

Reduction in V1 activation associated with decreased visibility of a visual target

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Abstract

The perception of a brief visual target stimulus can be affected by another visual mask stimulus immediately preceding or following the target. The link of this visual masking illusion, with visual cortical activation, offers insights into the neural mechanisms for visual perception. The present study investigated the association of the visibility of a target with cortical activation in humans using psychophysical testing and functional magnetic resonance imaging (fMRI). A visual masking protocol that was suitable for an fMRI study was developed. The event-related fMRI was used to measure activation in primary visual cortex (V1) during visual masking and unmasking stimulation. We found that the visibility of the target stimulus was reduced in the masking condition, due to the presence of mask stimuli, but not in the unmasking condition. We also found that the activation in V1 was modulated by the temporal separation of the mask stimuli from the target and was associated with the visibility of the target that was recorded during psychophysical testing and fMRI. These findings are consistent with what has been observed in the primate visual cortex of monkeys, i.e., the transient on-response and after-discharge of V1 neurons to the target stimulus were suppressed by forward and backward mask stimuli, respectively.

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