



5aSC22. The effect of lexical competition on vowel duration before voiced and voiceless English stops

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Background

- One source of phonetic variation: lexical competition (e.g. minimal pair competitor existence, neighborhood density)
- Competition can cause hyperarticulation, especially of vowel formants ([1], [2])
- Competition can also cause reduction: words with more neighbors have shorter duration ([3], [4])
- Minimal pair competitor existence, but not neighborhood density, causes **contrastive hyperarticulation** of the English initial stop voicing contrast:
 - Longer VOT for voiceless stops (T) ([5], [6])
 - Shorter VOT for voiced stops (D) ([6])

Research question: Is there contrastive hyperarticulation of the English final stop voicing contrast on the cue of preceding vowel duration?

- Goldrick, Vaughn, & Murphy 2013: in a reading task, minimal pair competitor existence **shortens** Vs before final D → **reduces** final voicing contrast; no effect on Vs before final T
- **Current study:** Corpus study, modeled on Wedel, Nelson, & Sharp 2018, looking for contrastive hyperarticulation of the final stop voicing contrast

Method

- Monosyllabic content words (verbs, common nouns, adjectives) ending in /p t k b d g/ extracted from the Buckeye corpus (Pitt et al. 2007)
- Exclusions included: words before pauses or utterance boundaries, inflected words, words in which target V preceded by a V, tokens with V durations more than 3 SDs from within-speaker mean
- 6,291 tokens (4,388 T-final words and 1,903 D-final words)
- Data analyzed with linear mixed effects models
- Dependent variable: **ratio** of duration of V to duration of word (V Ratio)
- Critical predictors:
 - MinPair: minimal pair competitor existence (Yes or No)
 - ND: neighborhood density
 - Voicing: voicing of the final stop (Voiced or Voiceless)
 - MinPair × Voicing
 - ND × Voicing
- Controls: Gender, Age, Part of Speech, Intervening C, # of Phonemes, Log Word-Average Biphone Probability, Vowel Category, Initial C Type, Word Familiarity, Previous Mention, Place of Articulation, MinPair × Place of Articulation, ND × Place of Articulation, Voicing × Place of Articulation
- Random intercepts for Speaker (n = 39) and Word (n = 426)

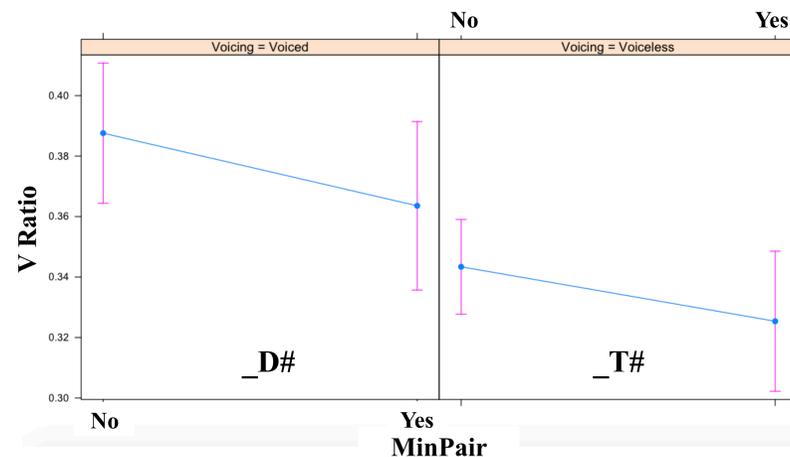
What Would Contrastive Hyperarticulation Look Like?

- An interaction of MinPair and Voicing and/or ND and Voicing such that:
 - Greater competition makes Vs longer before D and/or shorter before T
 - Or greater competition at least makes difference in V duration before D vs. T bigger

Results

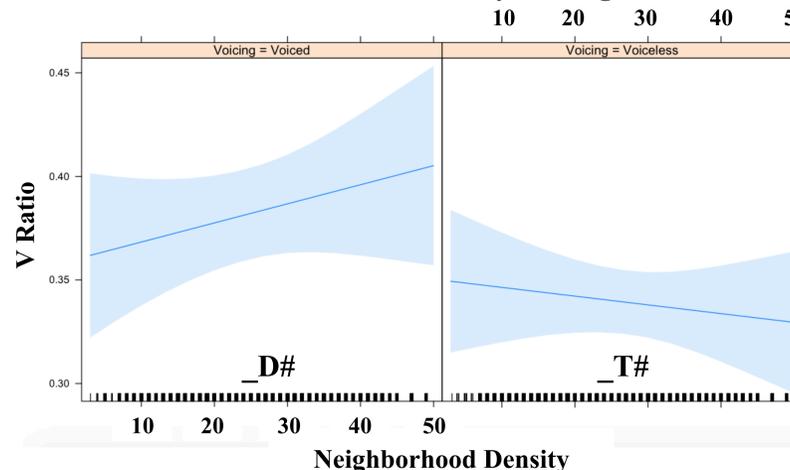
- Significant main effect of minimal pair competitor existence ($p(\chi^2) = 0.023$)
 - Smaller V ratios before D and T
 - No contrastive hyperarticulation
 - Instead, across-the-board reduction

Effect Plot: MinPair by Voicing



- Marginally significant interaction of ND and Voicing ($p(\chi^2) = 0.072$)
 - Contrastive hyperarticulation?

Effect Plot: ND by Voicing



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Discussion

- Minimal pair competitor existence **reduces** Vs before final voiced and voiceless stops
- Failure to find contrastive hyperarticulation under minimal pair competition consistent with Goldrick, Vaughn, & Murphy 2013

What accounts for these results?

- Three accounts of lexically conditioned phonetic variation ([5]):
 - *Production-internal*: pronunciation varies with ease of lexical access and production
 - *Listener-oriented*: competition → increased intelligibility to aid listener
 - *Perceptual restructuring*: with competition, stored exemplars more extreme → production targets more extreme
- Listener-oriented and perceptual restructuring accounts predict contrastive hyperarticulation, which is **not** found
- **Production-internal** explanations of the current results:
 - Competition facilitatory for production → reduction in duration ([4])
 - Minimal pair competitor existence affects initial and final contrasts differently (Goldrick, Vaughn, & Murphy 2013):
 - Initial minimal pairs (*tip/dip*) → facilitation/increased activation → contrast enhancement/hyperarticulation
 - Final minimal pairs (*tap/tab*) → inhibition/reduced activation → contrast reduction/hypoarticulation

Conclusion

- A corpus study corroborates Goldrick, Vaughn, & Murphy 2013's experimental result:
 - Minimal pair competitor existence does **not** cause contrastive hyperarticulation of the final stop voicing contrast on the cue of preceding V duration
- Instead, words with minimal pair competitors have shorter Vs before final voiced *and* voiceless stops → across-the-board reduction

Selected References

- [1] Wright, R. A. (2004). Factors of lexical competition in vowel articulation. In J. J. Local, R. Ogden, & R. Temple (Eds.), *Laboratory phonology* (Vol. 6, pp. 26–50). Cambridge, UK: Cambridge University Press. [2] Munson, B., & Solomon, P. N. (2004). The effect of phonological density on vowel articulation. *Journal of Speech, Language and Hearing Research*, 47, 1048–1058. [3] Kilanski, K. J. (2009). *The Effects of Token Frequency and Phonological Neighborhood Density on Native and Non-Native English Speech Production*. Ph.D. dissertation. University of Washington. [4] Gahl, S., Yao, Y., & Johnson, K. (2012). Why reduce? Phonological neighborhood density and phonetic reduction in spontaneous speech. *Journal of Memory and Language*, 66(4), 789–806. [5] Baese-Berk, M. & Goldrick, M. (2009). Mechanisms of interaction in speech production. *Language and Cognitive Processes*, 24(4), 527–54. [6] Wedel, A., Nelson, N., & Sharp, R. (2018). The phonetic specificity of contrastive hyperarticulation in natural speech. *Journal of Memory and Language*, 100, 61–88. [7] Goldrick, M., Vaughn, C., & Murphy, A. (2013). The effects of lexical neighbors on stop consonant articulation. *Journal of the Acoustical Society of America*, 134, EL 172–EL 177.