Title: HUMAN EMOTIONS

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Abstract:
Our main interest is to unravel the neural basis of emotion production and recognition in humans, by combining invasive and non-invasive methods.

Emotional behavior and experience are investigated by means of stereo-EEG electrical stimulation, performed in drug-resistant epileptic patients during pre-surgical monitoring. Indeed, high-frequency electrical stimulations (50Hz) proved to be effective in eliciting emotional behaviors and sensations that are typically difficult - if not impossible - to study using non-invasive techniques. Emotional effects of high-frequency stimulations include bursts of mirthful laughter, interoceptive sensations, disgust, fear and panic, according to the stimulated region. The evoked behavior, along with the verbal report of the patients, give us the opportunity to parcellate the emotional brain, precisely localizing the brain regions causally involved in the emergence of the several (motor-, interoceptive-, and memory-related) aspects of emotions.

Emotion recognition. The processing of other’s emotions and socio-emotional behavior (e.g. gaze direction, facial expressions) is investigated by means of a variety of invasive and non-invasive techniques, spanning from intracranial sEEG recordings, high-density EEG, MRI, TMS and clinical tests on neurological patients. In particular, intracranial sEEG recording allows to study the processing of emotional stimuli with an unmatched temporal and spatial resolution. Combining the results of electrical stimulation and intracranial recording on the same patients allows the identification of the regions contributing to both emotion production and observation, hence an emotional mirroring system underpinning emotion recognition and emotional contagion.

Emotion networks. The connectivity of the regions contributing to either the production or the recognition of emotion is also investigated by cortico-cortico evoked potentials (CCEP) studies on sEEG patients, and by tractography studies on healthy volunteers.

Skills/technology: intracranial recording; electrical stimulation; MRI, high-density EEG, TMS.

Publications

