

Intracranial Electrical Stimulation on the Face-Selective Brain Region Affected Conscious Perception of a Face during Binocular Rivalry

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Background: When two dissimilar monocular patterns are presented to the two eyes, they compete for perceptual dominance with awareness alternating spontaneously between one image and the other. Dubbed binocular rivalry, this phenomenon has been suggested as a useful means to study the neural correlates of consciousness (Blake & Logothetis, 2002). Previous neuroimaging studies have shown that visual awareness of one pattern during binocular rivalry is correlated with increased activation within the area responsive to the pattern (Tong et al., 1997). However, the causal influence of a category-specific brain region (e.g., the Fusiform Face Area (FFA)) on the conscious awareness of the image of the category (e.g., a face) during binocular rivalry has not been elucidated. To investigate a causal relationship between the FFA and conscious awareness of a face during binocular rivalry, we applied subdural electrical stimulation on macro-electrodes embedded in the FFA of epileptic patients while the patients tracked their conscious percepts during rivalry. **Methods:** Eleven epileptic patients with electrodes embedded in their inferior temporal cortex participated in the experiment. ERP signals were collected from multiple electrodes around the fusiform gyrus. A pair of electrodes showing greater N200 (REFs) component selectively in response to faces compared to scrambled faces and scenes were chosen as the sites of stimulation. During 100-sec rivalry period, a face was shown to the one eye and a scene was presented to the other eye. Six trains of biphasic electrical current (8.6mA, 5 Hz) were applied for 5 seconds with 10-sec ISI. None of the patients were aware of the electrical stimulation while they were tracking their conscious perception by pressing either “face” button or “scene” button. **Results:** 7 out of 9 patients showed prolonged mean predominance duration for face, not for scene, with stimulation on the FFA compared to without stimulation. The timing of influence was highly dependent on individual differences among patients; a positive correlation was observed between alternation rate and the delay of stimulation effect ($R^2 = .68$, $p < 0.007$). (Pearson et al., 2007 somewhere here). **Conclusions:** These findings constitute the first causative evidence that FFA is the

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