Development of Vowel Spaces from Age 21 to Age 49 in a Group of 11 Speakers

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Age as a sociolinguistic variable
Sociolinguistic variable

- Element of identity, group membership, style, etc. that influences use of speech characteristics.
- E.g., identity as a native of Martha's Vineyard is marked by centralization of diphthongs (Labov 1963)
Age-grading

• Changes in speech as people age
• Can be considered a style
  • Style: a set of linguistic variants with social meanings indexed specifically by each variant
    – e.g., “Sassy Gay Friend” style combines [-iŋ] (indexes intelligence) and /s/ fronting (indexes effeminate/gay) (Campbell-Kibler 2011)
    – Speakers can switch style
• Normally involves linguistic features with high degrees of social awareness
  • Noticeable to listeners
  • Generally semantic or lexical, not phonetic
Vowel space and characteristics

- Very common as points of sociolinguistic variation
  - Regional variability (Clopper et al. 2005)
  - Clear speech (Ferguson and Kewley-Port 2007)
- Speakers can clearly control to some degree
Is vowel space used in projecting “age”? What changes in vowel space would indicate age?

Descriptive information on the development of vowel space is needed.
Work on vowel space an age

- Most work is cross-sectional
  - Difficult to track individuals for significant amount of time
  - Tends to divide speakers into young and old (60+) (Watson & Munson 2007, Whiteside 2001)
    - Sometimes middle-aged groups
    - Scarcity of data on continuous changes

- Some longitudinal studies – public speeches and broadcasts by famous individuals
  - Queen of England's annual Christmas broadcasts (Harrington 2007)
  - Read or scripted speech
  - Differs common language use
    - Especially important in understanding age as a sociolinguistic variable in everyday speech.
Previous findings

- Previous studies show varied results
  - General trend of lowering formant values and decrease in overall space
    - Harrington et al. (2007) and Watson & Munson (2007) found general lowering in F1 and F2
    - Whiteside (2001) found lowering of F1 and F2 and an overall contraction of vowel space
    - Reubold et al. (2010) found lowering of F1, with a late increase in the male speaker, and no change in F2
  - A sociolinguistic variable?
    - What about everyday speech?
    - Need longitudinal data from spontaneous speech
Vowel space will change, with some degree of lowering and/or contraction.
The Up Corpus

- Recently constructed for longitudinal data from spontaneous speech (Gahl et al. in press)
  - Data from the “Up” documentary films by Michael Apted
    - Follows 14 individuals in the UK from age 7, filmed and interviewed every seven years – “56 Up” summer 2013
The Up Corpus

- Contains speech samples from 11 of the Up speakers from age 21 to 49
- Transcribed and time-aligned at the levels of utterance, word, and phone – 21,328 word tokens
- F0 and vowel formant measurements obtained using automatic formant extraction (Ueda et al. 2007)
  - Measured at multiple points, our study uses temporal midpoints of vowels.
Measuring vowel space

• We measured:
  • Vowel space perimeter
  • Range of F1 average values
  • F2 average in front vowels
  • F2 average in back vowels
Vowel space perimeter

- Average F1 and F2 values of tokens for each of the four point vowels, /i/, /u/, /a/, and /æ/. Perimeter measured as the sum of Euclidean distances between /i/ and /u/, /u/ and /a/, /a/ and /æ/, and /æ/ and /i/.

- From Ferguson and Kewley-Port (2007) measurements of vowel space in clear speech
Vowel space perimeter

- Age is not predictive of vowel space perimeter
- Changes in vowel space perimeter did not follow a consistent pattern.
F1 range

- Distance between average F1 value of low vowels (/æ/ and /a/) and average F1 value of high vowels (/i/ and /u/).
F1 range

- F1 range increases with speaker age.
Average F2 in front and back vowels

- Average F2 for each point vowel, /i/, /æ/, /u/, and /a/
- Front F2 = the average of the values for /i/ and /æ/
- Back F2 = the average of the values for /u/ and /a/
Average F2 in front and back vowels

- Age is not predictive of F2 in front vowels or back vowels
- Possible difference between sexes
  - F2 front tends to decrease in male speakers
Summary

- Specific hypothesis – vowel space will change as speakers age – confirmed

- F1 range increases as speakers age. Average F2 in front vowels shows tendency to decrease with age in male speakers.
  - Decrease in F2 average follows findings from previous work of a general decrease in formant values.
    - Like some other studies, not statistically significant
  - Increase in F1 range does not match earlier findings of a trend toward contracting vowel space.
Conclusions

- Different findings from previous work is not surprising.
  - Data from different speech contexts.
  - Provides a description of the development of vowel space from the same individuals in spontaneous speech.
- Now have a better understanding of how vowel space changes with age
  - Many reasons for change in vowel space
    - Psycholinguistic, physiological, social, etc.
  - Better able to address the larger question: “How do individuals project age as style or persona?”
References

5) Harrington, J. (2007). Evidence for a relationship between synchronic variability and diachronic change in the Queen’s annual Christmas broadcasts. Laboratory phonology, 9, 125-144.