Cross-modal plasticity in visual cortex of the early blind  
Sashank Prasad¹, Amy L. Thomas¹, Philip A. Cook², and Geoffrey K. Aguirre¹  
Departments of ¹Neurology and ²Radiology, University of Pennsylvania

Results - Blind differ from controls

Cross-modal responses

Auditory sentences vs. white noise

Controls

Blind participants

Tractography

Does visual deprivation produce a correlated alteration in the structure and function of occipital cortex?

Participants

<table>
<thead>
<tr>
<th>Blind (n=10)</th>
<th>Sighted (n=7)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Mean age (range)</td>
<td>56y (30-65)</td>
</tr>
<tr>
<td>Gender</td>
<td>3 ʖ 7 Ʌ</td>
</tr>
<tr>
<td>Age at blindness</td>
<td>0.4y (0-4)</td>
</tr>
<tr>
<td>Age at NLP</td>
<td>16y (0-30)</td>
</tr>
</tbody>
</table>

Methods

Cross-modal activation (BOLD fMRI at 3T)
- Auditory presentation of 1) sentences for plausibility judgment, 2) reversed sentences, 3) white noise
- Sentences blocked by semantic content (auditory/tactile/visual)
- Participants scanned in darkness with eyes closed

Cerebral Blood Flow (ASL Perfusion)
- Resting, 8 minute ASL perfusion scan, 3.4x3.4x5 mm

Diffusion Tensor Imaging (DTI)
- Two, 3.5 minute scans, 12 directions, 1.7x1.7x2 mm

Voxel Based Morphometry (VBM)
- 5 minute MPRAGE scan, 1x1x1 mm isotropic voxels
- Images warped to common template. Log Jacobian of warp matrix within ROIs indexes the relative degree of atrophy / hypertrophy.

Contact
Sashank Prasad: sashank.prasad@uphs.upenn.edu  
Geoffrey Aguirre: aguirreg@mail.med.upenn.edu

Reprints available: http://cfn.upenn.edu/aguirre

Summary
- Congenitally blind participants have cross-modal responses within the occipital cortex. These responses reflect semantic content.
- Blind participants have alterations in white matter structure compared to sighted controls.
- Resting CBF is related to cross-modal responses. Cross-modal activity may be a negative predictor of functional recovery (by extension from cochlear implant results).
- Functional and structural alterations may be driven by different aspects of visual deprivation (e.g., duration vs. quality).

Introduction

Alteration of structure and function in the blind
- Early blindness is associated with alteration of white matter structure and development of cross-modal responses within occipital cortex
- Disruption of cross-modal cortex interferes with tactile and auditory processing
- In the congenitally deaf, resting metabolism within the “auditory” cortex negatively predicts recovery of function following cochlear implant

Participants (D02S)
Blind participant (M03K)

Control
Blind participant

Within the occipital ROI

Functional and structural measurements from occipital cortex

Does visual deprivation produce a correlated alteration in the structure and function of occipital cortex?

Structure vs. Function

Summary

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