Sensitivity to coarticulatory and social factors in American English sibilant categorization

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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
  - Contextual information about the conversation
  - Social information about the speaker
1. Listeners compensate for coarticulation

Mann & Repp (1980); Yu (2010)

- /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 extreme coarticulatory information (Ohala, 1993)
- Little work has tested this empirically
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 categorization task
  - Coarticulatory environment: *used-yeast*
  - Non-coarticulatory environment: *sweep-swoop*
Harrington et al. (2008)

- Older people compensate for coarticulation more than younger people, who rather shift their category boundary.
2. Listeners make adjustments for perceived listener attributes

Strand (1999); Yu (2010)

- 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 [grouchəi]
  - ‘Sri Lanka’ is pronounced as [ʃri lanəkə]
- especially in /str/ clusters
  - ‘street’ is pronounced approaching [ʃtрит]
- but less common is /spr/ and /skr/ clusters
  - ‘scream’ is not approaching [ʃкрим]
  - ‘shopping spree’ is not approaching [ʃпəri]
/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)
Does a retracted /s/ preconsonantally have distinct socio-indexical meaning from a retracted /s/ elsewhere?

Does a retracted /st.I/ have different socio-indexical meaning that a retracted /s{p k}.I/?
Phillips (2018): Sample evaluation matrix

Please provide your impression of the speaker on the scales below:

- Attractive
- Masculine
- Unfriendly
- Casual
- Shy
- Heterosexual

Please select where the speaker might be from? (select all that apply):

- The South
- West coast
- The City
- The Midwest
- East coast
- The Country
- The Northeast
- The Southwest
- The Suburbs
- The Country
Phillips (to appear): Findings

In a social evaluations task with 342 participants:

- Across all speakers: a retracted /s/ in /sCr/ does not appear to 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.
Phillips (to appear): Findings

![Graph showing sensitivity to coarticulatory/social factors in sibilant categorization](image-url)
Phillips (to appear): Implications

✗ Does a retracted /s/ preconsonantally have distinct socio-indexical meaning from a retracted /s/ elsewhere?

✓ Does a retracted /st.ɪ/ have different socio-indexical meaning that a retracted /s{p k}.ɪ/?
  ▶ For some speakers, a retracted /s/ in /st.ɪ/ clusters less strongly indexed masculinity/sexuality compared to /s{p k}.ɪ/.
The Present Study

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

- **Task:** Nonce word phoneme categorization task
  - Nonce words necessitated by English phonotactics
  - Citation nonce words recorded by 2 straight, white male college students from Iowa

<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

- 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:
  
  \[ [s\{p,t,k}\_\text{imb}_\text{el}] \] to \[ [f\{p,t,k}\_\text{imb}_\text{el}] \]
Visual stimuli

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

scrimble 1

shcrimble 0
186 participants recruited online

- Age: Min. 18, Max. 56, Mean 30
- Gender: 71 female, 113 male, 2 non-binary
- Sexuality: 15 bisexual, 5 gay, 162 straight, 4 other
- Race: 9 Asian, 12 black, 16 Latinx, 6 Native, 137 white, 4 other
- Environment: 56 urban, 92 suburban, 38 rural
Analysis

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

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

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

![Graph showing patterns of retraction perception](image)
Implications & future directions

- The factors that led to sound change (e.g., no phonological contrast, highly context-specific coarticulatory triggers), not only encourage variation in production, but also 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.
Shifts in perceived masculinity
Male Role Attitudes Scale (Pleck et al., 1993)

<table>
<thead>
<tr>
<th></th>
<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>
<td>○</td>
</tr>
<tr>
<td>A man always deserves the respect of his wife and children.</td>
<td>○</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>
<td>○</td>
</tr>
<tr>
<td>A guy will lose respect if he talks about his problems.</td>
<td>○</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>
<td>○</td>
</tr>
<tr>
<td>It bothers me when a guy acts like a girl.</td>
<td>○</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>
<td>○</td>
</tr>
<tr>
<td>Men are always ready for sex.</td>
<td>○</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>
<td>○</td>
</tr>
<tr>
<td>I could never be friends with a gay man.</td>
<td>○</td>
<td>○</td>
<td>○</td>
<td>○</td>
</tr>
</tbody>
</table>
Shifts in perceived masculinity
Implications & future directions

- Along with Phillips (to appear), these findings appear to suggest that retraction in /sCr/ clusters is not indexing masculinity/straightness in the same way as a retracted /s/ elsewhere for most speakers.

- These associations hold only weakly for participants who more strongly endorse male stereotypes in /spr/ and /skr/ clusters.

- Future work is needed to better understand the socioindexical meaning of retraction.
Future directions

- Keep running more subjects:
  - Recruit more diverse listeners
  - Use more diverse talkers, including women and people of color
  - Analyze listeners ratings of the voices and faces on the relevant attributes


