# Revisiting the animacy, size, and curvature organization of human visual cortex


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vision and computational cognition group

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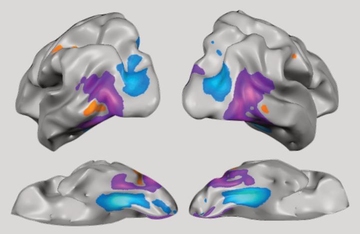
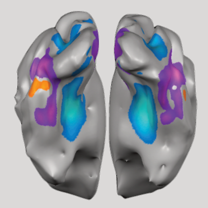
## BACKGROUND

- **large-scale functional division** of occipitotemporal cortex by animacy and real-world size [1]: regions responding preferably to large objects, all animals, and small objects



- this animacy-size division may be reflected by the mid-level visual feature curvature [2-4]



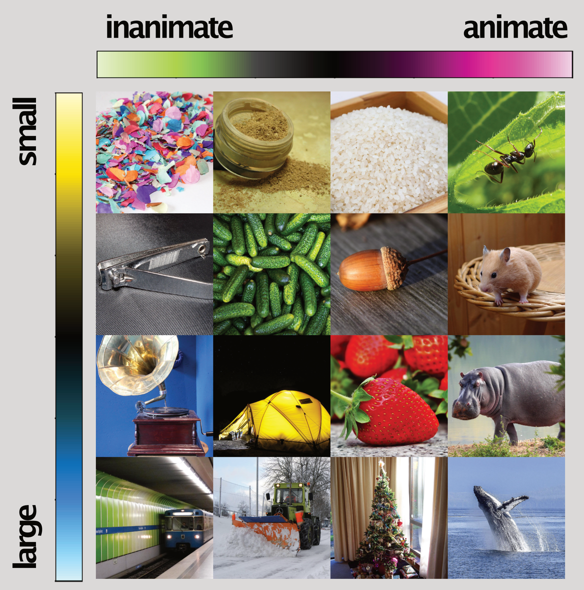

- but: previous work has focused on small hypothesis-driven sets of categories and objects isolated from the background [1-4]

▷ **do we find the animacy-size organization for natural images of more diverse object categories?**

▷ **does perceived curvature explain animacy and size preferences?**

## METHODS

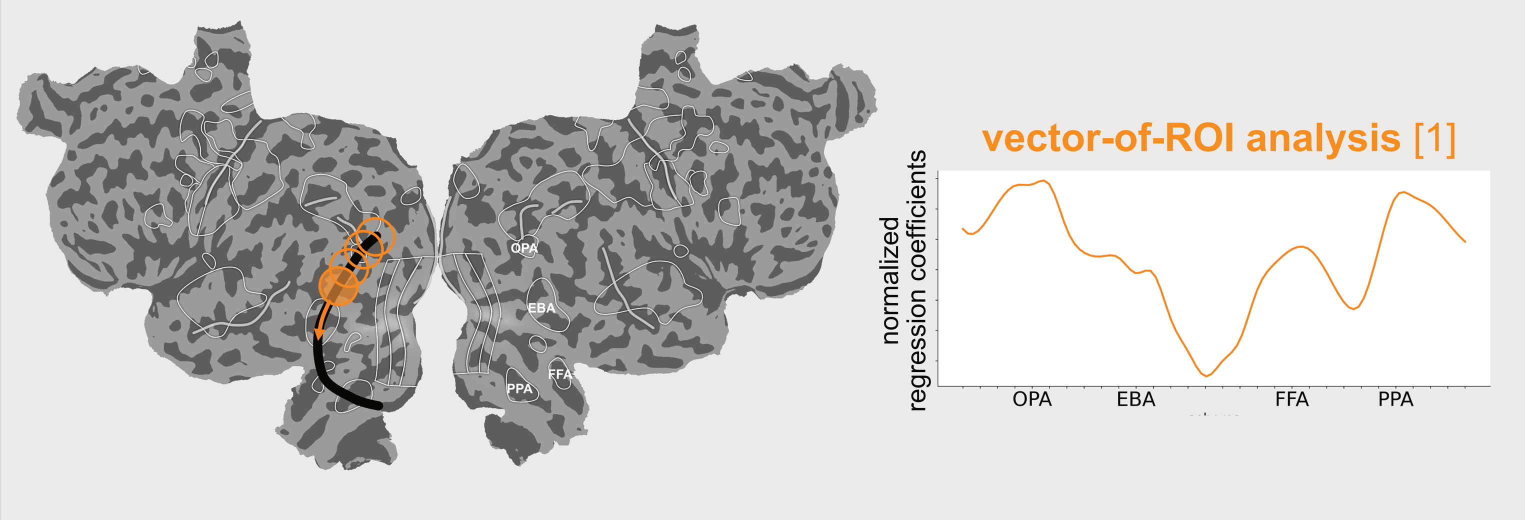
**THINGS-fMRI** [6]
- large-scale fMRI dataset
- 3 participants
- high-quality beta estimates of responses to 8,640 natural images of 720 diverse object categories



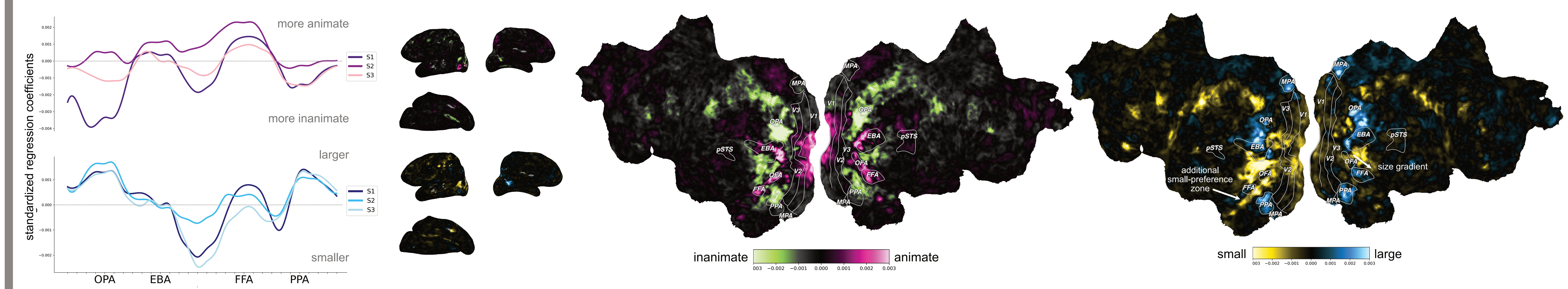

**THINGSplus** [7]
- database of image and object norms
- animacy: 1- 7
- real-world size: 0-520

**Perceived curvature**
- 2677 Amazon Mechanical Turk workers
- curvature ratings for 27,961 images
- M = 26.67 samples per image

| | a | s | c |
|---|---|---|---|
| animacy | 1.00 | | |
| size | -0.07 | 1.00 | |
| curvature | 0.29 | -0.38 | 1.00 |

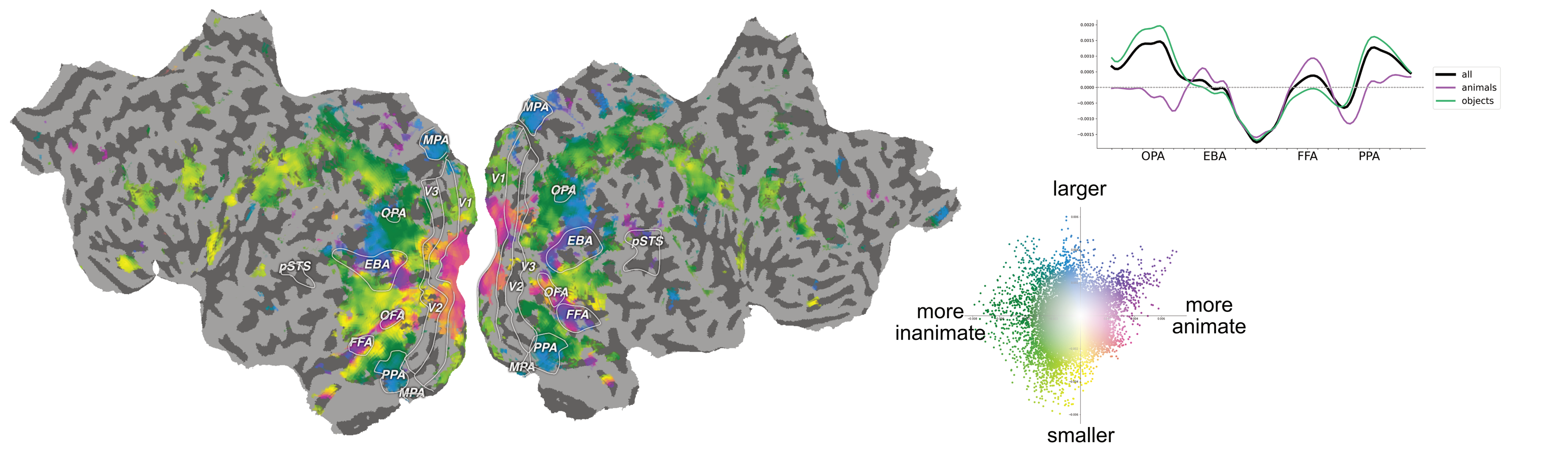




## Are animacy and size major organizational dimensions of diverse, naturalistic object images?




## Are animals organized by size?

▷ large-animate preferences in FFA and EBA, small-animate preferences in OFA




▷ **animacy organization generalizes to wide range of categories and natural images** with alternating pattern of animate- and inanimate-preference zones

▷ **similar size organization as in prior findings** with large-preferences in scene-selective regions and small-preferences in between

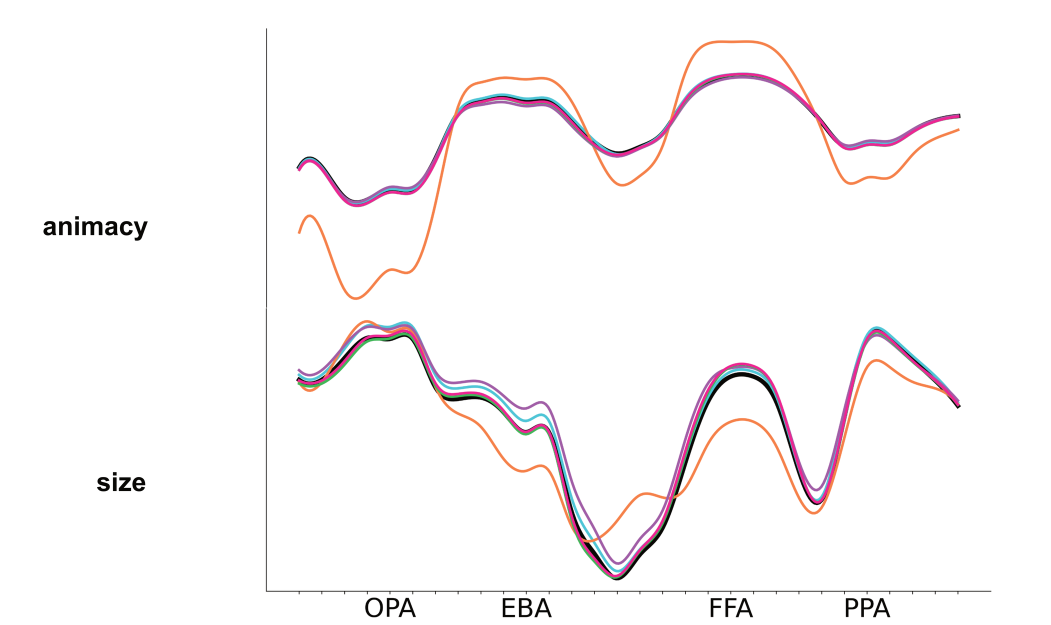
▷ **novel findings: finer size partition**
- large preferences in FFA
- large to smaller gradient between FFA and OFA
- additional small-preference cluster between FFA and PPA

## What factors may explain these effects?

▷ matching object categories or images to stimuli of prior studies [1, 2] preserved the overall response profiles

⟶ **finer size partition is not the result of larger size range, category diversity or display size/eccentricity**

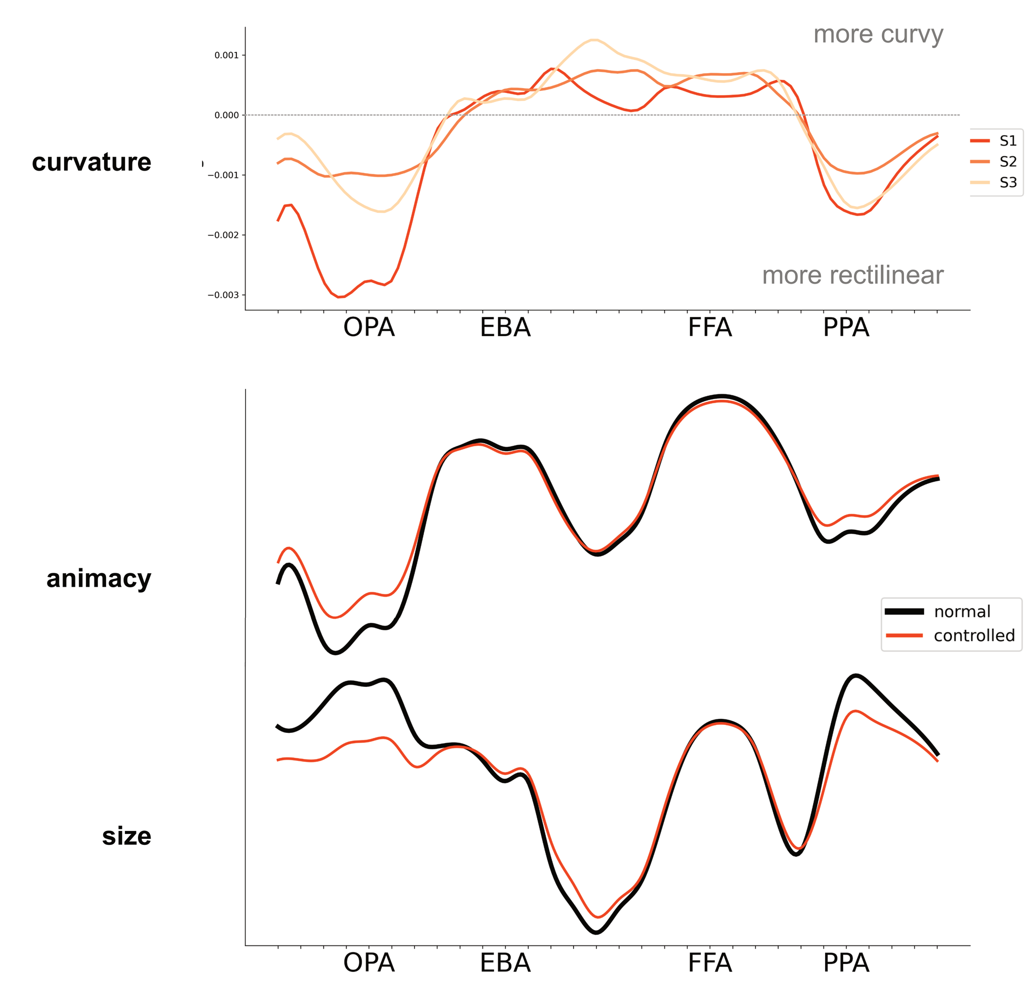
| | | |
|---|---|---|
| bias by human faces or body parts? | ⟶ | exclude images showing people |
| bias by display eccentricity? | ⟶ | control for display eccentricity |
| bias by display size? | ⟶ | control for display size |
| are extremely small or large objects organized differently? | ⟶ | exclude extremely small or large objects |
| are some object categories organized differently? | ⟶ | only categories matching [1] or [2] |




## Does perceived curvature explain animacy-size preferences?

▷ **curvature response profile mirrors prior findings** [2-4], with rectilinear-preferences in large-object preference zones and curvy-preferences in animal and small-object preference zones

▷ **but: controlling for curvature only slightly modulates animacy and size response profiles.**




## CONCLUSION

▷ depictions of naturalistic inanimate and animate images elicit similar large-scale topography as isolated ones

▷ objects of different **size** in natural images revealed **more alternating preference zones** along the cortex than isolated images

▷ the finer **size alternation is not a result of higher category diversity, size range, display size or object eccentricity**

▷ in natural images, **perceived curvature plays a minor role** in supporting these distinctions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