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Neuroscience of Enduring Change and Psychotherapy

An Introduction

Lynn Nadel and Richard D. Lane

The modern era of psychotherapy began over a century ago, guided by the assumption that psychological treatments were mediated by changes in the brain (Freud, 1895, 1920). Neuroscientific knowledge at the time was insufficient to sustain such a linkage, however, and the 20th century saw the burgeoning of the field of psychotherapy with hundreds of types of psychotherapy being developed, largely independent of neural underpinnings. Although we are far from understanding the neural basis of enduring change in psychotherapy at this time, recent developments in neuroscience provide a foundation for advancing knowledge in this area. A book on this topic seemed timely and perhaps overdue. As Kazdin (2006) noted, even after decades of psychotherapy research, there is no evidence-based explanation of how or why even well studied interventions produce change. We simply don't understand the mechanism(s) through which treatments operate. In our view, the need for such an evidence-based explanation persists and this need became the foundational basis for this book.

The proximal inspiration for the book was a paper published in 2015 in *Behavioral and Brain Sciences* (BBS) jointly written by four contributors to this volume (Lane, Ryan, Nadel, and Greenberg) titled "Memory Reconsolidation, Emotional Arousal and the Process of Change: New Insights From Brain Science." This paper brought together two separate lines of research—preclinical research on memory, including memory reconsolidation, and research on the role of emotion in the change process in psychotherapy. The lead author (RDL), a psychiatrist, psychodynamic psychotherapist, and neuroscientist specializing in emotion research, was strongly influenced by the work of Les Greenberg (LG), the creator of emotion-focused psychotherapy (EFT), which emphasized the essential role of emotion experiencing in the change process. Clinically, this often involves recalling important and problematic personal experiences in the past,

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activating the painful feelings associated with those experiences, and then using specific techniques to activate other, often healing, emotions that help to create a corrective emotional experience. Although EFT theory emphasized that such interventions altered memory structures called "schemes," a broader consideration of all the ways that emotion and memory might be interacting in this context had not yet been formulated.

Therapeutic emotional experiences during EFT often take place while past personal experiences are being recalled from what memory researchers call "episodic memory." This differs from the previously mentioned schemes, or the closely related concept of schemas, which correspond to what memory researchers call "semantic memory." Recent findings suggest three important considerations as we attempt to bring neurobiology to bear on therapy and to bridge this gap: (a) memories, however they are realized in the brain, appear to be modifiable, through a process often called "memory reconsolidation"; (b) the two forms of explicit memory, episodic and semantic memory, although undergirded by distinct brain networks, are in constant interaction; and (c) emotion plays a key role in memory. Regarding the latter, people cannot and indeed do not remember everything that happens in their lives, but they do remember what is most important. Emotion, among other things, is one of nature's ways of signaling what is important to a person. Memory is not just a record of the past but also an essential guide to the future. If change in therapy and better behavioral adaptation in the future involves altering memory through new emotional experiences while problematic memories are activated, a new approach to understanding change in psychotherapy might emerge.

These considerations led RDL to engage a colleague at the University of Arizona (LN), a memory researcher involved in creating the multiple trace theory, which anticipated the current focus on memory reconsolidation. Crossing paths a few years earlier when both served on a panel together, LN and LG had briefly discussed these ideas, but did not pursue it further, in part because LN is not a clinician. Another colleague at the University of Arizona (LR), a trained clinician, who also was involved in the memory research supporting multiple trace theory, was invited to add her talents to the effort. With LG's interest and willingness to actively collaborate on this project, we felt we had the expertise needed to flesh out an initial theory. The fact that LR hailed from and got her PhD in Toronto, where LG lived and worked, closed the circle and solidified connections within the group.

The BBS article presented a model of change in psychotherapy that transcended disciplines, resting on a common foundational mechanism. The article was accompanied by 28 commentaries—many supportive, some not. Many of the BBS respondents saw our proposal as innovative and of potential

importance but noted that there was still a great deal that needed to be understood. One important issue is that clinically we are interested in facilitating change that is enduring (i.e., not prone to relapse). By and large, long-term follow-up studies (e.g., one year or more) are not the norm in psychotherapy research, and yet our focus, guided by the phenomenon of memory reconsolidation, is on changes in memory and emotion that are enduring. This suggested to us that it would be useful to explore the relevant basic science as well as the many clinical applications of the change process that we were describing and that the time was right to hold a multidisciplinary conference.

In September 2017, a group of researchers and clinicians convened for two days at the University of Arizona in Tucson, with the goal of sharing ideas, hopefully in a way that would be helpful in preparing the chapters for this book. Day 1 featured basic (preclinical) research findings and their clinical implications. On Day 2, established authorities on different psychotherapy modalities were asked to describe their views of how change occurred in psychotherapy and, to the extent possible, to provide their views on the relevance of the model that we proposed. We have maintained this separation between preclinical and clinical sections in this book.

At the conference, Ajay Satpute, a Day 1 speaker, noted that the initials of the authors of the BBS paper formed the acronym LRNG and suggested using this acronym to refer to the core model of change described in the paper. This clever proposal seemed to be quite fitting given that the basic mechanism of change that we describe fundamentally involves learning. We will use it in this book.

The LRNG model specifies that many of the problems for which clients seek help involve recurrent behavior patterns that are out of awareness and that cause distress or dysfunction. These patterns typically arise because of experiences earlier in life involving intolerable emotions that needed to be avoided. The essential ingredients of enduring change, we proposed, consist of (a) activating the old problematic memories and their associated emotions; (b) having corrective emotional experiences that allow the old memories to be altered through reconsolidation; and (c) converting these updated episodic experiences into enduring semantic structures by practicing new ways of behaving and experiencing oneself and others in interaction with the world. We introduced the integrated memory model (IMM), stating that episodic memory, semantic memory, and emotion are highly interrelated—whenever one is activated the other two are likely to be as well. In promulgating the IMM, we were hoping to promote the view that different psychotherapy modalities can be understood to work by the same basic mechanism, even though they appear to have different foci of interest.

Given this framework, the conference started with an examination of the elements of this model, including emotion, different kinds of memory,

interactions between different kinds of memory, emotion–memory interactions, the evidence for memory reconsolidation, and the role of sleep in memory consolidation and perhaps reconsolidation. These topics and more are covered in the first seven chapters of this book from the scientists who presented at the conference on Day 1. Lynn Nadel's chapter seeks to provide an accessible, if selective, overview of memory research and to situate memory reconsolidation and some of the evidence supporting it in historical context. Ryan Smith addresses the important topic of conscious and unconscious emotion in relation to the fundamental principles of a computational neuroscience approach to brain function. Ajay Satpute (with co-authors Erik Nook and Melis Cakar) then writes about how the brain constructs emotional experiences and recalled memories and the essential role of language in the conceptualization of these experiences. Jessica Andrews-Hanna (with co-authors Mary-Frances O'Connor and Kalina Cristoff) addresses the topic of the dynamics of internal experience, so crucial in psychotherapy, from the very current and timely brain network perspective. Next, Joey Dunsmoor (with co-author Marijn Kroes) addresses the core topic of emotion–memory interactions and the evidence both pro and con that negative memories can be transformed through reconsolidation. Jessica Payne reviews fascinating evidence regarding the role of rapid eye movement (REM) sleep in memory transformation. Finally, Matthew Grilli (with co-author Lee Ryan) discuss how episodic and semantic memories contribute to the sense of self.

Part II of the book focuses on the processes of change in different psychotherapy contexts, including much of what was discussed on the second day of the conference. In the BBS paper, we highlighted four modalities with different theoretical traditions and assumptions: psychodynamic psychotherapy, cognitive-behavioral therapy (CBT), behavioral therapy, and EFT. All of these modalities are discussed in this book. Antonio Pascual-Leone (with co-author Les Greenberg) discusses the mechanisms of change in EFT. Jonathan Huppert (with co-authors Isaac Fradkin and Shawn Cahill) discusses current theories of change in CBT and behavioral therapy and provides a common explanatory framework that bridges them. Bruce Ecker discusses fundamental principles of memory reconsolidation and his take on their application to psychotherapy. He presents a form of therapy, coherence therapy, that is specifically designed to promote memory reconsolidation in the most efficient way possible. Hanna Levenson (with co-authors Lynne Angus and Erica Poole) discusses time-limited dynamic psychotherapy and presents some evidence for memory reconsolidation in that context. Finally, Rhonda Goldman (with co-author Alyssa Fredrick-Keniston) surveys the leading psychotherapy modalities and discusses the LRNG model from the perspective of psychotherapy integration.

While writing the 2015 BBS article, we were unaware of Bruce Ecker's writings on memory reconsolidation and psychotherapy, published several years earlier. As a consequence of this failure, the BBS paper did not give Dr. Ecker adequate credit for his work. Just before publication of the BBS paper, we learned of his seminal contribution and inserted a reference to his work in the final version. However, we must apologize for not doing justice to his contribution at the time. We were delighted, therefore, that he graciously agreed to write a chapter for this book to help make our coverage of this topic as complete as possible. His contribution has been considerable as it has contributed to our updating of the LRNG model, which we describe in the final chapter. Inclusion of this chapter, along with the cautionary note raised in a recent review by Elsey, van Ast, and Kindt (2018), demonstrates that there remain quite disparate opinions about the extent to which change in psychotherapy can be attributed to memory reconsolidation.

In Part III, we include three chapters that address integration in different ways. Richard Lane provides an empirically tractable account of recurrent maladaptive patterns, a core construct in psychodynamic psychotherapy, with the goals of highlighting the fundamental importance of emotion in the emergence of these patterns, helping clinicians who specialize in other modalities appreciate the value of the construct of recurrent maladaptive patterns for their work, and promoting research. Ryan Smith (and co-authors Richard Lane, Lynn Nadel, and Michael Moutoussis) discusses the phenomenon of enduring change from the perspective of computational neuroscience, which offers new ways of thinking about the etiology and treatment of clinical problems. In the final chapter, Richard Lane, Ryan Smith, and Lynn Nadel present a summary of the neural basis of the IMM and LRNG models and consider the basic science and clinical research agendas moving forward.

To the extent that this volume fulfills its purpose, it will reflect the extremely hard work of all of the authors and conference presenters. Some authors (Bruce Ecker and Jonathan Huppert) were not at the conference but graciously agreed to contribute chapters. Some presenters (Edna Foa, Michelle Craske, and Jacek Debiec) participated productively in the conference but could not submit chapters. All the authors engaged in a significant back-and-forth with the editors during the creation of the final versions of their chapters, and through us, the authors engaged with each other. It may have taken a bit longer than we anticipated, but what resulted was a much more integrated book than we started out with, and a final chapter that we hope reflects many of the issues that connect, and disconnect, the other chapters. For this we gratefully thank all of the authors for their efforts. We hope they, and our readers, conclude it was worthwhile.

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