Response to: *Autobiographical memory transformation across consolidation*
by Ruud M.W.J. Berkers and Marlieke T.R. van Kesteren
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We thank Berkers and van Kesteren for their interest in our work which used multi-voxel pattern analysis (MVPA) of high-resolution fMRI data to examine representations of recent and remote autobiographical memories (Bonnici et al., 2012). Their comments provide an opportunity to consider our findings further and to clarify our interpretation.

As the commentators indicated, the question of how autobiographical memories are instantiated in the brain and their subsequent neuronal evolution has long been debated. We availed ourselves of the advantages offered by MVPA to disclose individual autobiographical memory representations in particular brain regions (Chadwick et al., 2012). In so doing, we found that information about specific recent and remote autobiographical memories was present in a distributed set of areas that included the hippocampus and ventromedial prefrontal cortex (vmPFC). Of interest to Berkers and van Kesteren was the finding that information about the remote autobiographical memories was more readily detected in vmPFC compared to the recent memories. They speculated that this may be because retrieval of the remote autobiographical memories, which were 10 years old, may have involved reconstruction of the events using not only specific episodic details but also general semantic features perhaps extracted from multiple previous similar events. They further suggested that these semantic features may be represented in vmPFC (van Kesteren et al., 2012).

The commentators correctly noted that we ensured the recent and remote memories were re-experienced with equal and high vividness. But more than that, the frequency of recall, level of detail, emotional valence and the perspective taken were all matched between recent and remote memories. We also made strenuous efforts to study memories that were unique, excluding events that occurred repeatedly or were similar to other events. We also confirmed that subjects did not think about the previous week's stimulus-eliciting interview at all during scanning. From a (intensely-interrogated) phenomenological perspective, therefore, the recent and remote memories did not differ. We therefore believe that an explanation simply in terms of semantic features does not suffice. We agree that some memories do become semanticized in part or in whole over time, and do not dispute that the processing of recent and remote memories in our study must have differed on some level, otherwise the differential findings in vmPFC would not have emerged. However, we believe our data suggest a more complex course for autobiographical memories that remain vivid over long periods of time.

In this regard, Berkers and van Kesteren did not mention in their Journal Club that while the hippocampus as a whole contained information about recent and remote autobiographical memories in equal measure, we observed a striking intra-hippocampal difference whereby the posterior hippocampus contained more information about remote autobiographical memories. In another analysis we found little overlap in the neuronal populations sub-serving recent and remote autobiographical memories in the hippocampus (unlike cortical areas, where the overlap was more substantial). Thus, vmPFC was not the only brain region to respect the distinction between recent and remote autobiographical memories. We argue that these findings in vmPFC and hippocampus should be considered in tandem when hypothesising about potential mechanisms for systems-level consolidation of autobiographical memories.

Our study undoubtedly raises numerous questions, but in so doing provides clear targets for future research. It points to an urgent need to elucidate the role of the vmPFC in autobiographical memory. For instance, surprisingly little is known about remote autobiographical memories in patients with vmPFC lesions, where the emphasis has instead been on value representations. But such patients may have limited access to coherent representations of past experiences which could impact upon their value-based decision-making. Future studies must also pinpoint exactly what differs between recent and remote autobiographical memories, including feature dimensions, connectivity, and the processes they reply upon. In particular MVPA could facilitate longitudinal studies that track specific memory traces over years, providing unique insights into how individual representations develop, persist, change and decay.

In summary, we thank Berkers and van Kesteren for drawing the readers' attention to our article and highlighting the contributions that we hope our work makes to the study of autobiographical memory consolidation.

References

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