Invitation to the guest lecture

"Brain connectivity in autism, measured using source-space magnetoencephalography"

Manfred G Kitzbichler, PhD
Martinos Center for Biomedical Imaging, Charlestown, USA
Wednesday, 2nd of May 2012, 1:00 pm

HS 46
Main building
Dr.-Karl-Lueger-Ring 1
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Univ.-Prof. Dr. Claus Lamm

This talk takes place within the scope of “Forschungsseminar für Fortgeschrittene”
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Research interests

- **Autism**: Short- and long-range connectivity in autism, functional integration and segregation of ASD brain networks, individual coping strategies
- **Connectivity and networks**: Graph theory on directed and undirected brain networks, dynamic reconfiguration of whole brain networks. Connectivity measures: coherence, cross-frequency coupling, mutual information, Granger causality, etc
- **Complex Systems**: Self-organized criticality, metastability & chaotic dynamics in the brain and other biological systems, simulation of non-linear dynamics on networks
- **Imaging modalities**: Structural and functional MRI, diffusion tensor imaging, electro- and magnetoencephalography in source space, multi-electrode arrays, electrocorticography

Abstract: "Brain connectivity in autism, measured using source-space magnetoencephalography"

The behavioural difficulties of individuals suffering from autistic spectrum disorder (ASD) are diverse and are pointing at a fundamental underlying difference in cognitive processing. Previous studies found that autistic subjects prefer - and may have a special talent for - a more detail focused approach to perception than typically developed subjects. A term that has been coined to describe the preference in ASD to ignore context is “weak central coherence”, meaning that the binding of pieces of information from different regions of the brain into a “coherent” whole is weaker. In parallel to “central coherence” exists the concept of a “global workspace” in which information from all the functionally segregated parts of the brain is integrated, a process that relies fundamentally on long-range connections and the ability of the executive part of the brain to tap into and modulate regional functional processing. This conceptual analogy together with recent findings that ASD coincides with decreased long-range connectivity, is suggestive of altered workspace formation playing a role in autism.

I will present an overview of connectivity differences in ASD found in electrophysiological recordings within and across different frequency bands. In particular I will show some recent results from our lab, where we used the minimum-norm estimate (MNE) combining MRI and MEG recordings to track functional brain connectivity with high spatial as well as temporal resolution during number of paradigms. We found interesting regionally specific differences in in cross-frequency coupling during a face perception paradigm. In an ongoing resting-state study preliminary results point at regional segregation between the groups, with the frontal network dominating in controls and the posterior network emphasized in ASD subjects, especially in beta-band. We are planning to expand these studies to cross-frequency connectivity and to paradigms involving more dynamic and natural stimuli.