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Decoding Grapheme-Color Synesthesia using Multivariate Pattern Analysis

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Background

Synesthesia is a condition in which stimulation of one sensory modality evokes experiences in a second, unstimulated modality.

Grapheme-Color Synesthesia

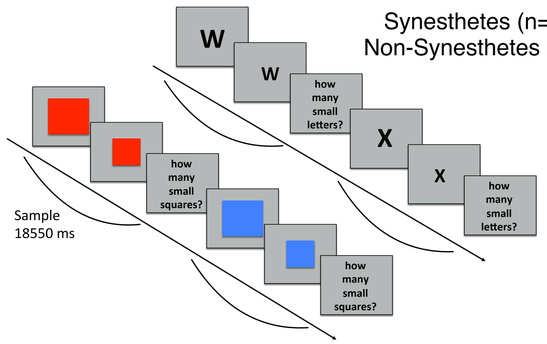
SYNESTHESIA

0123456789

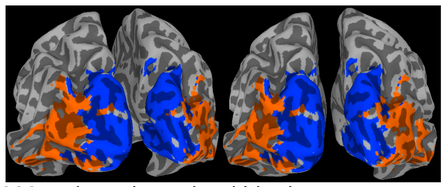
Is the subjective experience of synesthetic color generated by the same, or different, neural processes from those that support the perception of veridical color?

Experimental Design

Synesthetes (n=6)
Non-Synesthetes (n=6)



Feature Selection



Top 1000 activated voxels within downstream extrastriate areas are included in the Anterolateral ROI (Orange). Top 1000 activated voxels within V1-V4 are included in the Posteromedial ROI (Blue).

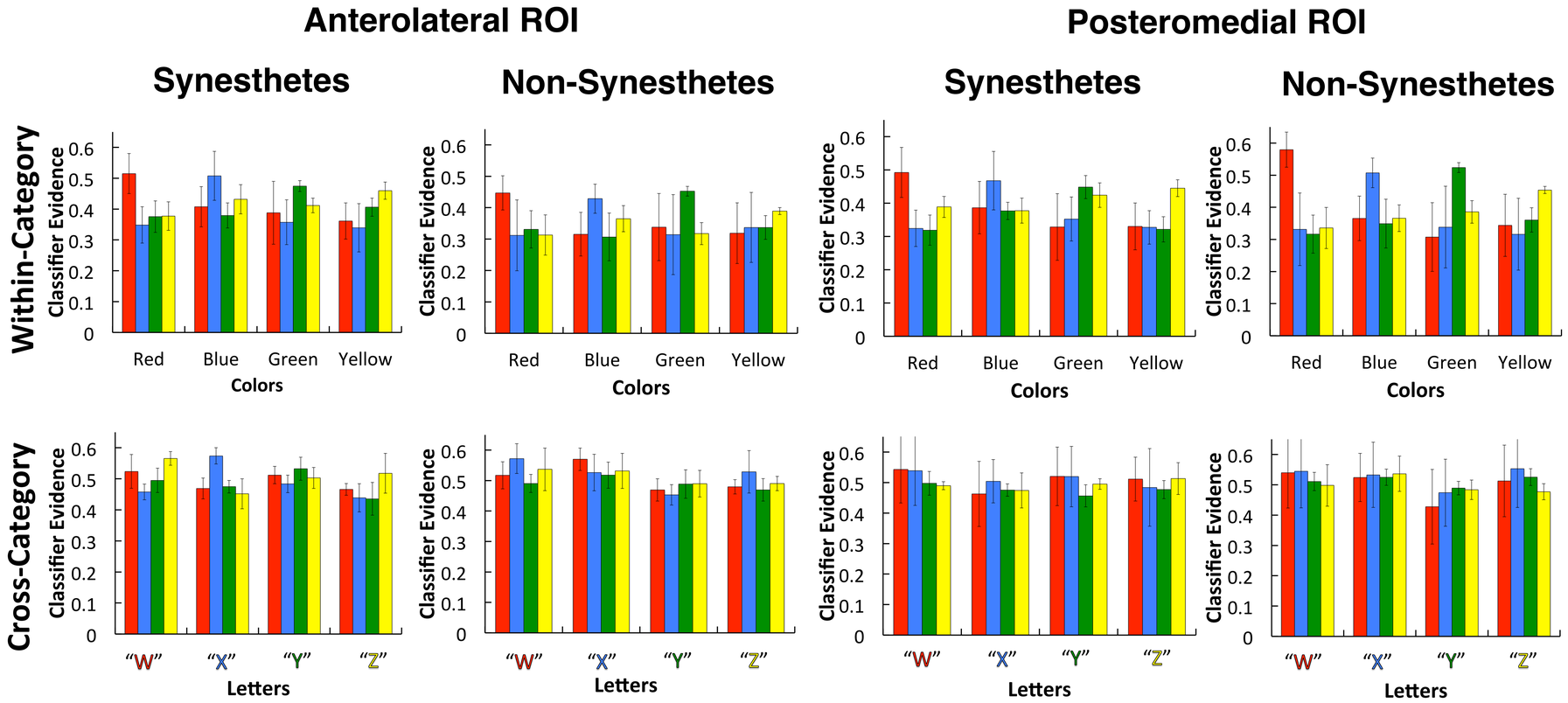
Training Set

Red Green
Blue Yellow

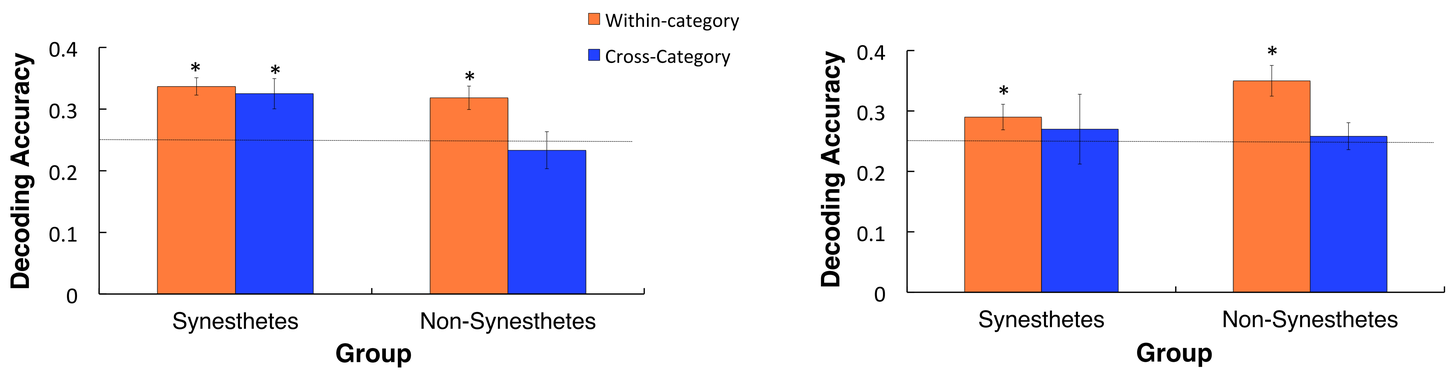
Hypothesis Test

- Step 1: Within-category multivariate pattern analysis (MVPA): “train on color, test on color” to identify regions that represent perceived color.
- Step 2: Across-category MVPA: “train on *color*, test on *letter*”. Successful cross-category decoding would indicate that synesthetic percept is supported, in part, by the same neural mechanisms that support the visual perception of veridical color.

Results: Classifier Evidence



Results: Classifier Accuracy



Conclusions

- **Cross-category decoding was only successful for synesthetes, and only in the anterolateral ROI.**
- **Grapheme-color synesthesia may result from connectivity between relatively high-level graphemic representations and non symbolic information.**

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