ORAL SESSION: Sensation & Perception

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Oral Sessions

Presentations

Early processing of odor valence in the human olfactory bulb

In non-human animals, the olfactory bulb (OB) process odor valence (Doucette et al., 2011) and have specific processing of odors innately associated with threats (Kobayakawa et al., 2007). Contrary to that, there is no study that has investigated the function of the OB in processing of odor valence in humans, instead most of the past researches focused on the central processing of valence and mainly implicating the orbitofrontal cortex (Seubert et al., 2017). Lack of evidence of valence processing earlier in the processing stream in the human olfactory system can, however, simply be explained by the fact that until recently (Iravani et al., 2019) there was no non-invasive method to evaluate functional processing of the OB. We aimed to determine whether odor valence is processed by the human OB using our recently developed method to measure OB function non-invasively (Iravani et al., 2019). We demonstrate that shortly after odor onset (~200 ms), perceived odor pleasantness was associated with gamma activity in the human OB.

Presenter

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Population receptive field mapping of white matter BOLD activities in human visual pathway

Neural activities in white matter (WM) is essential for information transmission and functional connectivity in the

brain. Recent studies suggest that functional activities of white matters can be detected by blood oxygenation level dependent (BOLD) fMRI. Visual field maps are fundamental representations in human early visual areas. However, visual field representations of white matter tracts in human visual pathway remain unexplored. In this study, we estimated population receptive field (pRF) maps of white matter tracts in human visual pathway with the 7T retinotopy dataset from Human Connectome Project (HCP).

Presenter

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Genetic influence is linked to cortical morphology in category-selective areas of visual cortex

Human visual cortex contains discrete areas that respond selectively to specific object categories such as faces, bodies, and places. A prominent yet unresolved question concerns strength of genetic and environmental influences on the organization of category-selective areas. Some studies have provided evidence in favor of an innate categorical organization. Face-vs-place selectivity can be detected in cortex of human infants by 5-6 months of age (Deen et al., 2017). However, monkeys raised without exposure to faces cannot develop normal face patches (Arcaro et al., 2017). To disentangle the relative contributions of nature and nurture to the formation of category-selective areas, we analyzed functional MRI data from an unprecedented number (n = 424) of monozygotic (MZ) and dizygotic (DZ) twins.

Presenter

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Investigating Neurophysiological Sources of Multimodal Neuroimaging in Humans

In the absence of non-invasive neuroimaging techniques with high spatiotemporal resolution in humans, techniques that fuse M/EEG and fMRI data have gained some traction. It is critical to examine the similarity of results obtained from these emerging techniques and the underlying neural responses. EEG is an electrophysiological technique with high temporal resolution, but a poor spatial resolution, with lack of access to deep brain areas. On the other hand, fMRI provides an indirect measure of neural activity with high spatial –but poor temporal– resolution. Previous studies have combined these two complementary modalities to study spatiotemporal dynamics of brain activity (Cichy et al, 2016; Salmela et al, 2018; Khaligh-Razavi et al, 2018). Here, we investigated the extent to which the spatiotemporal dynamics of brain activity obtained by EEG or fMRI, or the similarity-based EEG-fMRI fusion are consistent with that of neural activity obtained by an invasive technique with high spatiotemporal resolution (i.e. ECoG).

Presenter

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How the onset of blindness affects the interplay between crossmodal and intramodal plasticity

The study of sensory deprived individuals represents a unique model to test how experience interacts with intrinsic biological constraints to shape the development of the functional organization of the brain. In particular, it has been demonstrated that visual deprivation triggers enhanced representation of auditory information in the occipital cortex of early blind individuals. How this crossmodal reorganization impacts on the temporal regions typically responsive to sounds? As the brain is a highly interconnected organ it is unlikely that early visual deprivation would affect exclusively the occipital cortex leaving the rest of the network unaffected. A systematic investigation of this mechanism is still missing in the field: Whether the intramodal and crossmodal changes relate to each other remains unknown. A further open question is whether the onset of blindness has a role in tailoring the outline of the intramodal plasticity and how it might impact on the interplay between occipital and temporal regions.

Presenter

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Decoding texture from audio-haptic sources: an fMRI study

The perception of objects' properties (nature, shape, or texture) is not only based on tactile information but also relies on other sensory sources to enhance perception. While neural bases of visual and tactile processing for object exploration has been widely investigated (Zhang et al 2004), little attention has been paid to audio-haptic interactions(Kassuba et al 2013). Auditory signals occur frequently when we touch objects, and these sounds can convey useful information about the texture of the objects we explore(Lederman 1979, Kavounoudias et al 2019). In the present fMRI study, we examined audio-haptic integration during roughness assessment in adults.

Presenter

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