Object-specific coding in human perirhinal cortex is modulated by semantic confusability

Alex Clarke & Lorraine K. Tyler
Centre for Speech, Language and the Brain, University of Cambridge, UK.

alex@csl.psychol.cam.ac.uk

How are individual objects coded in the ventral visual pathway?

- Category-selectivity has been demonstrated in the posterior ventral temporal cortex (pVTC)
- But little known about how specific semantic entities are represented
- Perirhinal cortex (PRc) may be critical to support object-specific representations
- Extension of the ventral visual pathway
- Resolves ambiguity and enables fine-grained distinctions between objects (Cowell et al. 2011; Tyler et al. 2013)

Here we use representational similarity analysis to determine where categorical and object-specific semantic information is represented in the brain

- Compare the similarity of local activation patterns to predicted similarity based on visual, category and object-specific semantic information

Experimental design

- 16 participants (19 to 29 yrs) scanned with fMRI
- Task: Basic-level naming (e.g. “dog”)
- 131 different objects from 6 different categories (animals, fruit, vegetables, tools, vehicles, musical instruments)

MRI acquisition

- Functional MRI: continuous EPI, 2 s TR, 30 ms TE, 32 slices, voxel size = 3 mm³
- Structural MRI: T1-weighted MPRAE, voxel size = 1 mm³

References


Conclusions

- Gradient of informational specificity along the ventral stream
  - Visual to categorical to object-specific semantic representations
  - Fundamental role of the human perirhinal cortex in representing object-specific information
    - Distinct semantic feature RSA effects in the pVTC
    - PRc was increasingly activated for more semantically confusable objects