Influences of regional dialect, gender, and style on speech intelligibility in two listener populations

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Background

- Intelligibility of speech in noise is affected by sociolinguistic factors:
  - Plain lab speech is less intelligible than clear speech (Picheny et al., 1985)
  - Speech produced by males is less intelligible than speech produced by females (Bradlow et al., 1996)
  - Speech produced in an unfamiliar dialect is less intelligible than speech produced in a familiar dialect (Clopper & Bradlow, 2008)
- Results come from undergraduate listener population typical of psycholinguistic research

How do these social variables interact to influence intelligibility?

Do the effects of these sociolinguistic factors on intelligibility differ in a less homogeneous listener population?

Methods

Experiment 1:
- Conducted at the Ohio State University
- Listeners: 85 undergraduate students (median age: 20 yrs), 44 Midland dialect region, 41 Northern dialect region

Experiment 2:
- Conducted at the Center of Science and Industry (COSI) museum in Columbus, Ohio
- Listeners: 63 adult museum visitors (median age: 30 yrs), 34 Midland dialect region, 29 Northern dialect region

Task:
- 234 monosyllabic words mixed with noise at +5dB SNR, extracted from read passages
- identify words by typing them
- 6 lists of unique tokens of target words, balanced for:
  - talker dialect (8 Midland, 8 Northern)
  - talker gender (4 female, 4 male per dialect)
  - speech style (clear, plain)
  - lexical frequency (high, low)
  - phonological neighborhood density (high, low)
  - czeol predictability (high, low)
  - mention within passage (1st, 2nd)

Research Questions

- Listeners are more accurate with speech produced by Midland talkers than Northern talkers, and with clear speech than plain speech
- Talker dialect has a smaller effect on speech intelligibility of male talkers than intelligibility of female talkers
- Speech style does not influence intelligibility of male talkers, but does affect intelligibility of female talkers
- Similar effect sizes and interactions were found with listeners in both experiments

Results

- Listeners process speech produced by females differently than speech produced by males:
  - Phonetic reduction: female and male talkers may show different patterns of phonetic reduction leading to differences in intelligibility
  - Dialect variation: female and male talkers may show different patterns of dialect variation leading to differences in intelligibility
  - Listener expectations: processing may be affected by the expected degree of reduction or dialect variation paired with the perceived talker gender such that listeners expect more standard and more clear productions from women

Discussion

Acknowledgments

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Proportion correct word recognition

<table>
<thead>
<tr>
<th>Experiment 1 logistic mixed-effects model</th>
<th>Effect</th>
<th>Estimate</th>
<th>z-value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Talker dialect (Midland)</td>
<td>0.222</td>
<td>3.877</td>
<td>(p &lt; 0.01)</td>
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<tr>
<td>Speech style (clear)</td>
<td>0.297</td>
<td>5.413</td>
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<td>Talker gender (female)</td>
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<td>-1.415</td>
<td>(n.s.)</td>
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<td>Talker dialect x talker gender</td>
<td>0.079</td>
<td>3.383</td>
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<td>Speech style x talker gender</td>
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<tr>
<td>Talker dialect x speech style</td>
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<td>(p &lt; 0.05)</td>
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<table>
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<th>Experiment 2 logistic mixed-effects model</th>
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<td>Speech style (clear)</td>
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<td>Talker gender (female)</td>
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<td>-0.496</td>
<td>(n.s.)</td>
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