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

Auburn Lutzross, Will Schuerman, Ronald Sprouse, Susanne Gahl
University of California Berkeley, Linguistics Department

Introduction

This study investigates the development of vowel spaces in longitudinal speech samples of eleven talkers collected over a period of 28 years.

Data: The “Up” Corpus

The “Up” corpus was created to make available spontaneous speech data collected from the same speakers over multiple decades.

The speech samples were taken from the Up series of documentary films by director Michael Apted. The series follows 14 individuals from the United Kingdom, who have been filmed and interviewed at seven-year intervals since age 7.

The “Up” corpus contains speech samples from 11 of the participants from ages 21 to 49.

A total of 21,328 word tokens were transcribed and time-aligned at the level of utterance, word, and phone. F0 and vowel formant measurements were obtained using automatic formant extraction (Ueda, Hamakawa, Sakata, Hario, & Watanabe, 2007).

Measure 1: Vowel Space Perimeter

Vowel space perimeter was estimated as the sum of the Euclidean distances between point vowels: /i/ to /æ/ to /ɑ/ to /u/, as in these examples for two talkers:

Changes in vowel space perimeter did not appear to follow a consistent pattern.

Measure 2: F1 range

The F1 range: Estimated as the difference between the average F1 value, at the temporal midpoint of the vowel, for the low vowels /æ/ and /ɑ/ and the average F1 value for the high vowels /i/ and /u/.

Measure 3: Average F2 in front vowels

Age is not predictive of F2 in front vowels. Possible sex difference: F2 front tends to decrease in male talkers’ speech.

Statistical analysis: Linear mixed-effect regression with by-talker random intercepts and talker age as a fixed effect. Model R^2 = .53.

beta(Age) = 0.013, t = 2.13.

(Age is also significant in a model with by-talker random slopes, but inclusion of by-talker random slopes does not yield model improvement.)

Summary and conclusions

Our conversational speech data show some evidence consistent with age-related change in vowel spaces, in ages 21-49.

F1 range increases with talker age. F2 does not.

Conversational speech data can yield informative measurements of vowel characteristics.

Evidence from conversational speech complements data obtained under controlled conditions.

References


