

Post doctoral projects for the cluster CellNetworks by Prof. Herta Flor, Department of Cognitive and Clinical Neuroscience, Ruprecht-Karls-University of Heidelberg, Central Institute of Mental Health, Mannheim

Project area A: “Pain: Structural and functional alterations”

Pain is a complex yet tractable sensory perception that promises to reveal how functional plasticity in single neurons and dynamic perturbations of somatosensory networks affect the cognitive experiences of pain. In this project, we employ functional magnetic resonance imaging (fMRI) and electrophysiology to understand how structural and functional plasticity in the somatosensory system affects the processing of pain at the systemic level. Complementary research efforts in healthy humans and pain patients are directed at the identification of neural circuits that subserve sensory and affective pain memories using multimodal imaging and mathematical models of circuit interactions. Especially, we focus on structural and functional network changes based on altered connectivity of neural networks associated with learning and memory processes. Finally, the project entails transcranial magnetic stimulation (TMS) in order to elucidate the functional relevance of selected brain regions for the processing of sensory, affective, and cognitive aspects of pain perception.

Project area B: “Brain plasticity and learning in affective and anxiety disorders”

Alterations in associative learning and memory are core determinates for the development and maintenance of psychopathological conditions such as depression or anxiety, two mental disorders with tremendous impact on society. Therefore the project will focus on differences in emotion processing associated with altered learning mechanisms in patients with affective disorders in comparison to patients with anxiety disorders. In this project structural and functional magnetic resonance imaging (fMRI) as well as transcranial magnetic stimulation (TMS) will be used in order to clarify brain plasticity on the functional and structural level. The project also aims to identify the genetic modulation of neuronal networks associated with learning and memory processes in healthy persons and patients with affective and anxiety disorders. For the study of associative learning both instrumental and Pavlovian conditioning will be employed.