

***Effect of speaking style and lexical
competitor on the tense-lax
distinction in Korean-accented English***

Ye-Jee Jung & Olga Dmitrieva

Purdue University

Korean Linguistics in Crosslinguistic Context 2021

Table of Contents

- ▶ Introduction
- ▶ Research Question
- ▶ Methodology
- ▶ Results
- ▶ Discussion & Conclusion
- ▶ References

Introduction

- ▶ Speech produced by monolingual populations could be affected by several factors:
 - ▶ Speaking style (Picheny et al., 1986; Smiljanic & Bradlow, 2005)
 - Casual vs. Clear
 - ▶ The existence of a direct lexical competitor
 - With vs. Without, e.g. *heat – hit vs. pig (*peag)*
- ▶ People can modify their speech when fluent communication is compromised.
 - ▶ e.g. Speaking to the hard of hearing, L2 speakers
 - *Clear speech (vs. casual speech)* is used in these situations.
- ▶ Lindblom (1990) argues that speech fluency involves an ability to modify speaking style.

Introduction

- ▶ **Clear speech** is acoustically different from casual speech in various ways (Picheny et al., 1986; Smiljanic & Bradlow, 2005; Smiljanic & Bradlow, 2009).
 - ▶ Suprasegmental features:
 - Speaking rate
 - Pitch range
 - Pause frequency and duration
 - ▶ Segmental features:
 - Vowel duration
 - Formant frequency (F1 & F2) values/Vowel space
 - Voice Onset Time

Introduction

- ▶ Language-specific phonological contrast can be also enhanced in clear speech.
 - ▶ Uchanski (1992):
 - Durational contrast between English tense and lax vowels was enhanced in clear speech.
 - ▶ Leung et al (2016):
 - The English tense-lax contrast was enhanced in clear speech in both duration and spectral dimensions.

Introduction

- ▶ Previous studies have mainly included monolingual speakers.
 - ▶ Predominantly native English speakers.
- ▶ Clear speech studies in non-English languages:
 - ▶ Spanish (Bradlow, 2002)
 - ▶ Croatian (Smijlanić & Bradlow, 2005)
 - ▶ Korean (Cho et al., 2011).
 - Vowel space expansion was a universal strategy for clear speech.
 - Pitch modifications are language-specific.
 - e.g. in Korean clear speech, pitch modifications were not observed.

Introduction

- ▶ Not many clear speech studies have examined L2 speakers, to date.
- ▶ Previous studies on L2 clear speech:
 - ▶ Li & So (2006)
 - English clear speech produced by Hong Kong Cantonese speakers
 - ▶ Granlund, Hazan & Baker (2012)
 - English clear speech produced by Finnish speakers.
 - ▶ In both studies, acoustic modifications in L2 clear speech were comparable to L1 clear speech.

Introduction

- ▶ The existence of a direct lexical competitor is another factor that can affect speech production.
 - ▶ Both vowels and consonants could be affected.
- ▶ Baese-Berk & Goldrick (2009):
 - ▶ The VOT of word-initial voiceless stops in words with voiced competitor was longer than without competitor.
 - e.g. /k/ in *cod* (vs. *god*) was longer than /k/ in *cop* (vs. **gop*)
 - ▶ Lexical competition can lead to *hyper-articulation* of a consonant.

Introduction

- ▶ Wedel, Nelson, and Sharp (2018):
 - ▶ The VOT of word-initial voiceless stops was longer in words with a voiced competitor (e.g. *pat*).
 - ▶ The VOT of word-initial voiced stops was shorter in words with a voiceless competitor (e.g. *drunk*).
 - ▶ The Euclidean distance between vowels in the two-dimensional formant space also became greater with the existence of a lexical competitor (e.g. *sheep-ship*).
 - As a result, the VOT difference and the vowel quality difference was increased in words with minimal pairs.

Introduction

- ▶ Clopper and Tamati (2014): acoustic distance between a pair of vowels based on
 - ▶ a lexical competitor
 - ▶ a regional dialect (Northern vs. Midland).
 - Two pairs included: /ε ~ æ/ & /ɑ ~ ɔ/
 - /ε ~ æ/: no significant effect of a lexical competitor.
 - /ɑ ~ ɔ/: a significant interaction between a lexical competitor and a regional dialect.
 - ▶ The results suggest that spectral properties of vowels are subject to change when there is a lexical competitor.

Introduction

- ▶ To sum up, speech produced by monolingual population can be influenced by:
 - ▶ Speaking style
 - ▶ The existence of a lexical competitor
- ▶ Gaps in previous research:
 - ▶ Do these factors also influence non-native population?
 - ▶ Do these factors interact with each other?

Research Questions

- ▶ English has words that differ only in tenseness of a vowel.
For example:
 - ▶ *beat vs. bit; sheep vs. ship...*
 - ▶ This contrast does not exist in Korean.
- ▶ Research Questions:
 - ▶ Will Korean speakers of English enhance the English tense-lax contrast in clear speech?
 - If so, will they do in a non-native manner?
 - ▶ Will the existence of tense/lax competitor lead to increased distinctiveness between the two vowels?
 - If so, will it affect both native and non-native speech?
 - If so, will it be amplified in clear speech?

Methodology

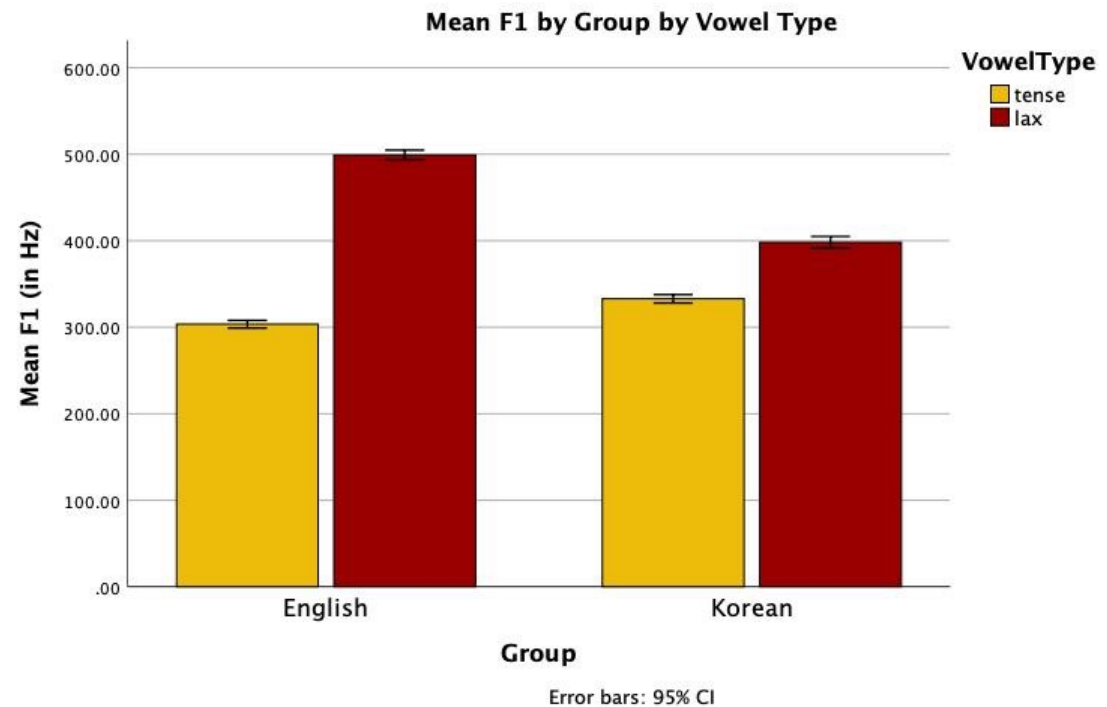
- ▶ Participants
 - ▶ 9 native Midwestern-English speakers (4M; age mean = 29.12)
 - ▶ 14 native Korean speakers (10M; age mean = 20.89)
 - Self-rated English proficiency score: 3.4 (out of 5)
- ▶ Stimuli
 - ▶ 4 English minimal pairs in terms of vowel tenseness (e.g. *heat* vs. *hit*)
 - ▶ 4 English words that contain /i/ and have no lax vowel counterpart (e.g. *need* vs. **knid*)
 - ▶ 4 English words that contain /ɪ/ and have no tense vowel counterpart (e.g. *pig* vs. **peag*)
- ▶ Procedures
 - ▶ Each participant read stimuli twice, with clear speaking style following casual speaking style, repeating three times within each speaking style.

Methodology

- ▶ Acoustic measurements
 - ▶ F1 and F2 values at midpoint of each vowel
 - ▶ Vowel duration
- ▶ Statistical analysis
 - ▶ Linear mixed model was implemented in SPSS.
 - *Subjects* as a random factor
 - *Speaker Group* (English vs. Korean), *Speaking Mode* (casual vs. clear), *Lexical Competitor* (with vs. without), and *Vowel Type* (tense vs. lax) as fixed effects.
 - Of specific interest were interactions between *Vowel Type* and other fixed factors.
 - F1, F2 and duration as dependent variables (separate models)

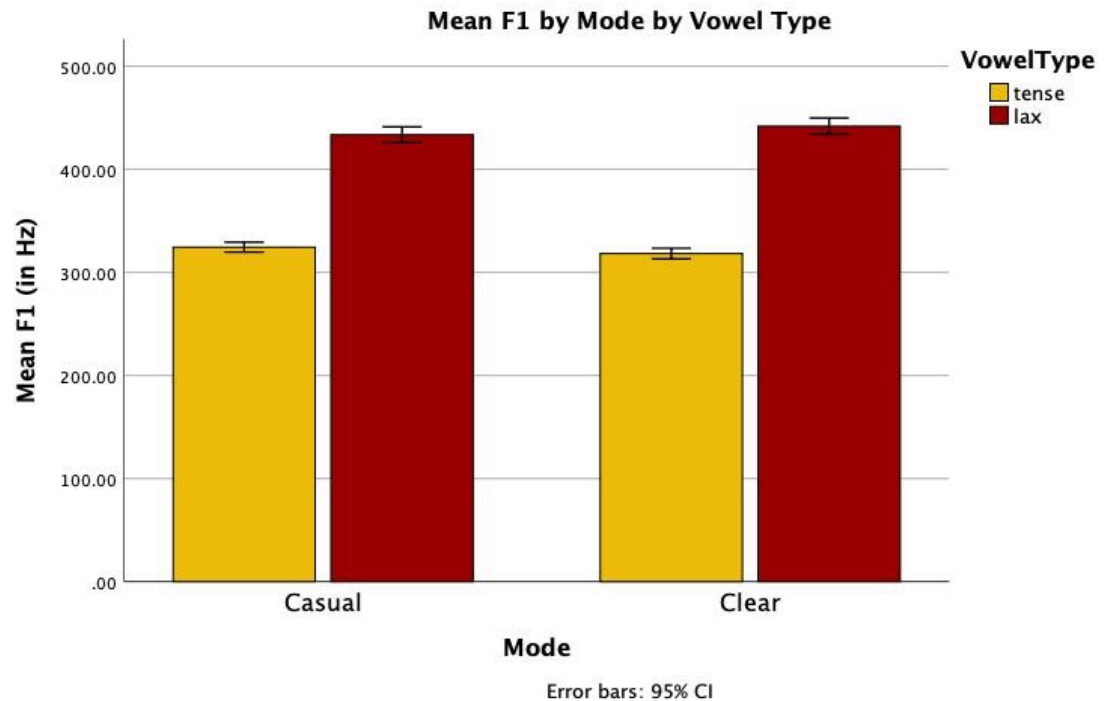
Results: F1 values

- ▶ The following interactions were significant for F1 values:
 - ▶ *Group * Vowel Type* ($F(1, 2192) = 475.893, p < .05$)
 - English group made a greater F1 difference between tense and lax vowels than Korean group did.



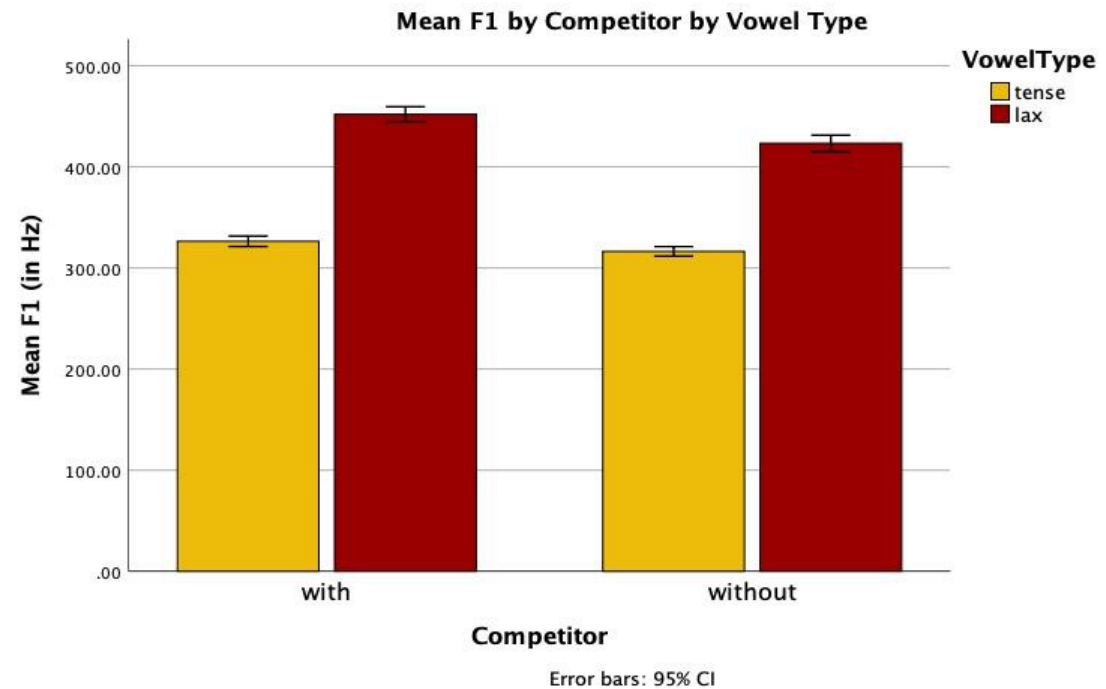
Results: F1 values

- ▶ The following interactions were significant for F1 values:
 - ▶ *Speaking Mode * Vowel Type* ($F(1, 2192) = 7.423, p < .05$)
 - The F1 difference between tense and lax vowels was greater in clear speech.



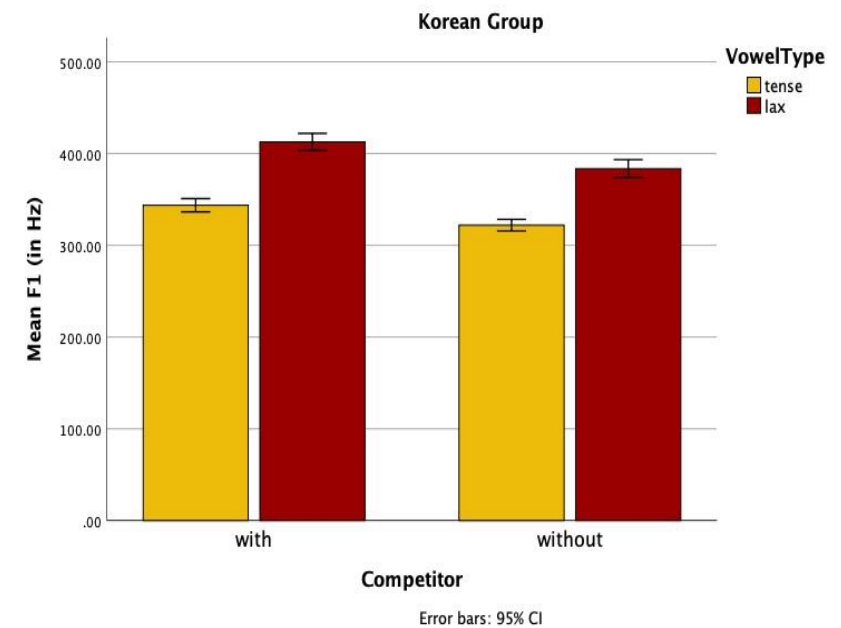
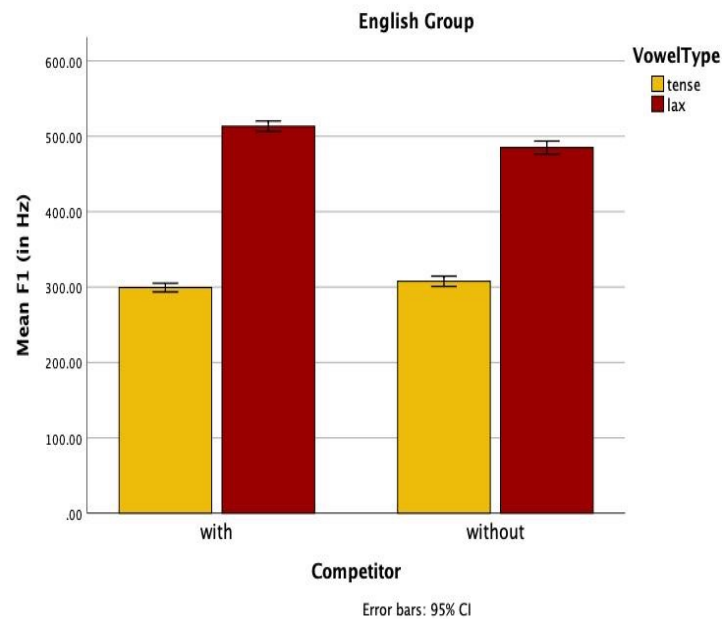
Results: F1 values

- ▶ The following interactions were significant for F1 values:
 - ▶ *Lexical Competitor * Vowel Type* ($F(1, 2192) = 13.694, p < .05$)
 - The F1 difference between tense and lax vowels was greater when there was a lexical competitor.



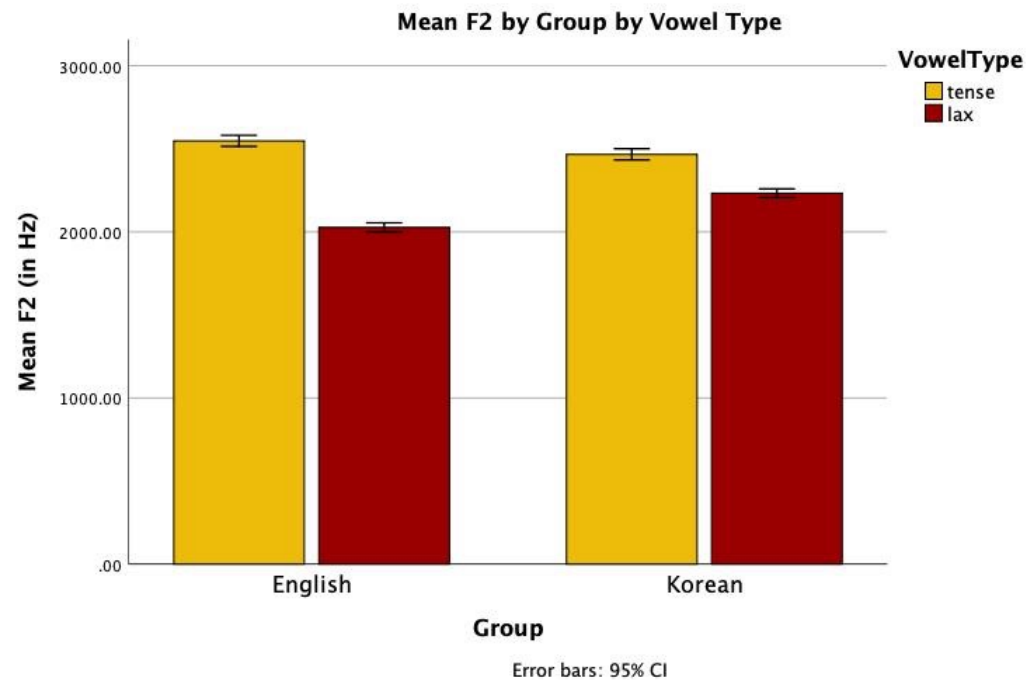
Results: F1 values

- ▶ The following interactions were significant for F1 values:
 - ▶ *Group * Lexical Competitor * Vowel Type* ($F(1, 2192) = 5.904, p < .05$)
 - English group made a bigger F1 difference between tense and lax vowels that have a lexical competitor.



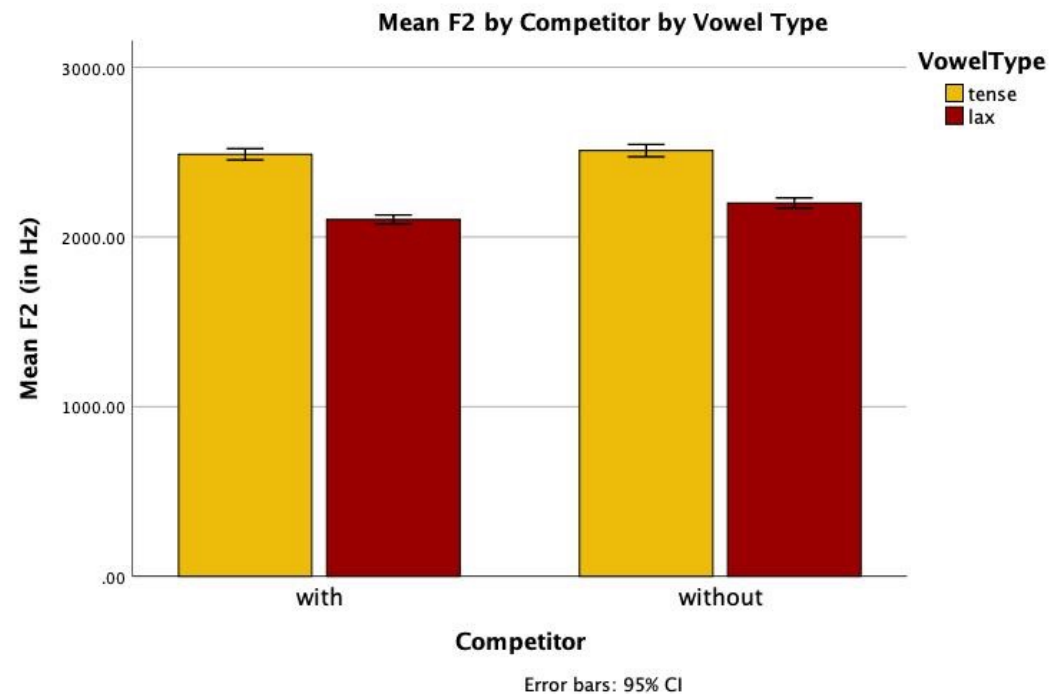
Results: F2 values

- ▶ The following interactions were significant for F2 values:
 - ▶ *Group * Vowel Type* ($F(1, 2192) = 78.975, p < .05$)
 - English group made a greater F2 difference between tense and lax vowels than Korean group did.



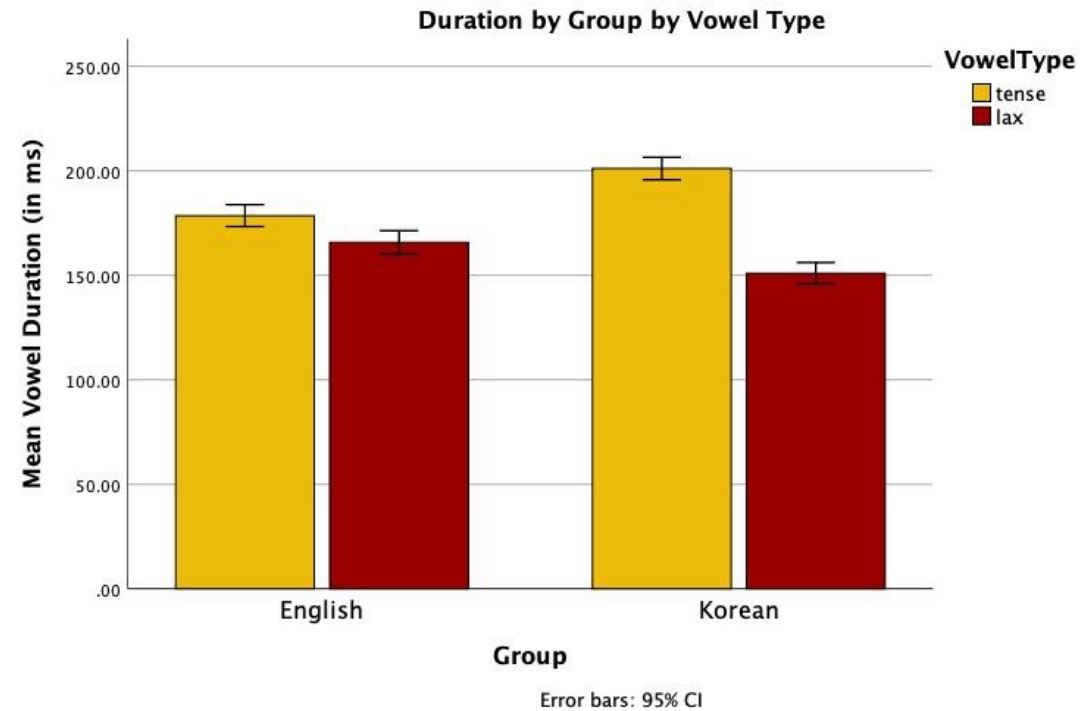
Results: F2 values

- ▶ The following interactions were significant for F2 values:
 - ▶ *Lexical Competitor * Vowel Type* ($F(1, 2192) = 5.854, p < .05$)
 - The F2 difference between tense and lax vowels was greater when there was a lexical competitor.



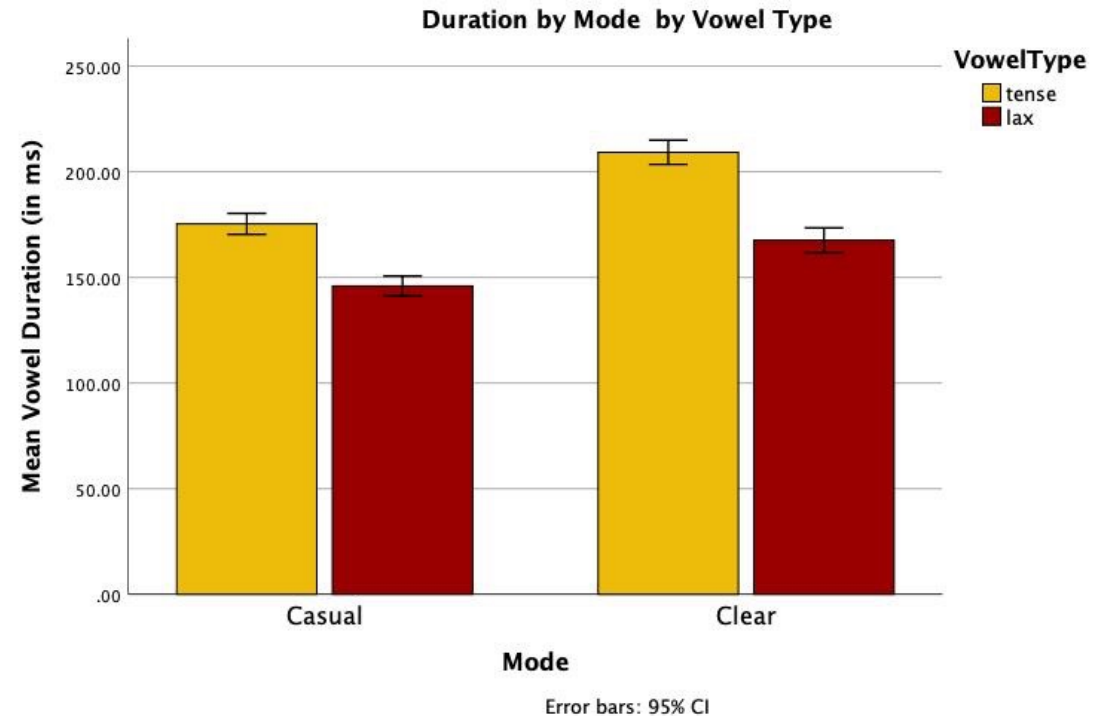
Results: Duration

- ▶ The following interactions were significant for vowel duration:
 - ▶ *Group * Vowel Type* ($F(1, 2192) = 59.730, p < .05$)
 - Korean group made a greater durational difference between tense and lax vowels than English group did.



Results: Duration

- ▶ The following interactions were significant for vowel duration:
 - ▶ *Speaking Mode * Vowel Type* ($F(1, 2192) = 6.734, p < .05$)
 - The durational difference between tense and lax vowels was greater in clear speech.



Discussion & Conclusion

- ▶ Whether speaking mode and lexical competition interact with each other remains unclear.
 - ▶ No significant interactions for *Mode by Lexical Competitor by Vowel Type*
- ▶ Other significant interactions found for each acoustic correlate:

F1	F2	V. Duration
Group * Vowel Type	Group * Vowel Type	Group * Vowel Type
Competitor * Vowel Type	Competitor * Vowel Type	Mode * Vowel Type
Mode * Vowel Type		
Group * Competitor * Vowel Type		

Discussion & Conclusion

- ▶ First, English and Korean speakers realized English tense-lax contrast differently:
 - ▶ English speakers produced a greater distinction between two in spectral properties (both F1 and F2).
 - ▶ By contrast, Korean speakers produced a greater distinction between two in duration.
 - In line with previous research (e.g. Cebrian 2006)
 - ▶ Classroom L2 instruction could have played a role (Wang & Munro, 1999).
 - Often in EFL classrooms, tense vowels are described as “long” vowels.
 - This may have led Korean speakers to over-rely on durational cue.

Discussion & Conclusion

- ▶ Next, vowels in words with lexical competitors in tenseness showed more extreme spectral values in both F1 and F2.
 - ▶ Tense-lax contrast could be enhanced when there is a possibility of confusion.
 - e.g. /i/ in *beat* was more “tense-like” since it can be confused with *bit*.
 - This was not the case for /i/ in *speak*, since there is no possibility of confusion.
- ▶ For F1, the effect of lexical competitors was greater for native English speakers.
 - ▶ Lexical knowledge could be more accessible to native speakers and thus have a greater effect on their speech.

Discussion & Conclusion

- ▶ Finally, both durational and spectral (F1 only) contrast between tense and lax were enhanced in clear speech.
 - ▶ Language-specific phonological contrasts are usually enhanced in clear speech produced by monolingual speakers (Uchanski, 1992; Leung et al., 2016).
 - ▶ Non-native speakers were also able to enhance in clear speech a phonological contrast that is absent from their L1.

Discussion & Conclusion

- ▶ Do Korean speakers of English enhance the English tense-lax contrast in clear speech? **YES**
 - If they will, do they do in a non-native manner? **NO**
 - *Mode * Vowel Type* was significant for duration and F1, suggesting that the contrast was significantly enhanced in clear speech across the groups.
 - However, *Group * Mode * Vowel Type* was not significant for any feature.
 - Two groups did not significantly differ in the way they used duration and F1/F2 to enhance the distinction between tense and lax vowels in clear speech.

Discussion & Conclusion

- ▶ Will the existence of tense/lax competitor lead to increased distinctiveness of two vowels? **YES**
 - ▶ If so, will it affect both native and non-native speech? **YES**
but...
 - ▶ If it is, will it be amplified in clear speech? **NO**
 - For F1 & F2, *Competitor * Vowel Type* was significant
 - The spectral differences between tense and lax vowels were greater when there was a lexical competitor.
 - *Group * Competitor * Vowel Type* was significant only for F1.
 - The effect of lexical competitor was stronger for native speakers but only for this feature.
 - *Mode * Competitor * Vowel Type* was not significant.
 - The effect of lexical competitor was not amplified in clear speech.

Discussion & Conclusion

- ▶ Future directions :
 - ▶ The role of English proficiency in production of clear speech by non-native speakers.
 - Stricter control over participants' English proficiency would shed more light on how it is related to L2 speech modification as factor of speaking style and lexicon knowledge.
 - ▶ While the acoustic parameters examined suggest that non-native clear speech is comparable to native clear speech, the equivalency of its perceptual effect is yet to be established:
 - Examining the intelligibility benefits of non-native clear speech, for both native and non-native listeners.

References

- ▶ Baese-Berk, M., & Goldrick, M. (2009). Mechanisms of interaction in speech production. *Language and cognitive processes, 24*(4), 527-554.
- ▶ Bradlow, A. R. (2002). Confluent talker-and listener-oriented forces in clear speech production. *Laboratory phonology, 7*.
- ▶ Cebrian, J. (2006). Experience and the use of non-native duration in L2 vowel categorization. *Journal of Phonetics, 34*(3), 372-387.
- ▶ Cho, T., Lee, Y., & Kim, S. (2011). Communicatively driven versus prosodically driven hyper-articulation in Korean. *Journal of Phonetics, 39*(3), 344-361.
- ▶ Clopper, C. G., & Tamati, T. N. (2014). Effects of local lexical competition and regional dialect on vowel production. *The Journal of the Acoustical Society of America, 136*(1), 1-4.
- ▶ Granlund, S., Hazan, V., & Baker, R. (2012). An acoustic–phonetic comparison of the clear speaking styles of Finnish–English late bilinguals. *Journal of Phonetics, 40*(3), 509-520.
- ▶ Leung, K. K., Jongman, A., Wang, Y., & Sereno, J. A. (2016). Acoustic characteristics of clearly spoken English tense and lax vowels. *The Journal of the Acoustical Society of America, 140*(1), 45-58.
- ▶ Li, H. C. N., & So, C. K. (2006). Acoustic analysis of vowels spoken clearly and conversationally by non-native English speakers. In *Proceedings of the 11th Australian International Conference on Speech Science & Technology* (pp. 444-448).

References

- ▶ Lindblom, B. (1990). Explaining phonetic variation: A sketch of the H&H theory. In *Speech production and speech modelling* (pp. 403-439). Springer, Dordrecht.
- ▶ Picheny, M. A., Durlach, N. I., & Braida, L. D. (1986). Speaking clearly for the hard of hearing II: Acoustic characteristics of clear and conversational speech. *Journal of Speech, Language, and Hearing Research, 29*(4), 434-446.
- ▶ Smiljanic, R., & Bradlow, A. R. (2005). Production and perception of clear speech in Croatian and English. *The Journal of the Acoustical Society of America, 118*(3), 1677-1688.
- ▶ Smiljanic, R., & Bradlow, A. R. (2009). Speaking and hearing clearly: Talker and listener factors in speaking style changes. *Language and linguistics compass, 3*(1), 236-264.
- ▶ Uchanski, R. M. (1992). Segment durations in conversational and clear speech. *Unpublished manuscript*.
- ▶ Wang, X., & Munro, M. J. (1999, August). The perception of English tense-lax vowel pairs by native Mandarin speakers: The effect of training on attention to temporal and spectral cues. In *Proceedings of the 14th international congress of phonetic sciences* (Vol. 3, pp. 125-128). Berkeley, CA: University of California.
- ▶ Wedel, A., Nelson, N., & Sharp, R. (2018). The phonetic specificity of contrastive hyperarticulation in natural speech. *Journal of Memory and Language, 100*, 61-88.

“

Thank you very much!
Questions or Feedback?