Revealing interpretable object dimensions from a high-throughput model of the fusiform face area

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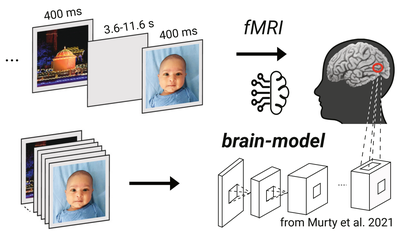
1 Introduction

- Visual cortex is organized into **category-selective regions** specialized for ecologically important objects.[1]
- The **fusiform face area (FFA)** responds highly selectively to visually presented faces.[2]
- However:
  1. FFA overlaps with non-face gradients (e.g., animacy, curvature).[3]
  2. FFA activation contains information about non-face objects.[4]
- **Which object dimensions are encoded in FFA response patterns?**

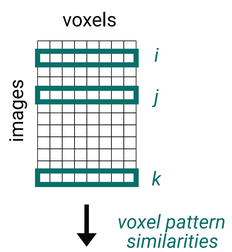
2 Methods

- We leveraged a recent, highly predictive **encoding model of FFA** that enables high-throughput tests of functional selectivity.[5]
- We **predicted FFA responses** to > 26,000 naturalistic object images from the THINGS database.[6]
- We identified **core representational dimensions** from predicted FFA responses by learning a sparse positive similarity embedding (SPoSE)[7] from 40 million odd-one-out similarity trials.

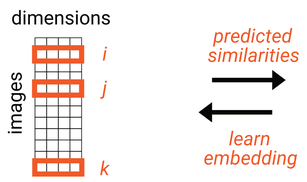
High-accuracy FFA encoding model



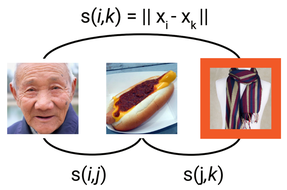
Model FFA responses



Object embedding

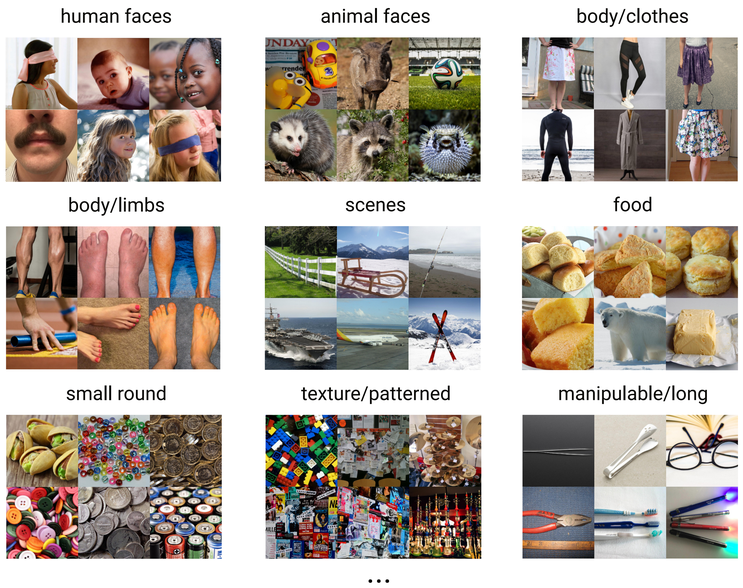


Odd-one-out



3 Results

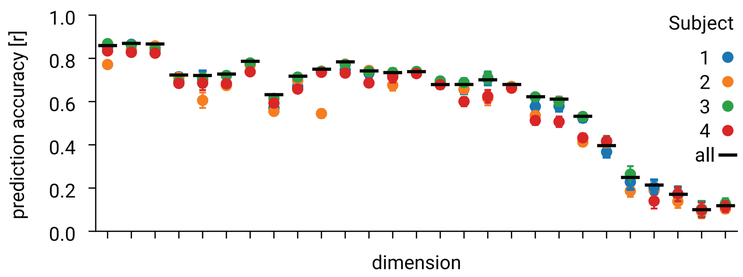
Which object features are captured by these dimensions?



→ **Interpretable perceptual & conceptual dimensions.**

→ **Not all dimensions are responsive to faces.**

How representative are these dimensions for individual subjects?

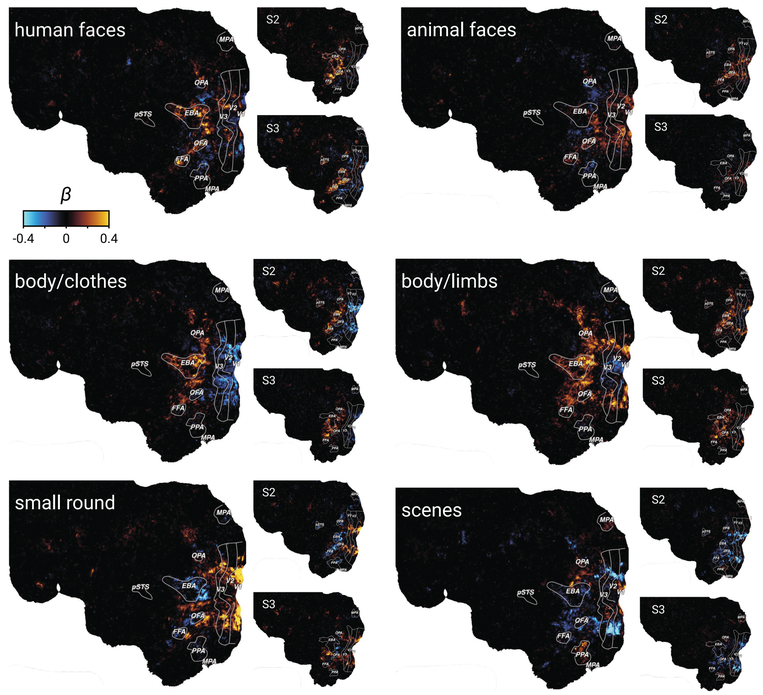


→ **Consistent effects not driven by individual participants.**

→ **Later (sparser) dimensions are less easily predicted.**

How do these dimensions manifest in non-synthetic data?

Voxel-wise encoding model using THINGS-fMRI[8]: An openly available, large-scale dataset of fMRI responses to thousands of object images.



4 Discussion

- Synthetic FFA responses encode a **broad space of object dimensions**
- Selectivity for human **face- and body** information **confirmed in vivo**.
- Validity of our approach for **unveiling representational dimensions** in object-selective brain regions.
- **Additional dimensions**, e.g. animal faces, scenes, shapes and textures.

References

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Poster # 53.337, Face perception: Neural mechanisms