Perceptual Adjustments:
All Pronunciations are Not Created Equal
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Introduction
People pronounce sounds differently for different reasons. Two ubiquitous reasons are:
1. The Context (e.g., Liberman et al., 1954): Contextually-driven changes are pervasive in dialects.
Examples of (contextually-driven) dialectal variations:
- R-dropping (Where did you park the car?): Boston speakers drop it’s after vowels, but never when /r/ is the first sound in a word, or when it occurs after a consonant.
- T-tapping (ladder [ladər] = ladder [ladər]): American English speakers ‘tap’ it’s when they occur intervocally, but never when they start a stressed syllable.
Place assimilation (/s/ → [ʃ] before a [t] cluster, as in ‘street’ or ‘construction’): In many Northeastern US dialects, /s/ becomes like [ʃ] (shh), but only before a [t] cluster.
2. The Speaker (e.g., Peterson & Barney, 1952): A speaker’s age, gender, and linguistic experience will determine the acoustic realization of any particular sound.
Examples of (speaker-driven) idiolectal variations:
- Laps, foreign accents, temporary physical states (food in one’s mouth, being drunk).

The Question: How do listeners handle variation in pronunciation?

Previous Research: Psycholinguistics
1. Listeners get rid of variability: Evidence based on contextually-driven variation
How might this work? One option: feature parsing (Gow et al.):
- “Odd” pronunciations result in phonemic categories that are expanded to accommodate the pronunciation.
- NYU dialect: /s/ becomes /ς/ when it immediately precedes [t] (street).
- Acoustically: Idiolect /ς/ and Dialect /s/ are identical.
- Perceptual system’s task is also identical: Recognize the underlying /s/.
- ONLY the source of the variation differs (Idiolectal vs. Dialectal).

2. Listeners represent variability: Evidence based on speaker-driven variation
How might this work? One option: perceptual learning:
- Idiolectal pronunciation general retuning of phonemic categories.
- Exposure to idiolectal pronunciation general retuning of phonemic categories.

Previous Research: Sociolinguistics
The different psycholinguistic accounts are based on different types of variation, but speech recognition models do not consider the source of a variation. Perhaps these models should be revised? After all, listeners appear to:
1. Listeners perceive variation in the way they talk: Speech perception, in turn, may be mediated by listeners’ beliefs about the speaker.
   - Listeners’ perceptual boundaries for a fricative contrast ([ʃ]-[s]) or a vowel contrast (a [æ]-a [i]) shifted depending on whether they saw a male or a female face ‘producing’ syllables which contained those sounds.
   - (Strand and colleagues)
   - Listeners perceived vowels differently depending on what they believed to be the dialect of the speaker they were listening to.
   - (Niedzvetski, 1999)

Our Research
Does the source of a particular variation determine how the perceptual system adjusts to it?
Specifically, is perceptual learning the same after exposure to dialectal variation as after exposure to idiolectal variation?

Idiolectal variation (not contextually-constrained) → perceptual learning:
- /ς/ in words like hallucinate, obscene, parasite
- /ς/ replaced with a sound midway between /s/ and /ς/ (/ς/)
- Listeners assign their category for /ς/ to accommodate this idiolectal pronunciation (Kraljic & Samuel, 2003)

Dialectal variation (contextually-constrained) → perceptual learning:
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Experimental Groups
Phase 1: Exposure (Lexical Decision) → Two groups
- Purpose: To expose listeners to a speaker whose pronunciation of /ς/ is ambiguous (75%).
- Manipulation: Ambiguity was attributable either to an Idiolect or to a Dialect.
  1. Idiolectal pronunciation: [ς] replaced /ς/ in a variety of lexical contexts (e.g., hallucinate, obscene).
  2. Dialectal pronunciation: [ς] replaced /ς/ only in when it immediately preceded [t] (e.g., construction, abstract).

Phase 2: Category Identification Test
- Purpose: To assess whether perceptual learning occurred for each exposure group.
  - Task: All participants categorized items on a VCV continuum; C ranged /ς/-like to /ς/.
  - Control: /ς/ category was set as the baseline (Phase 1).

Control Group
Phase 1: None
Phase 2: Same as experimental groups
- Purpose: To provide a baseline to which experimental groups’ responses were compared.
  - If exposure resulted in perceptual learning, participants in the experiment group(s) should have significantly more /ς/-responses than those in the control group.

Lack of perceptual learning: Because participants have this dialect?
To investigate, we had participants from the experiment read aloud 10 sentences that contained words with /ς/ and /ς/.
- We obtained the mean frequency for each participant’s /ς/ (ς/), /ς/ (ς/), and the /ς/ in idiolect (STR).
  - Within a speaker, /ς/ is always lower frequency than /ς/.
  - We calculated the difference between each participant’s S and their STR as a percentage of the difference between their S and SH. A person’s STR production could then be assigned a value of 0% (perfectly equal to their S pronunciation), a value of 100% (equal to their SH pronunciation), or any number in between.

On the basis of these frequencies, we split participants into two groups: Those who exhibited /ς/ as an Idiolect vs. as a Dialect – Background

Lack of perceptual learning: Dialectal exposure had no effect on perceptual learning.
- Exposed to the same pronunciation in the context of a dialect no perceptual learning.
- All acoustic-phonetic variations are not treated identically by the perceptual system.
- Exposure to idiolectal pronunciation general retuning of phonemic categories, even for phonetic contexts that were not in the exposure set.

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Figure 1: Exposure (Lexical Decision) — Two groups
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Figure 3: Lack of perceptual learning: Dialectal exposure had no effect on perceptual learning.
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