Phonagnosia, a Voice Homologue to Prosopagnosia

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Background:
There is a striking parallel between Developmental Prosopagnosia and Developmental Phonagnosia (the inability to recognize familiar voices).

Hypothesis: Developmental phonagnosics (dPhon) and prosopagnosics (dPros) have, surprisingly, normal perceptual representations of both voices and faces in that they can discriminate both faces and voices normally and have normal activation of posterior voice and face areas but they cannot recognize. But they are deficient in the white matter connections between the posterior areas defining voices (for dPhon) and faces (for dPros) and a region in the vmPFC where the links to a particular person are stored long term may underlie the recognition and imagination deficits.

2. Discrimination: Neither dPhon nor dPros show a deficit in discriminating what they can’t recognize!
A. A discrimination (match to sample) task for faces and blobs.

3. TVA Activity
AN shows normal activity in TVA, as dPros show in FFA, OFA.

4. Voice Imagination Task:
A. dPhon find it difficult to imagine voices, but are similar to controls with non-voices.
B. Average activation in 9 Controls show activation in vmPFC when imagining voices.
C. AN does not show activation in vmPFC when imagining voices.
D. A bootstrap analysis revealed the difference between AN and controls during voice imagination was significant in the vmPFC voxels depicted.

Note: dPros too cannot imagine faces (e.g., Grüter et al, 2009).

1. Assessment of Voice Recognition Deficit in a dPhon
Left: Frame grab of test (Link in references).
Bottom: Phonagnostic AN vs. Controls voice recognition results.

2. White Matter Connections:
Developmental phonagnosics and prosopagnosics have normal perceptual representations of voices and faces, respectively, so they can discriminate normally the entities that they cannot recognize. But they are deficient in the white matter connections between the posterior areas activating these representations (FFA & OFA for dPros and medial r. parietal cortex for dPhon) and a region in the vmPFC where the links to a particular person are stored long term. So they can discriminate faces and voices normally but cannot imagine or recognize them.

References:
https://usc.qualtrics.com/SE/?SID=SV_3eNnm65Fe8aTBnT

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