

Forskerlinjen

Project description (template)

Introduction:

The project aims to develop, test, and publish a battery of reliable and valid paradigms to assess the interaction between the hemispheres in healthy and clinical samples

Background:

The corpus callosum provides the major connection between the cerebral hemispheres and, consequently, it has an important role in human perception and cognition [2]. Firstly, information from the senses is predominately projected contralaterally resulting in an interhemispheric separation of perceptual information and requiring an integration of information between the hemisphere to achieve a unified representation of the perceptual environment [7, 11]. Secondly, functional hemispheric specialization for various cognitive functions (e.g., left-hemispheric dominance for language processing) demands the integration of information and coordination of processing between the hemispheres to allow for efficient cognitive processing [4, 5]. In both cases, the axons forming the corpus callosum support the relevant interaction between the hemispheres. At the same time, a plethora of psychiatric, neurological, and developmental conditions report deviations in corpus callosum anatomy. For example, patients with schizophrenia [1], long COVID [3], dementia [9], or dyslexia [6] show a substantial reduction in the size of the corpus callosum or alterations in its microstructural composition. However, to better understand the relevance of these structural changes for cognitive functioning or the symptomatology in these patients, also changes in the functional properties of the corpus callosum need to be understood. Thus, experimental paradigms for the assessment of interhemispheric interaction via the corpus callosum are highly relevant, and studies indeed report deficits in tasks assessing callosal functioning in the above conditions (e.g. [8, 12]). However, these studies are typically characterised by testing selective aspects of hemispheric interaction while omitting others. One reason for this selectivity, is that standardized methods for a comprehensive assessment of hemispheric interaction have, to date, not been developed. The present project was conceptualised as the first step towards a behavioural test battery that allows for reliable and valid assessment of corpus callosum functioning.

Research questions:

The research question is to develop, test, and publish a set of five paradigms to reliably assess corpus callosum functioning considering different cognitive and sensory modalities

Objectives and method:

The implementation of five paradigms (i.e., dichotic listening, visual half field naming, bilateral redundancy gain, Banich-Belger paradigm, alternating left-right finger tapping task). These paradigms were selected as lesion and split-brain studies suggest them to provide valid measures of hemispheric interaction (e.g. [10]) and as they cover multiple modalities (visual, auditory, motor) and diverse callosal functions (transfer and coordination). The aim is to optimise the design of the paradigms to secure high reliability (>.85) which will be established by testing a group of healthy individuals (N=50) in a test-

retest design. The paradigms will be published as “open” test battery that also can be downloaded and used by external researchers. The paradigms will be programmed in PsychPy, analyses will be conducted in R, and following open-science standards.

Student assignments:

Designing the 5 paradigms in software to administered experiments (e.g. PsychoPy), running/coordinating the data collection/management, statistical analysis. All process will take place in interaction with other students (interns, master thesis) and the supervisor.

About the research environment:

The project is associated with the CCN section and the Oslo Laterality Lab (<https://www.sv.uio.no/psi/english/research/projects/the-oslo-laterality-lab/index.html>). The testing will take in the CCN lab facilities: Participation in the monthly Oslo Laterality Colloquia and meetings within the CCN section. External collaborators might be taken in when expertise is required.

Supervision:

René Westerhausen

Ethical approvals and data:

The data collection is the main part of the experiment. Ethical clearance (PSI committee) will be sought ones the exact implementation of the paradigms is developed.

Tentative article:

Testing the corpus callosum: an open behavioural test battery for the assessment of interhemispheric interaction.

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