

Footprints of visual cortex organization in early object categorization

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Introduction

How do infants see the world?



Inanimate
Natural Artificial
Big Small Big Small

Animate
Human Non-Human
Faces Bodies Faces Bodies

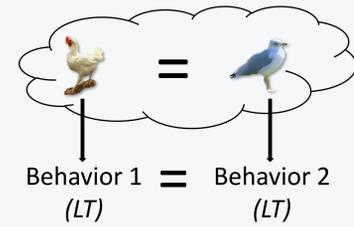


Do this organization^{1,2} account for the early categorization of visual objects in infants?

Methods

Infants groups:

- 4-month-olds (N = 24)
- 6-month-olds (N = 24)
- 8-month-olds (N = 24)
- 10-month-olds (N = 24)
- 19-month-olds (N = 25)



$$\text{Differential looking time} = \frac{|(LT_{right} - LT_{left})|}{(LT_{right} + LT_{left})}$$

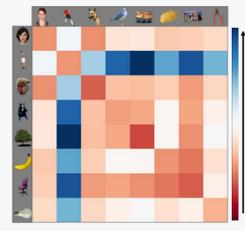
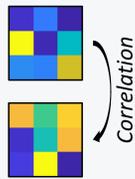
Dissimilarity measure: differential looking time

Adults (N = 15)



Pattern of activity for human faces

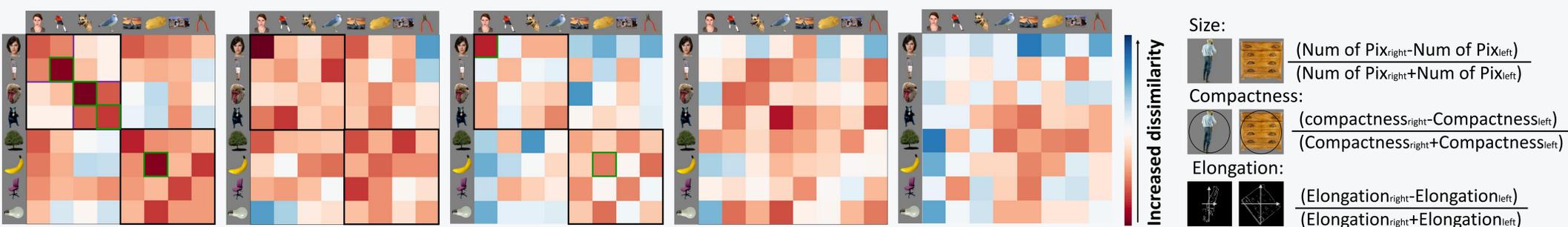
Pattern of activity for Artificial big



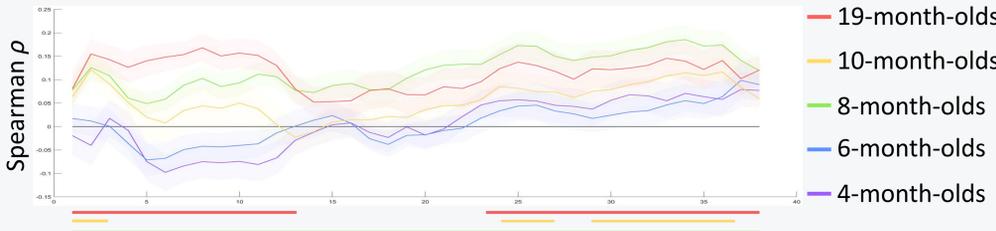
Dissimilarity measure: 1-rho

Results

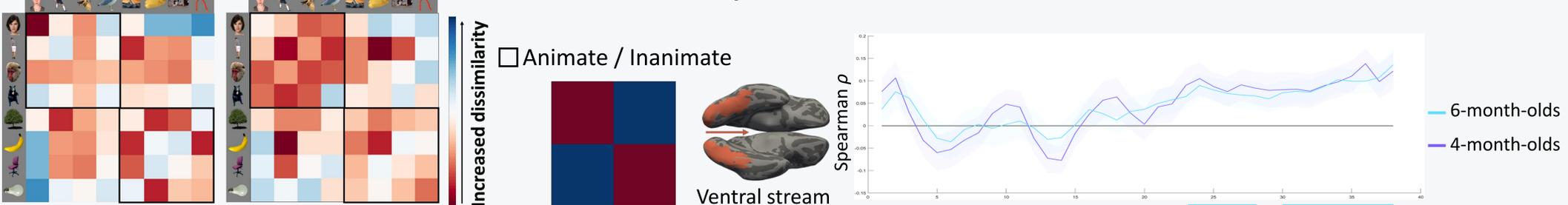
Experiment 1



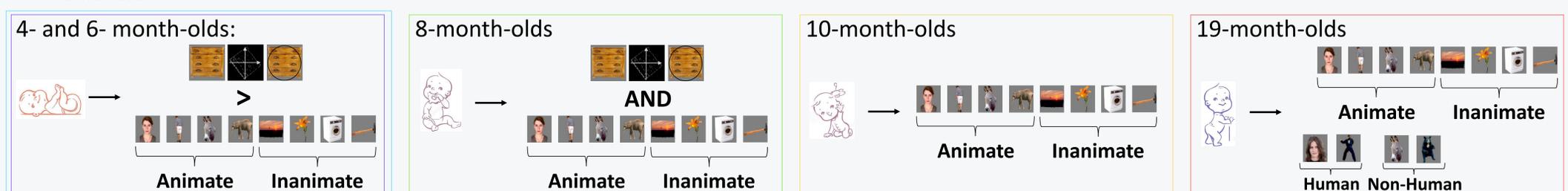
□ Animate / Inanimate □ Human / nonHuman □ Individual categories



Experiment 2



Overall



- Infants organize the world by visual categories: Animate and Inanimate
- Start by looking at lower-level visual features, then lose this guidance to look at more categorically-relevant information
- Infants behavior echoes the organization of object information in the adult visual cortex
- Older infants represent more visual categories, matching larger portion of the ventral stream
- The ability to form more and finer-grained visual categories critically depends on the ability to recruit and integrate more and more features

References

1. T. Konkle, A. Caramazza, Tripartite organization of the ventral stream by animacy and object size. *J. Neurosci.* **33**, 10235–10242 (2013).
2. N. Kriegeskorte et al., Matching categorical object representations in inferior temporal cortex of man and monkey. *Neuron* **60**, 1126–1141 (2008).
3. C. Spriet, E. Abassi, J.-R. Hochmann, L. Papeo, Visual object categorization in infancy. *Proc. Natl. Acad. Sci. U.S.A.* **119**, e2105866119 (2022).