Brain Mapping Center

SPECIAL SEMINAR

Sponsored by the UCLA Brain Mapping Center Faculty

The focus of these talks is on advancing the use of brain mapping methods in neuroscience with an emphasis on contemporary issues of neuroplasticity, neurodevelopment, and biomarker development in neuropsychiatric disease.

Hosted By: Marco Iacoboni, MD, PhD, Psychiatry and Biobehavioral Sciences, UCLA

Brain network dynamics during spontaneous strategy shifts and incremental task optimization

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With practice, humans can learn to improve their performance in a task by either optimizing a known strategy or discovering a novel, potentially more fruitful strategy. How does the brain support these two fundamental abilities? Subjects performed a simple perceptual decision-making task (Schuck et al., 2015). They could either use and progressively optimize the instructed strategy based on stimulus position or spontaneously devise and then use a new and more effective strategy based on stimulus color. We investigated how local and long-range BOLD coherence behave during these two different forms of learning by applying an unsupervised fMRI analysis technique we recently developed, specifically designed to track connectivity dynamics (Allegra et al., 2016).

Converging evidence showed that the posterior portion of the default network (i.e. the precuneus and the angular gyrus bilaterally) has a central role in the optimization of the current strategy: these regions encoded the relevant spatial information, and increased the level of local coherence and the strength of connectivity with other relevant regions in the brain. This increase was proportional to the task optimization achieved by subjects, as measured by the reduction of Reaction Times, and was transiently disrupted when subjects were forced to change strategy. By contrast, the anterior portion of the default network (i.e. medial prefrontal cortex) together with rostral portion of the fronto-parietal network showed an increase in local coherence and connectivity only in subjects that would at some point spontaneously change for the new strategy. Notably, such increase was detectable even at the very beginning of the task, when the alternative strategy was not yet implementable. Overall, our findings suggest that the default network, far from being “shut-down” during task performance, has a pivotal role in the background exploration and monitoring of potential alternative course of actions.

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Ahmanson-Lovelace Brain Mapping Center Conference Room (221)
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