



# Non-Coronal Lenition in American English

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The 23<sup>rd</sup> Manchester Phonology Meeting

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## BACKGROUND

- ❖ *Intervocalic post-stress* coronal stops -> lenti to flaps in American English.
- ❖ Non-coronal stops?
  - Across languages, non-coronals stops are not exempt from lenition.
  - 'Non-canonical' intervocalic labial and velar stops in English: Crystal & House, 1988, Warner & Tucker, 2011, Bouavichith & Davidson, 2013

## QUANTIFYING LENITION

Categorical variables:

- ❖ Overt label: stop or approximant?
- ❖ Presence of formant structure
- ❖ Presence of voicing
- ❖ Absence of bursts.

Gradient variables:

- ❖ Duration of closure
- ❖ Intensity
- ❖ Intensity difference with following vowel.

## FACTORS

- Stress: More lenition in *post-stress* than in *pre-stress* environment (*hobo* vs. *obese*).  
More lenition in *inter-unstressed* than in *post-stress* environment (*halibut* vs. *abacus*).
- Place of articulation: More lenition in velars than in labials.
- Rate and Style: More lenition in *faster*, more *casual* speech.

## PRESENT STUDY

Non-coronal stop in the lenition environment:  
Intervocalic post-stress (e.g. *rapid/rabid*) vs.

Prototypical voiced stops: Initial prevoiced (e.g. *bad, bun*) and Prototypical voiceless stops: Post-s voiceless unaspirated (e.g. *spun, spat*)

## METHODS

### STIMULI

- **Initial voiced:** *bad, bun/gap, gum*  
6 words per PA
- **Post-s voiceless:** *spat, spun/scab, scum*  
2 words per PA
- **Medial post-stress:** *rapid-rabid, bagging-backing*  
3 min pairs per PA

### PARTICIPANTS

- 20 NS Am. English
- W. Lafayette, IN
- 12 analyzed
- Words on the screen
- Over 70 'fillers'
- 3 randomized blocks
- Presentation: 2 sec
- ISA: 0.5 sec

### MEASUREMENTS

- **Intensity**  
Min Consonant  
Max Vowel – Min Consonant
- **Voicing**  
Duration and % of closure
- **Closure duration**
- **Onset f<sub>0</sub>**

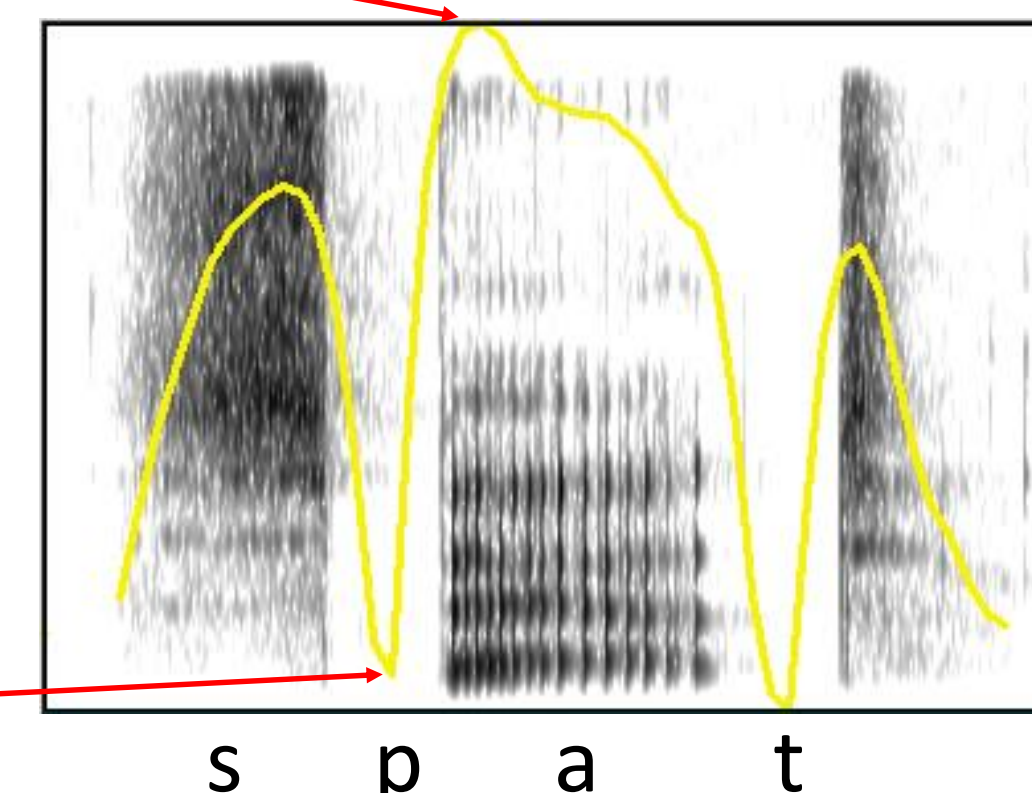
## DATA PREPARATION

### INTENSITY

- ❖ Signal pass Hann band filtered between 500 and 10,000 Hz to maximize the intensity difference between approximants and voiced stops
- ❖ Max intensity on stressed vowels (*preceding* for medial, *following* for initial and post-s)
- ❖ **Intensity Difference = Max Vowel – Min Consonant** (Hualde et al., 2010)

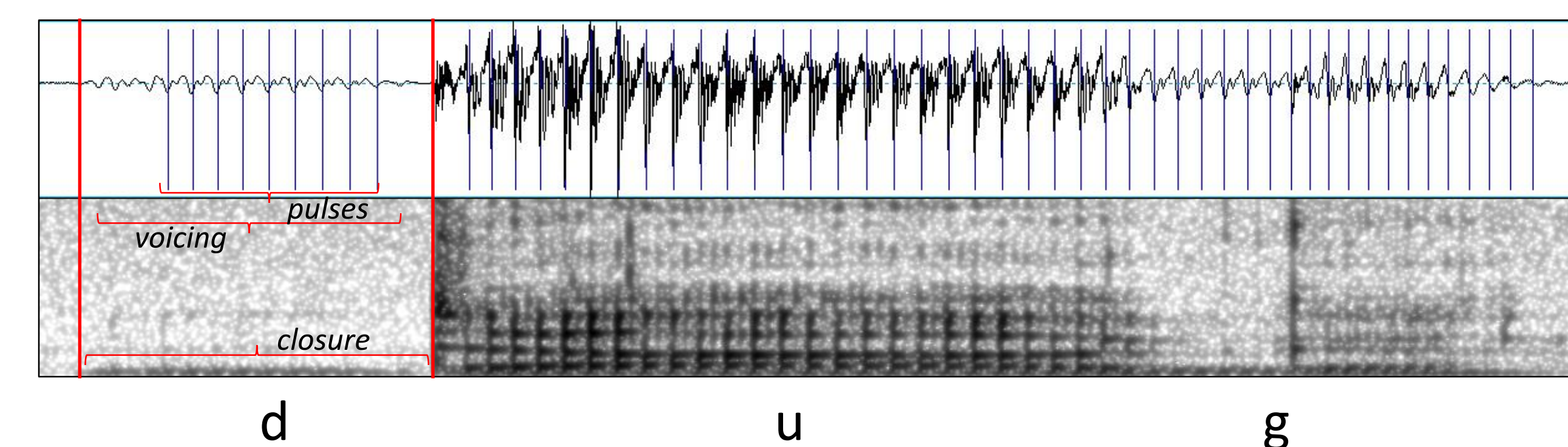
Max V intensity

Min C intensity



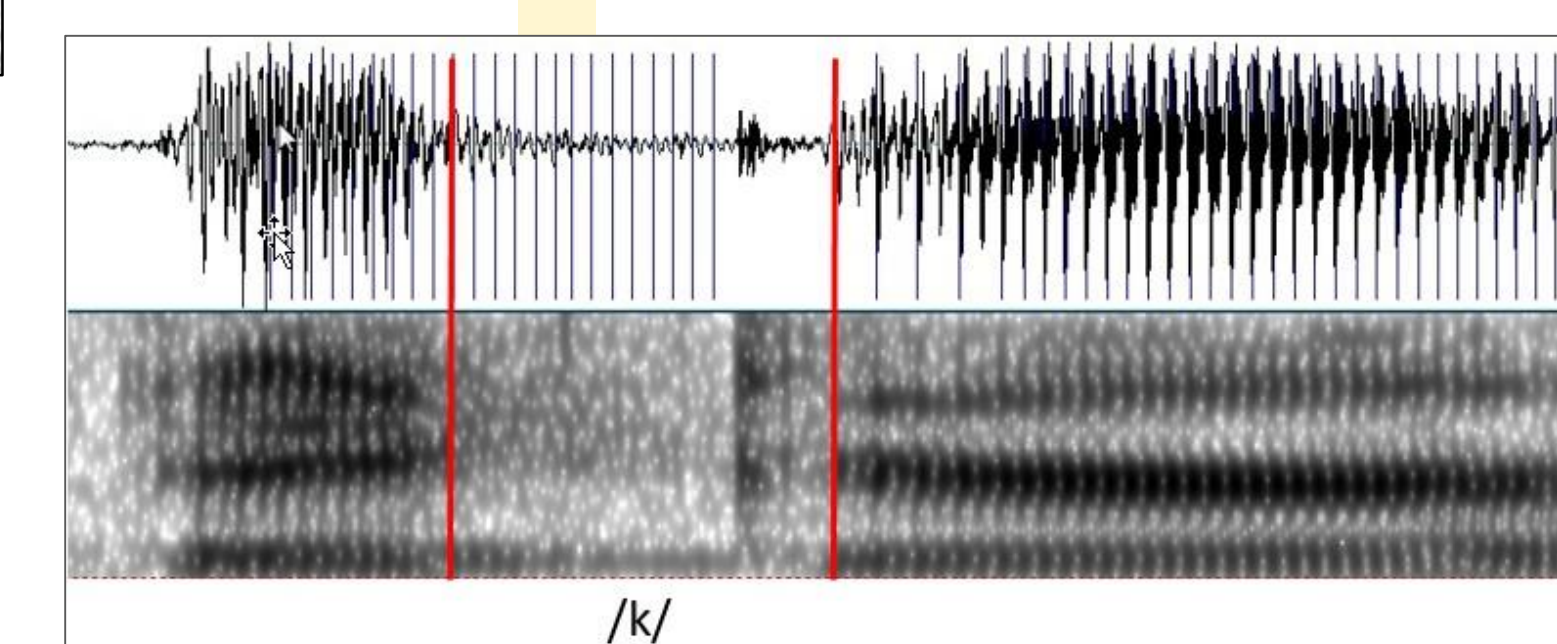
### VOICING

- ❖ Percent voiced closure – fraction of locally unvoiced frames from Praat's voice report.
- ❖ Voicing duration – marked manually.

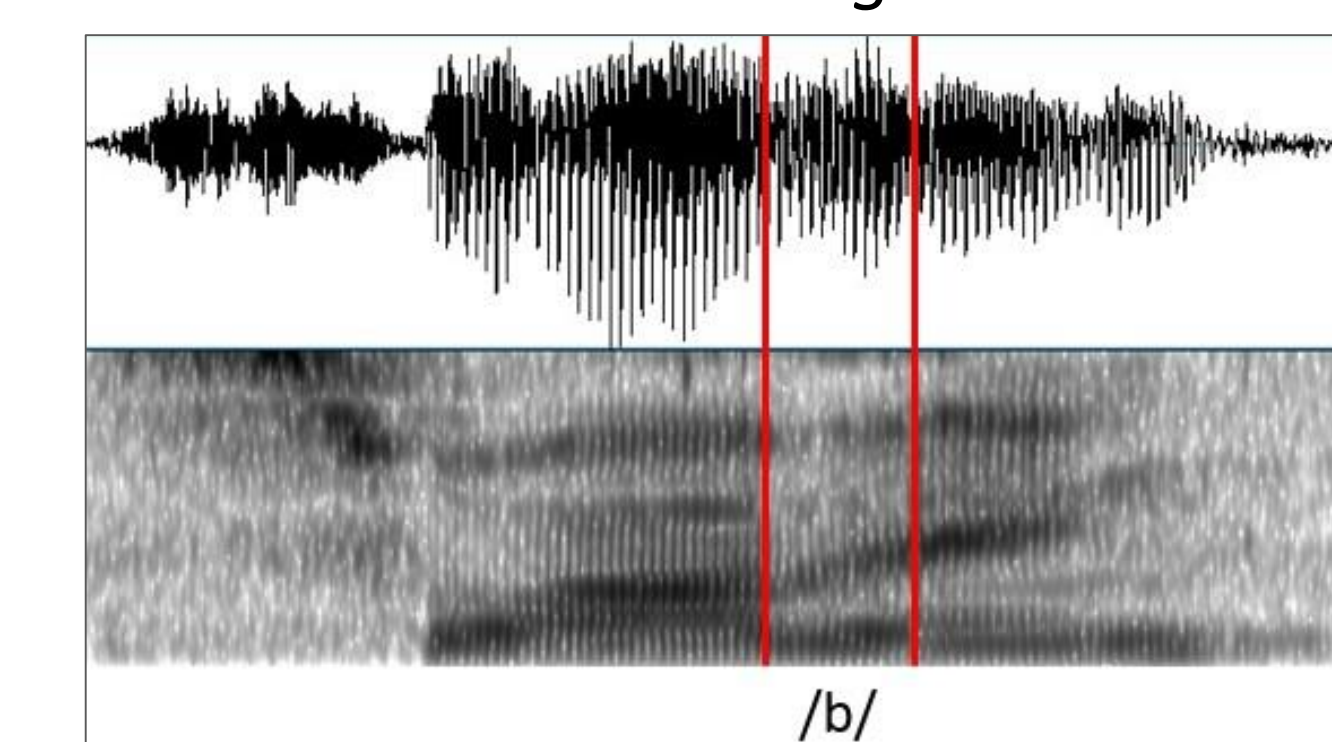


### CLOSURE

- ❖ Initially: from onset of voicing to release
- ❖ Medially for lenited stops: decrease in amplitude, formant visibility, and in waveform complexity



*bicker*



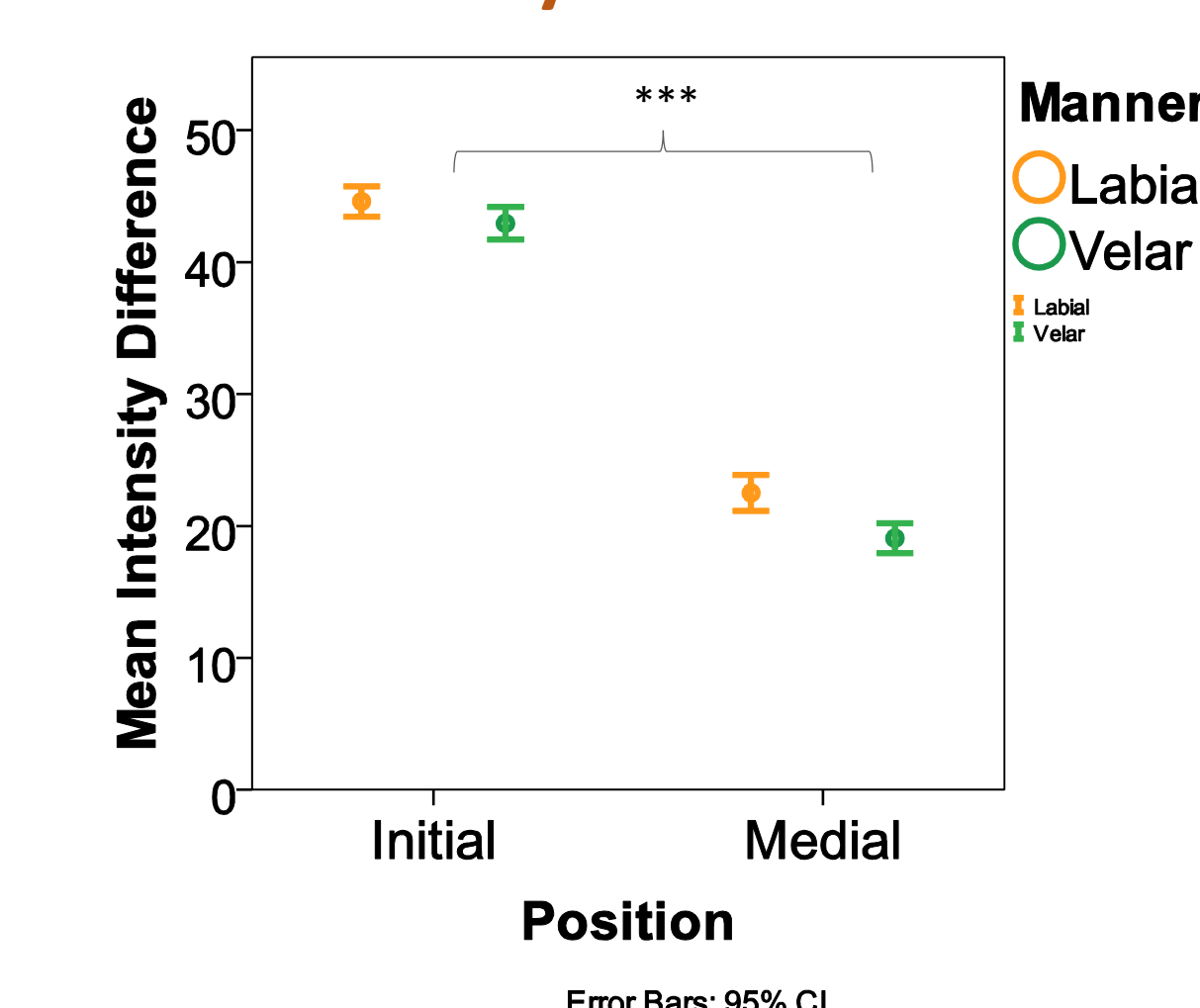
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## ANALYSIS AND RESULTS

For voiced, but not voiceless consonants

- ❖ **Intensity Difference:** Medial < Initial (Velar < Labial)
- ❖ Min Consonant Intensity: Medial > Initial (Velar > Labial)

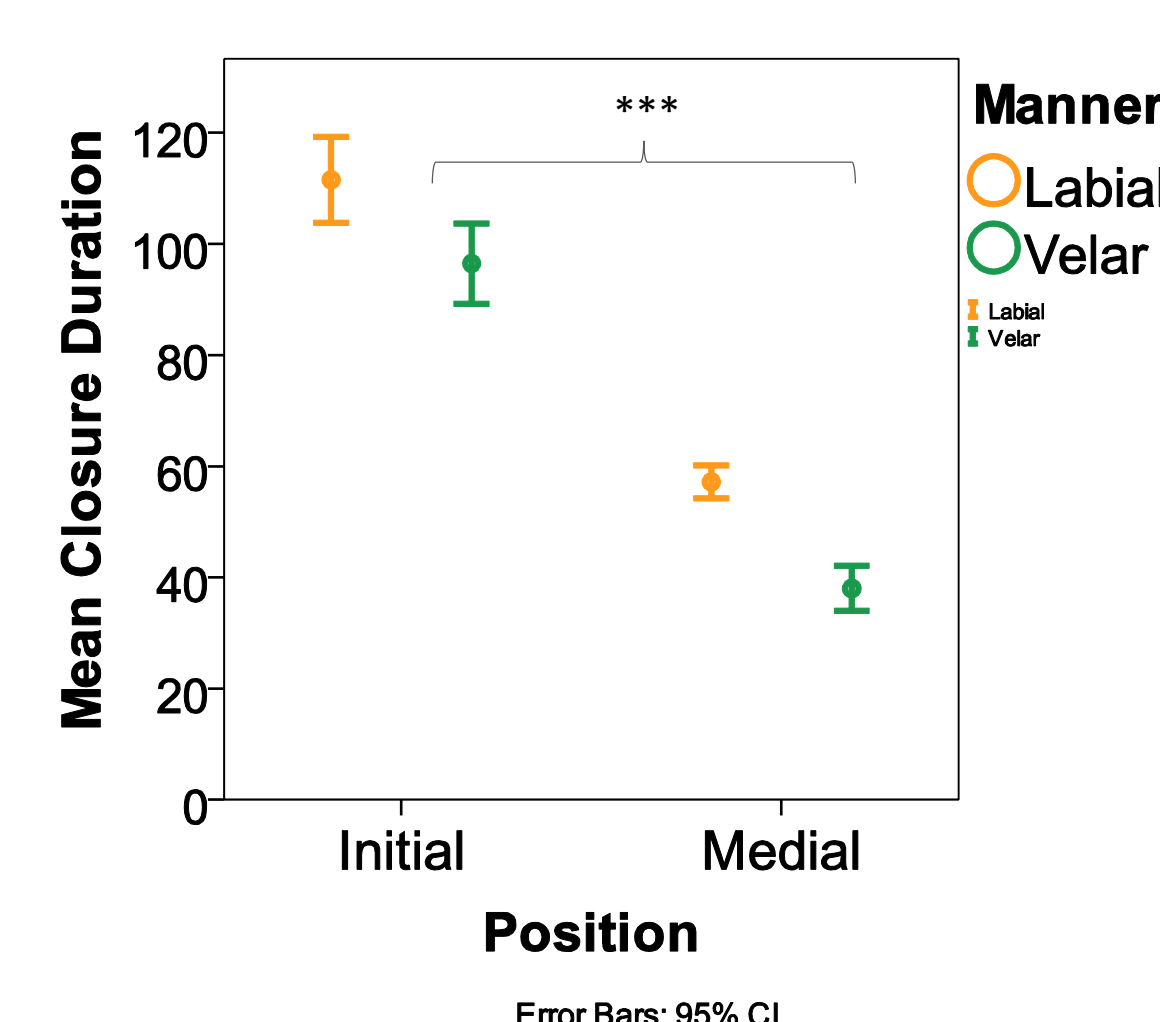
**Intensity Difference:**



For voiced, but not voiceless consonants:

- ❖ **Closure duration:** Medial < Initial (Velar < Labial)

**Closure Duration:**



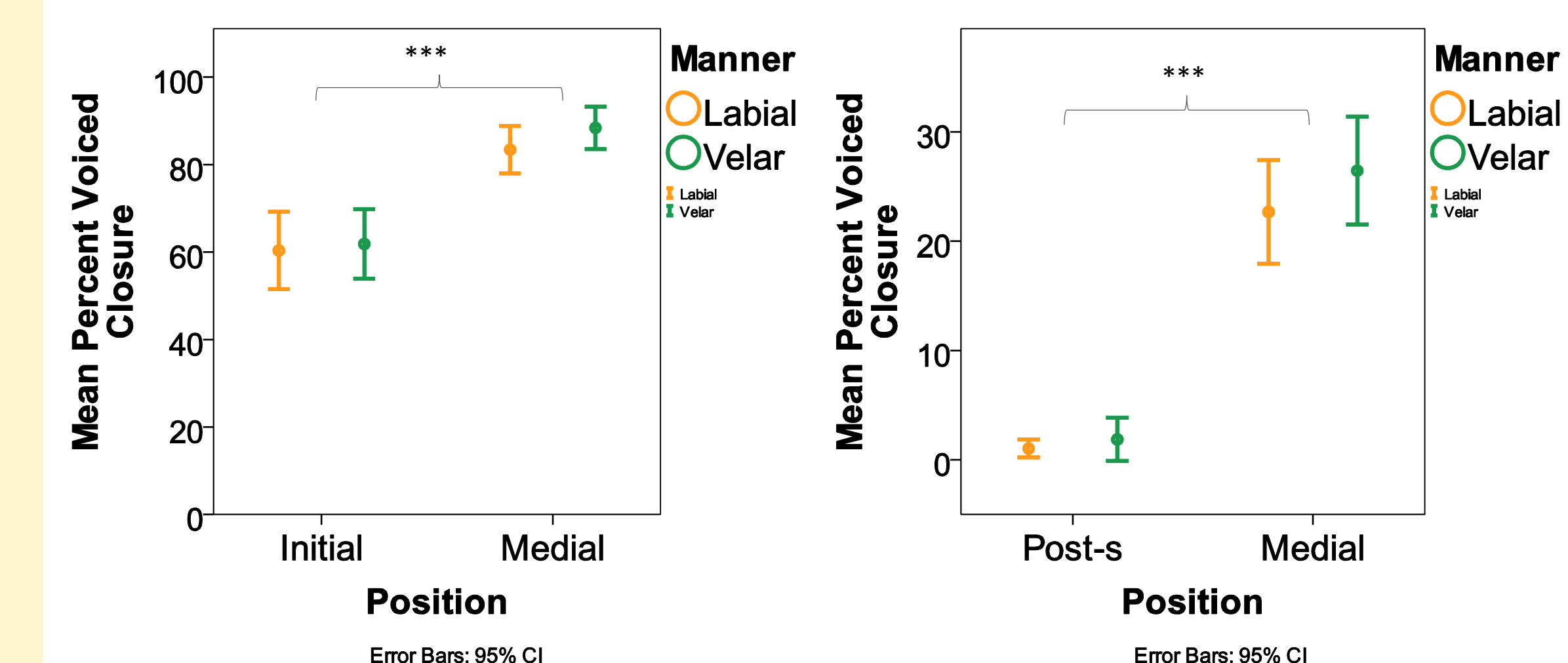
*Greater lenition of voiced than voiceless consonants along these dimensions?*

For both voiced and voiceless:

- ❖ **Percent voiced closure:** Medial > Initial/Post-s
- ❖ **Voicing duration:** Medial > Post-s (voiceless); Medial < Initial (voiced)

## RESULTS Cont-d

% Closure voicing, voiced stops: % Closure voicing, voiceless stops:



### Other observations:

- Over 50% of voiceless medial stops - some amount of voicing
- In these, the voiced portion - on average 63% of the closure
- Voiced medial stops – often approximant-like: formant structure and no visible release

*swabbing*

### Contrast:

- The contrast between voiced and voiceless medially is robustly maintained via *closure duration*, *voicing duration*, *preceding vowel duration*, *intensity differences*, but not *onset f<sub>0</sub>*.

## CONCLUSIONS

- Medial stops are lenited: *Shorter closure duration* and *less intensity difference* with adjacent vowels (voiced) and *more voicing during closure* (both voiced and voiceless)
- Voiced stops and especially velars appear more susceptible.
- Nevertheless, the contrast is not jeopardized, but perhaps shifted into another dimension: *not a prototypically stop voicing-like* (e.g. no onset f<sub>0</sub> difference was found)
- Control over production of voicing appears less precise than that over aspiration: voiceless stops can be phonetically voiced but voiced stops cannot become aspirated – Evidence that English is an *aspiration*, not *voice*, language?

## ACKNOWLEDGMENTS

Many thanks to Audrey Bengert, Alyssa Nymeyer, Bethany Sexton, Anna Williams, and Emilie Zeller for help with data collection and annotation and to all the participants for their time and patience.