The neuronal dynamics of face processing: from detection to recognition

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Abstract

Recognizing familiar faces rapidly and accurately is crucial for social interactions. However, how humans can move on from face detection to face recognition among hundreds of known faces remains largely unclear. In particular, the speed needed between face detection and face recognition has seldom been investigated. Event related potential (ERP) studies suggest that face detection occurs around 110ms while familiar face recognition may potentially rely on different components: the N170, the N250 or the N400.Using scalp EEG in control subjects and intracranial recordings in patients with drug-refractory epilepsy during a rapid go-no go categorization task, we compared electrophysiological responses between face detection (human vs animal faces) and face recognition (famous vs unknown faces, ie. familiarity level). We constrained participants to answer very rapidly and we used a large pool of stimuli in order to prevent top-down activation. Using both ERPs and single-trial decoding, a difference of _˜140ms was found between both detection and recognition conditions. This 140ms electrophysiological delay is remarkably similar with the delay observed in reaction time. Detection occurred around 100ms after stimuli onset while recognition occurred around 250ms post-stimulus. In contrast to some suggestions, this study demonstrates that individualizing a face as known (familiarity level) in a bottom-up paradigm takes a rather lengthy time compared to face detection (superordinate level). Why it takes such a long time needs to be investigated.

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