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Thema: **“Imaging the human brain’s representations of space, number and time”**

Ort: **Universität Regensburg, VG2.39 (Vielberth-Gebäude)**

Referent: **Assistant Professor Dr. Ben Harvey**
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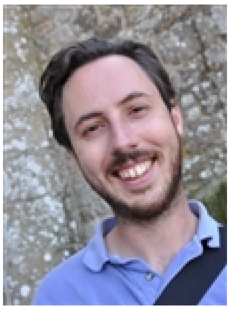

Perception of spatial quantities like the number and sizes of objects is implicated in many perceptual and cognitive functions, including foraging, attention control, decision making and mathematics. Using 7T fMRI and neural model based analyses, we reveal extensive and overlapping networks of neural populations showing selective responses to object number (numerosity) and size. These populations are organized into topographic maps, with numerosity and size preferences changing gradually across the cortical surface, mirroring the layout of early sensory cortices. We extend this approach to temporal quantities, the duration and frequency of visual events. Despite the central role of timing in perception and action planning, it remains unclear how the brain encodes and represents sensory event timing. We hypothesize that human neural populations may exhibit tuned responses to visual event timing. We display visual events (a circle appearing and disappearing) that gradually varied the time between circle appearance and disappearance (duration) and/or the time between consecutive circle appearances (period, i.e. 1/frequency). We summarize the fMRI responses to these events using neural models tuned to duration and period. These models captured fMRI responses well in several widely-separated temporo-occipital, parietal and frontal areas partially overlapping with the maps of numerosity and object size. Within these areas, we reveal topographic organization of event timing preferences. Therefore, various spatial and temporal quantities are processed in related networks of topographic maps, in regions implicated in object recognition, motion perception, attention control, decision-making and mathematics. Topographic maps group neurons with similar response preferences, thereby making neural processing more efficient by minimizing connection distances. We propose that such organization may be found for many cognitive functions. This allows characterization of neural computations and response selectivity underlying human cognition even at the limited spatial resolution of fMRI.

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