RUHR-UNIVERSITÄT BOCHUM

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Advances in layer specific fMRI

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Laminar and high spatial resolution fMRI of human auditory predictive processing

To deal with dynamic changes in the soundscape and adjust our behaviour accordingly, a key function of our brain is to *predict future states of the world*. This has led to a transformative way of thinking about brain function. That is, *what we perceive does not reflect the sensory stimulus itself, but rather a combination of the stimulus and an internal (generative) model of its causes.* This idea has led to several theoretical advances some of which are capitalized by *Predictive Coding* (PC). PC assumes that generative models are formed through the exchange of prediction errors (feedforward) and predictions (feedback) across hierarchical processing stages. In addition, PC assumes that prediction errors are modulated by the precision of currently available predictions. Results from invasive animal and human electrophysiological studies support the relevance of predictions for neural processing at different hierarchical levels. Nevertheless, especially in humans the evidence grounding PC principles onto fundamental neurocomputational units (i.e. cortical layers, subdivisions of subcortical structures) is limited and this hampers our understanding of how PC supports the processing of sounds in context in the human brain. Ultra-high field fMRI at high spatial resolution offers a unique opportunity to investigate how computations are embedded in the mesoscopic (cortical) architecture of the human brain (in vivo and non-invasively). Laminar fMRI has already been used to investigate predictive processes in the human visual cortex. In this talk I will describe recent advances in imaging the auditory pathway at UHF and results from studies investigating how predictions and prediction errors are processed in auditory cortical layers. I will also show how ultra-high field fMRI can be combined with biophysical and computational approaches to gain further insights into the computations underlying the BOLD response.

Host:

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