Naïve Categorization of American English Vowels

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I. Introduction & Background

Vowel perception studies typically investigate categorical boundaries between percepts with closely related acoustic structures using pre-established categories of expert phoneticians. However, without knowing the cognitive reality of these categories as naïve listeners experience them, perception-based phenomena cannot be fully interpreted. This study provides a first step towards understanding how naïve listeners experience vowel sounds. A modified pile-sort task was used to allow listeners to construct vowel categories/groups as they perceived them. Though there is some evidence for the psychological reality of traditional phonological categories, there is stronger evidence in support of the feature [+/- peripheral] in Labov (1994) and related work.

Previous Research in Vowel Perception – It's Categorical!
Difference Judgement Tasks:
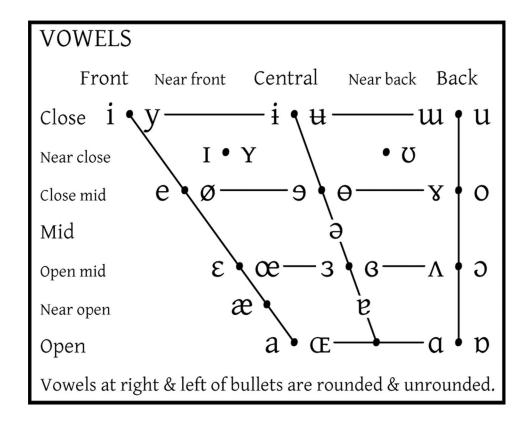• ABX• AB Crossover • AX (Same or Different?)

What we've learned:
-Discrimination is difficult WITHIN categories, easy BETWEEN categories
-Vowel perception is NOT continuous
-Discrimination is not uniform across the continuum (Liberman et al. 1957)
-The "free space to vary in" is larger for F2 than F1
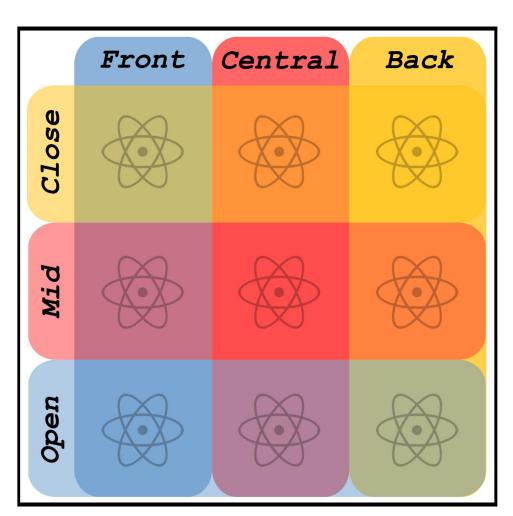
II. Research Questions

But… these findings have all used a priori linguistic/phonetic categories for the interpretation of results (e.g., we know where the /æ/~/ɛ/ crossover is but not the /æ/~/ʌ/ crossover even though /æ/-/ʌ/ are a minimal pair).

How does a linguist or phonetician categorize vowel sounds?
• Front/Central/Back • Close/Mid/Open • +/- Tense • +/- Round • +/- Peripheral

VOWELS

This leads to an atomic classification where every vowel is an island unto itself.

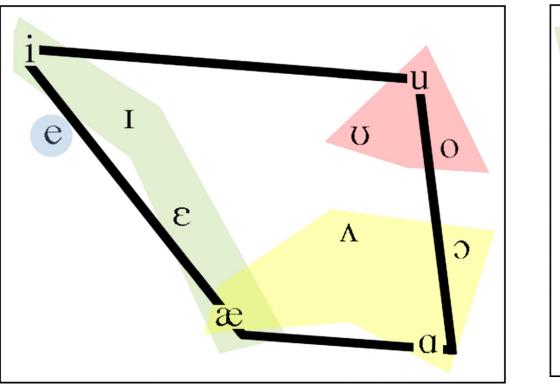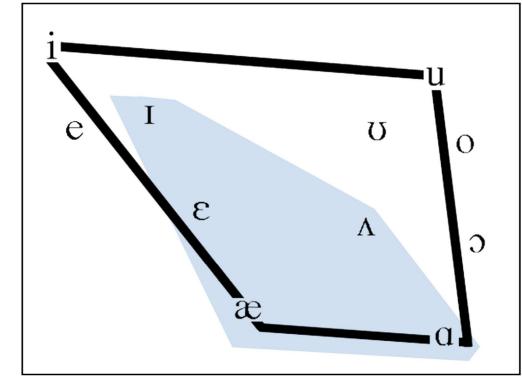## III. Experiment Design

• A modified pilesort task was used to allow listeners to construct vowel categories as they perceived them.
• 35 undergraduates at the University of Texas heard isolated natural-speech tokens of 14 vowels of American English:
    FLEECE, KIT, DRESS, TRAP, LOT,
    THOUGHT, STRUT, FOOT, GOAT, GOOSE,
    FACE, PRICE, CHOICE, MOUTH
• Listeners were asked to group vowel tokens into 2, 3, 4, 5, 7, and 9 categories.
• All listeners were previously familiar with the speaker who provided the token data.
• Listeners had no previous (formal) expertise in linguistics, phonetics, or the categorization of vowel sounds.
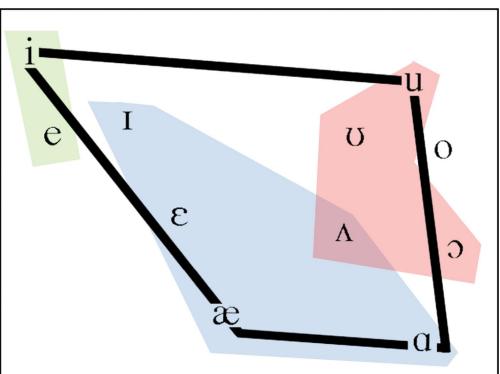
IV. Results

• Listeners report a range of idiosyncratic grouping choices (see ex. top right).

• Overall patterns of vowel categorization do emerge, generating a kind of folk-taxonomy of American English vowels.

• Surprisingly, though there is some evidence for the psychological reality of traditional phonological dimensions of vowels, there is stronger evidence in support of Labov's (1994) "peripheral" dichotomy of vowels.

• The "non-peripheral" vowels of the KIT, DRESS, TRAP, LOT, STRUT, and FOOT sets are highly similar in naïve listener groupings.

• Additional groupings include high-back round vowels of the GOOSE and GOAT sets and front-gliding diphthongs with high front monophthongs (grouping the PRICE, FACE, and FLEECE sets together).
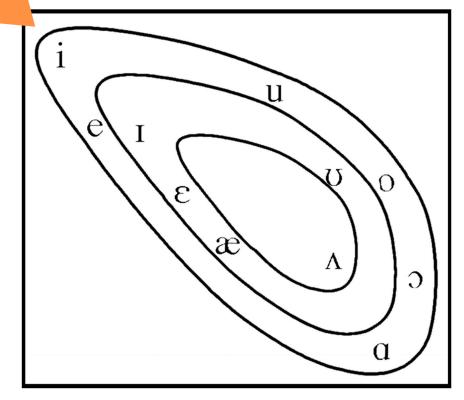

*4-Category Composite:
3 Monophthong groups;
/e/ + PRICE, CHOICE group*

*3-Category Composite:
2 Monophthong groups;
/i/, /e/ + PRICE, CHOICE group*

*2-Category Composite;
One clear [-peripheral] group*

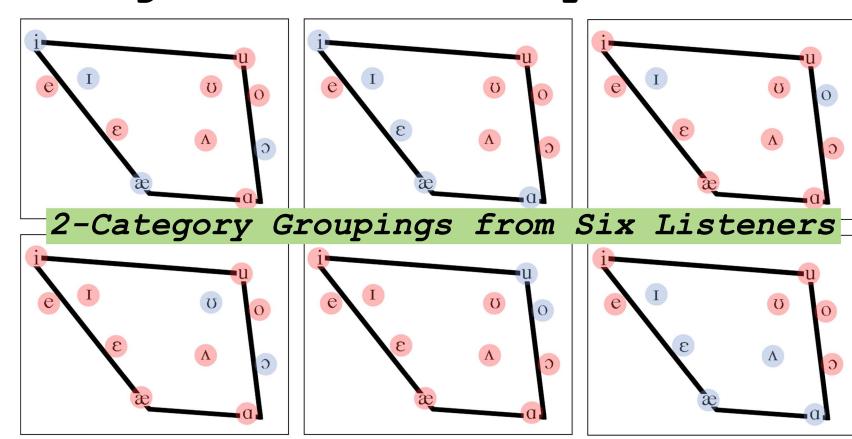*Articulatory Space of
American English Vowels
(after Labov, Ash, & Boberg 2006)*

Categorization Example

2-Category Groupings from Six Listeners

V. Conclusions

Since the listeners performing the categorization task are drawn from a wide variety of dialect backgrounds, it is unlikely that they are simply responding to an underlying awareness of vowel system changes.

The evidence from these results, then, may lend objective support to the post-hoc construction of the feature [+/- peripheral] in Labov (1994) and related work.

The ways in which these naïve groupings deviate from those of expert phoneticians can not only shed light on speech perception and language change phenomena, but also provide a principled benchmark from which future work on vowel perception, categorization, and change can proceed.

Perhaps we should begin to think of vowels first in terms of peripherality, rounding, and "tense" (tense vowels and diphthongs).

Q.) How would a listener with no prior knowledge of linguistic or phonetic terms categorize vowel sounds?