Issues in longitudinal vowel analysis: evidence from Montreal French

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Our previous work

  • Acoustic analysis of Montreal French vowel system
  • Evidence of linguistic change across the lifespan
    • Individual speakers participate in changes in the surrounding community as they age
Longitudinal change: complications

- What does it mean when speakers’ lifespan changes are *not* observed in the community?
  - Noise in the data?
  - Effects of the aging process?
  - Community changes we can’t see?
Montreal French corpora

- 1971: 120 speakers (Sankoff et al., 1976)
- 1984: 60 original plus 12 younger speakers (Thibault and Vincent, 1990)
- 1995: 12 original speakers plus 2 younger 1984 speakers (Vincent et al., 1995)
  - Allow for both trend and panel comparisons
Our sample

• 6 panel speakers
  • All recorded in 1971, 1984, 1995
  • 3 men, 3 women
  • All in their teens or 20s in 1971

• 12 trend speakers
  • 6 recorded in 1971, 6 recorded in 1984
  • Each sample matched for age, sex, class
  • All in their teens or 20s at time of recording
The variable under study

• Diphthongization of long vowels
  • Do individual speakers reflect changes in the degree and direction of diphthongization observed in the community over time?
  • Previous longitudinal work looked at [r] → [ɹ] (Sankoff & Blondeau, 2007); diphthongization is a change from below
QF vowel inventory: contrastive oral vowels

- **i**
  - *qui* ‘who’
  - *fée* ‘fairy’
  - *faite* ‘made’
  - *fête* ‘party’

- **y**
  - *lu* ‘read’
  - *jeu* ‘game’
  - *jeune* ‘young’

- **u**
  - *coup* ‘blow’
  - *pot* ‘pot’
  - *poste* ‘post’

- **ø**
  - *œ* ‘I’
  - *pâte* ‘pasta’

- **ε**
  - *a*
Two sources of vowel length

- Compensatory lengthening due to historical loss of /s/ or cluster simplification
  - Length may result in minimal pairs, e.g. *faite* [fɛt] ‘made’ ~ *fête* [fɛ:t] ‘party’
- Vowels preceding /ʁ/ and the voiced fricatives /z, v, ʒ, vʁ/ (*consonnes allongeantes*)
  - Length is strictly allophonic
QF vowel inventory: long oral vowels

dire ‘to say’

\(i:\)

\(\dot{i}:\)

\(y:\) nature ‘nature’

\(\varepsilon:\)

\(\varepsilon:\)

\(\varepsilon:\) longueurs ‘long parts’

\(\ddot{\varepsilon}:\)

\(u:\) épouse ‘wife’

\(o:\) pauvre ‘poor’*

\(o:\)

\(o:\) encore ‘still’

\(a:\) classe ‘class’

*/o/ is long regardless of phonological environment.
Length manifests as diphthongization

MC 33-y-o male

Bold symbols: glide targets

Critère ‘criterion’

Ghislain N., 13-84
Circled pairs differ significantly on F1 axis ($p < .001$); N= ~400 for long Vs, ~100 for short Vs
...and (non-high vowels only) addition of a raised offglide
Our research questions

• Have the degree and direction of diphthongization changed in the community over time?
• Do individual speakers participate in such a change as they age?
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• Have the degree and direction of diphthongization changed in the community over time?
• Do individual speakers participate in such a change as they age?
Change in apparent time

Diphthongization of \([\text{o}e:\text{R}] \rightarrow [\text{a}^\text{e}_\text{R}]\) in 1971 for 52 Montréal speakers by date of birth and social class:

<table>
<thead>
<tr>
<th>Age Groups in 1971</th>
<th>16-29</th>
<th>30-47</th>
<th>48-59</th>
<th>60-85</th>
</tr>
</thead>
</table>

Source: Cedergren, Clermont, & Côté (1981)
Change in apparent time

• Cedergren et al. found increased diphthongization of [œːr].
• Coded impressionistically: “diphthongization” = nucleus lowering
Change in real time – [œ:]

- 13 years later: [œ:] nucleus has stabilized on F1.
- Vowel backs.
- [œ:] glide target lowers, decreasing nucleus–glide distance.
Change in real time – [ɛː]

Similar changes in evidence for other long front vowels:

[ɛː] – backing and lowering but constant diphthongization

N = 133 (‘71), 103 (‘84)
Change in real time – [y:]

Similar changes in evidence for other long front vowels:

[y:] – backing and lowering, decreased diphthongization
Change in real time – [i:]

Similar changes in evidence for other long front vowels:

[i:] means, trend speakers (normalized)

N = 85 ('71), 79 ('84)

[i:] – lowering, decreased diphthongization
Long front vowel trends

- Lowering
- Backing
- Decreased diphthongization
Change in apparent time

Diphthongization of [oː] → [ɔː] in 1971 for 52 Montréal speakers by date of birth and social class:

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<tr>
<td></td>
<td>WC</td>
<td>LMC</td>
<td>UMC</td>
<td></td>
</tr>
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</table>

Source: Cedergren, Clermont, & Côté (1981)
Change in apparent time

• Cedergren et al. found increased diphthongization of [ɔ:].
• “Diphthongization” = nucleus lowering + glide raising
Change in real time – [o:]

- 13 years later: [o:] nucleus has stabilized on F1.
- [o:] glide target lowers, decreasing nucleus–glide distance.

\[ [o:] \text{ means, trend speakers (normalized)} \]

\[ N = 72 (\text{‘71}), 71 (\text{‘84}) \]

1971 1984

- [o:]\_ means, trend speakers (normalized)

N = 72 (‘71), 71 (‘84)
Change in real time – [ɑː]

Similar changes in evidence for other long back vowels:

[ɑː] – nucleus is stable; glide target lowers
Change in real time – [ɔː]

Similar changes in evidence for other long back vowels:

[ɔː] – nucleus is stable; glide target lowers
Long back vowel trend

- No change except for decreased diphthongization
Real time community trends

- Long front vowels: backing, lowering, decreased diphthongization
- Long back vowels: decreased diphthongization
Our research questions

• Have the degree and direction of diphthongization changed in the community over time?
• Do individual speakers participate in such a change as they age?
Panel speakers’ participation in community changes: 71–84

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<td></td>
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<td></td>
<td></td>
<td>✓</td>
</tr>
<tr>
<td>[y:] backing &amp; lowering &amp; lowering</td>
<td>✓</td>
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<tr>
<td>[ɛ:] backing &amp; lowering &amp; lowering</td>
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<td>[œ:] backing</td>
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<td>[α:]**</td>
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** glide fronts & lowers; nucleus stable
[y:] means, trend speakers (normalized)

N = 43 ('71), 44 ('84)

[y:] means, speaker 2, WC male (normalized)

N = 16 ('71), 14 ('84)
[ɑː] means, trend speakers (normalized)

N = 93 ('71), 98 ('84)

1971 1984

[ɑː] means, speaker 8, MC female (normalized)

N = 15 ('71), 16 ('84)

1971 1984
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** glide fronts & lowers; nucleus stable
[œː] means, trend speakers (normalized)

N = 93 ('71), 81 ('84)

[œː] means, speaker 7, WC+ female (normalized)

N = 14 ('71), 15 ('84)
[i:] means, trend speakers (normalized)

N = 85 ('71), 79 ('84)

[i:] means, speaker 13, MC male (normalized)

N = 21 ('71), 15 ('84)
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<td>√</td>
<td>raises glide</td>
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\[ \varepsilon: \] means, trend speakers (normalized)

\[ \varepsilon: \] means, speaker 8, MC female (normalized)

\(N = 133\ ('71), 103\ ('84)\)

\(N = 22\ ('71), 15\ ('84)\)
[o:] means, trend speakers (normalized)

N = 72 ('71), 71 ('84)

[0:] means, speaker 2, WC male (normalized)

N = 19 ('71), 14 ('84)
Individual patterns

- Participating in community change (e.g. #2)
- Stability across the lifespan (e.g. #7, #13)
- Movement of entire system (e.g. #49: lowering of all long vowels)
- Anomalous movements
Anomalous movements

• A result of physiological changes due to the aging process?
  • Harrington (2006): formant frequencies decrease with age.
  • This may explain anomalous raising or backing.
Anomalous movements

- Community change we can’t see yet?
  - Not likely: anomalous movements are typically specific to one speaker, not a group of them
Anomalous movements

- Noise in the data?
  - Possible: ~15 tokens coded per vowel per speaker in the panel.
The take-home message

- Clear patterns are evident in the community: lowering/backing of long front vowels and stability of long back vowels.
- Some speakers participate in these changes as they age, but true lifespan change needs to be disentangled from the effects of aging.
- More data may help clear up anomalous results.
Merci!

- to the National Science Foundation for grant BCS-0132463, 2002-2005, “Language Change Across the Lifespan” that supported the initial work on diphthongization carried out by Michael Friesner, Damien Hall and Gillian Sankoff
- to Bill Labov for designing the French version of Plotnik (Plotnik v.f.), and for working closely with us in adapting it to the needs of the present analysis.
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