Title: Brain oscillatory dynamics in the bottom-up/top-down balance of auditory attention: intracranial recordings

Authors: Bastien Intartaglia, Hesham ElShafei, Clara Fonteneau, Hélène Catenoix, Mathilde Bonnefond, Olivier Bertrand, Aurélie Bidet-Caulet

Affiliations:

Brain Dynamics and Cognition Team, Lyon Neuroscience Research Center; CRNL, INSERM U1028, CNRS UMR5292, University of Lyon 1, Université de Lyon, Lyon, France,

Hospices Civils de Lyon, Hôpital Pierre Wertheimer, Service de Neurologie fonctionnelle et épileptologie, Lyon, F-69000, France,

Translational & Integrative Group in Epilepsy Research Team, Lyon Neuroscience Research Center

Abstract:

Attention is a cognitive function that improves the processing of incoming information by enhancing relevant and filtering non-relevant information. This filtering relies on two types of processes: top-down and bottom-up processes. While these processes have been explored separately in previous studies, little is known on how these two processes interact at the level of brain oscillations. To explore this question, intracranial activity (sEEG) was recorded in 11 pharmaco-resistant epileptic patients performing a new paradigm measuring the interaction of these two processes. In this task, the presentation of a cue indicating (informative) or not (uninformative) the side of ear stimulation (i.e. an auditory target), triggers topdown attentional processes toward the target, which was reflected by an alpha desynchronization in contralateral temporal electrodes. The occurrence of distracting sounds during the cue-to-target delay disrupted participant top-down attention, which was reflected by smaller alpha desynchronization and smaller gamma evoked activity during the post-target period in temporal electrodes suggesting a less efficient auditory processing of the target. These results suggest that top-down and bottom-up mechanisms dynamically interact and compete at the level of brain oscillations, which has an impact on the efficiency of information processing from our environment.