How the Retrosplenial Cortex Changes Throughout the Process of Associative Learning by Amelia Leon

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The retrosplenial cortex, located in the posterior midline of the brain, is a small but important region that plays a role in memory and spatial processing (Vann, 2009). In fact, it is one of the first regions to undergo pathological changes in Alzheimer's Disease. The functional role of the retrosplenial cortex in learning remains unknown. In this experiment, we evaluated patterns of blood oxygen level dependent (BOLD) functional magnetic resonance imaging (fMRI) activations in the retrosplenial cortex during associative learning. We recruited 27 participants, who performed a conditional visuomotor associative learning task while we collected fMRI data. During the task, participants were required to learn the associations of three stimuli: two stimuli were always associated with the same responses, while the third stimulus changed its association conditional depending on what stimulus preceded it. Participants learned these associations through trial-and-error. We hypothesized that patterns of BOLD fMRI activations in the retrosplenial cortex would converge on a stable pattern as learning progressed. This prediction would be evident by a progressive increase in correlation in the spatial patterns of activations with learning. Twenty-one participants successfully completed the fMRI task and contributed to our final analyses. We evaluated changes in brain activations in blocks of 10 trials then evaluated how the brain activations in the retrosplenial cortex during the first ten trials correlated with all subsequent blocks of ten trials. No consistent patterns of correlations across learning were evident amongst the participants. For example, in some participants, correlations of spatial patterns of activation increased with learning but in others the opposite pattern was observed. The different patterns of activation across participants may indicate individual differences in learning, which could help in understanding how people learn. Future work will examine how these patterns of activations are related to behavior on a trial-by-trial basis.