
An objective neural index of implicit familiar face identity recognition with frequency periodic visual stimulation

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Résumé

Humans' excellent ability to recognize the same identity across different views of a same familiar face identity is well documented. However, this ability is generally measured with explicit behavioral tasks with little or no time constraints, therefore involving many other processes (e.g., association of independently generated names from the 2 images). Here we aimed at providing a simple implicit neural index of this ability using electroencephalographic (EEG) recordings coupled with fast periodic visual stimulation. Images of two famous face identities were presented alternated at a frequency rate of 6 Hz (i.e., one fixation per face) preceded by a 15 sec adaptation period to either (1) one of the two alternating face identities (adaptation condition) or (2) another identity not present in the alternating sequence (control condition). In contrast to previous studies using this approach, various unsegmented natural images, with the face varying in size, expression, lighting, head orientation, etc.. were presented for each face identity. EEG signals (128 channels) of 16 healthy participants were analysed in the frequency domain to compare the amplitude of the 3 Hz EEG evoked response, reflecting asymmetry between the two alternating faces, in the two conditions. Results show a significantly larger amplitude of EEG activity at 3 Hz, i.e., the identity repetition rate, for the condition with adaptation to one of the two alternating face identities ($0.39 \pm 0.08 \mu V$) than for the control condition with irrelevant adaptation ($0.16 \pm 0.07 \mu V$). This 3 Hz evoked response for familiar faces was found in most individuals following only a few minutes of stimulation and was maximally localized over the right occipito-temporal region, a region which is particularly important for face recognition. As expected, no significant amplitude difference was found between the two conditions for the 6 Hz stimuli presentation frequency, reflecting general processes. To conclude, we provide an ecological, objective, and sensitive stimulation technique to implicitly measure an individual's ability to generalize identity across different natural views of familiar faces, with the potential for providing a biomarker of impairments at this function in neurological conditions (e.g., Alzheimer's disease).

Mots-Clés: Face recognition, Visual adaptation, Electroencephalography, Fast Periodic Visual Stimulation

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