Attenuated hippocampal CA1 pattern reactivation and replay in rats with medial entorhinal cortex lesion

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During awake immobility and slow wave sleep hippocampal spikes from CA1 population bursts resemble place field sequences (replay/preplay) and neuronal assemblies that are identified during running on a linear track. These spontaneous hippocampal activity patterns are generally thought to reflect intrinsic hippocampal synaptic connectivity. How much they reflect experience during linear track sessions is not fully understood. In rats with bilateral lesions of the medial entorhinal cortex (MEC) we find that sequence replay was still highly significantly present but nevertheless strongly reduced as compared to control rats. In lesioned rats, the average activation strength of assemblies was similar during rest sessions before (PRE) and after (POST) running on the linear track (RUN), whereas for controls, average POST activation was higher than PRE activation. Since, in MEC lesioned animals CA1 theta phase precession was strongly disrupted, our findings suggest that sequence replay and assembly reactivation are partly independent of intact hippocampal phase precession.