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

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Background

- Speakers do not produce speech with similar temporal patterns \rightarrow Different articulation rates (AR)
- Factors affecting AR:
 - Dialectal variations in English [1], French [2], Dutch ____ [3], etc.

Goals

Compare different temporal patterns of two varieties of Spanish: Castilian Spanish (Madrid) vs Mexican Spanish (Mexico City)

- Speaking style and gender [4]
- Relation between speech rates and vowel space:
 - Faster speak rates \rightarrow shorter durations \rightarrow reduction of vowel space [5]
 - Stressed vs unstressed vowels \rightarrow vowel reduction
- Does AR differ across these two varieties?
- Does AR affect the compression of vowel space similarly?
- Do these varieties display similar rhythmic patterns?

Corpus

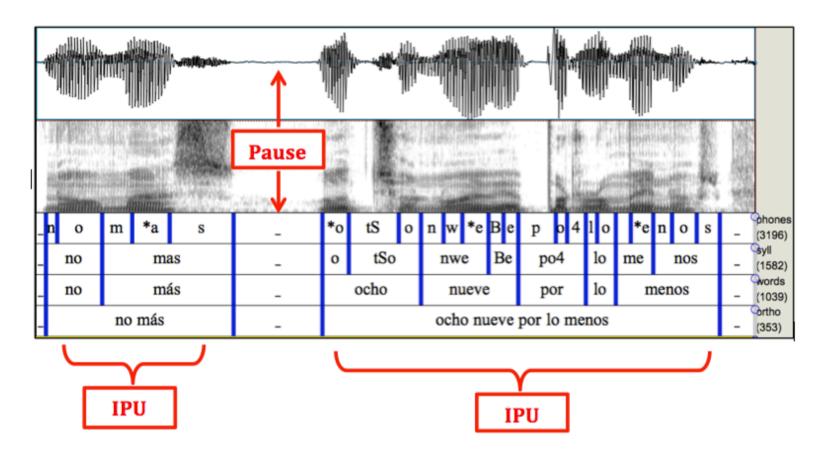
- 22 speakers (university students) 10 from Madrid (CAS) and 12 from Mexico City (MEX)
- ✓ 5.7 hours of speech
- Gender-balanced
- Read (short stories) vs spontaneous \checkmark speech (interview, narration & description of a painting)

Segmentation and Annotations

Methods & Metrics

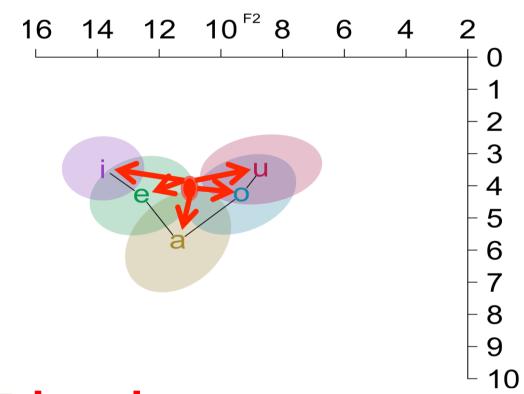
Articulation Rate

- 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



- Phones, syllables and words
- Pauses, disfluences, hesitations, filled pauses, lengthened words

Rhythm measures

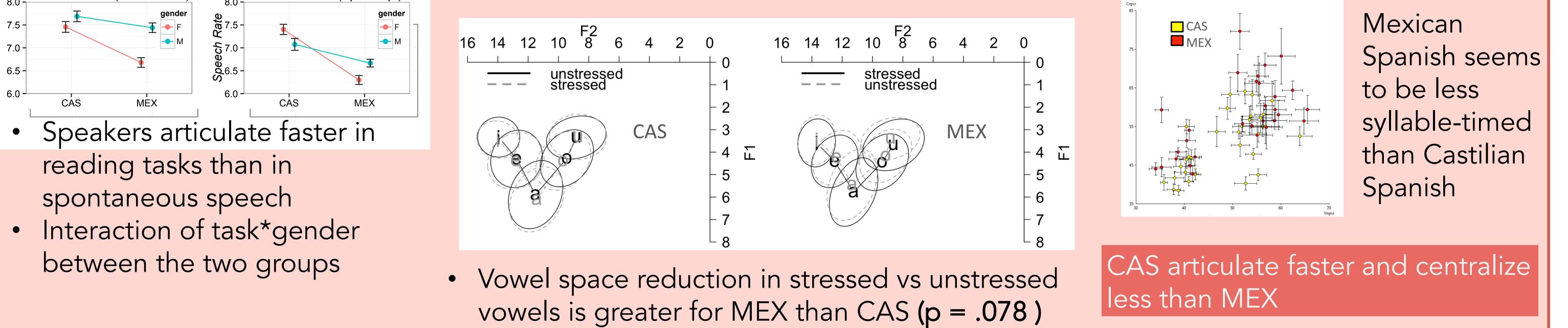
• ΔC , $\Delta V \& PVI$ (Pairwise Variability Index)

Results, Analysis and Discussion Rhythm patterns Articulation Rate & Vowel space **Articulation Rate** 16 14 12 10 F2 16 14 12 10 8 6 4 16 14 12 10 ^{F2} 6 2 0 SD AR 0.06 CAS 7.3 1.41 1.37 MEX 6.6 4 缸 0.02 CAS speakers produce almost one

Variant*Gender (Read. Tasks) Variant*Gender (Spont. Sp.

•

- MEX CAS Faster speech rates \rightarrow compression of vowel space For short vowels, CAS speakers do not compress their vowel space as much as MEX speakers
- Durations ~ lexical status (average)
- Durational differences between stressed vs unstressed vowels
- are greater in MEX (15%) than in CAS (7%) (p< .003)



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 Neetherlands. Language & Speech, 47 (3), 297-308. [4] Quené, H. (2008). Multilevel modeling of between-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