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Psychobiological Predictors and Neuromodulators of Chronic Back Pain

Autor: Mina Mišić
Institut / Klinik: Zentralinstitut für Seelische Gesundheit Mannheim (ZI)
Doktormutter: Prof. Dr. H. Flor

This dissertation investigated psychobiological mechanisms underlying chronic back pain (CBP). In Study 1, longitudinal diffusion tensor imaging data were used to assess whether white matter structural integrity could predict the transition from subacute to chronic back pain. The data pool consisted of data sets originating from three different sites. Patients with subacute back pain who recovered at follow-up showed significantly greater fractional anisotropy (FA) in the right superior longitudinal fasciculus (SLF) at baseline across all sites. The FA from the right SLF predicted recovery in both classification and dimensional approach. This suggests that SLF integrity, involved in attention and proprioception, may serve as a resilience factor against the development of chronic back pain and highlights the role of frontoparietal networks in pain vulnerability. Study 2 examined the effects of continuous theta-burst stimulation over the medial prefrontal cortex (mPFC) on ongoing pain modulation and brain connectivity in patients with persistent CBP to elucidate the role of mPFC in chronic state. While behavioral pain outcomes did not significantly differ between sham and active stimulation, functional connectivity between the mPFC and the left thalamus was reduced after active compared to sham stimulation. This supports the involvement of this circuit in pain maintenance and suggests that mPFC stimulation can modulate descending pain control pathways. The findings of these two complementary studies contribute to a mechanistic understanding of how different brain regions and networks interact in the onset and maintenance of chronic back pain, providing preliminary insights for targeted interventions. Future research should investigate how longitudinal changes in functional connectivity following neuromodulation relate to intervention response in chronic back pain, while also examining structural brain characteristics as potential promising targets for preventing the transition from subacute to chronic pain and cognitive-emotional factors to optimize outcomes for patients suffering from chronic pain.