP mapping, see Ecker et al. (2012). For session videos, see <https://bit.ly/2gDBpkP>. For a list of published case studies indexed by symptom, see <https://bit.ly/2tKXdyX>.)

“Jason,” in his mid-50s, contacted me for therapy because he was dismayed about a compulsive behavior of changing jobs and careers every 2 or 3 years for his entire adult life. Due to this pattern, he had “never become really good at anything” and had a relatively low income that greatly limited his possibilities in life. Jason viewed his compulsive behavior as a “lack of discipline,” a construal that created feelings of shame and failure.

That information fulfilled TRP Step A, symptom identification. To begin TRP Step B, eliciting the emotional learning driving his job-changing, I said, “Let’s see if getting out early from each career somehow makes sense in your life.” I was following coherence therapy’s core principle of *symptom coherence* (Ecker et al., 2012; Ecker & Hulley, 2016, 2017). I continued, “Would you feel OK about just imagining for a few minutes that you’ve stayed in any one of the jobs you’ve had? You’ve stayed, and *several* years have passed, and you’re developing more advanced skills, and you’re really becoming ensconced in that career.” This was coherence therapy’s discovery technique of *symptom deprivation* (Ecker & Hulley, 2017). If a symptom is produced as part of how an adaptive learning avoids a particular hardship or suffering, being without the symptom brings some sensation of the normally avoided distress.

Seconds later, I saw one of Jason’s fingers rapidly tapping his thigh. The avoided distress was coming through. Then he frowned and said, “Why is imagining that for a few seconds so uncomfortable? And images of my father are suddenly showing up.” A flow of implicit knowing to explicit knowing had begun.

By the end of his second session, Jason was richly in touch with what he had learned as a little boy from daily seeing, hearing, and feeling his father’s heavy depression and bitterness over being endlessly trapped in a factory job in their small town. His father’s daily dark mood and hopeless words about his dead-end life deeply scared and pained him, and he formed an implicit emotional learning, or schema, that I guided him to express in words as he was feeling it affectively. He arrived at this verbalization: “Staying in one career brings the deadness and misery that killed my father’s spirit. So I’ve *got* to switch jobs soon enough to keep that hell from ever happening to *me*.” Jason left my office carrying an index card inscribed with those words, to be read daily to foster integration of this major new awareness.

That fully coherent schema (“the emotional truth of the symptom” in coherence therapy parlance) had been ruling Jason’s behavior from outside of

awareness, but was now explicit for the first time in his life. He was now aware that regularly changing jobs, which he had been regarding as the problem and as indicating his defectiveness, was actually his own cogent, although painfully costly, solution for the problem of making sure that his father's "hell" would never happen to *him*. The depathologizing effect of this retrieval step is obvious and is therapeutic in itself.

TRP Step B was now accomplished. At the start of our third session, in reviewing the found schema it was clear that Jason's direct awareness of it had not diminished its compelling emotional realness. The idea of staying in one job on and on still felt as dangerous as ever. It is a frequent observation that after retrieval into integrated awareness, an emotional schema remains in force for as many sessions as it takes for TRP Steps C-1-2-3 to be carried out. Then the schema abruptly loses its subjective realness and power, and the markers of transformational change appear. This is a clear indication that the set of TRP Steps 1-2-3 functions as a specific factor that is the direct cause of the transformational change that immediately follows and that the nonspecific common factors of empathy, trust, alliance, etc., although amply present in the interval after Step B, are not sufficient to produce such change without the occurrence of TRP Steps 1-2-3. Furthermore, the set of TRP Steps 1-2-3 also functions as a common factor that is found to precede transformational change in diverse systems of psychotherapy, which implement those three steps using very different techniques.

With detailed knowledge of Jason's schema, it was time to carry out TRP Step C, finding some definite personal truth that strongly contradicted his lifelong knowledge that staying in one career would inevitably be lethal to his or anyone's spirit. Coherence therapy equips the therapist with numerous techniques for Step C (Ecker, 2016; Ecker & Hulley, 2017). Immediately I saw that the *past opposite experiences* technique was a good fit here: Certainly Jason, in his 50s, had known someone who was largely happy while remaining in one job or career for many years.

I then remembered that in our first session, he mentioned that he volunteered weekly at a special education school and that the great dedication of the teachers was very impressive and appealing to him. I now realized—those are people who have stayed in one career for many years, and not only are they not depressed as a result, they are so meaningfully engaged in their work that Jason is inspired by them.

Finding that source of contradictory knowledge fulfilled Step C and put me in a position to begin TRP Steps 1-2-3, the erasure sequence. I began that by saying, "Let's go over a couple of things that seem to feel true for you. It would be good if you could picture and *feel* these things as much as possible as we review them."

Then for TRP Step 1, conscious reactivation of the target learning, I said, “On one side are your father and other men in your hometown, stuck in their dead-end jobs to support their families. And you see and you *feel* their heavy unhappiness. And to you this means that staying in one job is *always deadening* like that, so you’d better make sure *you* never stay in one. Can you feel that?” Jason had been listening with closed eyes, and he nodded.

Next is Step 2, activating the contradictory knowledge in juxtaposition with the reactivated schema. So I said, “Now keep your father there on his side of the picture as we add this: On the other side are the special-needs teachers. You’re so in touch with the aliveness that they feel in their work. They are solidly planted in this *one career*” (note the specificity of the disconfirmation, deliberately spotlighted) “and you see how alive and continually engaging and satisfying it is for them, and that’s unmistakable to you, and it’s so different from what you ever thought was possible based on your father. Can you feel *that*?” And again he nodded.

That was step 2, creating the first juxtaposition experience, a strong experience of memory mismatch, so the target schema’s neural encoding was now rapidly unlocking, destabilizing, deconsolidating.

Step 3 is a few repetitions of that juxtaposition, now serving as counterlearning that updates and re-encodes the target schema. I did that simply by empathetically reviewing both sides from various angles, which is a natural way of “holding” and accompanying the client after a significant emotional experience, as well as facilitating metacognitive processing of the experience. I said, “And *both* experiences feel really true—that having just one career is only deadening, the way it was for your dad, and on the other side, having one career can be really dynamic and alive, as it is for those teachers. And you’re aware of both, side by side. Both feel so true—that Dad was so despairing in *his* one job and these teachers are so alive in *their* one job.” That was two overt repetitions of the juxtaposition.

After a silence of about 30 seconds, I asked, “How *is* it to be in touch with both sides like that?” That question prompted the both-at-once juxtaposition yet again for Step 3 and also began TRP Step V, the verification step, by gently probing for whether the target schema still felt real.

An initial marker of schema dissolution appeared immediately: I saw a pained look on Jason’s face, and he said, “It’s pretty upsetting to see that these negative expectations that shaped my whole life are a phony.” What had previously seemed horribly real now looked and felt “phony” to him. Schema nullification is immediate in many, but not all, cases.

When a troubling piece of personal reality loses its realness, people feel either joy or distress. Both are markers of disconfirmation and nullification of the target learning. Jason now was entering into a grief process that I helped him

to allow and experience in two subsequent sessions focused on processing his upsetting but liberating realization.

Then I again guided him to imagine staying in one job for many years, which at the start of therapy had brought strong discomfort. He no longer felt any danger or fear. The schema was no longer activating in response to its cues, which is the main marker of schema nullification.

Jason chose not to schedule more sessions. Six years later, he came back to address couple relationship troubles, and I learned that a few months after our prior work, he took a full-time job teaching in a community college and to this day had remained nicely satisfied with that work. Staying in one job for six years was unprecedented. The symptom of compulsive job-changing had ceased, with no further efforts to prevent it, and all of the markers of erasure were now verified.

Jason could tolerate the distress that accompanied schema nullification, but in some cases, the client's emotional system blocks the juxtaposition experience and does not allow schema nullification because the distress that would result exceeds the client's capacity. This complication is a form of resistance that is unique to the erasure process. It requires an extra process of gently guiding conscious recognition of that distress and rendering it tolerable, after which the juxtaposition is repeated and the schema dissolves (Ecker et al., 2012).

Matches and Mismatches With Lane, Ryan, Nadel, and Greenberg

This section reviews convergences and divergences between the clinical MR framework proposed in this chapter (and previously elaborated; Ecker, 2011; 2015a, 2015b, 2018; Ecker et al., 2012; Ecker & Toomey, 2008) and that of Lane et al. (2015).

Convergences

Three main themes are in accord between the two frameworks: MR is responsible for lasting therapeutic change; most clinical symptoms are generated by memory contents and are therefore susceptible to the MR process; and MR can unify the fragmented psychotherapy field.

Convergence: Therapeutic Change Occurs Through Memory Reconsolidation

The recognition that lasting therapeutic change occurs through MR, emphasized centrally by Lane et al. (2015), was the focus of my 2006 keynote address (Ecker, 2015b) and numerous publications and presentations since then. The steps of

the TRP were spelled out in my 2011 blog post, “Reconsolidation: A Universal, Integrative Framework for Highly Effective Psychotherapy” (Ecker, 2011). In 2012, colleagues and I published the first clinical text on utilizing MR in therapy (Ecker et al., 2012). It covers how MR research translates into the TRP for transformational therapeutic change and provides numerous case examples showing the moment-by-moment process of the TRP producing transformational change.

Convergence: Memory-Based Symptom Production

The integrated memory model of Lane et al. (2015) recognizes that the source of symptom production in the great majority of cases is the combined effect of episodic memory of specific experiences, semantic memory of implicit schematic knowledge, and the emotions they generate. Fundamentally the same account of memory and symptom production is advanced in my prior writings (Ecker, 2015a, 2018; Ecker et al., 2012; Ecker & Toomey, 2008) and in this chapter.

Convergence: Psychotherapy Integration and Unification

Lane et al. (2015) state:

The integrated memory model provides an opportunity to develop a common language that spans disciplines and a common mechanism underlying change in all psychotherapeutic modalities. We suggest that . . . the success of practitioners of a given modality depends upon their ability to access an integrated memory structure that may include aspects of experience not typically emphasized in the formal explication of that modality. (pp. 14–15)

Compare that statement with this one from Ecker et al. (2012):

[W]e predict that any system of psychotherapy (or series of therapy sessions) will be found to produce deep, lasting change only if the sequence of experiences described by TRP Steps 1-2-3 takes place successfully— independently of whether the therapist is aware of these steps taking place and irrespective of whether they occur explicitly or tacitly. . . . [T]he therapeutic reconsolidation process . . . is not and cannot be the possession of any one therapeutic system. . . . [T]he TRP would create a shared, empirically based frame of reference and a shared vocabulary, allowing these practitioners [of diverse therapies] to discuss their methods in a manner meaningful to each other and to practitioners of yet other clinical systems. That scenario . . . is the paradigm of psychotherapy integration we envision through the TRP. . . [serving as] a universal language and unifying framework through which seemingly dissimilar approaches to transformational change can be compared meaningfully, revealing their metapsychological and methodological common ground. (p. 152)

There has been progress in implementing the latter vision of TRP detection in case examples of transformational change from numerous different systems of psychotherapy. This is documented online at <https://bit.ly/15Z00HQ> and is discussed further later in the chapter.

Thus both Lane et al. (2015) and Ecker et al. (2012) envision psychotherapy unification through bringing all therapists into shared recognition that transformational change results from subjecting a symptom's underlying episodic and/or semantic memory to the reconsolidation process. This promising convergence toward a major unification of psychotherapy is not yet fully harmonious, however, due to significant differences, discussed next, in accounts of the specific process that induces reconsolidation and achieves transformational change.

Divergences

For clinical use of MR to reach fullest effectiveness, it is important for psychotherapists to acquire accurate understanding of the MR process, as revealed by neuroscientists' rigorously controlled studies. Addressed here are three areas of divergence between this chapter's account and that of Lane et al. (2015) regarding how a memory is destabilized (previously reviewed), the nature of the counterlearning that drives the unlearning and erasure of a destabilized target learning (previously reviewed; Ecker, Hulley, & Ticic, 2015), and the relationship between the MR process and emotional arousal (Ecker et al., 2015).

Divergence: How a Memory Is Destabilized

Lane et al. (2015) adopt multiple trace theory (MTT) as their overarching model of memory processes, and they provide the account of MR that MTT generates:

MTT suggests that every time a memory is retrieved, the underlying memory trace once again enters into a fragile and labile state, and thus requires another consolidation period, referred to as "reconsolidation." . . . MTT proposes that each time an episodic memory is recollected or retrieved, a new encoding is elicited. (p. 12)

However, as previously explained, the view that a memory destabilizes in response to reactivation, as MTT asserts, has been disproved by numerous studies (starting with that of Pedreira et al., 2004) showing that destabilization does not occur after reactivation alone, but only after reactivation plus a violation of the reactivated memory's expectation of how the world is, termed "mismatch" or "prediction error" by researchers. This critical element of mismatch is missing in

the MTT account of MR favored by Lane et al. (2015). That is a significant difference from how the process of change is represented in the TRP, which specifies the necessity of mismatch for destabilization in TRP Step 2. As noted earlier, the first juxtaposition experience (TRP Step 2) creates the mismatch that putatively induces target learning destabilization, and then a few repetitions of that juxtaposition experience (TRP Step 3) serve as counterlearning that disconfirms, nullifies, and replaces the target learning.

Although mismatch is absent in the account of MR by Lane et al. (2015), it is nevertheless present in their therapeutic methodology's "corrective emotional experience" component: The reactivated target learning's meanings, model, and expectations (semantic structures) encounter a disconfirming experience. In action, therefore, their methodology would fulfill the mismatch requirement, carry out the TRP, and produce transformational change. Similarly, the TRP is carried out and transformational change is achieved by many therapy systems that have no conceptualization of MR at all, as shown by Ecker et al. (2012). It is methodology, not scientifically accurate conceptualization, that determines clinical effectiveness. Differences between the conceptualizations of therapy systems may or may not indicate deep-structure differences of methodology. This suggests that research on transformational change in therapy may best be designed to identify the deep-structure, causal ingredients, here proposed to be TRP Steps 1–2–3 (the ECPE).

Divergence: Counterlearning Content

Similarly, the conceptual analysis of Lane et al. (2015) is at odds with MR research regarding the type of counterlearning that induces erasure and transformational change, yet their methodology accords with the research and is therefore effective. Specifically, Lane et al. state:

In this paper, we propose that change occurs by activating old memories and their associated emotions, and introducing new *emotional* experiences in therapy enabling new emotional elements to be incorporated into that memory trace via reconsolidation. . . . By activating old memories and their associated emotional responses in therapy, new *emotional* elements can be incorporated into the memory trace. (p. 3; emphasis added)

Likewise, they refer to "this model highlighting the importance of new emotional experiences" (p. 16) and title the article, "Memory Reconsolidation, Emotional Arousal and the Process of Change in Psychotherapy," which launches the

central message that new *emotional* experiences are required to induce change through MR.

To the extent that readers of Lane et al. (2015) are led to believe that the experience used for counterlearning must be emotional in itself, Lane et al. diverge from MR research findings, as well as from published clinical observations (Ecker, 2015a, 2018). Both have shown that even when the target learning has strong emotional components, as is nearly always the case in psychotherapy, the counterlearning experience that drives unlearning and erasure is not necessarily emotional in itself. That statement may initially seem counterintuitive, but its veracity becomes apparent through the following considerations.

In therapy, for transformational change the target learning is the implicit schema or model of reality (the semantic content) underlying the manifested symptom, not the emotion that arises from that construal of reality. It is the model that becomes disconfirmed and unlearned, not the emotion. (For further discussion of this point, see Ecker (2015a, pp. 25–30) and Ecker et al., 2015) A transformational change in the mental model immediately produces profound change in the emotion generated.

Mental models, even those that generate strong emotion, can in many cases be disconfirmed and nullified by juxtaposition with a factual knowing that by itself had no significant emotional quality for the client prior to the juxtaposition. An example from a published clinical case (Ecker, 2018) involves a woman in her 50s with a problem of lifelong anger that was found in therapy to be rooted in the implicit construal, formed at age 6 in response to being molested by her grandfather, “The world is just too unfair, in making this happen only to *me*, and to no one else.” As she first accessed those meanings and spoke those words in therapy, she was subjectively immersed in that construal, and it felt as real and true to her as when she was 6. The therapist understood immediately that her lifelong anger was her protest at the monstrous unfairness of the world. Minutes later, prompted by the therapist, she formed a juxtaposition of that learning with the contrary, factual knowing that sexual molestation of children is widespread. That familiar fact was already in her possession. It had no significant emotional quality for her by itself before the juxtaposition occurred. Thus, it was a dry fact that was brought into juxtaposition with the strongly emotional target learning, not a new experience that was emotional in itself. The juxtaposition experience, however, was instantly aglow with amazement and wonder as the familiar fact suddenly disconfirmed and dissolved a construal that had been distressing her intensely for a lifetime from outside of awareness. The world hadn’t been horribly unfair to her after all. Her frequent anger responses then disappeared permanently.

In my experience of guiding thousands of juxtaposition experiences, a large fraction of them, probably more than half, were of the type just described,

namely, the disconfirming knowledge or experience was in itself emotionless prior to the juxtaposition. If therapists believe that only a new experience that is distinctly emotional in itself can serve to disconfirm and rewrite target emotional learnings, they would be precluded from utilizing a major class of options for facilitating effective juxtaposition experiences. For most clinicians, it seems counterintuitive that during original learning emotion does play a causal role in shaping the semantic knowledge created and in how that knowledge is encoded in memory, but that the process of unlearning does not inherently require a disconfirmational knowledge that is emotional.

It could be argued that in such instances where the disconfirming knowledge is emotionless in itself, the resulting juxtaposition experience nevertheless *is* emotional, and it is *that* new emotional experience that induces lasting change successfully. However, that view is not supported by a close examination of the fast phenomenology observed in these cases, such as that of the woman just described: The juxtaposition experience registers first and very rapidly on the purely semantic level of noticing that what is true about the world is radically different from the belief, construct, or expectation that one has been holding. There is not yet any emotion during the fraction of a second required for this initial, direct disconfirmation, but the transformational change of semantic knowledge (mental model) has already occurred. Then, with metacognitive *recognition* of the disconfirmation and its personal significance in subsequent seconds, emotion is generated. In some cases, the personal meaning of the disconfirmation is very appealing, so strong positive emotion arises, as for the previously described woman. In other cases, the personal meaning of the disconfirmation is very unappealing, as for “Jason” in the previous section, so strong negative emotion arises. The very fact that the quality of emotion depends on the particulars of the disconfirmation shows that the emotion *follows from* the disconfirmation and is a by-product of the core process of change in semantic knowledge. Thus, the phenomenology observed in psychotherapy supports not the view that emotional arousal is *causal* in the process of transformational change, but rather that emotion arises secondarily from that process of change and reliably accompanies it. In other words, the process of transformational change causes emotion to occur, not the other way around.

Divergence: Relationship Between MR and Emotional Arousal

It seems likely, in my opinion, that many readers of Lane et al. (2015) would acquire the incorrect understanding that emotional arousal is an inherent, fundamental feature of the reconsolidation process. However, according to the article’s lead author, the intention was not to communicate that idea, but rather the idea that emotional arousal is an integral feature of the reconsolidation process as

applied to psychotherapy (Richard Lane, private communication, September 3, 2018).

Laboratory MR studies with both human and animal subjects have shown that the reconsolidation process occurs for target learnings of many types (Lee, 2009), some of which do not involve emotion at all (such as motor memory, spatial memory, and object recognition memory). It is definite, therefore, that the brain's processes of memory destabilization, updating, and reconsolidation do not fundamentally involve emotional arousal or new emotional experiences (Ecker, 2015a, 2018; Ecker et al., 2015).

In the specialized context of psychotherapy, as a rule the target learning for transformational change is an emotional learning, that is, an implicit schema or mental model that originally formed in the presence of intense emotion and that induces emotional arousal when reactivated. However, as noted previously, the specific semantic content of the schema and the emotion aroused by that content when reactivated are two different things. For example, the semantic content consisting of an expectation of receiving deserved, harsh criticism and humiliation in response to making any mistake is distinct from, although linked to, the emotions of fear and shame that arise when that semantic memory content is reactivated. The specific semantic content is the target of change via disconfirmation and nullification, not the accompanying emotion.

Thus, viewed in terms of the MR process of change, the accompanying emotion is a relatively peripheral feature; while viewed in terms of the pragmatics of psychotherapy, the client's emotional arousal must be facilitated with great care and skill, a task that has high priority and often necessarily occupies much time and attention in therapy sessions.

Both viewpoints are important, as is their synthesis: Due to the necessity of target learning reactivation for the MR process of change (TRP Step 1), emotional arousal accompanies the process because the target learning in therapy is an emotional learning in nearly all cases. I suggest that is the main reason why extensive psychotherapy outcome research has found a strong positive correlation between arousal of previously blocked emotion and positive therapeutic outcome. That accompanying emotion is indeed an integral feature of the reconsolidation process in psychotherapy, although it is not directly or centrally involved in the core MR process of disconfirmation and erasure of semantic memory, as previously described (Ecker et al., 2015).

Research Agenda

The clinical methodology presented in this chapter, the TRP, directly applies the process found to induce target learning destabilization and erasure in laboratory

MR studies that have been abundantly reconfirmed. Research is needed to evaluate the claim that the TRP, in fact, induces target learning erasure in psychotherapy sessions.

To that end, case examples of coherence therapy are advantageous because in them it is readily apparent that (a) the client has the same distinct set of experiences as in laboratory demonstrations of erasure (the erasure sequence or ECPE defined in Table 11.2) and (b) those experiences result in the same distinct markers of erasure that neuroscientists use as confirmation that MR has occurred in human studies. For that distinct process and its unique outcome (erasure) to occur in therapy in tight correspondence with their occurrence in laboratory studies is a strong confirmation of the TRP as an effective, versatile clinical translation of MR research, especially if taken together with the wide range of dispelled symptoms listed in Table 11.1.

That form of TRP confirmation already has much support from many detailed, anecdotal accounts of coherence therapy cases (indexed at <https://bit.ly/2tKXdYX>). To make that confirmation rigorous, it must be carried out by unbiased evaluators applying standardized criteria for identifying fulfillment of each step of the TRP and each marker of erasure. Those criteria must be defined by clinical TRP experts. Evaluation of video-recorded sessions according to those criteria can be done using existing methods of qualitative process analysis and rating of depth of experiencing. That rigorous confirmation of the TRP would demonstrate empirically that MR fulfills the criteria for being an evidence-based psychotherapeutic mechanism of change (Kazdin, 2007), which would for the first time put the psychotherapy field on a transtheoretical scientific foundation.

In that regard, it is also important to test the following two hypotheses:

Hypothesis I: The markers of erasure (transformational change) begin to appear in therapy sessions only following TRP Steps 1-2-3, that is, a juxtaposition experience repeated a few times, so if the markers begin to appear, the prior occurrence of TRP Steps 1-2-3 can be detected if the moment-to-moment process throughout the session(s) is thoroughly documented and examinable. As a rule, also detectable are TRP Steps A-B-C occurring prior to TRP Steps 1-2-3.

Hypothesis II: No markers of erasure appear in the interval between completion of TRP Step B, in which the client gains direct (affective and metacognitive) awareness of an emotional learning or schema driving symptom production, and the completion of TRP Steps C-1-2-3 occur, even though the nonspecific common factors (Wampold, 2001) are strongly in evidence in that interval, which can span several therapy sessions, but as soon as TRP Steps C-1-2-3 are carried out, the markers begin to appear.

Preliminary, noncontrolled testing of Hypothesis I was done by Ecker et al. (2012) by examining previously published case studies from four different systems of psychotherapy. Cases were selected solely by the criteria that transformational change was achieved and moment-to-moment process was adequately documented. All steps of the TRP were detected in all four cases. This method of examining cases continued with the publication of many additional TRP detection reports, all of which are listed online at <https://bit.ly/15Z00HQ>. To make this method empirically sound, it too must be carried out by unbiased evaluators applying standardized criteria for each step of the TRP and each marker of erasure.

In testing Hypothesis I, awareness of certain nuances is important, such as the fact that a juxtaposition experience can occur serendipitously without being expressed or even metacognitively noticed by the client (for an example, see Ecker, 2015a, pp. 32–33). Also, if all three markers appear and persist following TRP Steps 1-2-3, the dispelled symptom was generated solely by the target learning addressed. If, however, schema non-reactivation is achieved but symptom production continues, the existence of at least one other symptom-generating schema is indicated.

Regarding Hypothesis II, confirmation would establish that transformational change requires a specific factor (TRP Steps 1-2-3, the erasure sequence) and is not produced by nonspecific common factors alone. That would disconfirm nonspecific common factors theory (Wampold, 2001) and confirm as well as refine the “corrective experience” paradigm (Castonguay & Hill, 2012; Goldfried, 1980). Here, an important nuance is the recognition that in a subset of cases, TRP Step C is fulfilled by the client’s experience of the therapist, and then TRP Steps 1-2-3 occur on that basis, which could be misinterpreted to mean that the nonspecific common factors have created transformational change, when actually the specific factor of TRP Steps 1-2-3 is responsible. Hypothesis II has much support from the frequent clinical observation of exactly that in coherence therapy, such as in the case example of “Jason.” (For further discussion, see Ecker 2013, 2015b, 2018; Ecker et al., 2012.)

The fact that optimal clinical application of the TRP requires technique eclecticism, as previously noted, implies that the TRP itself (as distinct from any particular protocol that implements it) is outside the range of applicability of the empirically supported treatment and evidence-based treatment frameworks, which require testing a manualized behavioral procedure for efficacy and/or effectiveness in controlled studies. However, the TRP fits naturally within an empirically supported principles of change framework (Rosen & Davidson, 2003).

Conclusion

The empirical findings on erasure via memory reconsolidation, the therapeutic methodology implied by those findings, and the transformational level of therapeutic effectiveness produced by that methodology are new, fundamental developments for the psychotherapy field. As such, even as these developments bring major advances and benefits, they may also unavoidably pose challenges to some established approaches. The digestion of these new developments by clinicians and researchers already is, and will continue to be, a complex, uneven process. I have written this chapter with the aim of facilitating the adoption of this invaluable body of knowledge by usefully illuminating it. Any initial darkness obscuring the unique therapeutic value of memory reconsolidation will soon be dispelled by psychotherapists who utilize and witness its effects in their own sessions.

References

- Agren, T. (2014). Human reconsolidation: A reactivation and update. *Brain Research Bulletin*, *105*, 70–82. doi:10.1016/j.brainresbull.2013.12.010
- Agren, T., Engman, J., Frick, A., Björkstrand, J., Larsson, E. M., Furmark, T., & Fredrikson, M. (2012). Disruption of reconsolidation erases a fear memory trace in the human amygdala. *Science*, *337*, 1550–1552. doi:10.1126/science.1223006
- Alfei, J. M., Ferrer, A., Monti, R. I., Molina, V. A., Bueno, A. M., & Urcelay, G. P. (2015). Prediction error and trace dominance determine the fate of fear memories after post-training manipulations. *Learning & Memory*, *22*, 385–400. doi:10.1101/lm.038513.115
- Auber, A., Tedesco, V., Jones, C., Monfils, M., & Chiamulera, C. (2013). Post-retrieval extinction as reconsolidation interference: Methodological issues or boundary conditions? *Psychopharmacology*, *226*, 631–647. doi:10.1007/s00213-013-3004-1
- Beckers, T., & Kindt, M. (2017). Memory reconsolidation interference as an emerging treatment for emotional disorders: Strengths, limitations, challenges, and opportunities. *Annu Rev Clin Psy.* 2017;13:99–121. doi:10.1146/annurev-clinpsy-032816-045209
- Bouton, M. E. (2004). Context and behavioral processes in extinction. *Learning & Memory*, *11*, 485–494. doi:10.1101/lm.78804
- Castonguay, L. G., & Hill, C. E. (Eds.). (2012). *Transformation in psychotherapy: Corrective experiences across cognitive behavioral, humanistic, and psychodynamic approaches*. Washington, DC: American Psychological Association.
- Clem, R. L., & Schiller, D. (2016). New learning and unlearning: Strangers or accomplices in threat memory attenuation? *Trends in Neuroscience*, *39*(5), 340–351. doi:10.1016/j.tins.2016.03.003
- Dunbar, A. B., & Taylor, J. R. (2017). Reconsolidation and psychopathology: Moving towards reconsolidation-based treatments. *Neurobiology of Learning & Memory*, *142*(Pt A), 162–171. doi:10.1016/j.nlm.2016.11.005
- Ecker, B. (2011, January 2011). Reconsolidation: A universal, integrative framework for highly effective psychotherapy [Web log post]. Available from <https://bit.ly.1zjKtMr>

- Ecker, B. (2013). Nonspecific common factors theory meets memory reconsolidation: A game-changing encounter? *Neuropsychotherapist*, 2, 134–137. doi:10.12744/tnpt(2)134-137
- Ecker, B. (2015a). Memory reconsolidation understood and misunderstood. *International Journal of Neuropsychotherapy*, 3, 2–46. doi:10.12744/ijnpt.2015.0002-0046
- Ecker, B. (2015b). Psychotherapy's mysterious efficacy ceiling: Is memory reconsolidation the breakthrough? *Neuropsychotherapist*, 16, 6–24. doi:10.12744/tnpt(16)006-024
- Ecker, B. (2016). Guidelines for creating juxtaposition experiences. *Coherence Therapy Clinical Note Series*, 7, 1–7. <http://www.coherencetherapy.org/resources/notes.htm>
- Ecker, B. (2018). Clinical translation of memory reconsolidation research: Therapeutic methodology for transformational change by erasing implicit emotional learnings driving symptom production. *International Journal of Neuropsychotherapy*, 6, 1–92. doi:10.12744/ijnpt.2018.0001-0092
- Ecker, B., & Hulley, L. (2016). Overview of coherence therapy and its use of memory reconsolidation. *Coherence Therapy Clinical Note Series*, 6, 1–12. <http://www.coherencetherapy.org/resources/notes.htm>
- Ecker, B., & Hulley, L. (2017). *Coherence therapy practice manual and training guide* (8th ed.). Oakland, CA: Coherence Psychology Institute.
- Ecker, B., Hulley, L., & Tivic, R. (2015). Minding the findings: Let's not miss the message of memory reconsolidation research for psychotherapy. *Behavioral and Brain Sciences*, 38, e7. doi:10.1017/S0140525X14000168
- Ecker, B., Tivic, R., & Hulley, L. (2012). *Unlocking the Emotional Brain: Eliminating Symptoms at Their Roots Using Memory Reconsolidation*. New York, NY: Routledge; 2012.
- Ecker, B., Tivic, R., & Hulley, L. (2013a). A primer on memory reconsolidation and its psychotherapeutic use as a core process of profound change. *Neuropsychotherapist*, 1, 82–99. doi:10.12744/tnpt(1)082-099
- Ecker, B., Tivic, R., & Hulley, L. (2013b). Unlocking the emotional brain: Is memory reconsolidation the key to transformation? *Psychotherapy Networker*, 37(4), 18–25, 46–47.
- Ecker, B., & Toomey, B. (2008). Depotentiation of symptom-producing implicit memory in coherence therapy. *Journal of Constructivist Psychology*, 21, 87–150. doi:10.1080/10720530701853685
- Else, J. W. B., & Kindt, M. (2017a). Breaking boundaries: Optimizing reconsolidation-based interventions for strong and old memories. *Learning & Memory*, 24, 472–479. doi:10.1101/lm.044156.116
- Else, J. W. B., & Kindt, M. (2017b). Tackling maladaptive memories through reconsolidation: From neural to clinical science. *Neurobiology of Learning & Memory*, 142A, 108–117. doi:10.1016/j.nlm.2017.03.007
- Goldfried, M. R. (1980). Toward the delineation of therapeutic change principles. *American Psychologist*, 35, 991–999. doi:10.1016/j.appsy.2009.10.015
- Jarome, T. J., Kwapis, J. L., Werner, C. T., Parsons, R. G., Gafford, G. M., & Helmstetter, F. J. (2012). The timing of multiple retrieval events can alter GluR1 phosphorylation and the requirement for protein synthesis in fear memory reconsolidation. *Learning & Memory*, 19, 300–306. doi:10.1101/lm.024901.111
- Kazdin, A. E. (2007). Mediators and mechanisms of change in psychotherapy research. *Annual Review of Clinical Psychology*, 3, 1–27. doi:10.1146/annurev.clinpsy.3.022806.091432

- Kindt, M., Soeter, M., & Vervliet, B. (2009). Beyond extinction: Erasing human fear responses and preventing the return of fear. *Nature Neuroscience*, *12*, 256–258. doi:10.1038/nn.2271
- Krawczyk, M. C., Fernández, R. S., Pedreira, M. E., & Boccia, M. M. (2017). Toward a better understanding on the role of prediction error on memory processes: From bench to clinic. *Neurobiology of Learning and Memory*, *142A*, 13–20. doi:10.1016/j.nlm.2016.12.011
- Kroes, M. C., Schiller, D., LeDoux, J. E., & Phelps, E. A. (2015). Translational approaches targeting reconsolidation. *Current Topics in Behavioral Neurosciences*, *28*, 197–230. doi:10.1007/7854_2015_5008
- 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*, e1. doi:10.1017/S0140525X140000412009
- LeDoux, J. E., Romanski, L., & Xagoraris, A. (1989). Indelibility of subcortical emotional memories. *Journal of Cognitive Neuroscience*, *1*, 238–243. doi:10.1162/jocn.1989.1.3.238
- Lee, J. L. (2009). Reconsolidation: Maintaining memory relevance. *Trends in Neuroscience*, *32*, 413–420. doi:10.1016/j.tins.2009.05.002
- Lee, J. L. C., Nader K., & Schiller, D. (2017). An update on memory reconsolidation updating. *Trends in Cognitive Sciences*, *21*, 531–545. doi:10.1016/j.tics.2017.04.006
- McGaugh, J. L. (2000). Memory: A century of consolidation. *Science*, *287*, 248–251. doi:10.1126/science.287.5451.248
- Merlo, E., Milton, A. L., Goozée, Z. Y., Theobald, D. E., & Everitt, B. J. (2014). Reconsolidation and extinction are dissociable and mutually exclusive processes: Behavioral and molecular evidence. *Journal of Neuroscience*, *34*, 2422–2431. doi:10.1523/JNEUROSCI.4001-13.2014
- Nader, K., & Einarsson, E. O. (2010). Memory reconsolidation: An update. *Annals of the New York Academy of Sciences*, *1191*, 27–41. doi:10.1111/j.1749-6632.2010.05443.x
- Nader, K., Hardt, O., & Lanius, R. (2013). Memory as a new therapeutic target. *Dialogues in Clinical Neuroscience*, *15*(4), 475–486.
- Pedreira, M. E., Pérez-Cuesta, L. M., & Maldonado, H. (2004). Mismatch between what is expected and what actually occurs triggers memory reconsolidation or extinction. *Learning & Memory*, *11*, 579–585. doi:10.1101/lm.76904
- Reichelt, A. C., & Lee, J. L. C. (2013). Memory reconsolidation in aversive and appetitive settings. *Frontiers in Behavioral Neuroscience*, *7*, 1–18. doi:10.3389/fnbeh.2013.00118
- Riccio, D. C., Millin, P. M., & Bogart, A. R. (2006). Reconsolidation: A brief history, a retrieval view, and some recent issues. *Learning & Memory*, *13*, 536–544. doi:10.1101/lm.290706
- Robertson, E. M. (2012). New insights in human memory interference and consolidation. *Current Biology*, *22*, R66–R71. doi:10.1016/j.cub.2011.11.051
- Rosen, G. M., & Davidson, G. C. (2003). Psychology should list empirically supported principles of change (ESPs) and not credentialed trademarked therapies or other treatment packages. *Behavior Modification*, *27*, 300–312. doi:10.1177/0145445503027003003
- Ryan, L., Hoscheidt, S., & Nadel, L. (2008). Perspectives on episodic and semantic memory retrieval. In E. Dere, A. Easton, J. Huston, & L. Nadel (Eds.), *Handbook of behavioral neuroscience* (pp. 5–18). Amsterdam, The Netherlands.

- Schroyens, N., Beckers, T., & Kindt, M. (2017). In search for boundary conditions of reconsolidation: A failure of fear memory interference. *Frontiers in Behavioral Neuroscience, 11*, 65. doi:10.3389/fnbeh.2017.00065
- Sevenster, D., Beckers, T., & Kindt, M. (2013). Prediction error governs pharmacologically induced amnesia for learned fear. *Science, 339*, 830–833. doi:10.1126/science.1231357
- Soeter, M., & Kindt, M. (2011). Disrupting reconsolidation: Pharmacological and behavioral manipulations. *Learning & Memory, 18*, 357–366. doi:10.1101/lm.2148511
- Treanor, M., Brown, L. A., Rissman, J., & Craske, M. G. (2017). Can memories of traumatic experiences or addiction be erased or modified? A critical review of research on the disruption of memory reconsolidation and its applications. *Perspectives on Psychological Science, 12*(2), 290–305. doi:10.1177/1745691616664725
- Wampold, B. E. (2001). *The great psychotherapy debate: Models, methods, and findings*. Mahwah, NJ: Erlbaum.