

## Introduction

This study investigates the realization of Accentual Phrase (AP) medial lenis obstruents in Seoul Korean (SK) spontaneous speech.

- AP is the prosodic constituent above the PWd [1].
- Seoul Korean lenis obstruents are optionally voiced in the AP-medial position [1].
- Since the voicing is optional, they can also be voiceless within a PWd [1, 2].
- These are exceptions to AP-medial voicing [1, 2].
- Domain-initial strengthening lengthens lenis obstruents and shortens them in lower prosodic positions [3].
- Lenis obstruents are also pronounced as fricative and approximants; i.e., \*reduced\* AP-medially [4, 5].

## Does the segmental realization reliably mark the prosodic phrasing?

- How does prosodic position condition voicing, shortening, and reduction of Korean lenis obstruents in spontaneous speech?
- If lenis obstruent voicing is optional, are shortening and reduction also optional? Is the prosodic conditioning of the segmental realization of lenis obstruent optional?
- If the prosodic conditioning of the segmental process is optional, then it suggests the segmental realization might not be a reliable cue for prosodic phrasing [6]. However, if the exceptionally fully voiceless lenis obstruents are still 'lenited' in other ways, i.e. shortened and/or reduced, then the segmental realization may mark the prosodic phrasing reliably.

## Methods

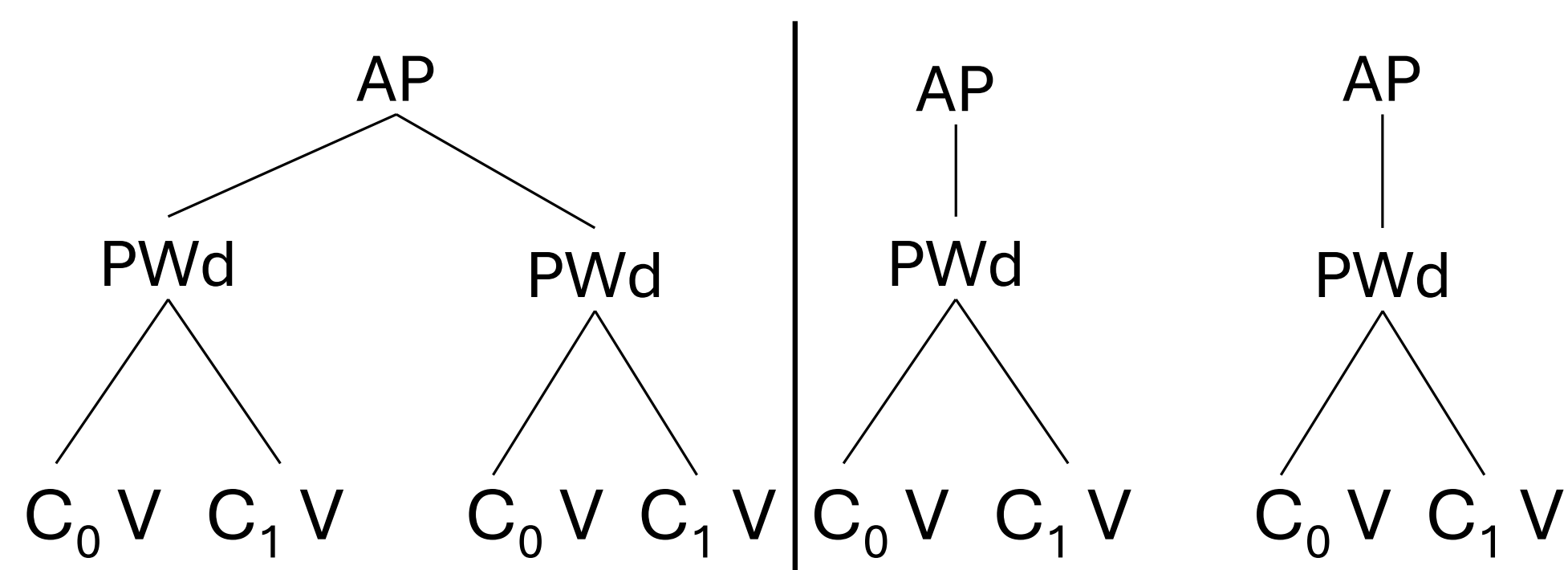


Figure 1. C<sub>1</sub> are AP-medial by being PWd-medial. 36,801 PWd-initial (C<sub>0</sub>) and 54,311 PWd-medial (C<sub>1</sub>) tokens investigated

- Data: The Seoul Corpus [7]. Spontaneous speech corpus of 40 Seoul Korean speakers (4 age groups from 10-40, and 2 genders). About 24 hours of spontaneous speech transcribed and segmented into Utterances, PWds, and phones, but not into prosodic constituents like APs or IPs.
- 91,112 intervocalic lenis obstruents: proportion of voicing, degree of reduction, and duration.
- Voicing: Proportion of voiceless interval by 'Voice Report' function in Praat [8, 9]
- Reduction: Absolute value of minimum intensity velocity (Velocity of intensity at point C in Fig 2, 'Closure Velocity Extremum' (CVE)) [10-12]
- Duration: Duration of the interval between the two inflection points of the velocity of intensity contour [10-12] (from C to D in Fig 2)

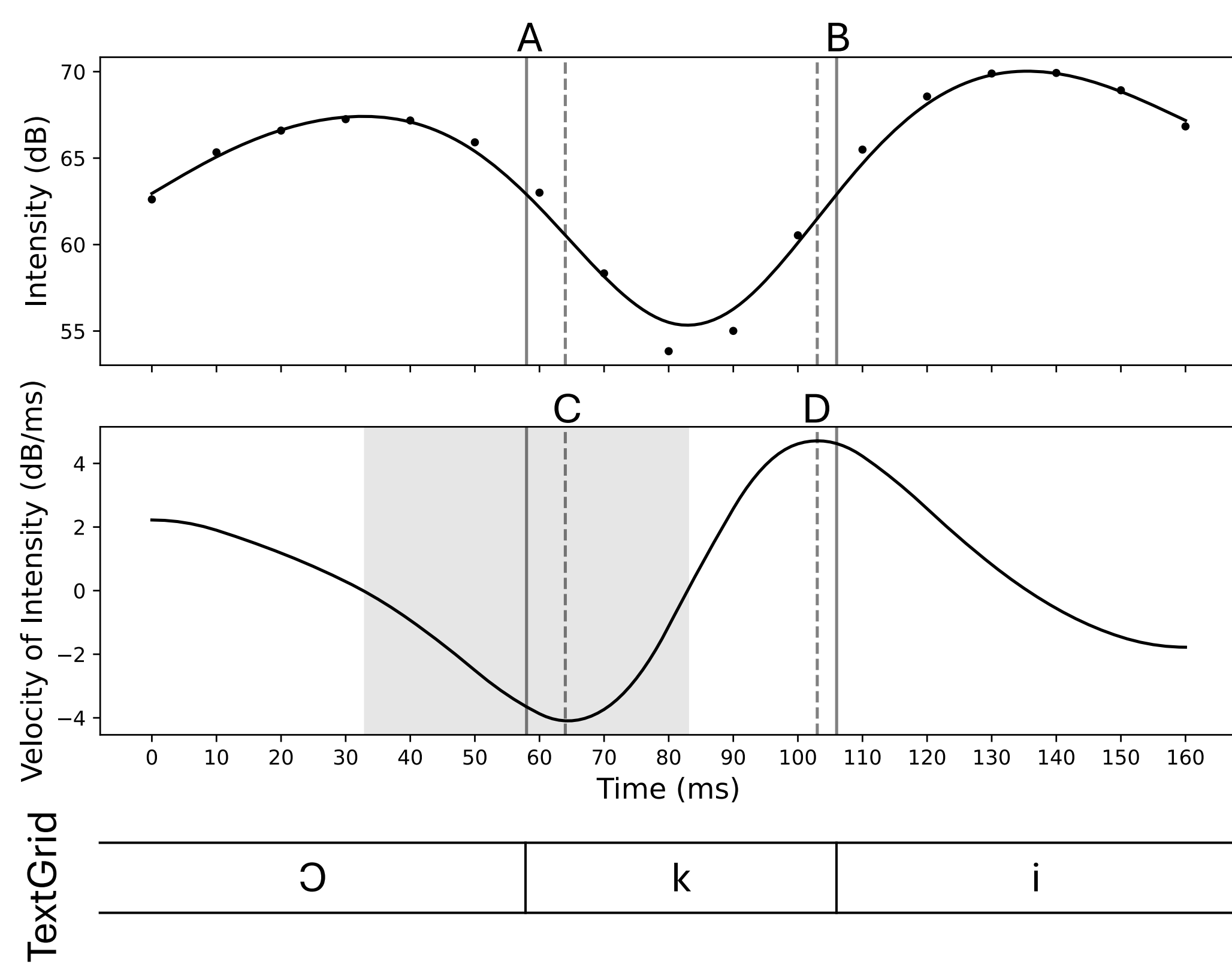


Figure 2. Measuring the degree of reduction (CVE) and the consonant duration using the intensity contour. A and B are the forced-aligned consonant boundaries in the corpus TextGrid. C and D are the inflection points of the velocity of intensity.

## References

- [1] S.-A. Jun, "The accentual phrase in the Korean prosodic hierarchy," *Phonology*, vol. 15, no. 2, 1998. [2] J.-I. Han, "Intervocalic stop voicing revisited," *Speech Sciences*, vol. 7, no. 1, 2000. [3] T. Cho and P. A. Keating, "Articulatory and acoustic studies on domain-initial strengthening in Korean," *J. Phon.*, vol. 29, no. 2, 2001. [4] D. J. Silva, "The phonetics and phonology of stop lenition in Korean," *Ph.D. Dissertation. Cornell University*, 1992. [5] K. Yoo, "The production and perception of domain-initial strengthening in Seoul, Busan, and Ulsan Korean," *Ph.D. Dissertation. University of Cambridge*, 2020. [6] A. Arvaniti and M. Baltazani, "Intonational Analysis and Prosodic Annotation of Greek Spoken Corpora," in *Prosodic Typology*, S.-A. Jun, Ed., 1st ed., Oxford University Press/Oxford, 2005. [7] W. Yun et al., "The Korean corpus of spontaneous speech," *Phonetics and Speech Sciences*, vol. 7, no. 2, 2015. [8] L. Davidson, "Variability in the implementation of voicing in American English obstruents," *J. Phon.*, vol. 54, 2016. [9] L. Davidson, "Phonation and laryngeal specification in American English voiceless obstruents," *JIPA*, vol. 48, no. 3, 2018. [10] J. Kingston, "Lenition," in *3rd Conference on Laboratory Approaches to Spanish Phonology*, Cascadilla Proceedings Project, 2008. [11] T. Ennever, F. Meakins, and E. R. Round, "A replicable acoustic measure of lenition and the nature of variability in Gurindji stops," *Laboratory Phonology*, vol. 8, no. 1, 2017. [12] J. Katz and G. Pitzanti, "The phonetics and phonology of lenition: A Campidanese Sardinian case study," *Laboratory Phonology*, vol. 10, no. 16, 2019. [13] S.-A. Jun, "Lenis Stop Voicing Rule," *Theoretical Issues in Korean Linguistics*, 1994.

## PWd-medial lenition: more fully voiced, shorter, and more reduced

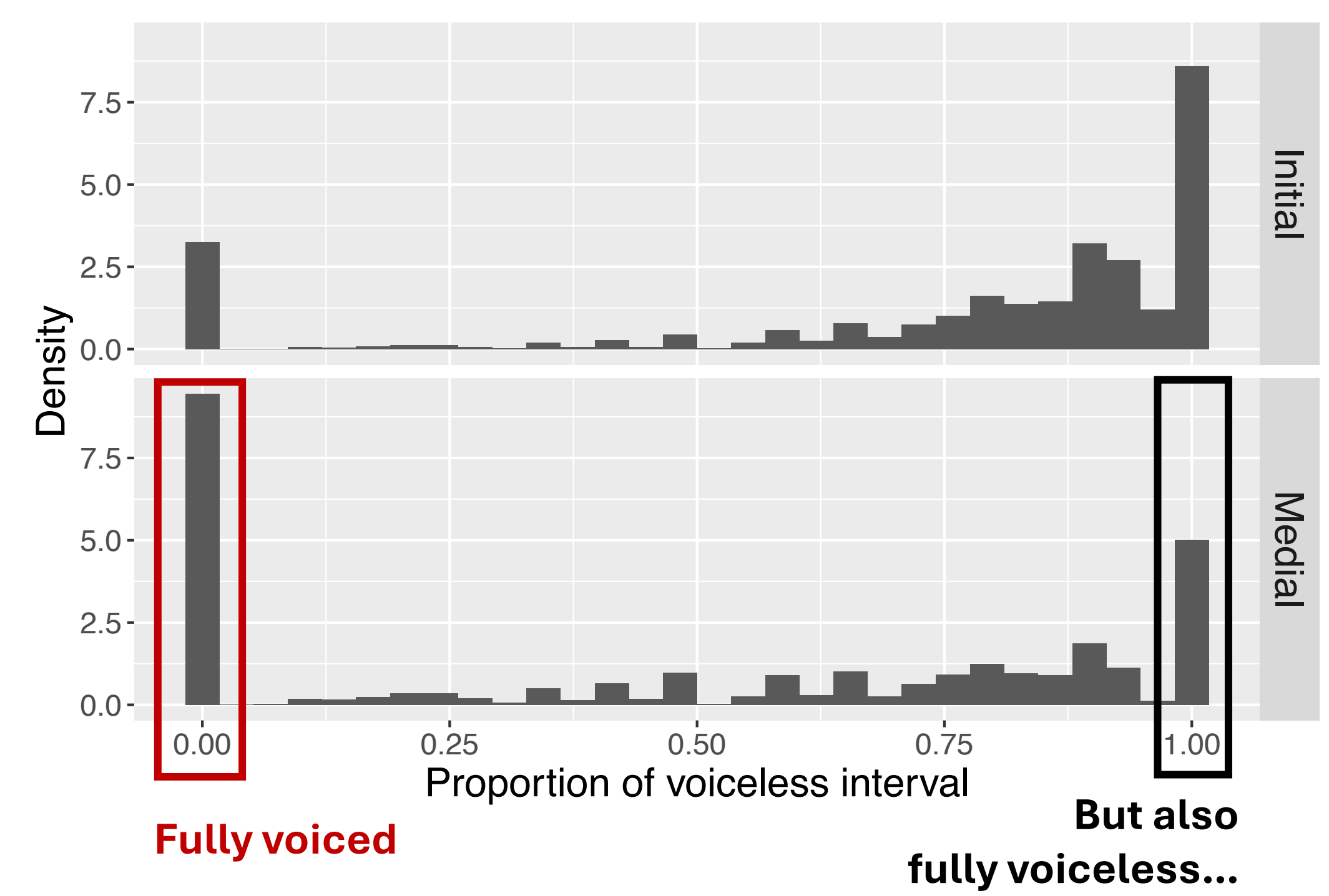


Figure 3. Voicing

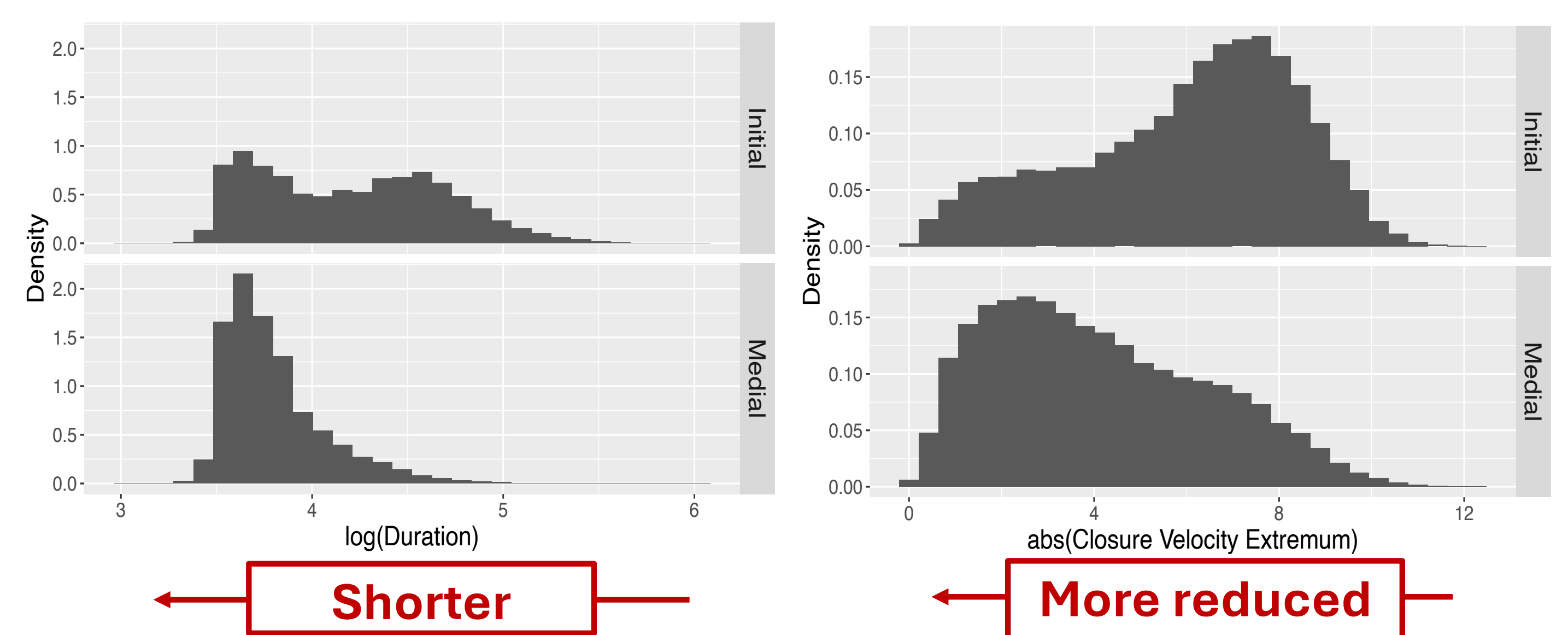


Figure 4. Duration (left) and CVE (right)

## Voicelessness isn't always predictable from preceding vowel devoicing [13]

Out of the fully voiceless lenis obstruents in the PWd-medial position, 17% were preceded by fully devoiced vowels [13], but 31% were preceded by fully voiced vowels. These 31% tokens were exceptionally voiceless [1, 2, 13].

Fully <b>voiced</b> lenis obstruents		
Preceding Vowel	Initial	Medial
Fully <b>voiced</b>	3,916 (94%)	16,057 (91%)
Intermediate	209 (6%)	1,625 (9%)
Fully devoiced	6 (0%)	11 (0%)
Fully <b>voiceless</b> lenis obstruents		
Preceding Vowel	Initial	Medial
Fully devoiced	969 (9%)	1,556 (17%) - Predictable
Intermediate	6,616 (61%)	4,915 (52%)
Fully <b>voiced</b>	3,331 (31%)	2,931 (31%) - Unpredictable

Table 1. Fully voiced/voiceless lenis obstruents (N = 42,142) by PWd position and by the voicing of the preceding vowel.

## However, even the unpredictably voiceless tokens are lenited: shorter and more reduced

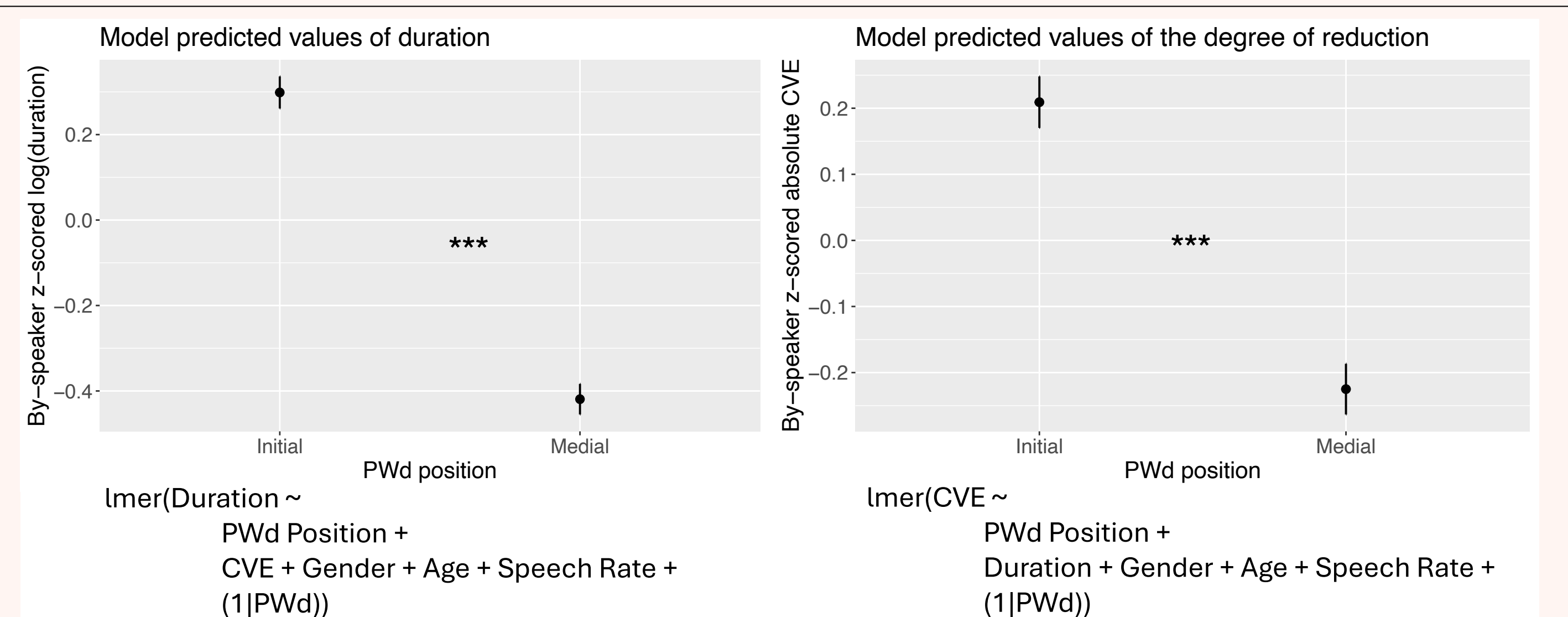


Figure 5. Model predicted values of duration (left) and CVE (right) for the fully voiceless lenis obstruents preceded by fully voiced vowels. The fully voiceless PWd-medial tokens were shorter and more reduced than the PWd-initial tokens.

- The optionality of voicing suggests that a segment's realization is not a reliable cue to prosodic constituency [6].
- However, lenition (shortening/reduction) appears not to be optional as the exceptionally voiceless tokens are also reduced and shortened.
- Jointly, shortening and/or reduction reliably mark the medial position in a prosodic constituent.

## Acknowledgements

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