Abstract

Title

Effects of attention on visual processing between cortical layers and cortical areas

Authors

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Primary field

Perception & Action

Primary methodology

Computational Modelling

Background

Attention is critical to high level cognition and it improves perceptual abilities. Many studies have delineated how attention affects neuronal firing rates, rate variability, and neuronal correlations, but a detailed understanding of how this differs between cortical layers and different cell types is still not clear. Current research interest is focused on the way neural information is exchanged among different neural populations within and between cortical regions.

Methods

Electrophysiological recordings performed in Newcastle, by using multi-contact silicone probes allowed to access neural activity of macaque V1 and V4, while performing cued spatial attention task. The signal analysis went through the extraction of Local Field Potentials (LFPs) and Envelope Multi-Unit Activities (MUA_ES), to address the main issue of aligning laminar depths across experimental sessions. Reference alignment point was chosen to fall within the granular layer of both V1 and V4, the location of earliest input current. Next stages of analysis consisted in trial-averaging, then computing the Current Source Densities (CSDs) and Latency indexes. The selection of the earliest significant sink locations were performed manually with the support of a Matlab® Graphical User Interface developed for the specific purpose. Lastly, all of the above electrophysiological measures (LFPs, MUAEs, CSDs, Latency indexes) were averaged across experimental sessions.

Results

The main results achieved by now consist of the laminar depth alignment distances for each session, and the average laminar profiles of the two cortical regions (V1, V4). This will allow to access the single-unit activity to test hypotheses about the information processing at cellular level.