<table>
<thead>
<tr>
<th><strong>Title</strong></th>
<th>Age-related differences in neural activity for novelty and relational encoding of scenes</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Author(s)</strong></td>
<td>Leow, Wei Yang Dayton</td>
</tr>
<tr>
<td><strong>Citation</strong></td>
<td>Leow, W. Y. D. (2015, March). Age-related differences in neural activity for novelty and relational encoding of scenes. Presented at Discover URECA @ NTU poster exhibition and competition, Nanyang Technological University, Singapore.</td>
</tr>
<tr>
<td><strong>Date</strong></td>
<td>2015</td>
</tr>
<tr>
<td><strong>URL</strong></td>
<td><a href="http://hdl.handle.net/10220/25917">http://hdl.handle.net/10220/25917</a></td>
</tr>
<tr>
<td><strong>Rights</strong></td>
<td>© 2015 The Author(s).</td>
</tr>
</tbody>
</table>
Age-related Differences in Neural Activity for Novelty and Relational Encoding of Scenes

Introduction

- Episodic memory decline is a hallmark of the aging brain. Episodic encoding can be delineated into novelty (processing the unfamiliarity) and relational (processing the meaningfulness) encoding. Literature indicates that activation in the fusiform gyrus (FG), hippocampus, parahippocampus and inferior frontal gyrus (IFG) are involved in relational encoding of scenes, while the inferior occipital gyrus (IOG) is additionally involved in novelty encoding of scenes, serving as viable regions of interest (ROIs) when examining age-related differences in functional connectivity (FC) between the left and right parietal regions. However, the use of FC analysis to support the HAROLD model is currently lacking in present literature. Furthermore, age-related studies on novel and relational encoding have not examined if novelty and relational encoding are differentially affected by age.
- Hence, it will be informative to evaluate if the HAROLD effect is evident for novelty and relational encoding. This study utilized a fMRI task sensitive to both novelty and relational encoding of scenes to investigate age-related differences in the functional connectivity (FC), focusing on a priori ROIs, with the HAROLD effect being predicted.

Aims & Hypotheses

Aims

1. To examine age-related differences in the functional connectivity for novelty and relational encoding of scenes.

Hypotheses

1. Both young and older adults are expected to show activation in the respective ROIs for novelty and relational encoding of scenes.
2. Both young and older adults are expected to show significant FC between the left and right IFG for novelty and relational encoding of scenes.
3. Older adults are predicted to show a greater FC between left and right IFG compared to young adults for novelty and relational encoding of scenes.

Method

Participants

- 16 older adults (9 female, 2 left-handed) mean age = 66.2 (SD = 6.5); MMSE = 29.3 (SD = 0.7)
- 23 young adults (12 female, 2 left-handed) mean age = 23.3 (SD = 2.2); MMSE = 29.9 (SD = 0.3)

Task

- Novelty encoding: Non-scrambled novel (N) vs Non-scrambled repeating (R) Contrast.
- Relational encoding: Non-scrambled novel (N) vs scrambled novel (S) Contrast.
- Accuracy (ACC) and reaction time (RT) during scan were recorded; post-scan recall was tested for unintentional encoding.

Image acquisition & preprocessing

- Images acquired in a 3.0 T MRI scanner (EPI parameters: TE 30 ms, TR 3000 ms, FOV 192 mm, matrix 64x64, slice thickness 3 mm, 39 axial slices with 0.75 mm gap).
- Preprocessing was carried out using statistical parametric mapping 8 (SPM 8) on MATLAB 7.9, following the diffeomorphic anatomic registration through exponentiated lie algebra (DARTEL) pipeline.

Data analyses

Behavioral data: 2 (Age) x 3 (Condition) analysis of variance (ANOVA) were performed on ACC and RT recorded during scan, and on post-scan ACC. Post-hoc multiple pair-wise comparisons were performed for significant interaction or main effects, with p < .05.

Imaging results: Significant cluster-level activations for novelty encoding of scenes in (a) older adults, (b) young adults, (c) older > young adults, and (d) young > older adults, after adjusting for intra-cranial brain volume and RTs, at p < .05 (FDR corrected), k > 20. No significant cluster-level activations were found in group analyses, after adjusting for gray matter probability and RTs, at p < .001 (uncorrected), k > 20.

Conclusion

- Consistent with previous studies, young adults showed activations in the respective ROIs for novelty and relational encoding of scenes.
- Although activation analyses lend support for HAROLD model for novelty encoding of scenes, there was no age-related increase in the functional connectivity between left and right IFG. No significant IFG activity was found in older adults for relational encoding of scenes. This could be explained by (1) the poor elicitation of relational encoding, as reflected in their lower post-scan ACC performance than young adults; and (2) the absence of significant right hippocampal activity, resulting in the consequential decreased IFG activation.

Project Title: Age-related Differences in Neural Activity for Novelty and Relational Encoding of Scenes

Supervisor: A/P Chen Shen-Hsing Annabel

www.ntu.edu.sg/ureka