Joint Programme - Neurodegenerative Disease Research

EUFIND 7T Workshop 1

DZNE Magdeburg and OvGU Magdeburg, 10'h and 11'h of November 2016

JPND research

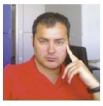
Maastricht University Medical(entre

JPND research

Prof. Dr. Yasin Temel

Yasin Temelis a neurosurgeon and leads the Deep Brain Stimulation (DBS) program at the MUMC. The main neuroanatomical structures under r investigation here are located in the basal ganglia. This group works on establishing links between behavioural and neurospycholgical effects for multiple clinical whorts in cluding movement and neurodegenerative diseases, epilepsy and neuropsychiatric disorders By incorporating and collaborating with various disciplines, techniques and experts <kross science, the research group is able to provide a novel and integ rated approach to the study of brain-behavi oural relationships.

Dr. Kamil Uludag



Kamil Uludag is an Associate Professor at the Department of Cognitive Neuroscience, faculty of Psychol09y & Neuroscience at Maastricht University. Kamil conducted his PhDon Near-Infrared Optical ISpectroscopy, his postdoc on the physiological and physicalbasis of functional magnetic resonance imaging (MRI), and was appointed as the Head of Human Brain Imaging group at the Max-Pianck-Institute for Biological Cybernetics. Here at the MUMC he is continuing his work on the basi soffMRI, studying cogniti on in the human brain uti lizing the new Ultra-High Field (UHF) human MRI scannersandquanttative anatomIcalMRI.

Bethany lsaacs, PhD Student

Bethany is a PhD student in Clinical Neuroscience conducting a cellaborative project under the supervison of Prof. Tcmcl and Prof. Forstmann (Univcrsity of Amstcrdam) with a background in anatomical Incuroimaging of thc subcortcx. The goal of the current project is to integra e l information from structural MRI with additional techniques including diffusion and tractography, resting-state functional MRI and quantitative susceptability mapping at UHF. With this, we hope to gain insight in to the optimal imaging techniques required for accurate anatomical targeting of subcortical brain arCIas for treatmCInt with DBS.

Resources that we have access to

- 3 Tesla, 7 Tesla and 9.4 Tesla MAI
- Experts in the field of neuroimaging with a special focus on imaging the subcortex
- Human and animal electrophysiol ogy (single cell recordings, local field potentials, EEG)
- Post martern specimens
- Healthy control populations (no limitations on data sharing)
- Patient populations induding but not limited to: Parkinson's Disease, Huntington's Disease, Essential Tremor, Alzheimer's, Tourettes, Obsessive Compulsive Oisorder, Epilepsy and Tinnitus (some limitations on data sharing)

Questions that we want to answer

One ofour major areas ofinterest ri ght now i s the shift from standardized atlas based identification of basal DBS targets to the individualised pati ent specitlc analysis for identifying optimal location for electrode placement. This is an attempt to maximise the efficacy ofDBS treatment and minimize the occurence ofunwanted side effects. The successful application ofDBS requries not only the accurate imaging of structural neuroanatomy but also i dentification ofthe connectivity profiles between target locations to both the rest of the basal ganglia as well as higher cortical areas. Therefore, we aim to use UHF MRI to answer the following questions:

- i. Can functional subdivisions of the subthalamic nucleus (STN) be accurately imaged in-vivo with UHF MRI; specifically with diffusion weighted and resting state functional connectivity techni ques? ii. Can this be used to identify optimal target location for DBS? iii. Are these structural and/or functional Subdivisions ofthe STN different acrosspati ents?
- Can UHF MRI of post mortem brain specimens provide novel insight in to the connectivity i. within the basal ganglia and ii. between the basal ganglia and the rest ofthe cortex?
- What are the optimal sequences, MR parameters and post processing techniques required for accurate imaging ofbasal structures at UHF?
- Do electrophysiological recordings taken from DBS during surgeries reflecting the motor component ofthe STN correspond to the same motor component identi fied wi th MRI? •this is our primary proof-of-concept study

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Websites

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