Perceptual Adaptation to Foreign-Accented Speech Reshapes the Internal Structure of Phonetic Categories

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INTRODUCTION

Perceptual Learning of Accented Speech
• Native listeners robustly adapt to talker-specific speech variation in foreign-accented speech (intellegibility studies [1-2], and studies of phonetic adjustment [3-5]).

Remaining Questions about Talker-Specific Adaptation
• Measures have focused on phonetic boundary shifts [3-4].

How is there a reorganization of internal category structure beyond the boundary region?
• Rich internal structure: typicality of speech instances affects speech perception and word recognition in a gradient manner [6].
• The representation of phonetic structure is malleable [7].
• Listeners track talker-specific phonetic detail [8].

How does accent adaptation attenuate lexical competition?
• Adaptation to foreign-accented speech increases lexical activation of intended words [5].
• It is unknown whether adaptation alleviates competition between phonetically-similar words [9].

PRODUCTION DATA

Mandarin-accented word-final /d/ is acoustically similar to English /t/ and often cause perceptual confusion.

Native-American
English

Burst duration (ms)

Visual targets

/d/-final
/t/-final

Vowel duration (ms)

English /d/

English /t/

Mandarin /d/

Mandarin /t/

Burst duration (ms)

Vowel duration (ms)

* Minimal pairs of /d/-final and /t/-final words produced by a male native-English speaker vs. a native-Mandarin speaker

METHOD

Each experiment has an exposure phase and a test phase.

EXPOSURE PHASE: Auditory lexical decision task
Participants were assigned into one of the two conditions.
• Experimental condition: 30 /d/-final words (e.g., overload)
• Control condition: 30 replacement words (e.g., animal)
• n = 24 each condition in each experiment

TEST PHASE

EXPERIMENT 1: Cross-modal priming

Prime Type

Visual target type

/d/-final
/t/-final

Related priming

/d/-final
/t/-final

Unrelated priming

/d/-final
/t/-final

RESULTS: EXP 1

RT priming effect (unrelated-related, ms)

Incomplete adaptation: increase in priming for /d/ words, but no decrease in lexical competition

RESULTS: EXP 2

Shift of phonetic category boundary: increase in /d/ responses

RESULTS: EXP 3

Reorganization of internal structure: increase in perceived goodness

DISCUSSION

More than a boundary shift: the internal phonetic structure is reshaped following talker-specific adaptation.
• Ambiguous tokens were incorporated into a recalibrated category [3-5].
• Unambiguous tokens were perceived as better exemplars of the intended category.

Adaptation to foreign accents is harder than adaptation to native variants: no decrease in lexical activation for phonological competitors (e.g., “seed” for the intended word “seed”).
• In contrast with perceptual adaptation to native-accented speech [5].

Adaptation occurs at the sub-phonemic level: re-weighting of acoustic cues.
• Experimental group relied on the burst cue to a greater extent than control group did.

Future directions: to what extent the observed adjustment in the phonetic structure and cue-weighting strategy are context-specific?

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