

REPLY TO WALKER AND STICKGOLD:

Proposed boundary conditions on memory reconsolidation will require empirical verification

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Broadly speaking, nonreplications of the kind we reported (1) can occur for three reasons: (i) the original finding was a false-positive, (ii) the replication was a false-negative, or (iii) some unanticipated variable moderated the effect. The authors of the original study, Walker and Stickgold (2), now propose several potential moderators (3).

We welcome such discussion; however, we should note that both parties are now “hypothesizing after the results are known” (4), and are therefore in an exploratory (“hypothesis-generating”), rather than confirmatory (“hypothesis-testing”) phase of scientific inquiry (5). Any post hoc conjectures will require empirical verification.

Walker and Stickgold (3) note that participant age and session time had a larger range in the replications. Because these authors raised these points previously, we have already addressed them in our article (see *SI Results* in ref. 1). In brief, reconsolidation scores had no appreciable relationship with either session time or age.

Walker and Stickgold (3) refer to the subtle modification of the instructions of Exps. 3 and 4 in our study (1), but their line of reasoning is a little hard to decipher: if this was a critical moderator then why were reconsolidation effects not observed in Exps. 1 and 2, which used instructions identical to the original study (2)? The instructions were changed in Exps. 3 and 4 precisely because we were attempting to match the error rates reported in the original study.

Similarly, Walker and Stickgold (3) note that in Exp. 1, overnight improvements in speed were smaller than in Exps. 2–4. Again, if this were a critical moderator, reconsolidation effects would have emerged in Exps. 2–4.

Walker and Stickgold (3) refer to “two independent replications” of the original finding (6, 7). We briefly discussed this set of studies (6, 8) in our article (1) and we do not believe that Walker and Stickgold’s (3) characterization is accurate. In all studies (6–8) there was a small day 2 to day 3 performance increment, whereas the original finding was a performance decrement: the effects are in opposite directions. These studies were interpreted as “blocked offline gains” because the improvements were smaller than in a no-intervention control group. Not only is this a qualitatively different effect, it is rather tenuous evidence for reconsolidation: (i) there was no “no-reactivation” control condition; (ii) the intervention (transcranial magnetic stimulation rather than new learning) was delivered during, rather than after reactivation; and (iii) such “offline gains” can often be driven by procedural confounds (9).

Finally, Walker and Stickgold (3) note that “almost two dozen human studies and over 900 animal studies have reported reconsolidation.” We are concerned that many of these studies do not use adequate controls, have not been independently replicated, and do not test retrieval failure explanations (see *Discussion* in ref. 1; also see ref. 10).

To conclude, we disagree that the moderators proposed by Walker and Stickgold (3) can be viewed as “boundary conditions” on reconsolidation theory because they (i) are at present only post hoc conjectures and (ii) do not provide a compelling account of the extant data. Nevertheless, this discussion has generated a number of testable hypotheses that can be empirically verified with new data.

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