Brain structural correlates of metacognition in perceptual decision-making

What are the brain structures involved in the computation of metacognitive judgements? One scientific approach to this question is to use structural magnetic resonance imaging (MRI) to identify brain regions or white matter tracts which structural features covary with metacognitive performance. Very few studies have investigated the structural correlates of metacognition and were modestly powered. The aim of this internship is to analyze data from a highly powered study to provide a robust description of the structural correlates of metacognition.

The data used for this project are collected by the Skuldnet network (http://skuldnet.org/), an international consortium for the study of consciousness. Within distributed sites, healthy volunteers are recruited to perform a visual discrimination and metacognition task and an MRI exam. During the behavioral task, the participants are asked to indicate the direction of moving dots embedded in a random dot kinetogram by clicking with the mouse on a left or right target. Subsequently, they are asked to report the confidence in their response. To ensure that the estimation of metacognitive performance is not biased by discrimination performance, a titration of the difficulty of the task is performed before the main experimental session to achieve similar level of discrimination performance across participants. Metric of metacognitive performance will be extracted from the behavioral data and correlated with features of brain structure. Additionally, computational modelling of the decision process and confidence computation will be estimated and parameters of the model used as regressors in the neuroimaging analyses to further disentangle the brain region involved in decision-making and metacognition. The MRI data collected include classical T1-weighted imaging as well as quantitative and diffusion MRI data. This data will allow extracting various features of brain structure such as grey matter volume and microstructural properties of grey and white matter.

The task of the selected candidate will include a literature review, the formulation of hypothesis regarding the brain regions putatively involved in metacognition and the preprocessing, analysis and interpretation of results regarding the neuroimaging data. Applicants should be comfortable programming in MATLAB and have basic knowledge of statistic. Applicants with a background in engineering, computer science or physics are also encouraged to apply.

The work will take place at the *Laboratoire de Psychologie et Neurocognition* in Grenoble.

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