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Saccade- and fixation-locked analysis of EEG data during active vision

Event-related brain potentials (ERPs) to visual stimuli are usually recorded while subjects maintain a steady fixation. This procedure has many advantages, but differs clearly from natural vision, which consists of an active sampling of the environment with two or three saccadic eye movements per second. An alternative approach to EEG analysis, summarized in the present talk, is to align the EEG not to stimulations, but to the onsets of saccades or eye fixations while subjects are allowed to move their eyes freely (saccade- and fixation-related potentials). This approach requires simultaneous high-resolution eye tracking and the handling of several data-analytical problems. To exemplify that it is nevertheless a useful addition to standard ERP methodology, I will present data from two lines of research: In the first line, we have investigated how visual-cortical potentials evoked by involuntary micro-saccades influence EEG data even in traditional EEG paradigms that require steady fixation. In a second line of research, we recorded fixation-related potentials during sentence reading to study the time course of visual word recognition under natural conditions. In particular, I will focus on the theoretically relevant question whether readers can extract the meaning of a parafoveal word before they fixate it.