

## Human Midcingulate Cortex Encodes Distributed Representations of Task Progress

Clay Holroyd

The function of midcingulate cortex (MCC) remains elusive despite decades of investigation and debate. Complicating matters, individual MCC neurons respond to highly diverse task-related events, and MCC activation is reported in most human neuroimaging studies employing a wide variety of task manipulations. Here we investigate this issue by applying a model-based cognitive neuroscience approach involving neural network simulations, functional magnetic resonance imaging and representational similarity analysis. We demonstrate that human MCC encodes distributed, dynamically-evolving representations of extended, goal-directed action sequences. These representations are uniquely sensitive to the stage and identity of each sequence, indicating that MCC sustains contextual information necessary for discriminating between task states. These results suggest that standard univariate approaches for analyzing MCC function overlook the major portion of task-related information encoded by this brain area, and point to promising new avenues for investigation.