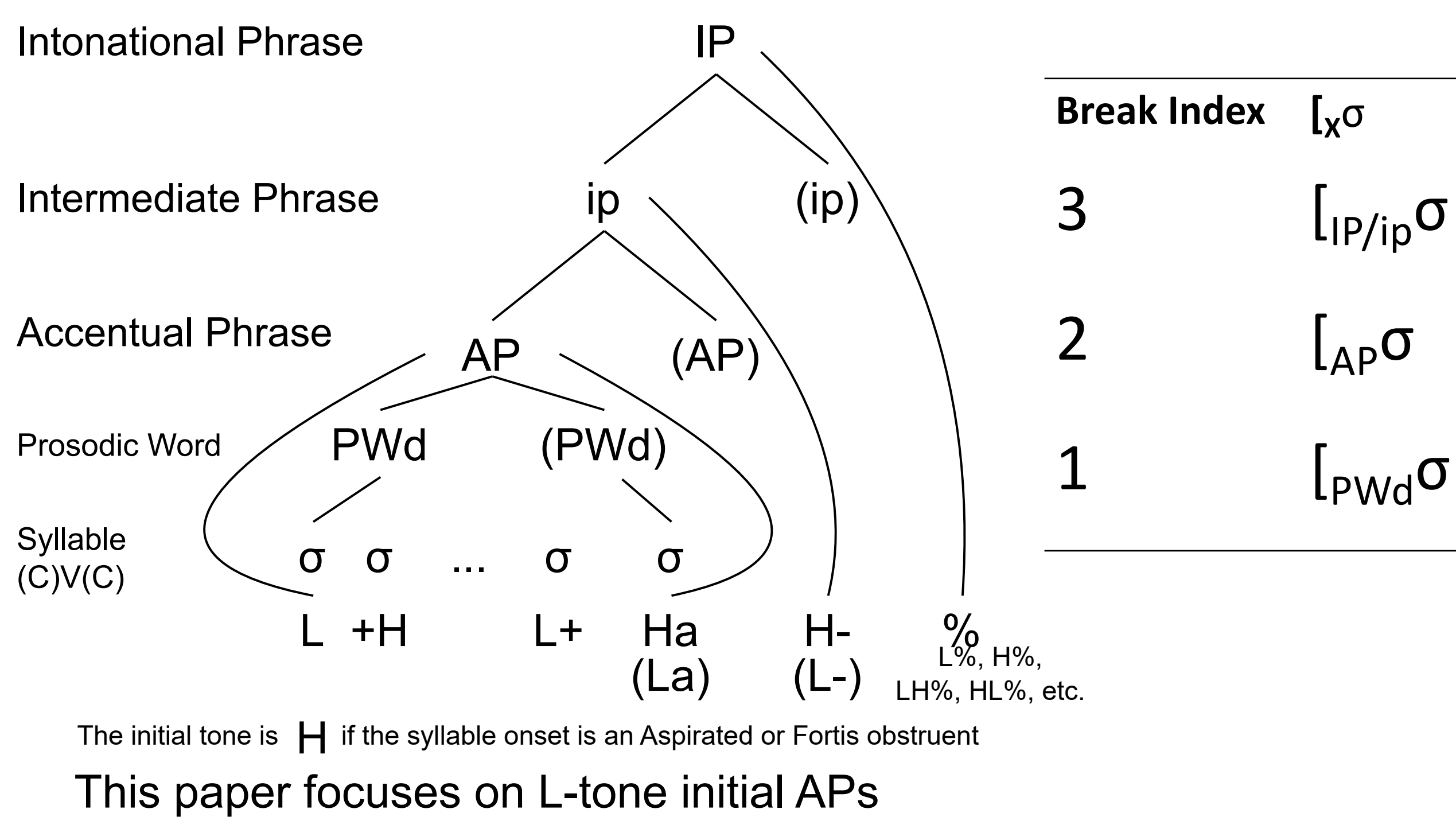


Introduction

This study reports an initial exploratory analysis of the separability of the acoustic cues to the Accentual Phrase (AP) boundaries of Seoul Korean in spontaneous speech

- Seoul Korean AP boundaries are 'tonally marked' [1, 2]
- AP also conditions lenis stop realization—lenis stops are strengthened AP initially (Domain-initial strengthening, [3] a.o.; optionally voiced and lenited non-initially (Lenis voicing rule, [1, 4, 5] a.o.)
- Listeners sensitive to both tonal [6, 7, 8] and segmental cues [9]
- Less is known about how the two kinds of cues interact to create the percept of AP juncture
- Less work on intonation of spontaneous speech in Korean, likely due to lack of publicly available prosodically transcribed spontaneous speech corpus
- Most corpora provide PWd boundaries (or 'Eojeol' in Korean) and Utterance boundaries (IP boundaries marked with notable pauses) but no AP boundaries

Prosodic Constituents in Seoul Korean in the K-ToBI model [1]

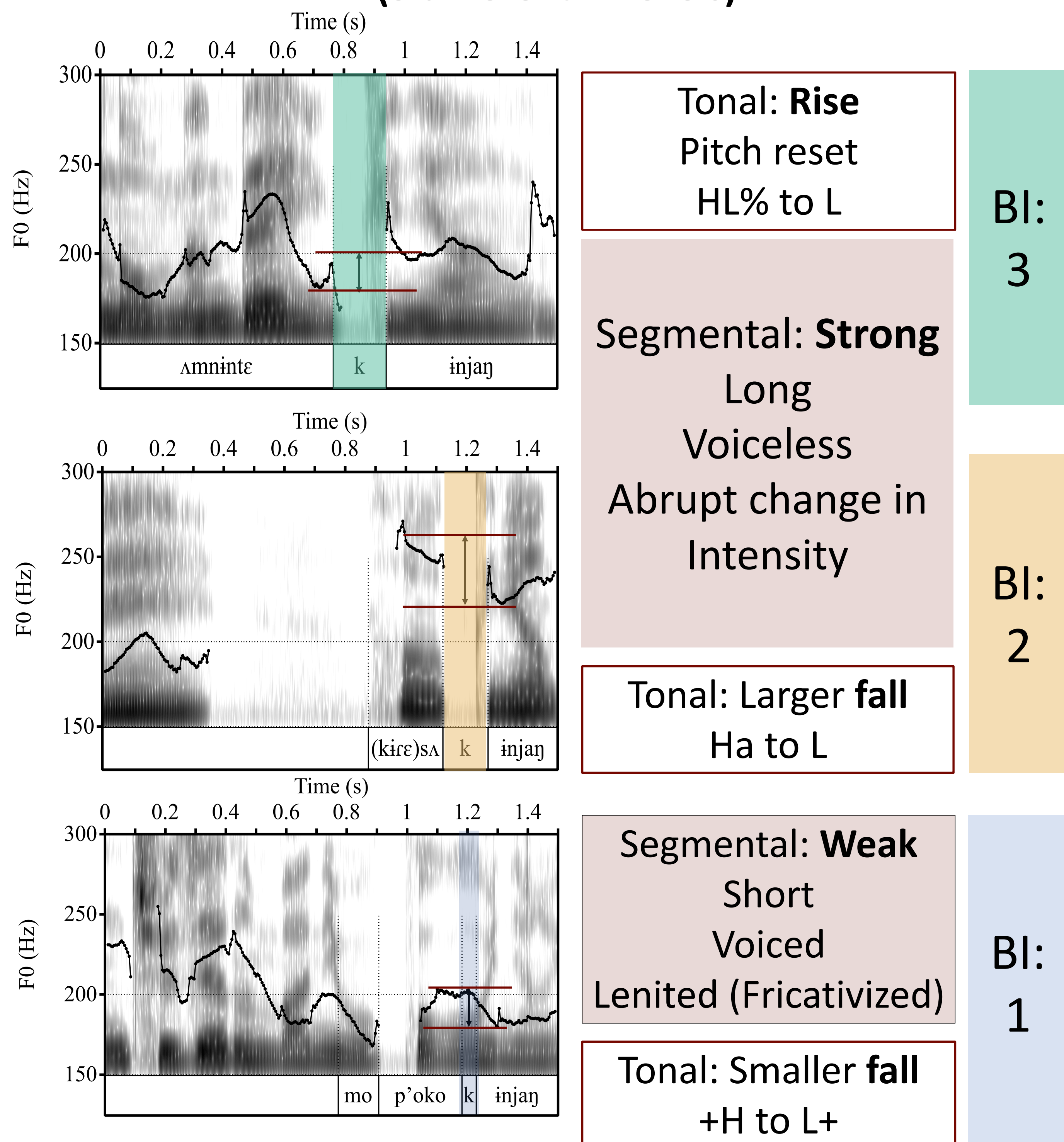


Measurements

- Tonal cue: change in F0 from the previous syllable, normalized as fraction of range
- Segmental cue: three measurements taken from the lenis stop interval—proportion of voiced interval [10], Speech-rate normalized duration [9] and change of rate in intensity [11]; and combined into one variable using the Principal Component Analysis [12]
- Tonal cue: <0 fall, >0 rise
- Segmental cue: <0 voiced, lenited; >0 voiceless, strong

Prosodically-conditioned realizations of a syllable with a lenis onset

Same PWd: /kinjaŋ/ realized in 3 prosodic positions (3 different BI levels)

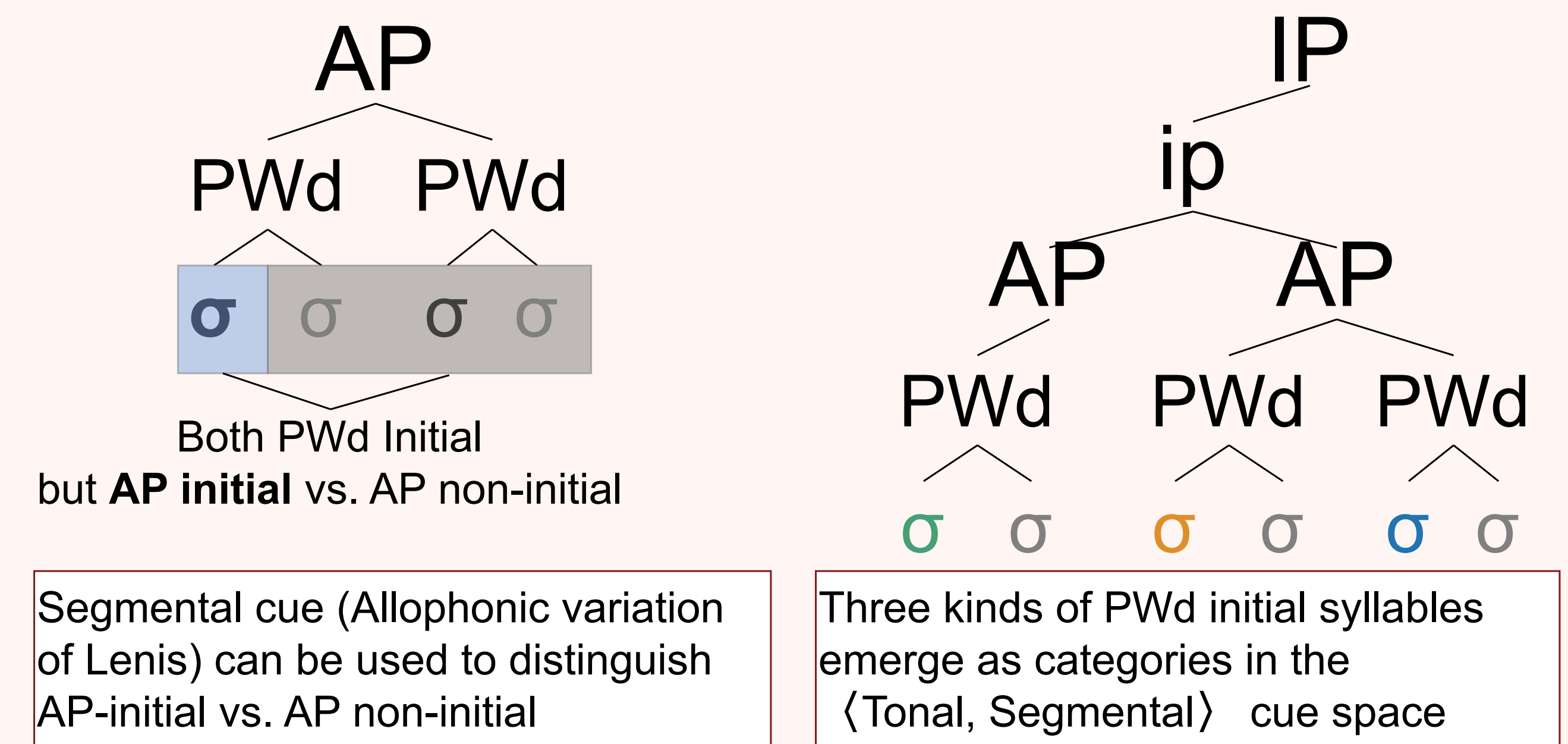


Acknowledgements

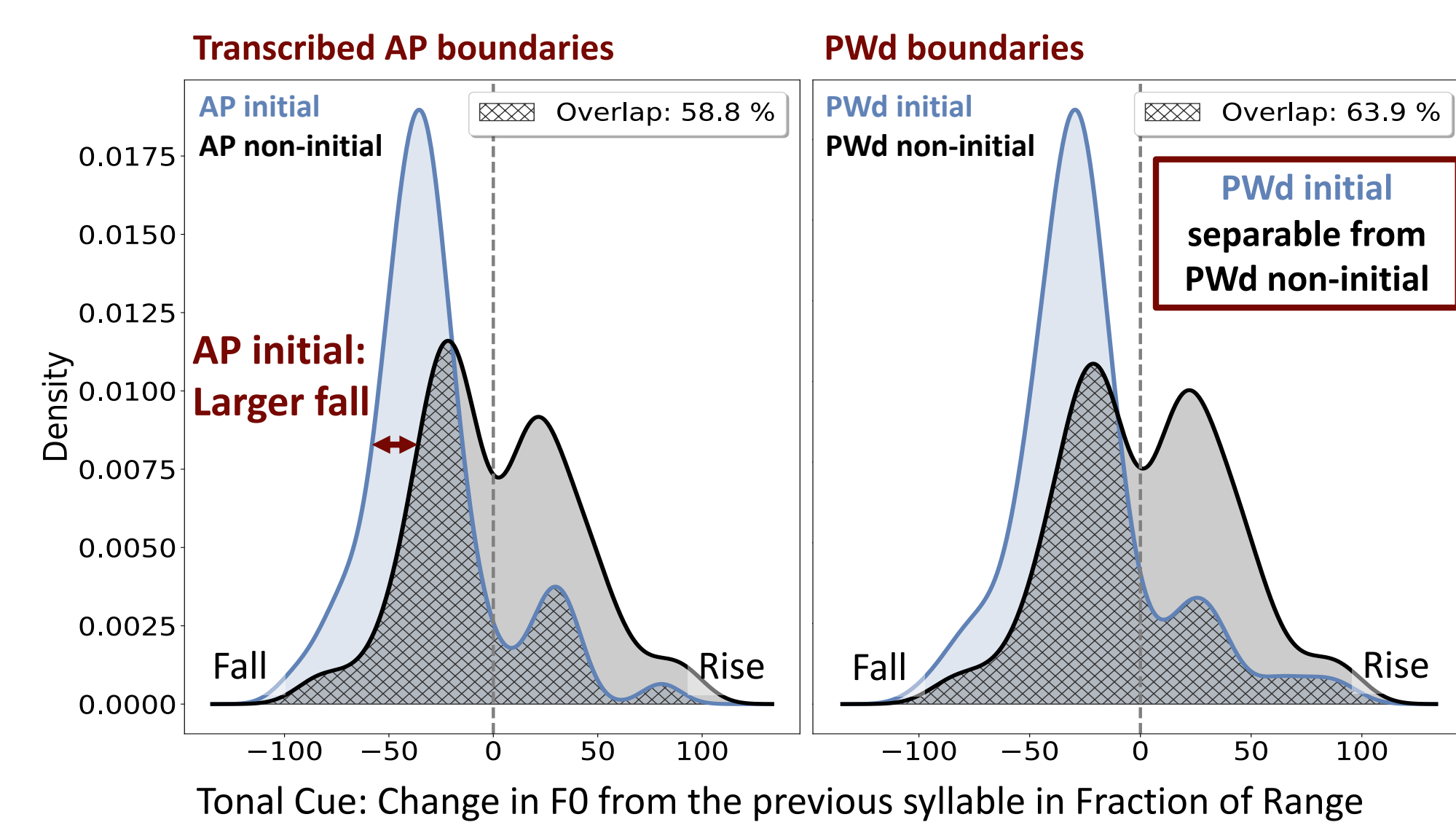
I would like to thank Professor Yun for sharing the Spontaneous speech corpus, Professor Jun for sharing the labeled data. Kristine Yu, John Kingston and UMass Sound Workshop.

This study: separability of tonal and segmental cues in two data sets

- Transcribed Data: small (403 σ), K-ToBI transcribed (PWd, AP and IP) [13], various speech styles such as story-reading, but not spontaneous speech
- Spontaneous Data: larger (6497 σ) and spontaneous speech but only PWd boundaries [14]

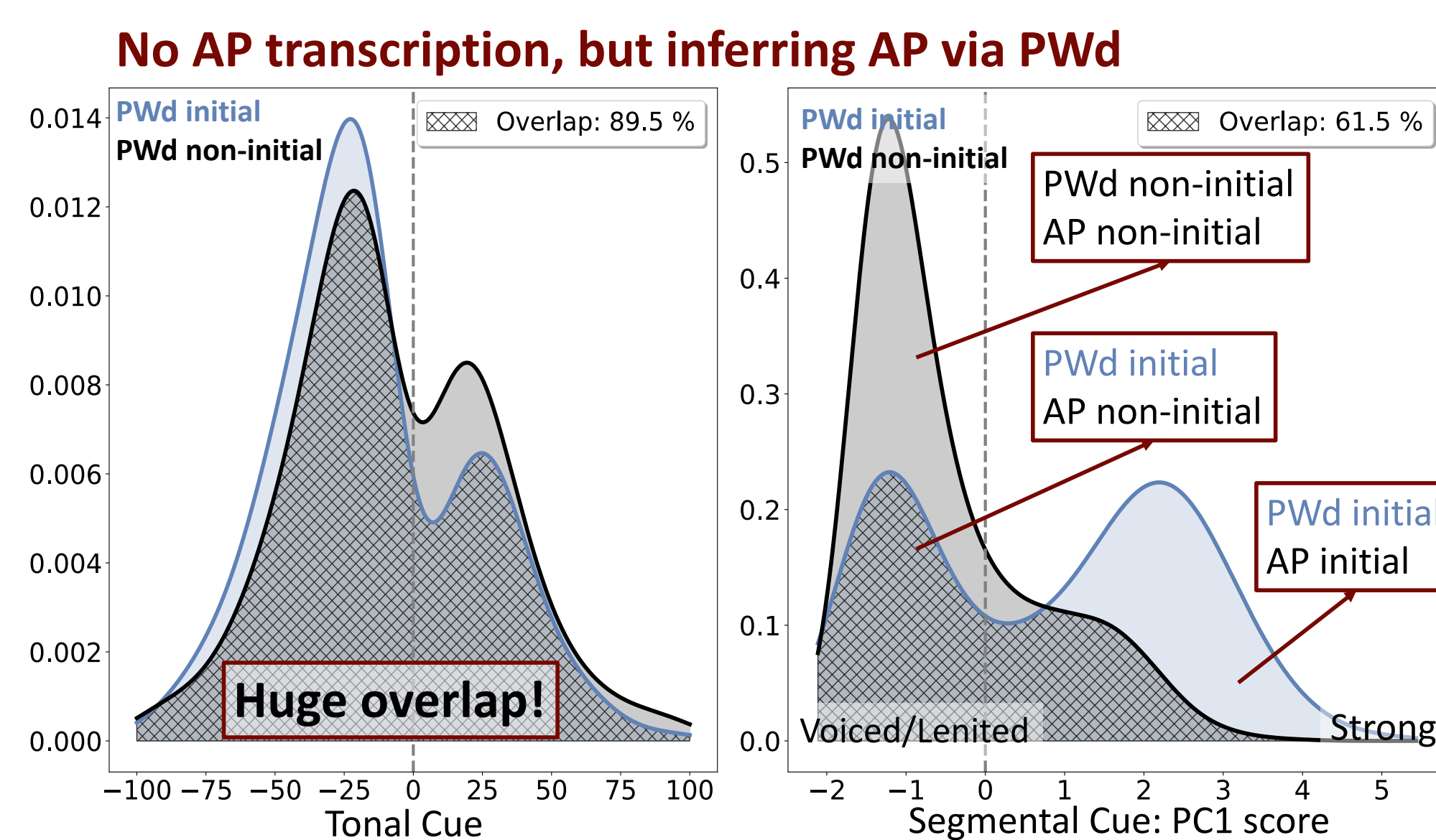


Results



Transcrib. Tonal ✓ Seg. N/A

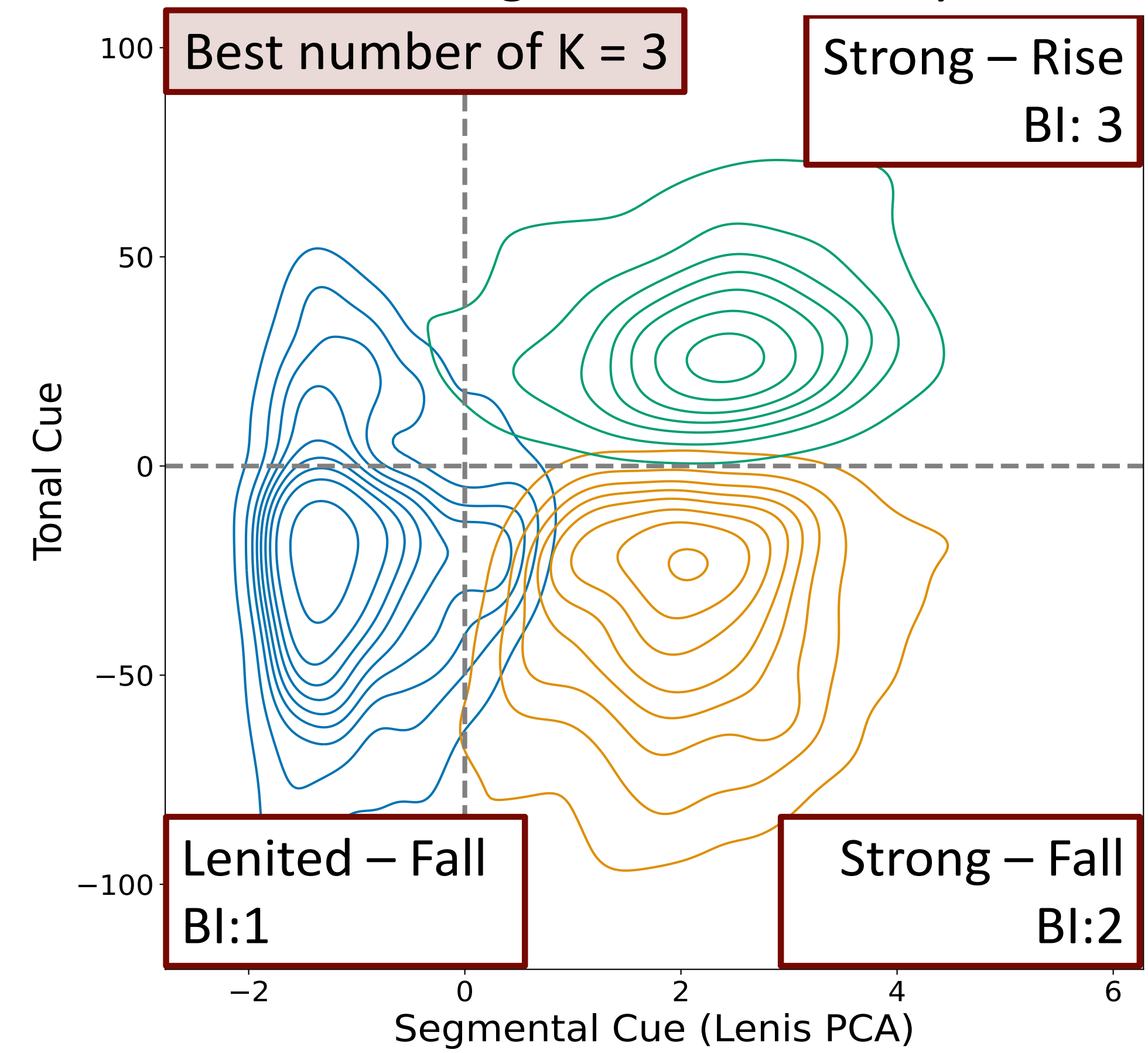
In Data set 1, most PWd initial syllables were also AP initial (66/96, 69%)



Spont. Tonal X Seg. ✓

In Spontaneous Speech, the Segmental cue but not the Tonal cue separated PWd initial from PWd non-initial.

K-Means Clustering on PWd-initial syllables



Three expected PWd - initial syllable types emerge in <Ton, Seg> space

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- [1] S.-A. Jun, "The accentual phrase in the Korean prosodic hierarchy," *Phonology*, vol. 15, no. 2, pp. 189–226, 1998. [2] S.-A. Jun, "K-ToBI (Korean ToBI) Labelling Conventions (version 3.1)," [3] T. Cho and P. A. Keating, "Articulatory and acoustic studies on domain-initial strengthening in Korean," *J. Phon.*, vol. 29, no. 2, pp. 155–190, 2001. [4] D. J. Silva, "The phonetics and phonology of stop lenition in Korean," *Ph.D. Dissertation*, Cornell University, 1992. [5] S.-A. Jun, "Lenis Stop Voicing Rule," *Theoretical Issues in Korean Linguistics*, p. 101, 1994. [6] S. Kim and T. Cho, "The use of phrase-level prosodic information in lexical segmentation: Evidence from word-spotting experiments in Korean," *JASA*, vol. 125, no. 5, pp. 3373–3386, 2009. [7] S. Kim, T. Cho, and J. M. McQueen, "Phonetic richness can outweigh prosodically-driven phonological knowledge when learning words in an artificial language," *J. Phon.*, vol. 40, no. 3, pp. 443–452, 2012. [8] A. Tremblay, T. Cho, S. Kim, and S. Shin, "Phonetic and phonological effects of tonal information in the segmentation of Korean speech: An artificial-language segmentation study," *Appl. Psycholinguist.*, vol. 40, no. 5, pp. 1221–1240, 2019. [9] K. Yoo, "The production and perception of domain-initial strengthening in Seoul, Busan, and Ulsan Korean," *Ph.D. Dissertation*, University of Cambridge, 2020. [10] L. Davidson, "Variability in the implementation of voicing in American English obstruents," *J. Phon.*, vol. 54, pp. 35–50, 2016. [11] J. Kingston, "Lenition," in *3rd Conference on Laboratory Approaches to Spanish Phonology*, pp. 1–31, Cascadilla Proceedings Project, 2008. [12] C. Dalcher, "Statistical methods for quantitative analysis of multiple lenition components," in *ICPhS*, 2007. [13] S.-A. Jun, S.-H. Lee, K. Kim, and Y.-J. Lee, "Labeler agreement in transcribing Korean intonation with K-toBI," in *INTERSPEECH*, pp. 211–214, 2000. [14] W. Yun, K. Yoon, S. Park, J. Lee, S. Cho, D. Kang, K. Byun, H. Hahn, and J. Kim, "The Korean corpus of spontaneous speech," *Phonetics and Speech Sciences*, vol. 7, no. 2, pp. 103–109, 2015.