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**Reconsolidation versus Retrieval Competition: Rival hypotheses to explain memory change in psychotherapy**

Chris R. Brewin

*Clinical Educational and Health Psychology, University College London, London WC1E 6BT, United Kingdom.*

**[c.brewin@ucl.ac.uk](mailto:c.brewin@ucl.ac.uk)**

**Abstract:** I suggest it is premature to assume memory reconsolidation provides a unifying model of psychotherapeutic change given our current state of knowledge, and that other basic memory mechanisms, also supported by neuroscience, have a stronger claim at present. In particular, I propose that retrieval competition provides a more plausible alternative to memory reconsolidation.

Two opposing views concerning memory change have held sway in cognitive science as in psychotherapy research (Brewin 1989, 2006). One states that interventions such as supplying misinformation or conducting psychological therapy can in principle result in a permanent change in the underlying memory representation: Here, Lane et al. argue for this position and that it is attributable to a process of reconsolidation. The alternative view is that representations cannot be permanently altered, and that such interventions

create new memories that leave the original intact. Whether old or new memories then determine behavior is decided through a process of retrieval competition, with the most accessible memory having the greatest influence (Brewin 2006).

Reconsolidation has not yet been extensively studied in humans and there is controversy over whether it has been unambiguously established. A number of studies have used reconsolidation manipulations to reduce people's emotional response to a fear-inducing experience, an approach which leaves the declarative recollection of that experience intact. Other studies, such as those reported by the authors, have demonstrated changes in memory for one set of objects brought about by participants being given an indirect reminder of this set just before being exposed to a new set of objects. Using this design, in which there is no explicit retrieval of the original memory, it is hard to prove unambiguously that reconsolidation has taken place, although other recent research has addressed some of these issues (Chan & LaPaglia 2013; Kroes et al. 2014).

Even if the manipulations in these studies are producing genuine reconsolidation effects on declarative memory, these are relatively small in absolute terms. They are also obtained with designs involving the memorization of personally meaningless stimuli. Given apparent boundary conditions for reconsolidation effects (Alberini et al. 2013), such effects might not occur with memories of painful experiences that people have recalled and perhaps ruminated over dozens if not hundreds of times. Moreover, anxious individuals may be less likely to show fear-related reconsolidation effects (Soeter & Kindt 2013). Finally, the claim that memories have been permanently changed can

logically only be studied by thorough retesting and trying to elicit the original memory in another way, something that remains to be done.

Some predictions made by Lane et al. do not obviously favor a reconsolidation approach. For example, one suggestion was that propranolol is likely to be contraindicated in posttraumatic stress disorder (PTSD) therapy as it may slow the reconsolidation of memories that incorporate a new sense of safety. Preliminary evidence appears to support the use of propranolol, however (Brunet et al. 2011). The authors also suggested that selective serotonin reuptake inhibitors (SSRIs) are likely to impair the processes of change in psychotherapy because their adverse effects on REM sleep will interfere with reconsolidation. However, most of the evidence suggests that psychotherapy when given in combination with SSRIs achieves better outcomes than when given alone (e.g., March et al. 2004; van Apeldoorn et al. 2008).

The main alternative possibility is that psychotherapy creates new memories that compete with existing ones. Many contemporary theories of human and animal cognition (e.g., Kesner & Rogers 2004; Poldrack & Packard 2003) favor the idea that learning produces a variety of new representations that can collaborate or compete with existing memories for control of behavior. Lane et al. mention extinction, a well-established therapeutic process which is thought to operate in this way, but do not explain why they consider reconsolidation to be a more likely candidate for explaining therapeutic change. Among the advantages of a retrieval competition approach are that it does not assume a very malleable memory system that is constantly subject to change. In evolutionary

terms, it would seem better to have a memory system that was able to keep a permanent record of extremely stressful or threatening events, as this information could be critical for survival. In fact, although it is fashionable to emphasize the malleability of memory, there is also plenty of evidence for its stability and reliability (Brewin & Andrews 2014). This is hard to explain if memories are constantly being updated, leaving no trace of the original behind.

Another advantage accrues from the fact that relapse is reasonably common even after successful psychotherapy. This is hard to explain if it is assumed the underlying memory has been permanently updated. It is much more consistent with the idea that recovery is brought about by the creation of stable alternative memory structures, but that the original remains able to be reactivated under a specific set of circumstances. This is a helpful model when teaching relapse prevention procedures to patients nearing the end of a course of therapy. It emphasizes that the return of negative feelings and cognitions is a continuing hazard, but one that is not catastrophic and probably reflects the presence of specific triggers. Patients can then be encouraged to re-institute the coping mechanisms they have been taught, rather than interpret the relapse as a sign of treatment failure.

At present our understanding of therapeutic change is rudimentary, and proposals for new mechanisms grounded in cognitive neuroscience are extremely welcome. It is likely that the many varieties of transformation that patients undergo will never be explained by any one mechanism, whether reconsolidation or retrieval competition. Basic research on memory change does however constitute one of the most promising lines of

enquiry that are presently available, and findings from both animal and human research have the capacity to deliver new insights into what makes therapy effective. Although I agree with the authors that different forms of memory, such as semantic and episodic memory, are strongly interlinked, this does not mean that they are all equally important in different types of psychopathology. There are also perceptual forms of memory that appear to be distinct from episodic memory and may become relatively disconnected within conditions such as posttraumatic stress disorder (Brewin 2014; Brewin et al. 2010). It seems highly likely that our understanding of different change mechanisms needs to develop in tandem with a more differentiated view of human memory systems.

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