

Abstract

The human primary visual cortex (V1) is a predominant component for contextual modulations (CM) in basic stimuli. For complex stimuli such as faces, CM has been mainly attributed to category-specific mechanisms, due to its disruption by inversion. However, the magnitude of CM depends on the local signal intensity in both basic and face stimuli. This functional similarity suggests that CM in complex stimuli like faces may not be exclusively caused by high-level, category-specific mechanisms, but partly inherit this functionality from V1. To address this potential link between V1 and face-specialized contextual mechanisms, the susceptibility of CM to local signal intensity when processing basic gratings and complex face stimuli was measured in 51 individuals. For basic stimuli, participants detected a horizontal Grating within a Same (iso-oriented) or Different (orthogonally-oriented) context, or Isolated. For complex stimuli, participants performed a delayed eye-matching task with eyes presented within Same or Different faces, or Isolated, in Upright or Inverted orientations. Local signal intensity was manipulated parametrically in each task, by varying the contrast of the local grating and by varying eye dissimilarity via morphing. Contrast detection and eye-matching morph thresholds were obtained for each individual. For both Upright faces and Gratings, CM were consistently stronger in Same context than Different context, resulting in a significant correlation of CM profile across tasks. CM magnitude was calculated by first regressing out Isolated thresholds from Same and Different context thresholds separately, and then regressing Same residuals from Different residuals. For CM magnitude, we only found a consistent relationship between Gratings and Inverted Faces. Despite obeying similar functional principles (profiles), the CM for Grating and Upright face stimulus therefore seem to rely on independent mechanisms. To further investigate the relationship between face CM and V1, we address the potential correlation between our behavioral measures and participants' V1 size.

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