CRC 1451 - Project B06: Network-level mechanisms underlying adaptation of motor control

Stroke is increasingly understood as a network disorder that often affects white matter connections, leading to a wide range of motor deficits. By combining connectome-based lesion-symptom mapping with a machine learning algorithm, we identified task-specific disconnection patterns that predicted initial motor impairment and outcome for distinct upper limb movements. The time- and task-dependent differences in the prediction of distinct aspects of motor control highlighted that the structural reserve of motor and various non-motor networks plays a seminal role in the recovery of basal motor control. Conversely, more complex reach-to-grasp movements more strongly rely on specialized neural circuitry including fronto-parietal and subcortical motor areas. Our results extend our current network-level understanding of task-specific motor impairment and recovery, and emphasize the potential of connectome-based lesion-symptom mapping for future clinical applications.

Theresa Paul is a postdoc in project B06. After completing her PhD in the lab of Lukas J. Volz with an emphasis on functional and diffusion MRI in stroke patients, she now focuses on the role of motor learning processes in stroke recovery.

Lukas Hensel is a clinician scientist and postdoc in project B06. He investigates motor control of reaching via kinematic assessments of both natural and standardized movements in human volunteers and stroke patients.

Gereon R. Fink is the CRC spokesperson and PI in projects B03, B06, Z01, and Z03. He conducts basic and translational neurological research with a focus on the motor system to improve the diagnosis and treatment of neurological diseases.

Lukas J. Volz is a PI in project B06. In his research, he uses a multimodal approach to further our understanding of human motor control and how functional reorganization of the motor system enables functional recovery after stroke.

Stroke

doi.org/10.1161/STROKEAHA.125.050929

ORIGINAL CONTRIBUTION

Distinct Disconnection Patterns Explain Task-Specific Motor Impairment and Outcome After Stroke

Frauke Esser, MSc*; Theresa Paul, PhD*; Elizabeth Rizor, PhD; Ellen Binder, MD; Lukas Hensel, MD; Anne K. Rehme, PhD; Corinna Ringmaier, MD; Anna Schönberger, MD; Caroline Tscherpel, MD; Simone Vossel, PhD; Frank E. Garcea, PhD; Christian Grefkes, MD, PhD; Gereon R. Fink, MD, PhD; Scott T. Grafton, MD; Lukas J. Volz, MD, PhD