Towards understanding visual awareness: An intracranial EEG study on transient suppression phenomena of conscious visual perception

Results:

Aim of the present project was to study and elucidate the neural mechanisms of blink and saccadic suppression by taking advantage of intracranial electrophysiology. We found a characteristic biphasic broadband gamma decrease-increase pattern over early visual areas, during both blinks and saccades.
A high-frequency spectral magnitude decrease and low-frequency magnitude increase during blinking was also recorded over parietal cortex, temporal cortex and particularly robust over prefrontal cortex. The high-frequency spectral magnitude decrease and low-frequency magnitude increase recorded during eye movement execution over early visual areas and prefrontal cortex likely reflects neural correlates of a top-down signal associated with visual suppression. Furthermore, we found a significant saccade-related decrease in the gamma band of V1 approx. 40 ms prior to saccade onset, i.e., in a time window that was completely non-overlapping with saccade onset. This result supports the hypothesis, because a bottom-up mechanism could not yet function at that time.
Saccades more than blinks however elicited a late, narrower-banded gamma response over early visual areas that may reflect the processing of new visual input after saccadic movement to a new eye position. A comparable pattern with a phasic broadband gamma augmentation followed by a more narrow-banded sustained gamma response was previously found in the primate visual cortex during visual stimulation with Gabor stimuli.
We conclude that early visual areas, including striate- and extra-striate cortices, as well as areas of higher visual processing are involved in the processing of visual awareness.

Published Work:

Kern, M., Aertsen, A., Schulze-Bonhage, A. & Ball, T. (2013). Heart cycle-related effects on event-related potentials, spectral power changes, and connectivity patterns in the human ECoG. *Neuroimage, 81*, 178–190.

Areas of interest:

Cognitive Neuroscience, Interoception, Resting State, Cerebral Network Structures, ECoG

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