Lexically-guided category retuning affects low-level acoustic processing

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Lexically guided category retuning

<table>
<thead>
<tr>
<th>Exposure: Ambiguous sound in lexically unambiguous environment</th>
<th>“platypu[s/f]”</th>
<th>“gira[s/f]”</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>[s/f] = [s]</td>
<td>[s/f] = [f]</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Test lexically ambiguous environment</th>
<th>“ni[s/f]”</th>
</tr>
</thead>
<tbody>
<tr>
<td>“NICE”</td>
<td>Knife</td>
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</tbody>
</table>
Research question

What level of speech perception is affected by the “knowledge” that a speaker produces non-canonical pronunciation variants?

Mechanisms of retuning process -> unknown
Focus on result of retuning process: “retuned categories”

Conditions of cross-speaker generalization of retuned fricatives
-> mixed results in literature whether talker level is involved

Attention to detail necessary to build a full model
Why cross-speaker generalization?

Adaptation to fricatives is speaker specific

Presumably because fricatives provide speaker specific information (whereas, e.g., stops don’t)

(Kraljic & Samuel, 2007)

How much specificity?
• Identity of the fricatives matters not the voice
  • Identical fricatives allow for cross-speaker transfer
    (Eisner & McQueen, 2005)
  • “Similar” fricatives allow for cross-speaker transfer
    (Kraljic & Samuel, 2005)

-> phoneme-level specificity
critical sounds /f/-/s/, English

**Exposure:** lexical decision
  -> 1 female speaker

**Test:** categorization of English minimal pairs
  -> female speaker heard during exposure
  AND new male speaker

Cross-experiment manipulation of acoustic match between the two speakers’ test continua
Experiment 1

Natural fricative endpoints for both speakers

speaker heard during exposure

28 participants
Experiment 1

Natural fricative endpoints for both speakers

speaker heard during exposure

new male speaker

no generalization

28 participants
Discussion

No generalization because

• The range of the /f/-/s/ continuum between exposure and test speaker differs
  • f-bias for exposure speaker
  • s-bias for generalization speaker

• Listeners heard good /s/ endpoints
  • for generalization speaker

1.) Initially cross-speaker generalization followed by re-set for generalization speaker
2.) If range of continua made more similar then generalization should occur
Prediction 1: Split by repetitions

Initially cross-speaker generalization followed by re-set for generalization speaker

1\textsuperscript{st} repetition 2\textsuperscript{nd} repetition 3\textsuperscript{rd} repetition 4\textsuperscript{th} repetition 5\textsuperscript{th} repetition

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- **female exposure speaker**
- **male generalization speaker**
- **f-ambiguous**
- **s-ambiguous**
Prediction 2 -> Experiment 2

If range of continua made more similar then generalization should occur

Data from Experiment 1
Old and New Fricative Spectra

Experiment 1

Experiment 2

/s/ exposure speaker
/g/ generalization speaker
Experiment 2

Prediction 2
If range of continua made more similar then generalization should occur

28 participants
Learning effect is robust for exposure speaker
-> Independent of generalization to other speakers

**Generalization**
Acoustic similarity between fricatives matters
Possibly perceptual similarity matters

-> within-speaker modulation of generalization effect
Generalization is independent of voice/speaker
-> talker level not involved

Abstract phoneme representation
Why does the acoustic match matter?

Exemplar models
What information would be stored?

Cross-speaker generalization suggests that knowledge about retuned categories is used early during processing