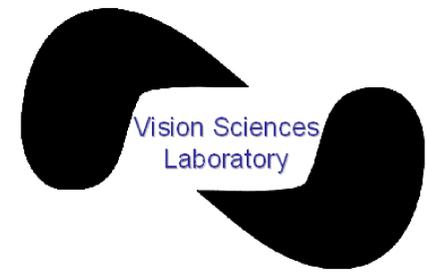




The neural basis of lightness constancy in the visual system

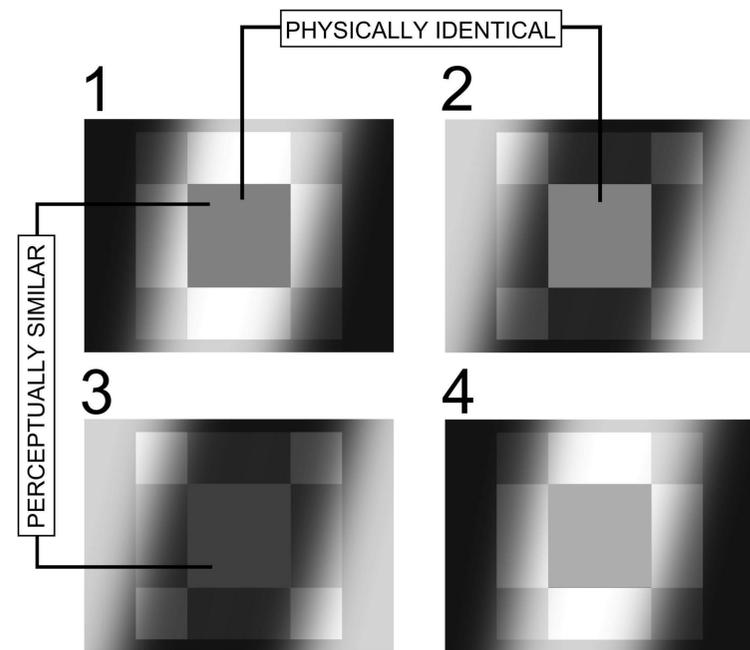


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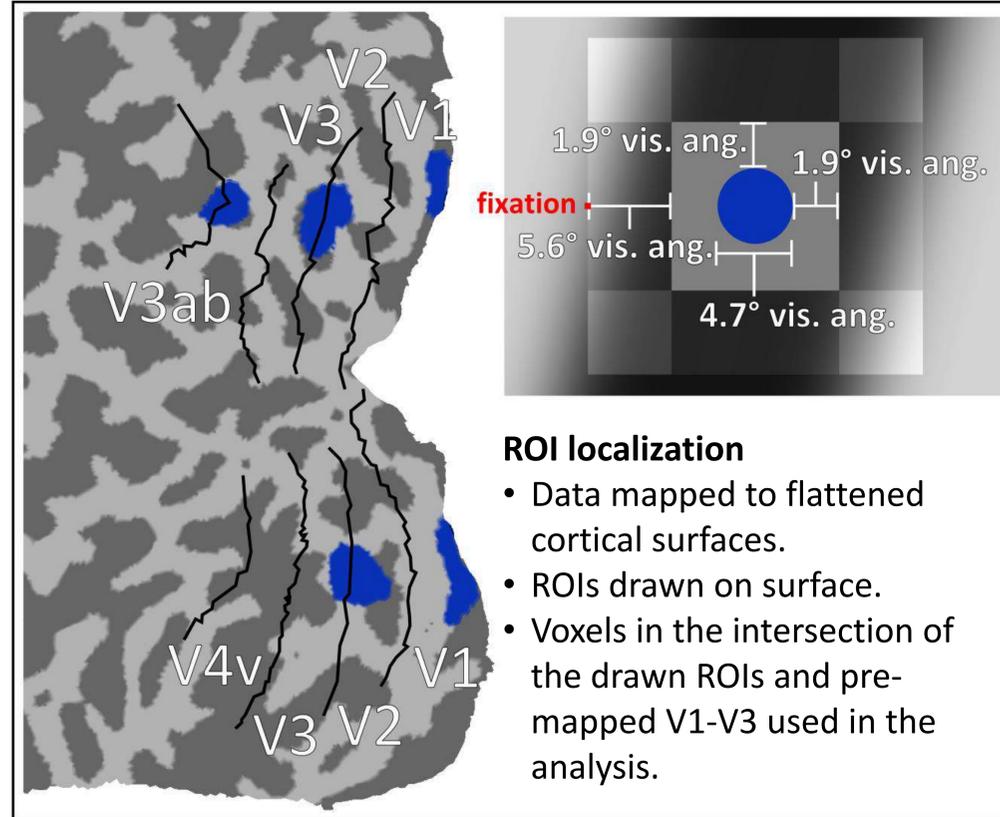
Goal

Use multivariate methods to identify the neural correlates of lightness constancy in early visual cortex.

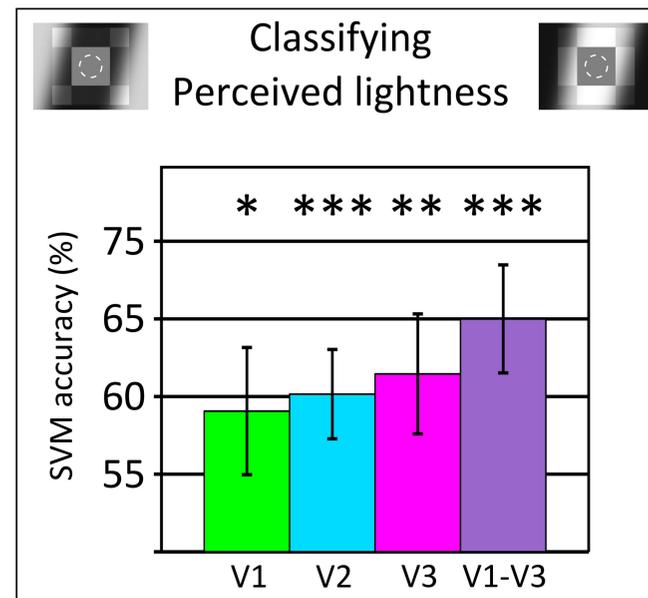
Methods



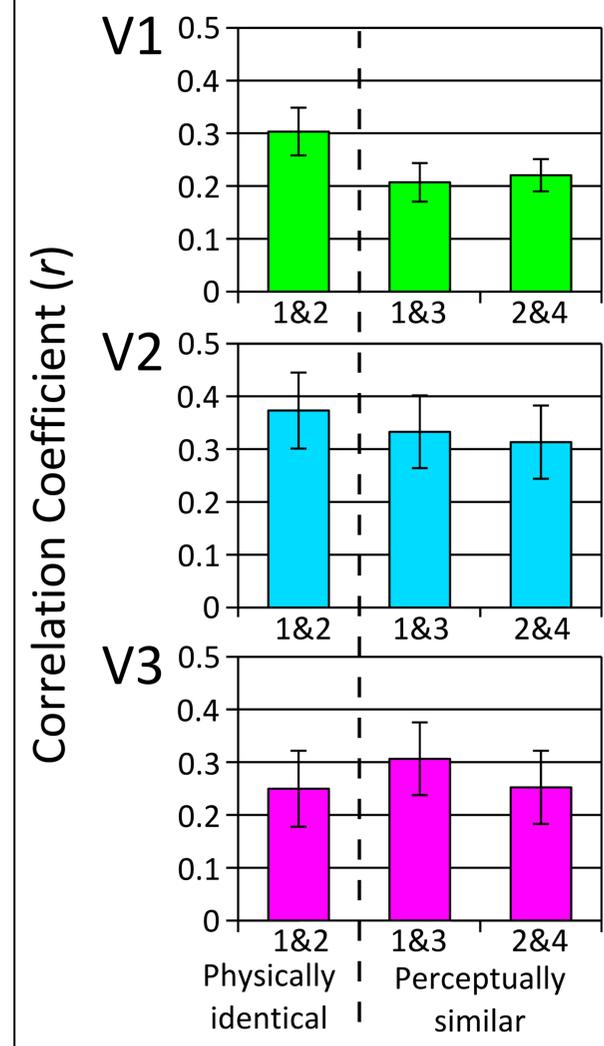
- 4 experimental conditions:
 - (1, 2) Used contextual cues to make a target luminance appear lighter or darker¹ (see above).
 - (3, 4) Subjects adjusted the actual luminance of a target in a different display to match the appearance of the two context-cued stimuli.
- fMRI parameters:
 - 2-second EPI sequence, 24 slices, 2 mm isomorphic voxels, covering most of visual cortex.
 - 8 runs, each with two 20s blocks of each condition (random order) with 20s ISIs.
- ROI localizer runs (3):
 - A flashing Mondrian pattern identified voxels responsive to a region in the center of the target.



Classification Results



- Data for each condition within localized ROIs in V1, V2 and V3 were averaged across TRs in a block.
- 2-way classification was performed between conditions 1 and 2, using SVM.
- Above-chance classification was possible in all early visual areas.



Correlation Results

- Correlation analysis was performed on block-averaged data across conditions within each localized ROI.
- In a region coding perceived lightness rather than physical luminance properties, perceptually similar targets (1&3, 2&4) should have higher correlations than physically identical ones (1&2).
- This was not the case for any of our three early visual cortex regions.
- Suggest that the majority of voxels in early visual cortex respond to physical, rather than perceived stimulus properties.

Conclusions

- Our results support previous findings (Boyaci et al., 2007) that early visual cortex carries information about context-dependent variations in perceived lightness.
- The data are inconclusive about the specific involvement of early visual cortex in processing perceived lightness, that give rise to this information.

¹ Inspired by an illusion created by J. Gurney [<http://gurneyjourney.blogspot.com>]

² Boyaci, H., Fang, F., Murray, S.O., Kersten, D.J. (2007). Responses to lightness variations in early human visual cortex. *Current Biology* 17 (pp. 989–993.)