

# Out of sight, out of mind: The influence of communicative load and phonological neighborhood density on phonetic variation in real listener-directed speech



Scarborough and Zellou, 2022

# Background and Past Research

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## ***A. Speech clarity during communication***

- Hypospeech → hyperspeech continuum dependent on constant monitored communicative context (Lindblom, 1990)
- Phonetically enhance lexical items that can be characterized as more difficult for listeners to understand
- Words with high neighborhood density (Hi ND) = hyperarticulated vowels & increased coarticulation relative to words with fewer neighbors (Lo ND)

# Background and Past Research

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## ***B. Real listener-directed speech***

- Authenticity matters in the elicitation of clear speech
  - different productions for real vs. imagined listeners
- Speaker's awareness of listener's access to sources of information independent of the signal modulates their output along the hyper- to hypo-speech continuum (Lindblom, 1990)

# Background and Past Research

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## *C. Lexical effects*

- Neighborhood density can also influence communicative load
  - Hi ND words are more likely to be confused than Lo ND words; so the phonetic signal is of higher importance in Hi ND words

# Research Prediction and Aims





















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- Brings together the two aspects of communicative load—both situational and lexical—to examine their effects on patterns of phonetic variation in speech to real listeners
- In particular, communicative load was manipulated via the presence or absence of visible target words
- Predicts greater communicative load in the Fill-in task, leading to more hyperarticulation in this task, relative to the Magnet task

# Methods: stimuli

- 96 monosyllabic target words: half Hi ND and half Lo ND with each equally containing four vowel phonemes /i/ /æ/ /ε/ /ɑ/
- Within each vowel phoneme, target words were selected to match surrounding phonetic context
  - e.g., ledge (Hi ND) and pledge (Lo ND)
- 64 monosyllabic filler items included; words unambiguous in pronunciation & had clear sound-spelling correspondences

# Methods: speakers & procedure

				
				
				
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## ***Speakers***

- 18 undergraduate students who speak American English

## ***Procedure***

- Produced each target word while completing an interactive task with a real listener confederate
- Confederate seated facing the participant but unable to see the computer screen (with visual stimuli)
- Speakers' task was to produce instructions (using a carrier phrase) to confederate so each target word item would be correctly placed on a 5 x 4 grid consisting of different shapes varying by color
- Participants not allowed to repeat the instruction & listener confederate trained to provide no linguistic feedback & visual cue hesitations

# Methods: procedure

- To elicit two levels of listener-directed clarity, participants completed this task twice in two separate blocks:

## ***First block***

- Fill-in task = participants read instructions (of where to place item in correct location on their grid) to confederate who completes a worksheet containing a blank version of the grid



# Methods: procedure

## ***Second block***

- Magnet task = participants read instructions to the confederate on where to place each target word on the 5 x 4 grid

However in this task ...

- Confederate's blank grid on large magnetic board (visible to both confederate & participant)
- Participants selected a magnet with the corresponding lexical item written on it and passed it directly to the confederate who then placed it in the correct location on the magnetic grid
- Always in this block order: first fill-in task, second magnet task

# Findings

## ***A. Vowel duration***

- Shorter vowels in the Magnet task, relative to the Fill-in task
- While vowels were longer for Hi ND words than for Lo ND words in the Fill-in Task, this ND-conditioned difference was not present in the Magnet task

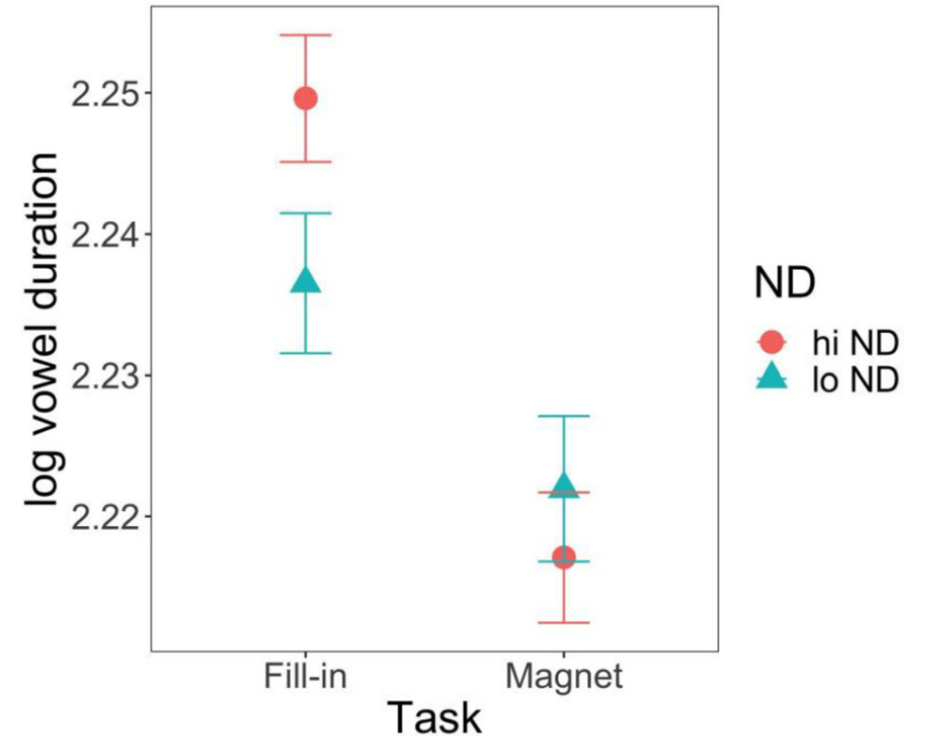


FIG. 2. (Color online) Mean and standard deviation of log vowel duration from the 96 target words (half Hi ND, half Lo ND) produced by participants in the Fill-in and Magnet tasks to the real listener confederate.

# Findings

## B. Vowel formants

- In both tasks, vowels produced in Hi ND words are more peripheral in the vowel space— most apparent for /i/, /ε /, and /æ/.
- Vowel duration predicted degree of vowel hyperarticulation: longer vowels were produced with greater vowel dispersion

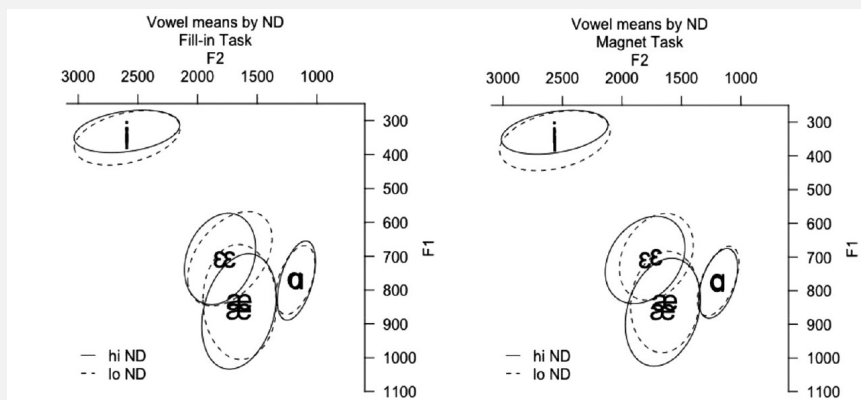
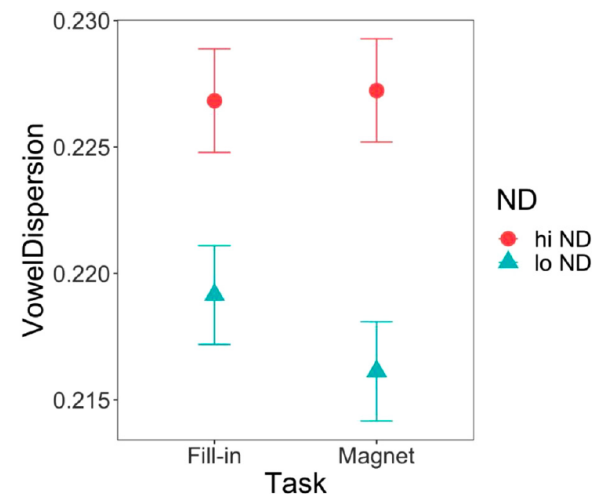


FIG. 3. F1/F2 (Hz) mean and ellipses for the four vowels in Hi and Lo ND words produced in the Fill-in and Magnet Tasks.

- Greater vowel hyperarticulation (visible as more peripheral vowels) in Hi ND words than in Lo ND words in both tasks
- However, larger difference in vowel dispersion between Hi and Lo ND words in productions during the Magnet task
- While Hi ND vowels have numerically similar dispersion values across tasks, dispersion appears to be greater in Lo ND words in the Fill-in task relative to the Magnet task



# Key Takeaways

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- Speakers adjust their productions of words in accordance with knowledge about visual presence of the word for their listeners
- Lo ND words that were not visually present for the listener also showed hyperarticulation, indicating that words with a greater communicative load are produced with spectral enhancement as well
- Words produced for a second time within a conversation are reduced in duration relative to their first mention (does not occur in this research)
  - Focus on first mentions
- Speech to real listeners is much different than to those who are not present