Some Effects of Dialect Variation on Lexical Processing

Cynthia G. Clopper
Ohio State University
Acknowledgments

Collaborators:
Janet Pierrehumbert, Northwestern University
Terrin Tamati, Indiana University

Undergraduate Research Assistants:
Sarah Glazier
Kenney Hensley
John Pate
How does variation affect speech processing?

What sources of variation?
- contextual, individual, social

Processing of what kinds of categories?
- linguistic, indexical
**Processing Linguistic Categories**

phonetic context shapes how specific acoustic properties are perceived (Ladefoged & Broadbent, 1957; Strand, 1999)

vowel category boundaries shift to reflect local dialect variation (Rakerd & Plichta, 2003)

beliefs about a talker’s regional background affect fine-grained vowel perception (Niedzielski, 1999)
Processing Linguistic Categories

clear speech > conversational speech  (Picheny et al., 1985)

single talker > multiple talkers  (Sommers et al., 1997)
familiar talkers > unfamiliar talkers  (Nygaard et al., 1994)

local dialect > non-local dialect  (Mason, 1946)
standard dialect > non-standard dialect  (Clopper & Bradlow, 2008)

native accents > non-native accents  (Bradlow & Bent, 2003)
familiar accents > unfamiliar accents  (Clarke, 2003)
Processing Indexical Categories

identification of familiar talkers is possible under degraded conditions, such as reversed or sinewave speech (Sheffert et al., 1996)

gender identification is good even under degraded conditions, such as low-pass filtering or whisper (Lass et al., 1976)
Processing Indexical Categories

listeners can identify talker ethnicity based on short answering machine messages (Purnell et al., 1999)

listeners can identify talker region of origin with above-chance performance (Clopper & Pisoni, 2004, 2006; Van Bezooijen & Gooskens, 1999)

local dialect > non-local dialects (Clopper & Pisoni, 2006; Williams et al., 1999)

adult listeners > adolescent listeners (Williams et al., 1999)
Overarching Research Questions

How do linguistic and indexical sources of variability interact in speech production?

- **Phonetic reduction and social-indexical marking**
  (Clopper & Pierrehumbert, 2008)

What are the effects of dialect familiarity on cross-dialect speech processing?

- **Local dialect effects on lexical processing** (Clopper & Pate, 2008; Clopper & Tamati, 2010; Clopper, 2011)
Phonetic Vowel Reduction

beet → bit
bait → bet
bat →

but →

boot → boat → bought
put →
Phonetic Vowel Reduction

Phonetic vowel reduction in high predictability contexts
(Lieberman, 1963)

- Cut the meat into small **chunks**.
- I did not know about the **chunks**.

Phonetic vowel reduction in words with few neighbors
(Wright, 2004)

- **judge**: budge, fudge, jut (7)
- **bit**: sit, wit, bet, bat, bin, bid (35)
Phonetic Vowel Reduction

Reduction processes reflect lexical competition effects in perception and/or production

- Listener-oriented interpretation: Talkers produce reduced variants when they think that the listener will be able to understand them (Lindblom, 1990)

- Talker-oriented interpretation: Talkers produce reduced variants when the target word is easy to access (Bell et al., 2009)
Stylistic Variation

Listener-oriented interpretation (Picheny et al., 1986)
- More hyperarticulated forms when the listener is hearing-impaired or a non-native speaker

Talker-oriented interpretation (Labov, 1972)
- More extreme dialect-specific forms when less attention is paid to speech

Are more extreme social-indexical variants produced in contexts that promote reduction?
Phonetic Reduction and Social-Indexical Variation

Oprah Winfrey (Hay et al., 1999)
- More monophthongization of /aj/ in high frequency words than low frequency words

Perceived sexual orientation (Munson, 2007)
- Larger differences between heterosexual- and homosexual-sounding men for words with few neighbors than words with many neighbors
Northern and Midland American English

Labov et al., 2006
The Northern Cities Vowel Shift

beet → bit → bait → bet → but → bought

boot → put → boat

Labov, 1998
Phonetic Reduction and the Northern Cities Vowel Shift

beet -> bit
bait -> bet
bat -> but
booth -> bought
put -> boat

Phonetic Reduction and the Northern Cities Vowel Shift

Semantic predictability

- Talkers: 15 Northern, 15 Midland
- Target words: 16 high predictability (HP), 16 low predictability (LP)

Neighborhood density

- Talkers: 10 Northern, 10 Midland
- Target words: 80 “easy”, 80 “hard”
Semantic Predictability
Neighborhood Density
Phonetic Reduction and Indexical Variation

More extreme dialect-specific variants are produced in the same contexts in which phonetic reduction is observed.

- Talkers produce more extreme dialect-specific variants when the target word is easy to access in perception and/or production.
Overarching Research Questions

How do linguistic and indexical sources of variability interact in speech production?
  • Phonetic reduction and social-indexical marking (Clopper & Pierrehumbert, 2008)

What are the effects of dialect familiarity on cross-dialect speech processing?
  • Local dialect effects on lexical processing (Clopper & Pate, 2008; Clopper & Tamati, 2010; Clopper, 2011)
Implicit lexical recognition memory is facilitated when the word is repeated by the same talker (Palmeri et al., 1993) or a perceptually similar talker (Goldinger, 1996).

Listeners are slower to respond in a speeded phoneme classification task as the number of different talkers increases (Mullennix & Pisoni, 1990).

Segmentally ambiguous primes can facilitate lexical decision as well as unambiguous primes in cross-modal priming (van Alphen & McQueen, 2006).
Implicit Lexical Recognition Memory

Talkers: 3 Midland, 3 Northern
Listeners: 21 Midland, 16 Northern, 13 Mobile

Familiarization: open-set word recognition in noise
Recognition memory: open-set word recognition in noise
  • same talker (same token)
  • different talker (same dialect)
  • different dialect (different talker)
Repetition Benefit

![Graph showing difference scores across repetition type: Same Talker, Different Talker, Different Dialect. The graph compares Midland and North dialects.](image)
Implicit Lexical Recognition Memory

Significant repetition effects were observed for words produced during familiarization by a Midland talker.

No repetition effect was observed for words produced during familiarization by a Northern talker, regardless of listener dialect.

More robust encoding during familiarization for the local, standard variety than for the non-local variety.
Speeded Lexical Classification

Talkers: 1 Midland, 1 Northern
Listeners: 13 Midland, 6 Northern
Target words: bad, bed

Three blocks of trials:

- Control: Midland tokens only
- Control: Northern tokens only
- Mixed: Midland and Northern tokens
Speeded Lexical Classification

F2 (Hz)

F1 (Hz)

- ▲ Midland bad
- ▲ Midland bed
- ● Northern bad
- ○ Northern bed
Classification Accuracy

Proportion Correct

Control - Midland  Control - Northern  Mixed  Mixed - Midland  Mixed - Northern

Condition
Classification Response Time

![Bar chart showing response times for different conditions: Control - Midland, Control - Northern, Mixed, Mixed - Midland, Mixed - Northern. The chart displays RT (ms) on the y-axis and Condition on the x-axis.]
Speeded Lexical Classification

Performance on Northern targets was slower and less accurate overall than performance on Midland targets, regardless of listener dialect.

Mixing Midland and Northern targets led to even less accurate performance on Northern targets.

Faster and more accurate processing of the local, standard variety than the non-local variety.
Lexical Decision

Talkers: 3 Midland, 3 Northern
Listeners: 32 Midland, 22 Northern, 15 Mobile
Target words: /ɛ, æ/ minimal pairs

Cross-modal priming
- match trials: “bat”
- mismatch trials: “bat”
- unrelated trials: “bat”
Priming Effects

![Bar chart showing response times for Match, Mismatch, and Unrelated prime types, with separate bars for Midland and North conditions.](chart.png)
Lexical Decision

Matching prime facilitates lexical decision for both Midland and Northern targets.

Mismatching prime inhibits lexical decision for Midland targets, but not Northern targets, regardless of listener dialect.

The non-local primes are ambiguous enough to reduce the inhibition effect observed for the local, standard primes.
Local Dialect Effects on Lexical Processing

Lexical representations are stronger and processing is faster for local (and/or standard) dialects than for non-local dialects.

- Repetition effects in lexical recognition memory
- Faster and more accurate lexical classification
- Inhibition due to minimal pair primes in lexical decision

Local dialect effects are observed for both local and non-local listeners.
Local Dialect Effects in Lexical Processing

The observed local dialect effects may reflect listeners’ expectations about the kind of speech that they will hear in a university laboratory setting.

- expect local and/or standard variety
- no specific instructions regarding dialect in the recognition memory and lexical decision tasks

Listener expectations have been shown to affect performance in the laboratory (Hay et al., 2006; Niedzielski, 1999)
Dialect Variation and Lexical Competition

Lexical competition in production drives reduction processes in both listener-oriented and talker-oriented interpretations.

Both interpretations can be extended to account for the observed interaction between dialect variation and phonetic reduction.

- Talkers produce more dialect-specific forms when lexical access is easier for the talker and/or the listener.
Dialect Variation and Lexical Competition

Lexical competition in perception can account for the observed local dialect effects on lexical processing.

- Assuming that listeners expect to hear a local or standard variety, local or standard variants are less acoustically ambiguous.
- Those variants are therefore easier to recognize and encode.
Dialect Variation and Lexical Competition

Factors affecting baseline lexical activation

- frequency (Johnson, 1997)
- recency (Johnson, 1997)
- predictability (Gaskell & Marslen-Wilson, 2001)
- social-indexical variants
- expectation