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Do Spaniards speak faster than Mexicans? Studying Spanish Rhythm in natural speech

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Background

- Speakers do not produce speech with similar temporal patterns → Different articulation rates (AR)
- Factors affecting AR:
 - Dialectal variations in English [1], French [2], Dutch [3], etc.
 - Speaking style and gender [4]
- Relation between speech rates and vowel space:
 - Faster speak rates → shorter durations → reduction of vowel space [5]
 - Stressed vs unstressed vowels → vowel reduction

Goals

- Compare different temporal patterns of two varieties of Spanish: Castilian Spanish (Madrid) vs Mexican Spanish (Mexico City)
 - Does AR differ across these two varieties?
 - Does AR affect the compression of vowel space similarly?
 - Do these varieties display similar rhythmic patterns?

Corpus

- ✓ 22 speakers (university students) 10 from Madrid (CAS) and 12 from Mexico City (MEX)
- ✓ 5.7 hours of speech
- ✓ Gender-balanced
- ✓ Read (short stories) vs spontaneous speech (interview, narration & description of a painting)

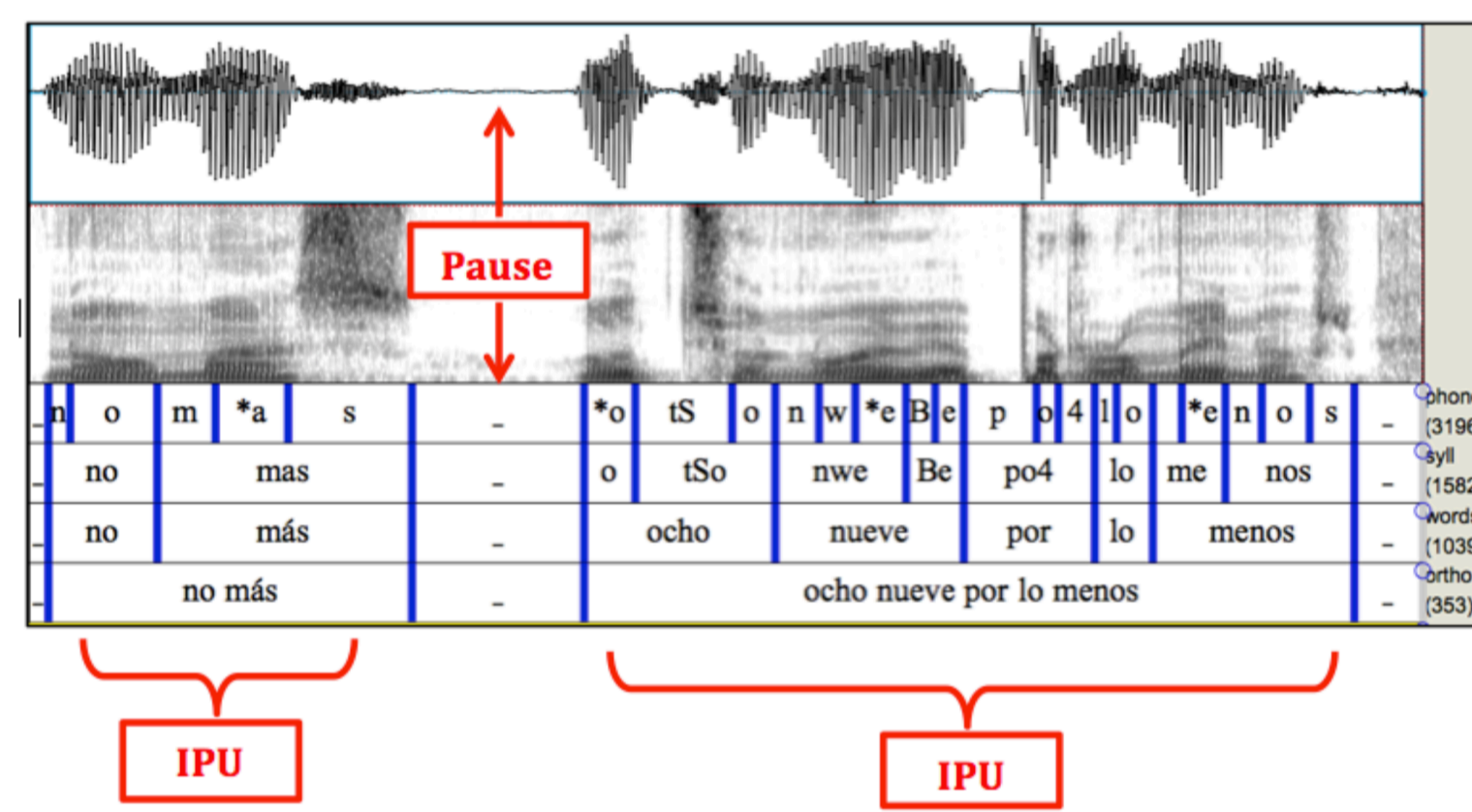
Segmentation and Annotations

- ✓ Phones, syllables and words
- ✓ Pauses, disfluencies, hesitations, filled pauses, lengthened words

Methods & Metrics

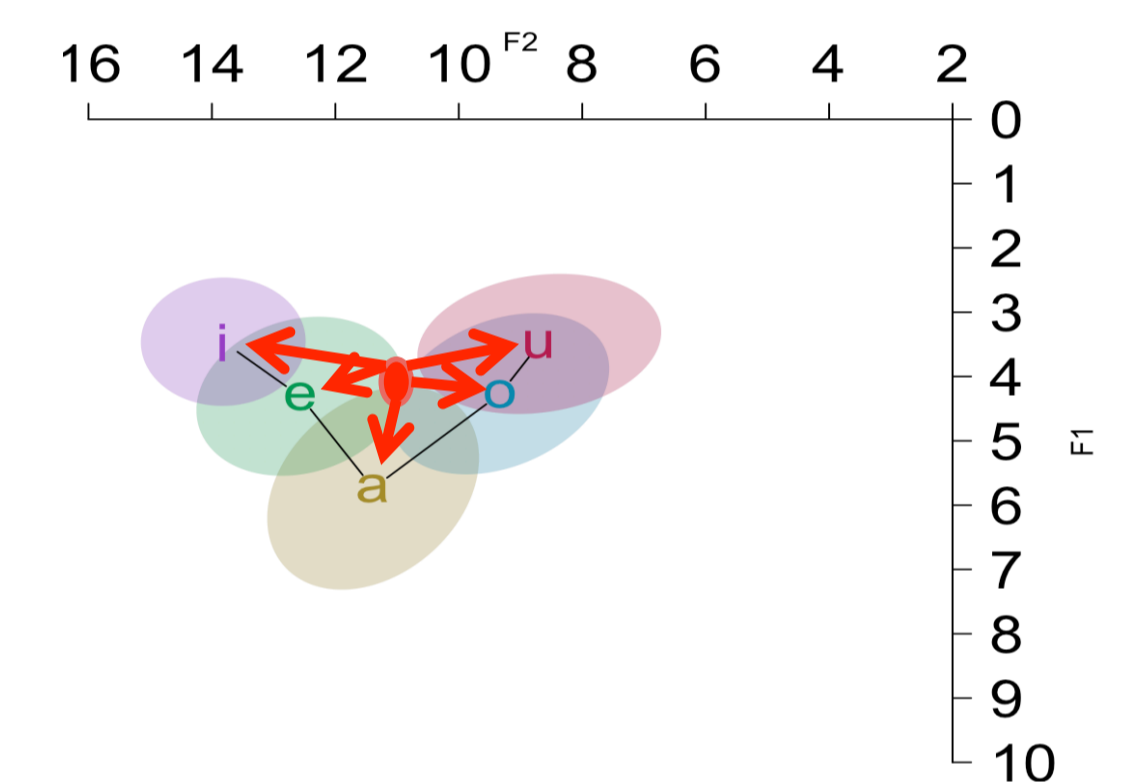
Articulation Rate

- 4,618 Inter-Pausal Units (IPUs)
- Excluded IPUs containing < 3 syll. / hesitations/lengthened words



Vowel space

- Extraction of F1 & F2 at the mid-point of each vowel
- Degree of dispersion: sum of Euclidean distances from the gravity center to each vowel per speaker



Rhythm measures

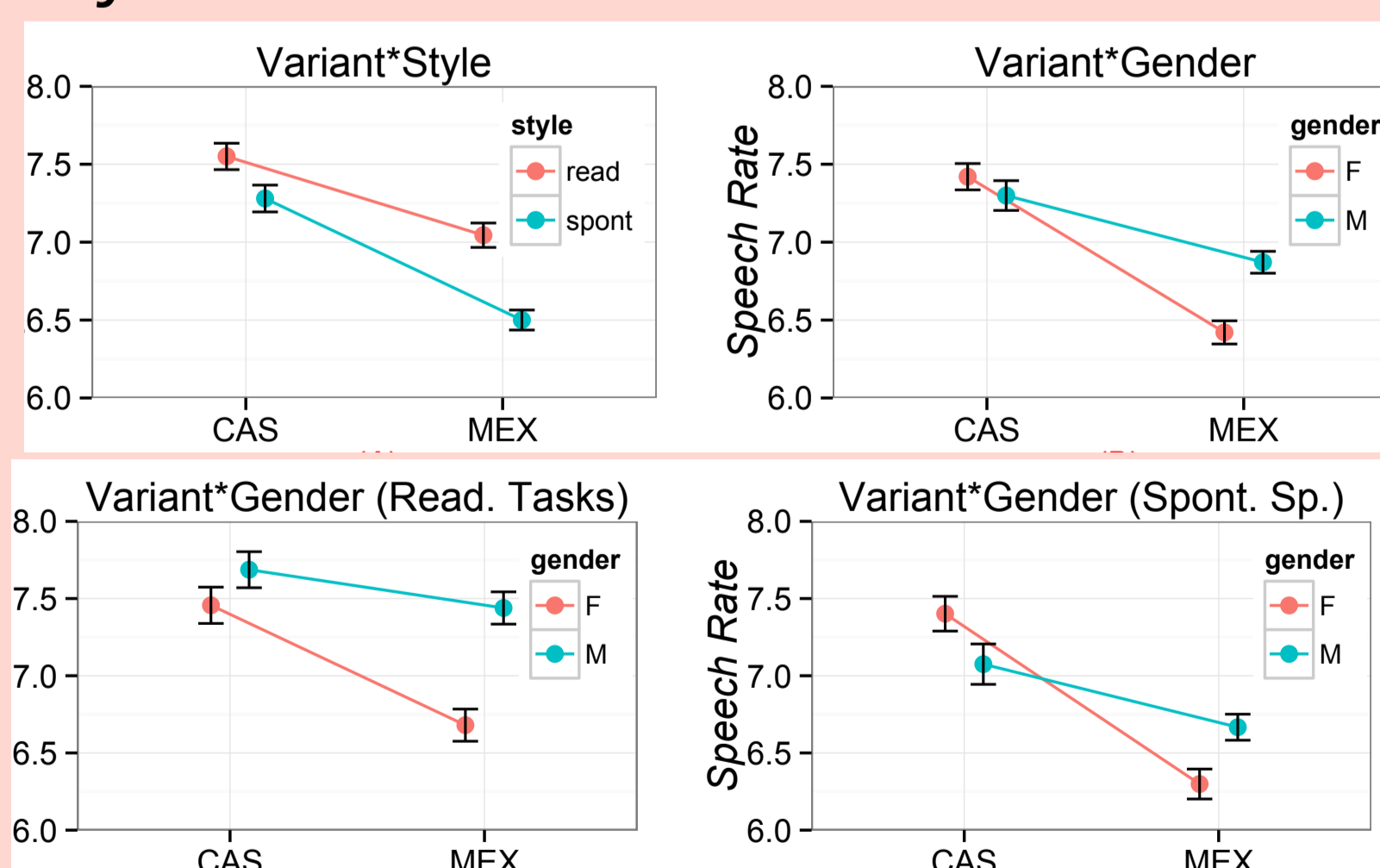
- ΔC , ΔV & PVI (Pairwise Variability Index)

Results, Analysis and Discussion

Articulation Rate

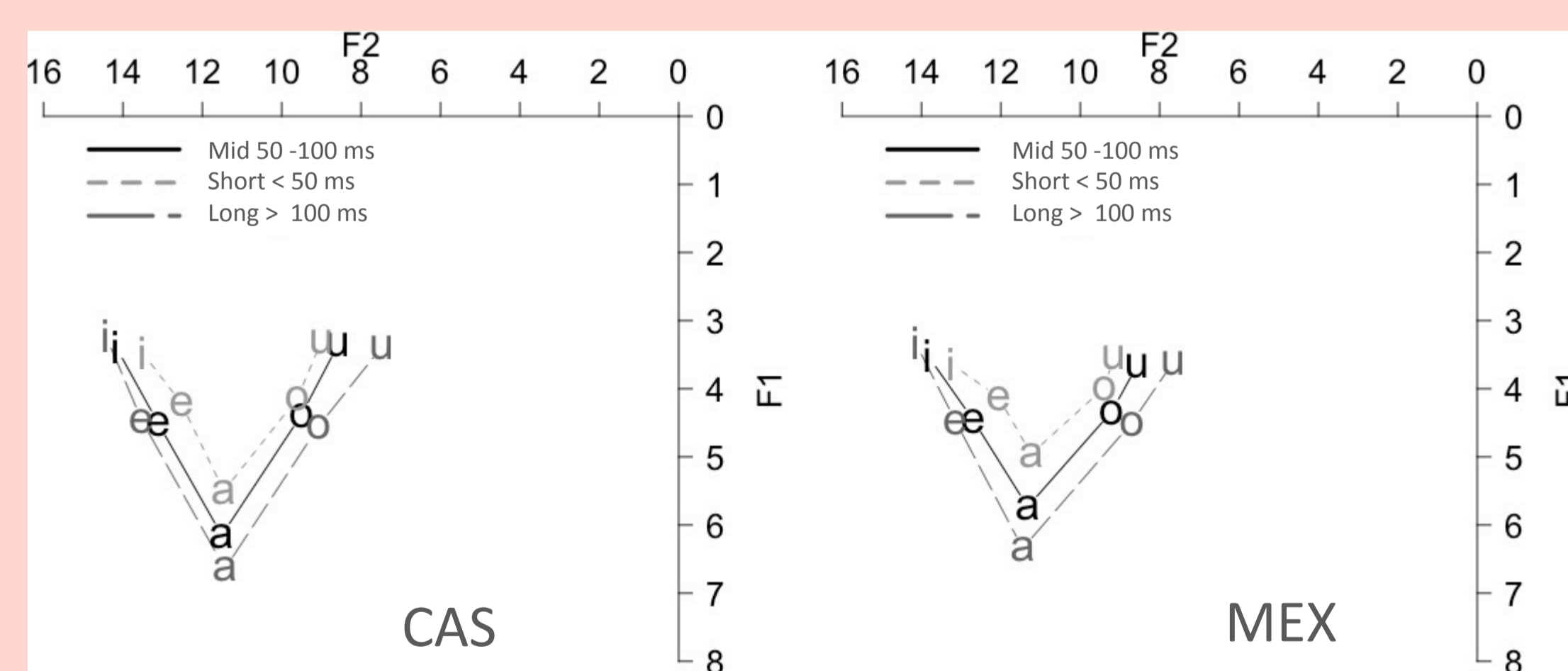
	AR	SD
CAS	7.3	1.41
MEX	6.6	1.37

- CAS speakers produce almost one syllable more than MEX

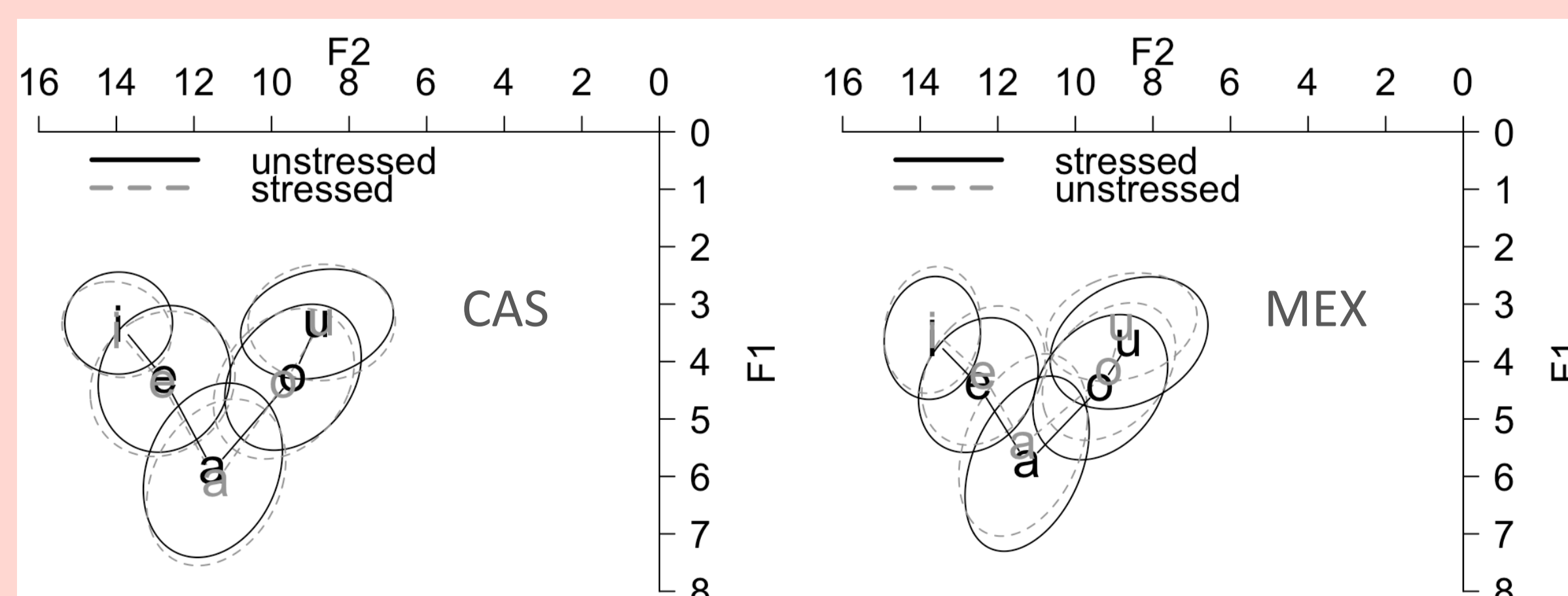


- Speakers articulate faster in reading tasks than in spontaneous speech
- Interaction of task*gender between the two groups

Articulation Rate & Vowel space

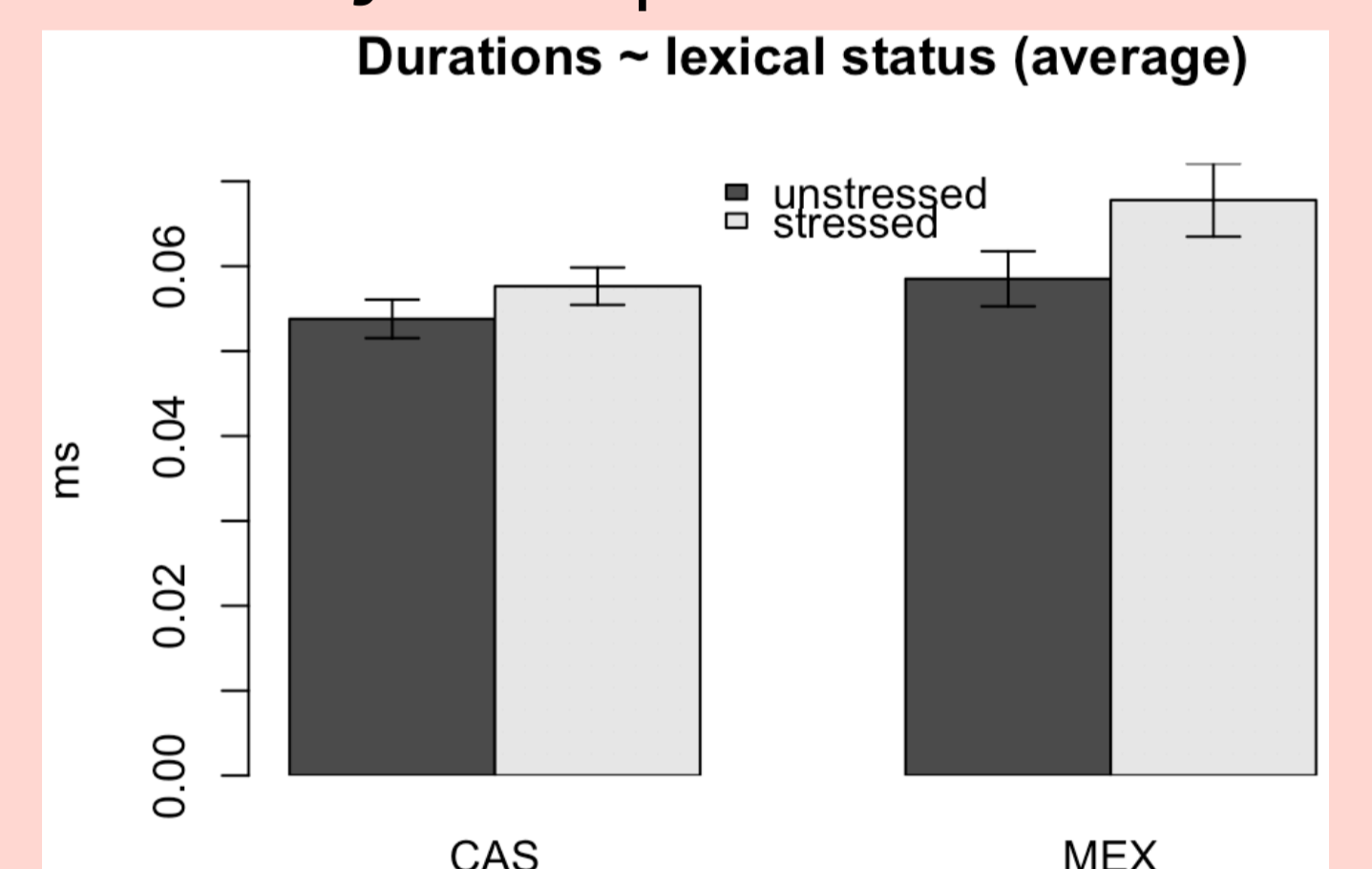


- Faster speech rates → compression of vowel space
- For short vowels, CAS speakers do not compress their vowel space as much as MEX speakers

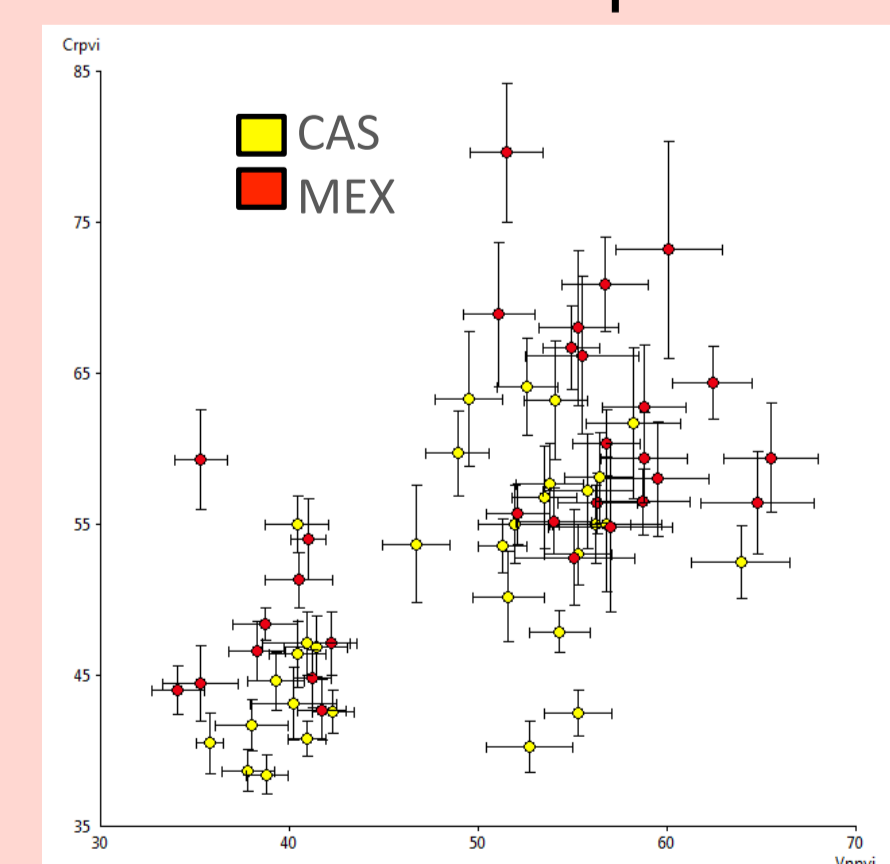


- Vowel space reduction in stressed vs unstressed vowels is greater for MEX than CAS ($p = .078$)

Rhythm patterns



- Durational differences between stressed vs unstressed vowels are greater in MEX (15%) than in CAS (7%) ($p < .003$)



Mexican Spanish seems to be less syllable-timed than Castilian Spanish

CAS articulate faster and centralize less than MEX

References

[1] Jacewicz, E., Fox, R. A., & Wei, L. (2010). Between-speaker and within-speaker variation in speech tempo of American English. *Journal of the Acoustical Society of America*, 128, 839-350. [2] Schwab, S. & Avanzi, M. (2015). Regional variation and articulation rate in French. *Journal of Phonetics*, 48, 96-105. [3] Verhoeven, J., de Pauw, G. & Kloots, H. (2004). Speech rate in a pluricentric language: A comparison between Dutch in Belgium and the Netherlands. *Language & Speech*, 47 (3), 297-308. [4] Quené, H. (2008). Multilevel modeling of between-speaker and within-speaker variation in spontaneous speech tempo. *Journal of the Acoustical Society of America*. 123, 1104- 1113. [5] Tsao, Y.-Ch., Weismer, G., Iqbal, K. (2006). The effect of intertalker speech rate variation on acoustical vowel space. *Journal of the Acoustical Society of America*, 119 (2), 1074-1082