Listeners’ social attributes influence sensitivity to coarticulation in the perception of sibilants in nonce words

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Speech perception

- Listeners use the wealth of information available to them in perception, including:
  - Phonetic/phonological information from the surrounding segments
  - Visual and aerotacticle information
  - Lexical information
  - Social information about the speaker
  - Contextual information about the conversation
Compensation for coarticulation

- Listeners compensate for coarticulation, filtering out context-induced variation to recover the intended message.
- Mann & Repp (1980)
  - /s/ has a lower CoG preceding /u/ due to lip rounding.
  - When presented with an ambiguous stimulus, listeners are more less likely to hear [ʃ] preceding rounded vowels.

(Yu, 2010, Fig 1)
Compensation and sound change

- Sound change is thought to begin when listeners do not compensate for coarticulation (Ohala, 1993)
- Harrington et al. (2008): In standard southern British: /u/ fronts...
  - following coronals and [j] for older speakers
  - across the board for younger speakers

(Harrington et al., 2008, Fig 2)
Harrington et al. (2008)

- Perception experiment: forced choice lexical decision task
  - Coarticulatory environment: used-yeast
  - Non-coarticulatory environment: sweep-swoop
Harrington et al. (2008)

- In a lexical decision task, older speakers compensate more younger speakers, who shift their category boundary
  - Coarticulatory environment: *used-yeast*
  - Non-coarticulatory environment: *sweep-swoop*
Adjustments for perceived listener attributes

- Listeners shift their perception in response to social attributes, like gender and gender typicality.
- Strand (1999)
  - Men typically produce sibilants with lower CoG than women.
  - When presented with an ambiguous stimulus, listeners are less likely to hear [ʃ] for perceived male talkers.

(Yu, 2010, Fig 1)
/s/-retraction

- in the context of /r/
  - ‘grocery’ is pronounced as [ɡrʊʃəi]
  - ‘Sri Lanka’ is pronounced as [ʃəi ˈlɑŋkə]
- especially in /str/ clusters
  - ‘street’ is pronounced approaching [ʃtəɪt]
- but less common is /spr/ and /skr/ clusters
  - ‘scream’ is not approaching [ʃkɹim]
  - ‘shopping spree’ is not approaching [ʃpɹi]
/s/-retraction distribution

(Baker et al., 2011, Fig 2)
Sociolinguistic overview of retraction

- “A general American innovation” (Shapiro, 1995): Not strictly dialectal or regional, but more eastern than western
- Equally exhibited by men and women in Philadelphia and elsewhere (Gylfadottir, 2015); more female than male in North Carolina (Wilbanks, 2017)
  - Possibly due to the role of /s/ in indexing gender and sexuality
Social evaluation of sibilants

**Fronted /s/:**
- More middle class (Stuart-Smith, 2007)
- More feminine (Stuart-Smith, 2007)
- More gay (Levon, 2014)

**Retracted /s/:**
- More Southern/country (Campbell-Kibler, 2011; Podesva & Van Hofwegen, 2014)
- More masculine (Zimman, 2013; Podesva & Van Hofwegen, 2014)
- More lesbian (Podesva & Van Hofwegen, 2014)
Socio-indexical meaning of retraction: Phillips (to appear)

In a social evaluations task with 342 participants:

- For 8 all talkers: a retracted /s/ in /sCr/ does not appear index masculinity or straightness for male talkers or gayness for female speakers.
- For talkers rated as less typical on a given trait, the expected associations of a retracted /s/ emerge in /spr/ and /skr/ environments.
  - E.g., a male talker more likely to be perceived as gay across the board is more likely to be perceived as straight in /spr/ and /skr/ words but NOT in /str/ words.
Socio-indexical meaning of retraction: Phillips (to appear)
Research question

1. Do individuals compensate for coarticulation in /str/ clusters but not /s{p,k}r/ clusters?
2. Does perceived speaker masculinity affect phoneme categorization in these clusters?
3. What can perception patterns in these clusters tell us about their associated social meaning?
Methods

- Task: Nonce word forced choice ‘lexical’ decision task
  - Nonce words necessitated by English phonotactics
  - Containing /SCr/ onsets

<table>
<thead>
<tr>
<th>simble</th>
<th>shimble</th>
</tr>
</thead>
<tbody>
<tr>
<td>sprimble</td>
<td>shprimble</td>
</tr>
<tr>
<td>strimble</td>
<td>shtrimble</td>
</tr>
<tr>
<td>scrimble</td>
<td>shcrimble</td>
</tr>
</tbody>
</table>
Auditory stimuli

- Citation nonce words recorded by 2 straight, white male college students from Iowa
- Onsets from ‘simble’ & ‘shimble’ were extracted and digitally mixed to create a 7-step continuum from /s/ to /ʃ/
- Each step was cross-spliced onto the preconsonantal targets, creating a continuum from:
  \[ s\{p,t,k\}.\text{imběl} \] to \[ ʃ\{p,t,k\}.\text{imběl} \]
Visual stimuli

- Faces normed as more or less masculine than average from the Chicago Face Database (Ma et al., 2015)
Procedure

<table>
<thead>
<tr>
<th>scrimble 1</th>
<th>shcramble 0</th>
</tr>
</thead>
</table>

Listeners’ social attributes influence sensitivity to coarticulation
29 UChicago undergraduates recruited

Self-reported demographics:

- Gender: 17 female, 11 male, 1 non-binary
- Sexuality: 7 bisexual, 1 lesbian, 18 heterosexual, 3 no response
- Race/Ethnicity: 5 Asian, 3 black, 5 Latinx, 13 white, 1 other
- Environment: 13 urban, 15 suburban, 1 rural
Analysis

- **Analysis**: Responses (/s/ vs. /ʃ/) modeled using logistic mixed models with speaker, step and target.
Compensation for coarticulation

![Graph showing compensation for coarticulation](image)
Patterns of retraction perception

Pattern 1: No compensation, i.e. no effect of cluster

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Listeners’ social attributes influence sensitivity to coarticulation
Patterns of retraction perception

Pattern 2: Compensation for retraction, i.e. increased /s/ response in /str/ clusters
Patterns of retraction perception

Pattern 3: Total compensation for retraction, i.e. no /ʃ/ responses at all in /str/ clusters
Patterns of retraction perception

Pattern 4: Compensation in all clusters

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Implications & future directions

- The factors that led to ultimate sound change (e.g. no phonological contrast, highly context-specific coarticulatory triggers), not only encourage variation in production, but also to the variation in perception strategies.

- Individuals patterns in perception may tell us about their communities of practice.
  - Listeners not compensating, may have little experience with retraction.
  - Listeners exhibiting total compensation, may be from communities phonologizing retraction.

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Listeners’ social attributes influence sensitivity to coarticulation.
Shifts in perceived masculinity

Listeners' social attributes influence sensitivity to coarticulation
Male Role Attitudes Scale (Pleck et al., 1993)

<table>
<thead>
<tr>
<th>Strongly Agree</th>
<th>Slightly Agree</th>
<th>Slightly Disagree</th>
<th>Strongly Disagree</th>
</tr>
</thead>
<tbody>
<tr>
<td>It is essential for a guy to get respect from others.</td>
<td>○</td>
<td>○</td>
<td>○</td>
</tr>
<tr>
<td>A man always deserves the respect of his wife and children.</td>
<td>○</td>
<td>○</td>
<td>○</td>
</tr>
<tr>
<td>I admire a guy who is totally sure of himself.</td>
<td>○</td>
<td>○</td>
<td>○</td>
</tr>
<tr>
<td>A guy will lose respect if he talks about his problems.</td>
<td>○</td>
<td>○</td>
<td>○</td>
</tr>
<tr>
<td>A young man should be physically tough, even if he’s not big.</td>
<td>○</td>
<td>○</td>
<td>○</td>
</tr>
<tr>
<td>It bothers me when a guy acts like a girl.</td>
<td>○</td>
<td>○</td>
<td>○</td>
</tr>
<tr>
<td>I don’t think a husband should have to do housework.</td>
<td>○</td>
<td>○</td>
<td>○</td>
</tr>
<tr>
<td>Men are always ready for sex.</td>
<td>○</td>
<td>○</td>
<td>○</td>
</tr>
<tr>
<td>The thought of men having sex with each other is disgusting.</td>
<td>○</td>
<td>○</td>
<td>○</td>
</tr>
<tr>
<td>I could never be friends with a gay man.</td>
<td>○</td>
<td>○</td>
<td>○</td>
</tr>
</tbody>
</table>
Shifts in perceived masculinity

Listeners’ social attributes influence sensitivity to coarticulation
Implications & future directions

- Along with Phillips (to appear), this findings appear to suggest that retraction in /str/ clusters is not indexing masculinity/straightness in the same way as a retracted /s/ elsewhere for most speakers.
- These associations holds only weakly for participants who more strongly endorse male stereotypes.
- Future work is needed to better understand the socioindexical meaning of retraction.
Future directions

- Currently setting the experiment up online with the intent to:
  - Recruit more diverse listeners, including more diverse orientations to gender norms
  - Use more diverse talkers, including women and people of color


