Yod variation in Victoria, B.C.: An acoustic-centred approach

Sky Onosson
University of Victoria

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1. The data
2. Yod: history, current status
3. Analysis: methodology and results
4. Going forward…
Victoria English Project

- Synchronic Corpus of Victoria English (SCVE)
- 162 speakers; 114 in Vic. Vowels Project
- Birth years: 1913–1996 (84 years)
- Victoria’s Vowels Project: collaboration with Drs. Alex D’Arcy & Becky Roeder
  - 2015 presentations: ADS Portland, NWAV Toronto
Victoria's Vowels

Features investigated:

1. Canadian Shift:
   recent and aggressive

2. GOOSE/GOAT fronting:
   correlated for women only

3. GOOSE~TRAP:
   F2 proximity indicates innovative dialect (Boberg 2008)

4. START retraction:
   distinct from mainland B.C.

5. BAG/BAN raising:
   both raised, Western feature
Yod forms: history and variation

- Two historical sources for GOOSE set (Wells 1982):
  - 15th century: Great Vowel Shift [oː] → [uː], e.g. moon;
  - 17th century: merger of multiple vowels to [ɪu, ju]
- Two processes of deletion of yod (Glain 2012):
  - Early Yod Dropping: after palatals, r, and l-clusters, e.g. chew, rude, blue
    - homophonous pairs: threw–through, brewed–brood
    - largely complete in most dialects worldwide
  - Later Yod Dropping: post-coronal, e.g. tune, new, student
    - Cf. non-coronal onsets: e.g. cute, few, pew, etc.
    - mainly N. American dialects, variable application
Yod variation in N. America

- *Atlas of N. American English*: widespread fronting and unrounding of /uw/ has led to loss of distinction between yod vs. non-yod forms
  - e.g. *do* vs. *due*

- Retained in two nonadjacent regions of southeast U.S.
  - perceptually distinct: *orange*
  - acoustically distinct: *purple*

- What about Canada?

Yod variation in Canada

- **Summaries:** Clarke 2006, Boberg 2010
- **Speaker preference:** Orkin 1970, Pringle 1985, Woods 1999
  - preference for *yod*, deletion perceived as ‘American’
- **Self-reporting:** Scargill 1974, Chambers 1998; **researcher perception:** Gregg 2004, Clarke 2006
  - higher rates vs. U.S.
- **Overall:** ‘divided and unsettled’, but moving towards lower rates of usage (Boberg 2010)
- **Acoustic analysis:** … ?
Research questions:

1. How can *yod* be identified acoustically?

2. What is the status of *yod* production/retention in Victoria, in terms of individual lexical items as well as social factors?
Acoustic study

1. Perceptual analysis of subset of SCVE
2. Acoustic analysis of perceptually-identified yod tokens, establishment of acoustic criteria for yod identification
3. Application of acoustic criteria to full SCVE corpus
4. Statistical analysis of yod occurrence
Perceptual analysis

- Speakers: 15 out of 114
  - 20–96 years old
  - 8 female, 7 male
- Wordlist items with /uw/: boots, cool, do, due, food, fool, new, soon, student, too, tool, tooth, tube
- 192 tokens, 156 unanimously identified (81%)
- 3 speakers: zero tokens with yod
## Perceptual analysis

<table>
<thead>
<tr>
<th>Speaker</th>
<th>Word(s)</th>
<th>Speaker</th>
<th>Word(s)</th>
<th>Speaker</th>
<th>Word(s)</th>
</tr>
</thead>
<tbody>
<tr>
<td>DI20f</td>
<td>new soon</td>
<td>CL41m</td>
<td>due new student tube</td>
<td>CD78m</td>
<td>do due</td>
</tr>
<tr>
<td>PA22m</td>
<td>soon</td>
<td>DR57m</td>
<td>due new tube</td>
<td>EM78f</td>
<td>due tube</td>
</tr>
<tr>
<td>BB39f</td>
<td>new</td>
<td>HR57m</td>
<td>due new tube</td>
<td>GK80m</td>
<td>due new tube</td>
</tr>
<tr>
<td>HG40m</td>
<td>new</td>
<td>JB58f</td>
<td>new student</td>
<td>DJ96f</td>
<td>due new student</td>
</tr>
</tbody>
</table>
Acoustic analysis

- What acoustic qualities to measure?
  - spectral formants (F1-F3), acoustic intensity, duration
  - discrete time-points vs. averages

- Characteristics measured (Praat scripts: Kawahara 2010, Xu 2015):
  - post-onset duration (including glide + nuclear vowel)
  - F1, F2, F3 & intensity values at 20 discrete time-point intervals
  - mean, minimum, maximum values for F1, F2, F3 & intensity
  - intensity change over time (increase/decrease)
## Significant ‘global’ acoustic factors

<table>
<thead>
<tr>
<th>Factor</th>
<th>Effect Size (F)</th>
<th>Significance (p)</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Duration</strong></td>
<td>29.9</td>
<td>1.42e-07 ***</td>
</tr>
<tr>
<td>Minimum Intensity</td>
<td>5.786</td>
<td>0.0171 *</td>
</tr>
<tr>
<td><strong>Mean F2</strong></td>
<td>27.51</td>
<td>4.15e-07 ***</td>
</tr>
<tr>
<td>Minimum F2</td>
<td>4.182</td>
<td>0.0422 *</td>
</tr>
<tr>
<td><strong>Maximum F2</strong></td>
<td>41.07</td>
<td>1.13e-09 ***</td>
</tr>
<tr>
<td>Maximum F3</td>
<td>4.089</td>
<td>0.0446 *</td>
</tr>
</tbody>
</table>

* p < 0.05, *** p < 0.001
## Discrete formants

<table>
<thead>
<tr>
<th>Timepoints</th>
<th>t1</th>
<th>t2</th>
<th>t3</th>
<th>t4</th>
<th>t5</th>
<th>t6 (circled)</th>
<th>t7</th>
<th>t8</th>
<th>t9</th>
<th>t10</th>
<th>t11</th>
<th>t12</th>
<th>t13</th>
<th>t14</th>
<th>t15</th>
<th>t16</th>
<th>t17</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>F1</strong></td>
<td>–</td>
<td>–</td>
<td>4</td>
<td>6</td>
<td>5</td>
<td>–</td>
<td>–</td>
<td>–</td>
<td>–</td>
<td>–</td>
<td>–</td>
<td>–</td>
<td>–</td>
<td>–</td>
<td>–</td>
<td>–</td>
<td>–</td>
</tr>
<tr>
<td><strong>F2</strong></td>
<td>22</td>
<td>38</td>
<td>44</td>
<td>48</td>
<td>53</td>
<td>55</td>
<td>52</td>
<td>48</td>
<td>40</td>
<td>33</td>
<td>18</td>
<td>14</td>
<td>10</td>
<td>8</td>
<td>4</td>
<td>1</td>
<td>–</td>
</tr>
<tr>
<td><strong>F3</strong></td>
<td>7</td>
<td>9</td>
<td>7</td>
<td>4</td>
<td>–</td>
<td>–</td>
<td>–</td>
<td>–</td>
<td>–</td>
<td>–</td>
<td>–</td>
<td>–</td>
<td>–</td>
<td>–</td>
<td>–</td>
<td>–</td>
<td>–</td>
</tr>
</tbody>
</table>

**cf.: Mean F2, F=27.5; Max. F2, F=41**

\[ p < 0.001, \ p < 0.01, \ p < 0.05 \]
Formant trajectories

Non-\textit{yod} tokens

\textit{Yod} tokens
Sex-differentiated criteria

- **ANOVA:** Speaker sex ~ F2 at 20%, F=15.68, $p=0.000106^{***}$

<table>
<thead>
<tr>
<th>F2 at 20% of vowel duration</th>
<th>Female</th>
<th>Male</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Yod</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Upper quartile</td>
<td>2580 Hz</td>
<td>2103 Hz</td>
</tr>
<tr>
<td>Mean</td>
<td>2373 Hz</td>
<td>2058 Hz</td>
</tr>
<tr>
<td>Lower quartile</td>
<td>2258 Hz</td>
<td>1930 Hz</td>
</tr>
<tr>
<td><strong>Non-yod</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Upper quartile</td>
<td>2080 Hz</td>
<td>1746 Hz</td>
</tr>
<tr>
<td>Mean</td>
<td>1715 Hz</td>
<td>1444 Hz</td>
</tr>
<tr>
<td>Lower quartile</td>
<td>1241 Hz</td>
<td>1125 Hz</td>
</tr>
</tbody>
</table>
Yod retention, loss

- **Criteria**: F2 at 20% > 1930 Hz (male), 2258 Hz (female)
- **LYD-subject words**: *due, new, student, tube*
  - N=443
  - **Retention of yod**: N=174, 39.3%
  - **Dropping of yod**: N=269, 60.7%
## Variation by sex

<table>
<thead>
<tr>
<th>Sex</th>
<th>Rate of <em>yod</em> occurrence</th>
<th>Mean</th>
<th>Median</th>
</tr>
</thead>
<tbody>
<tr>
<td>Female</td>
<td></td>
<td>39.69%</td>
<td>50%</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Male</td>
<td></td>
<td>39.24%</td>
<td>25%</td>
</tr>
</tbody>
</table>

### Distribution

- **Female**
  - Mean: 39.69%
  - Median: 50%

- **Male**
  - Mean: 39.24%
  - Median: 25%
Lexicalized variation

<table>
<thead>
<tr>
<th>Word</th>
<th>Tokens</th>
<th>Yod</th>
<th>Rate</th>
</tr>
</thead>
<tbody>
<tr>
<td>new</td>
<td>112</td>
<td>53</td>
<td>47.3%</td>
</tr>
<tr>
<td>tube</td>
<td>113</td>
<td>42</td>
<td>37.2%</td>
</tr>
<tr>
<td>due</td>
<td>113</td>
<td>25</td>
<td>22.1%</td>
</tr>
<tr>
<td>student</td>
<td>105</td>
<td>54</td>
<td>51.4%</td>
</tr>
</tbody>
</table>
Lexicalized variation by sex

Female speakers

- NEW: 53%
- TUBE: 38%
- DUE: 15%
- STUDENT: 50%

Male speakers

- NEW: 50%
- TUBE: 29%
- DUE: 21%
- STUDENT: 50%
Variation by age and sex

Rate of yod occurrence

Speaker age (Male = left, Female = right)
# Duration, age, and yod variation

## Duration vs. Sex
- **Effect size**: 0.159
- **p**: 0.691

## Duration vs. Age
- **Effect size**: 4.366
- **p**: <2e-16***

## Duration vs. Age, non-yod tokens
- **Effect size**: 4.054
- **p**: <2e-16***

## Duration vs. Age, yod tokens
- **Effect size**: 1.191
- **p**: 0.199

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### Graph

**Duration (ms)**

<table>
<thead>
<tr>
<th>Speaker age</th>
<th>Non-yod</th>
<th>Yod</th>
</tr>
</thead>
<tbody>
<tr>
<td>60+</td>
<td>224</td>
<td>212</td>
</tr>
<tr>
<td>40-59</td>
<td>205</td>
<td>206</td>
</tr>
<tr>
<td>24-39</td>
<td>195</td>
<td>191</td>
</tr>
<tr>
<td>14-23</td>
<td>173</td>
<td>189</td>
</tr>
</tbody>
</table>
Summary

- **Acoustic analysis**
  - Significant factors: F2 ~20-30%, duration
  - Sex-differentiated criteria for formant measurement

- **Yod variation**
  - Relatively high rate of occurrence
  - Distinct by lexical item and sex, non-age-graded

- **Duration**
  - Positive correlation with age only for non-

*yod* variants
Future research

❖ Experimental study:

1. Is *yod* variation perceptible to Victorians?

2. What is the social function of such variation?

❖ Canadian Raising:

❖ *Victoria ~ Winnipeg*
References (B–L)


Thank you...
Yod variation in S. Ontario

- Four ‘yod’ words examined: 
  avenue, coupon, news, student
- Words differ on sociolinguistic factors, e.g. only avenue is nationally-oriented, and lacks age-grading

Self-reported rate of yod usage in avenue: (Chambers 1998, p. 237)