Brain Stimulation Methods

Tuesday, Jun 19: 10:30 AM - 11:45 AM
Oral Sessions
Tuesday - Oral Session

Presentations

1029: Focal non-invasive disruption of resting-state connectivity using ultrasound neurostimulation

10:30 AM - 10:42 AM
In order to establish the functional roles of brain areas it is often necessary to look at the impact of disrupting the brain area. This can be done reversibly using a number of neuromodulation methods such as transcranial magnetic stimulation and transcranial current stimulation. However, the spatial resolution and physiological efficacy of these techniques is limited. Even more critically, the modulatory effect of these techniques is highly variable both within and across individuals. We show, however, that with focused ultrasound neurostimulation (FUN) it is possible to transcranially and reversibly modulate neural activation with relatively high spatial resolution, high efficacy, and high inter-subject reproducibility. Here we report an investigation into the effects of FUN on the resting-state activity of spatially proximal cortical areas, the supplementary motor area (SMA) and dorsal frontal pole (FPC) of the macaque (Macaca mulatta).

Presenter

Lennart Verhagen, WIN, Department of Experimental Psychology, University of O

1001: Brain connectivity change with deep brain stimulation and levodopa treatment in Parkinson’s disease

10:42 AM - 10:54 AM
Levodopa and later, deep brain stimulation (DBS) have become the mainstays of therapy for motor symptoms associated with Parkinson's disease (PD). Although these therapeutic options lead to similar clinical outcomes, the neural mechanisms underlying their efficacy are different. In particular, the physiological mechanisms leading to effectiveness of DBS still remain to be clarified (Chiken and Nambu, 2016). Therefore, investigating the differential effects of DBS and levodopa on functional brain architecture and associated motor improvement is of paramount interest. Here, for the first time, we addressed a direct comparison between the effect of levodopa medication and DBS of the subthalamic nucleus (STN) on functional brain connectivity in the same group of PD patients examined before and after electrode implantation.

Presenter

Karsten Mueller, Max Planck Institute for Human Cognitive and Brain Sciences

1052: Inhibitory TMS differentially affects brain network communication depending on the stimulation site

10:54 AM - 11:06 AM

The human brain is organized into large-scale, functional connectivity (FC) networks, each associated with different sensory or cognitive functions. Sensory networks are predominantly internally connected, while cognitive networks are rather connected globally to a variety of other networks [Power 2011]. In earlier studies, transcranial magnetic stimulation (TMS) has been evaluated for its modulating effect of FC within specific brain networks. However, fewer studies have tested the brain-wide effect of TMS and comparing various stimulation sites in cognitive and sensory networks of the same subjects. Here, we characterized the effect of repetitive, inhibitory TMS of the salience (SAL), the visual (VIS) and a control network on network- and global-FC in the human brain.

Presenter

Gabriel Castrillon, Technische Universität München

1604: Causal account of brain network computations driving value-based choice

11:06 AM - 11:18 AM

Decisions based on subjective values are essential for survival, for instance when deciding what we should (not) eat. Despite their importance, little is known about the mechanisms underlying such decisions. Recent studies using scalp EEG and transcranial alternating current stimulation (tACS) suggest that disruptions of fronto-parietal gamma phase-coupling reduce the preference-consistency of value-based decisions (Polania et al. 2014, Polania et al. 2015). However, the neural circuit mechanisms that underlie such tACS-induced effects remain unknown. Here we use concurrent tACS-fMRI (Moisa et al., 2016) to investigate these mechanisms. We focus specifically on brain areas related to reward (O'Doherty et al., 2017) and memory (Shadlen et al., 2016), which we hypothesized might connect with frontal and parietal areas during the readout of values for choice.

Presenter

Marius Moisa, SNS lab, University of Zurich

1009: Understanding the effects of transcranial direct current stimulation on response inhibition

11:18 AM - 11:30 AM

Transcranial direct current stimulation (tDCS) shows promise for cognitive modulation. However, its mechanism of action on large-scale brain networks is poorly understood and there are large variations in behavioural response. Response inhibition is a key aspect of cognitive control. Coordinated interactions between the Default Mode Network (DMN) and the Salience Network (SN) are required. Within the SN, the right inferior frontal gyrus/anterior insula (rIFG/rAI) is important for this coordination (Sridharan et al. 2008; Hampshire & Sharp 2015). Variability in the structure of the tract connecting the rAI to the dorsal anterior cingulate cortex/pre-supplementary motor area (dACC/preSMA), another key SN node, predicts network and behavioural responses during response inhibition (Bonnelle et al. 2012; Jilka et al. 2014). We used simultaneous tDCS-fMRI to study the influence of network structure and function on responses to rIFG tDCS. We hypothesised that rIFG tDCS: 1) improves response inhibition; 2) structural connectivity influences its effects; and 3) modulates network activity and functional connectivity.

Presenter

Lucia Li, Imperial college london

1232: Longitudinal Structural Covariance Associated with Antidepressant Electroconvulsive Therapy Response

11:30 AM - 11:42 AM

Major depressive disorder (MDD) is a highly prevalent and symptomatically heterogeneous disorder [1] with substantial variability in treatment response. The Hamilton Depression Rating Scale (HDRS) [2] is commonly used to evaluate clinical improvement, though different neural systems may account for changes in particular symptom profiles. Electroconvulsive therapy (ECT) shows rapid and robust clinical effects in patients with treatment resistant MDD [3]. Here, we address how symptom dimensions segregate, change, and relate to structural neuroplasticity over ECT index in a large multisite cohort of ECT patients with MDD. We further introduce a novel representation of relative treatment-related volumetric changes based on graph theory.

Presenter

Benjamin Wade, UCLA