

Tradeoffs between the accuracy and integrity of autobiographical narrative in memory reconsolidation

Carlos Montemayor

San Francisco State University, Department of Philosophy, San Francisco, California, 94132.

cmontema@sfsu.edu

<https://sites.google.com/site/carlosmontemayorphilosophysfsu/home>

Abstract: Lane et al. propose an integrative model for the reconsolidation of traces in their timely and impressive article. This commentary draws attention to tradeoffs between accuracy and self-narrative integrity in the model. The tradeoffs concern the sense of agency in memory and its role in both implicit and explicit memory reconsolidation, rather than balances concerning degrees of emotional arousal.

Recent findings on the relation between memory storage and retrieval provide empirical support to the reconsolidation hypothesis defended by Lane et al. The integrative memory model they propose seems to be the best way to accommodate a vast amount of data, including findings on how emotion shapes and informs cognition in memory storage and retrieval (e.g., LeDoux 1996). According to that integrative model, when a memory is retrieved there is a critical process of reconsolidation, which presents the opportunity to amend or even disrupt the memory's content at retrieval, based on contextual information

and emotional feedback (Nadel et al. 2000). Lane et al. review this body of evidence with rigor and clarity, so I shall not elaborate on the experimental merits of their proposal. Rather, I shall highlight some theoretical difficulties that lie ahead for their reconsolidation hypothesis, and suggest one way to address them.

The theoretical problems I would like to raise concern the nature of reconsolidation as a process that affords access to information about events in the past. The interactive components that Lane et al. propose create three tradeoffs concerning the balance between the epistemic value of a memory trace (i.e., the accuracy of the information that makes knowledge about the past possible) and its narrative value (i.e., the contextual coherence of the information in an overall self-narrative and what it evokes in the subject). It is not entirely clear how the integrative model achieves this balance.

Striking this balance is crucial for the process of reconsolidation. As Lane et al. argue, reconsolidation may alter the original emotional aspects of memories and also recontextualize or modify their content. Ideally, however, epistemic information contained in episodic memories, or the accurate information that leads to knowledge of past events, should be preserved across reconsolidations. Episodic memories seem to require a format for storage and retrieval that frames information metrically, according to temporal tags which depend on time-keeping mechanisms (Gallistel & King 2009; Montemayor 2013). Lane et al.'s integrative memory model is interactive and proposes that reconsolidation modifies memory traces; their model creates the theoretical problem

that it is not clear how this metric information is guaranteed to be systematically preserved, as will be elucidated below.

First, there is a tradeoff between the *rigidly* itemized storage and retrieval of event-traces and the *flexibly* reconstructive reproduction of traces. Emotional and social aspects of a trace may modify how the trace is stored and contextually interpreted, thereby changing or even eliminating epistemic features of the trace. Reconsolidation must neither modify the trace to a degree that it loses its epistemic characteristics but nor must it preserve it in a rigid way, such that it cannot be interpreted in different forms.

Second, there is a tradeoff between the quality of access to traces and their semantic or episodic detail. Remembering events in excruciating detail is one extreme of the spectrum of semantic and episodic accuracy and remembering events in the most abstract and ambiguous way is at the other. Evidence shows that the brain normally strikes a balance between these extremes (Quiroga 2012).

If traces are very malleable, however, it is difficult to guarantee that enough accurate detail will be preserved in reconsolidation. So-called reality monitoring requires that memory traces retain an adequate amount of detail for the identification of the causal origin of such traces (see Johnson 1991). When the emotional response components of the integrative model interact too much with episodic information or with semantic structures, this can jeopardize the retention of information required for reality monitoring. Another related difficulty is the existence of evidence suggesting that the emotional

malleability of semantic information may render the memory system epistemically inadequate, leading to systematic confabulation (Loftus 2005). Without suggesting that the integrative memory model suffers from problems concerning confabulation, it is clear that a balance between malleability and accuracy is needed. More information is required in order to determine fully how such a model may achieve this balance.

Lane et al. are right, however, in claiming that accuracy cannot be the sole purpose of the memory system. The evocative power of a set of memories cannot be captured by their accuracy, temporal order, or causal origin *alone*. How, then, should we understand such evocative power in terms of information processing? Stored memories are a “pile” of traces and for them to become evocative, autobiographical narrative must be infused into the information they contain. Such infusion, however, could be elicited in many ways, including modifications in perspective from the first to the third person point of view (Rice & Rubin 2009).

A third tradeoff is that the more one stays within a structure that is ordered linearly, the less accurate the description of the stream of consciousness *as one experiences* it from different vantage points will be, and the more one departs from a linear narrative, the higher the risks of confabulation. Findings suggest that social interactions may help stabilize the malleability of traces (Wegner 1986), but the exact role of social interactions for the integrative memory model is unclear.

These three tradeoffs are crucial to clarify the distinction between implicit (or unconscious) and explicit (or conscious) memory reconsolidation, which features centrally in the integrative model. Could it be that the implicit system has different rules for balancing these tradeoffs? Presumably the explicit system plays a major role in autobiographical memory, but the implicit system, as Lane et al. explain, is evolutionarily more primitive and is frequently involved in reconsolidation. Evidence on the sense of agency in reconsolidation may help clarify how the integrative model balances the tradeoffs and complexities of memory, both implicit and explicit. If the implicit system obeys different rules for reconsolidation, detailed evolutionary explanations of the older emotional-organismic system and its relation to conscious autobiographic memory – which probably evolved recently – could be helpful in clarifying this aspect of the integrative model (see Cosmides & Tooby 2013 for the adaptive value of the implicit memory system).

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