Neural Correlates of Recollection and Familiarity-Based Recognition Memory For Faces

Brian Gonsalves, Lila Davachi*, Ken A. Norman*, Tim Curran* & Anthony D. Wagner
Department of Psychology, Stanford University
*Martinos Center for Biomedical Imaging, MGH/MIT/HMS
#Department of Psychology, Princeton University,
+Department of Psychology, University of Colorado, Boulder

Overview

- Neural mechanisms of recollection (R) and familiarity (F) within and beyond medial temporal lobes
- Relationship between these mechanisms at memory encoding and retrieval
- Effects of perceptual similarity on R and F

Encoding Activations Associated With R and F

Retrieval Activations Associated With R and F

Goals:

Expand on prior results by:
1) Exploring neural correlates of R and F in MTL and beyond
2) Scanning at encoding and retrieval in the same set of subjects
3) Including a similarity manipulation to test effects of perceptual similarity on R and F
Manipulating Perceptual Similarity

\[
\text{Parent A} + \text{Morph} = \text{Morph}
\]

Conditions

<table>
<thead>
<tr>
<th>Conditions</th>
<th>Studied</th>
<th>Morph</th>
<th>Unstudied</th>
</tr>
</thead>
<tbody>
<tr>
<td>Study</td>
<td>Parent A</td>
<td>Parent A</td>
<td>X</td>
</tr>
<tr>
<td>Test</td>
<td>Parent A</td>
<td>Morph</td>
<td>Morph or Parent</td>
</tr>
</tbody>
</table>

Experimental Procedure

Study Phase
Task: Detect target face and intentional encoding
60 Parents later tested;
60 Parents later tested as Morphs;
15 Targets

Test Phase
Task: Face recognition - "Remember", "Know", or "New"
60 Studied Parents;
60 Morphs
60 Unstudied

Behavioral Results

Overview of fMRI Results

- Effects within MTL for R and F at encoding and retrieval
- Effects beyond MTL for R and F at encoding and retrieval
Overview of fMRI Results

- Effects within MTL for R and F at encoding and retrieval
  - Hippocampus: R-selective at encoding
  - Supports recall-to-reject
  - MTL cortices: Familiarity-like response at retrieval
  - R-selective at encoding

- Effects beyond MTL for R and F at encoding and retrieval

Other R-Selective Regions at Encoding

- L. inferior frontal gyrus
  - Coordinates: -51, 36, 18

- R. fusiform
  - Coordinates: 45, -57, -18
Summary

• Neural mechanisms of R & F within and beyond medial temporal lobes:
  – R-selective network at encoding
  – Future directions:
    – Parametric manipulation of levels of familiarity
    – Relationship between familiarity-related response reductions and similar priming reductions

• Encoding and retrieval:
  – Process-specific activations at encoding and retrieval are neurally distinct

• Effects of perceptual similarity on R and F:
  – Similarity manipulation unsuccessful
  – Future direction: parametric similarity manipulation