# SC113. Brain activity in interictal, ictal, and chronic migraine

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## Introduction

Migraine is a fluctuating disorder. Analyzing changes in cerebral activity throughout migraine variations has greatly contributed to our understanding of the pathophysiology of this condition in the past. Yet, most neuroimaging methods of analysis evaluate indirect markers of neural activation such as regional metabolism or blood flow. In contrast, electrophysiological assessment provides explicit information about the underlying synaptic processes. In this study we evaluated brain activity in different forms of migraine using an electrophysiological-based neuroimaging approach (Low Resolution Brain Electromagnetic Tomography, LORETA).

## Objective

To compare cortical activity between interictal, ictal, and chronic migraine patients and healthy controls.

## Materials and methods

One hundred participants (25 healthy controls and 75 migraine patients: 25 ictal, 25 inter-ictal, and 25 chronic) were included. A sixty-second artifact-free resting-state 22-channel electroencephalogram segment from each individual was analyzed using eLORETA. Mean subject-normalized Delta (1-3Hz), Theta (4-7Hz), Alpha (8-12Hz), Beta (13-30Hz), and Gamma (31-45Hz) band activity from each group was compared (whole brain, voxel-wise) with that of controls. Brain areas that systematically exhibited differences in neural activation were selected for data-driven post-hoc region of interest (ROI) analyses.

## Results

Significant contrasts in brain activity with respect to healthy controls were observed in multiple regions across groups (Fig. 1). Consistent differences mostly comprised six specific brain areas: bilateral subgenual gyrus (BA25), left extrastriate visual cortex (L-BA7), right dorsal entorhinal gyrus (R-BA34), bilateral dorsal posterior cingulate cortex (BA31), and bilateral supramarginal gyrus (BA40). The subgenual and right dorsal entorhinal gyrus presented significantly lesser activity in ictal migraine patients compared to the other groups. In the left extrastriate visual cortex higher alpha activity was observed in the interictal group, while the ictal and chronic groups exhibited more low and high frequency activity respectively.

## Conclusions

Brain activity tends to vary in relation to migraine phase and severity. Key regions exhibiting variations include the subgenual gyrus, a cortical region tightly connected to

the hypothalamus and brainstem, and a portion of the extrastriate visual cortex (BA7) that harbors V3a, known for its implications in migraine aura. Our finding of reduced neural activity in the subgenual gyrus in ictal migraine patients suggests that the increased blood flow observed in this region during spontaneous migraine attacks in seminal studies might in fact reflect increased inhibitory neuron activity. Similarly, the phase and severity-dependent band-specific alterations in the visual cortex that we found expand our knowledge about migraine electrophysiology, particularly the thalamocortical dysrhythmia commonly described.

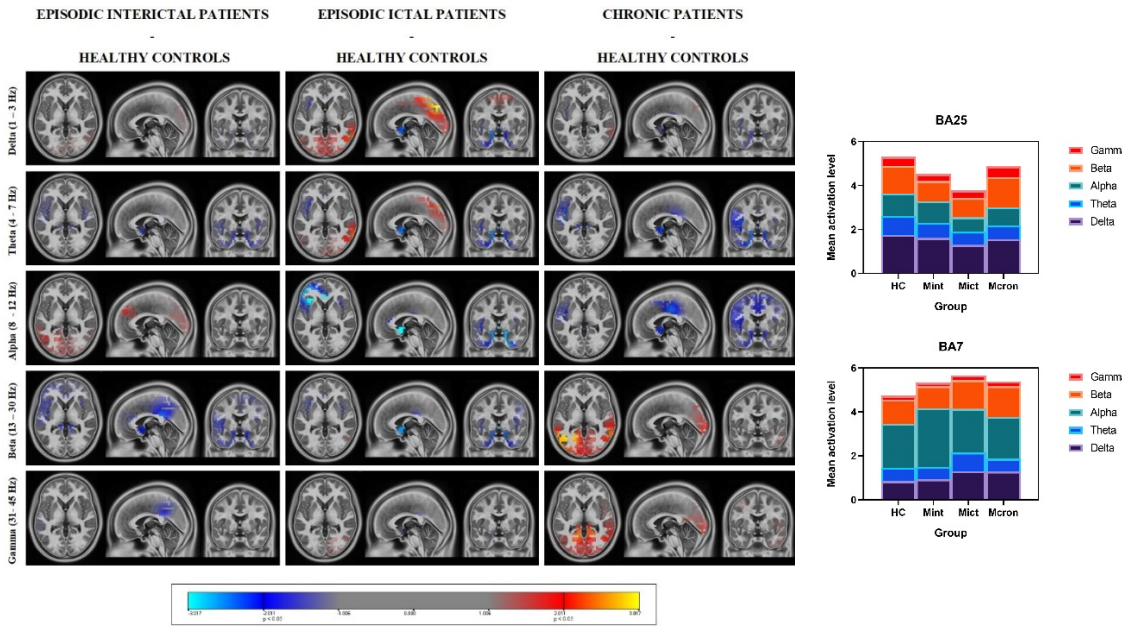


Figure 1. Left, comparisons of cortical activity between migraine groups and healthy controls. Right, region of interest analyses.