The Topographic Representation of Global Object Perception in Human Visual Cortex

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Introduction

- A series of fMRI studies showed that global relative to local object perception leads to reduced activity in V1 and enhanced activity in higher-object sensitive cortex [1, 3]
- However, the analyses techniques adopted in these studies lacked the spatial sensitivity to make inferences about the fine-grained spatial organization of these signatures

Question

What is the fine-grained topographic profile of brain activity underlying global object perception?

fMRI experiments

Retinotopic mapping experiment [2] (all participants)

Diamond experiment (n = 5)
Local = percept of four individual segments moving vertically and out of phase. Global = percept of a diamond shape moving horizontally and coherently behind occluders.

Spinners experiment (n = 5)
Local = percept of four dot pairs circling around their common center. Global = percept of two large squares circling around the center of the display.

Dots experiment (n = 5)
Local = percept of four apertures whose dots move vertically and out of phase. Global = percept of four apertures whose dots move horizontally and coherently.

Results

- When compared to fixation, the back-projection profiles of the local and global percept in V1 reveal increased activity in cortical sites encoding the physical stimulus, validating our back-projection approach.
- When the global percept is compared to the local one, a wide-spread deactivation occurs in V1 for the diamond and dots stimuli, whereas there is a mixed pattern for the spinners stimulus.
- Moreover, for the global relative to the local percept, the bistable diamond and spinners stimulus show a relatively wide-spread enhancement of activity in the VLOC, whereas there is deactivation for the unambiguous dots stimulus in this area.

References