Vowel raising in Washington English: What’s the BAG deal?

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Cascadia Workshop in Sociolinguistics, CWSL 1
University of Victoria, March 1-2 2014

Research funded by National Science Foundation award BCS-1147678
1. **Goal**: What are the implications, for sociolinguistic theories of merger, of the low-front prevelar raising of BAG (aeg) observed in the English of Washington state?

   *Merger*: (def.) “In sound change, a process characterized by coalescence of vowel qualities resulting in loss of phonological contrast (Labov, 1994: 33)”.

2. **Background**: Theoretical types of merger

3. **Methods**: To examining path of the change, present overlap data for three generations of Washington speakers

4. **Results**:  
   - Change in apparent time (inter-generational patterns)  
   - Individual variability
Research Questions

**Research Question I:** Does one (or more) of the theoretical types of merger proposed by Labov (1994) best fit the data for most speakers in the sample? Do these elucidate our understanding of the mechanism of the merger?

**Group-level** examination of by-generational differences in apparent time to indicate community-wide patterns:
- H0: Inter-generational variability will obscure any pattern.
- H1: Inter-generational variability will point to merger by transfer.
- H2: Inter-generational variability will point to merger by approximation.

**Research Question II:** Do we see different configurations reflecting different merger strategies at the speaker level?

**Individual-level** examination of speaker-level variation:
- H0: Individual variation will make it difficult to discern any pattern.
- H1: We will see merger by transfer.
- H2: We will see merger by approximation.
Background

- Younger speakers’ target for BAG (aeg) appears to be [ɛ ɛ̝] (ehg~eyg), not (eyg) (Freeman, 2013).
- Disruption of the symmetry of a vowel system (Martinet 1952, Chen & Wang 1975).
- Phonological implications of raising either (ɛ) or (æ) to (ey) may be minimal.
  - (eyg) may be susceptible to phonetic crowding: low functional load “bagel”, “vague”, “plague”, “pagan”
  - no (æg~eyg) minimal pairs
- but merging (æ) with (ɛ) has more significant implications.
  - “bag/beg”, “lag/leg”, “rag/regular”
Merger Type I

• Merger by Approximation: (2 subtypes)

• (1) Vowels A and B both shift, resulting in a new vowel quality intermediate to the original phonetic values (“middle ground”).

• (2) or, one affected vowel gradually approaches the other
Merger Type I

- Merger by Approximation: (2 subtypes)
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Merger Type 2

- **Merger by Expansion:**
- Distribution of Vowel B (shifting V) becomes enlarged, eventually assumes the mean value of Vowel A.
- Indistinguishable from merger by approximation in mid-course

![Diagram showing stages of merger](Diagram)
Merger Type 3

- Merger by **Transfer**:
- unidirectional shift in which elements of distribution B are transferred into A, leaving no intermediate phonetic forms.
- McMahon (1999): easy type to see.
- Inference: acoustic effects easiest to observe.
Methods

Speakers: 18 Caucasian-Americans Apparent-time sample, 3 generational cohorts:

Generation 1 (n=5): born 1900-1950 (eldest 100 y.o.a.)
Generation 2 (n=8): born 1951-1976
Generation 3 (n=5): born 1977-1992 (youngest 21 y.o.a.)

Materials: /æ(g), ɛ(g), ey(g)/ + /i, a, ɔ, u/

Words in carrier: “Write ___ today.”
Reading passage: Aesop’s Fables “The Cat and the Mouse” (adapted)

Digitally recorded using a 44kHz sampling rate
Penn Phonetics Lab Forced Aligner (P2FA) for forced-alignment
Measures: Vowel duration, F1-F3 measured at 20, 50, 80% into vowel
Nearey-2 normalization
PhonR for midpoint plotting (McCloy 2013), SSANOVA (trajectory)

Token count: 14,519
Spectral Overlap in Merger Research

- Spectral Overlap Assessment Metric: Normalized scatter for two vowel distributions is modeled as two best-fit ellipsoids angled to reflect the distribution's orientation in F1xF2xDuration space. (Wassink, 1999, 2006).
- Overlap Proportion: ($\Omega$ value from 0-1.0, or 0-100%) Represents the area of the region shared by both vowel distributions.
- Conservative heuristic:
  - COMPLETE: $\Omega=75-100$
  - PARTIAL OVERLAP: $\Omega=21-74$
  - NO OVERLAP: $\Omega=0-20$
Operationalizing Types of Merger

- **Approximation (expansion):** Might appear numerically as: Complete or partial overlap between affected vowel(s) with residual forms at neighboring classes.

- **Transfer:** Might appear numerically as: Complete overlap with target distribution, but No overlap with intermediate neighboring classes.
## Summary: Generational Differences

Table 1: % of speakers in each generational cohort who show COMPLETE SPECTRAL OVERLAP for (aeg) with a neighboring vowel.

<table>
<thead>
<tr>
<th>Gen.</th>
<th>(ey~aeg)</th>
<th>(ɛg~ aeg)</th>
<th>(ɛ~aeg)</th>
<th>(ae~aeg)</th>
</tr>
</thead>
<tbody>
<tr>
<td>1 (n=5)</td>
<td>0%</td>
<td>0%</td>
<td>20%</td>
<td>60%</td>
</tr>
<tr>
<td>2 (n=8)</td>
<td>13%</td>
<td>50%</td>
<td>35%</td>
<td>63%</td>
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<tr>
<td>3 (n=5)</td>
<td>40%</td>
<td>40%</td>
<td>40%</td>
<td>60%</td>
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</table>

3-D (F1xF2xDuration) overlap proportions (logHz data). COMPLETE: \( \Omega = 75\% \) or higher, PARTIAL: \( \Omega = 21-74\% \), NO OVERLAP: \( \Omega = 0-20\% \)
• (ey~eyg) appear to become more separate as speaker age decreases
• (ey) is higher than (eyg)
• (ɛg~eyg) BEG, BAGEL are similar in trajectory

source: Freeman (2013)
RQ2:

• Do we see different configurations reflecting different merger strategies at the speaker level?
Approximation

Here, (aeg) shows raising to [ɛ] (eh) without expansion (distribution shows limited F1 range). But (ae) targets in all environments are widely dispersed.

(ehg) also shows raising with approximation to (ey).
Transfer

(ehg): Transfer to (eyg) likely.

(aeg): Expansion evident. Intermediate forms overlap with (ae), (eh) and (ey).
Summary

• Generational view shows us possible progression of a merger by approximation.

• Intermediate forms commonly observed. We observe evidence for lowering of (eyg). Spectral evidence for both subtypes (“middle ground”, and “approaching”).

• Little evidence found for merger by transfer (possible assessment for only 1 speaker), but it is easy to detect. The raising of (ehg) most likely candidate for transfer.

• Transfer: This type is not common cross-linguistically. Where it is, it has been associated with lexically-diffusing change (McMahon, 1999).
Implications

• (eyg)’s small membership create no problem for raising.

• In fact, some ambiguity arises because of the small membership, enabling (eyg)-class forms to be reanalyzed as (ehg), e.g., “vague”

• But (aeg) raising to (ehg) is problematic. (aeg) forms become diphthongal (when raised), enabling distinction from (ehg).

• Theories should account for speakers’ reorganization of the phonetic features supporting the contrast. Trajectory information is important--indicates spectral differentiation. Is this merger?

• Bottom line: We see *both* the tendency for maintenance of distinction (in two larger word-classes (ehg, aeg), and loss of contrast (eyg)).
References


APPENDIX A

Overall means for vowel duration (in ms), and for the first two formants (F1, F2) at three measurement points (20, 50, 80%). All speakers pooled.

<table>
<thead>
<tr>
<th>Vowel</th>
<th>Duration (ms)</th>
<th>20%</th>
<th>50%</th>
<th>80%</th>
<th>20%</th>
<th>50%</th>
<th>80%</th>
<th>20%</th>
<th>50%</th>
<th>80%</th>
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