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Temporal Differences in Theta Reset

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Poster Presentation 55

TEMPORAL DIFFERENCES IN THETA RESET

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Neurons within the hippocampus (HPC), entorhinal cortex (EC), and anterior cingulate (AC) display a characteristic 4 - 12 Hz frequency EEG pattern called the theta rhythm. Experimental disruptions of this theta rhythm are correlated with deficits in cognitive processing. Hence, theta may contribute to learning and memory. One proposed mechanism suggests theta resets by stopping and restarting again, phase-locking itself to incoming sensory input. This reset may allow cells to be in a maximal state of firing when sensory information arrives, thereby strengthening synapses and, hence, cognitive processing. Previous studies from this lab have shown that theta reset occurs in the HPC, EC and AC and that theta reset is highly predictive of correct working memory. However, the neural mechanism behind theta reset is still unclear. Theoretically, the HPC, EC, and AC theta rhythm is generated via projections from the medial septal area (MSA), which contains neurons that fire in a rhythmically bursting pattern. Inhibition of these neurons precedes theta reset in the HPC. It has been hypothesized that if MSA generates theta in the EC and the AC as well as the HPC, then reset of the EC and AC should occur at the same time as HPC reset. This study looks at temporal differences in theta reset in the HPC, EC, and AC.