MAX PLANCK INSTITUTE
FOR HUMAN COGNITIVE AND BRAIN SCIENCES

Monday, November 28, 2022, 15:00 hrs
Hybrid Meeting (Lecture Hall and via Zoom)

Institute Colloquium

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Negative BOLD revisited: assessing neuronal contributions and control of cerebral blood flow changes through non-BOLD fMRI

Many in the fMRI community are familiar with the small pesky blue blobs that usually accompany positive BOLD responses (PBRs), which, more often than not, represent noise. However, fewer are familiar with anticorrelated regions of a sustained nature: the negative BOLD response (NBR), evoked in response to certain stimuli and whose physiological origin is still a matter of debate.

Through simultaneous measurements of cerebral blood flow (CBF) and BOLD (PBR and NBR) in the human visual cortex at 3T, we first attempted to gain a better understanding of the underlying NBR physiology in relation to PBR and probed for differences in their neurovascular coupling. An in-house developed multi-echo segmented EPI readout, DEPICTING (capable of short echo times, TE_1<2ms), was employed in combination with an optimized pseudo-Continuous Arterial Spin Labeling (pCASL) to improve the inherently low sensitivity of CBF measurements.

Additionally, while neuronal activity has long been linked to the BOLD response based on electrophysiological recordings, the extent to which such neuronal contributions and their metabolic load can be interpreted from non-BOLD fMRI data is not yet fully understood. We, hence, attempted to assess such contributions and differences in the neuronal control of CBF in PBR and NBR regions through analysis of the timecourses and application/extension of a neuronal population-dynamics-inspired flow-metabolism model.