Probabilistic reduction in Spanish-English bilingual speech

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Probabilistic reduction

- The more predictable a unit is, the more reduced (e.g. shorter duration) it is in production [Hall et al., 2018]
- Characterized by frequency, local predictability, and informativity [Cohen Priva, 2015]
- Reflects language-specific experience

Bilingualism

- A bilingual is someone with experience in two (or more) languages
- Probabilistic reduction has not yet been studied in bilingual speech
- Bilinguals' languages are simultaneously active, and **mutual influence** is unavoidable [Kroll et al., 2015]

Research question

Broad

How does probabilistic reduction operate in bilingual speech?

Narrow

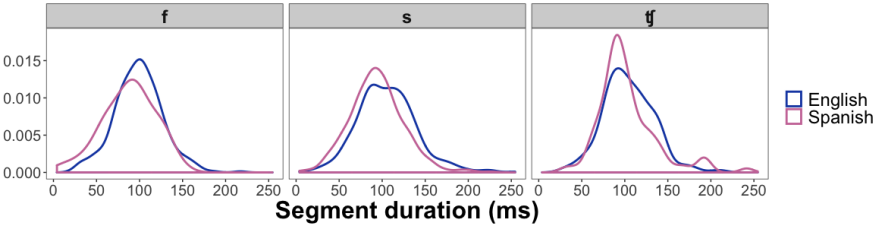
Are consonant reduction patterns in Spanish-English bilingual speech better accounted for by **separate-lexicon** or **pooled-lexicon** probabilistic measures?

Database & target segments

- Bangor Miami corpus of Spanish-English bilingual speech [Deuchar et al., 2014]
- Word-medial, intervocalic [f], [s], and [tʃ]
  - Occur in both languages
  - Identified from orthographic transcriptions, using pronunciation dictionaries
  - Exclusionary criteria & random sample ensuring equal numbers for each language ($n = 7896 \rightarrow n = 2052$)
  - Duration measured by forced alignment with hand-correction

Linear regression analysis

- Comparison of linear mixed effects models *with the same structure* using *lmer* in *R* [Bates et al., 2015]:
  1: **Separate-lexicon model**
  2: **Pooled-lexicon model**
- Dependent variable: Segment duration



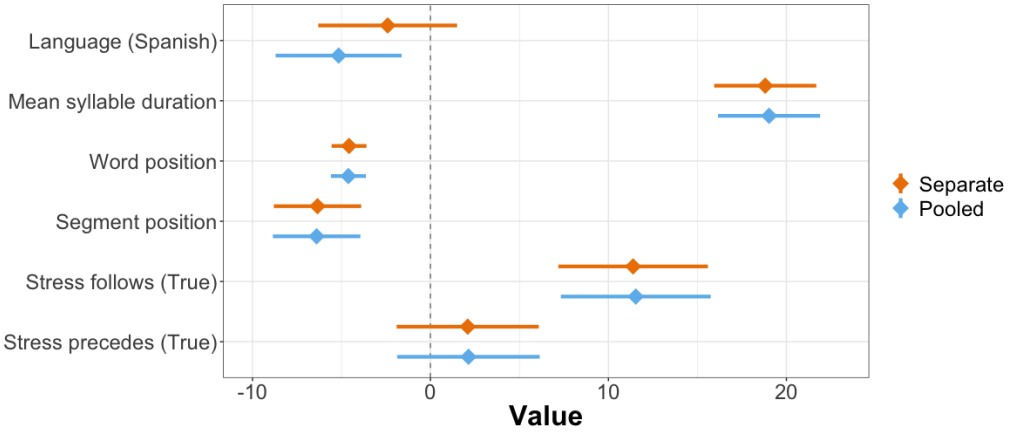
Fixed and random effects

- Control fixed effects (speech rate, stress, etc.)
- Probabilistic fixed effects:
  - Word frequency
  - **Segment frequency**
  - **Segment local predictability**
  - **Segment informativity**
- Random speaker intercepts, by-speaker random slopes for segment frequency, predictability, and informativity

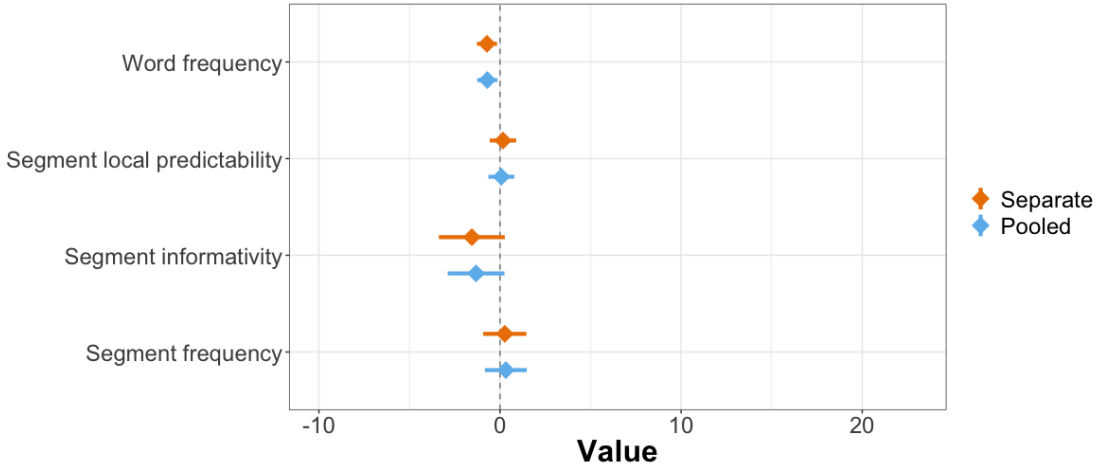
Model comparison results

- Compare AIC values (Akaike's Information Criterion)
  - Lower values $\rightarrow$ better fit
- **Difference in fit is not meaningful** ($\Delta = 2.6$) between *pooled-lexicon* ($AIC = 19509.5$) and *separate-lexicon* ($AIC = 19512.1$)

Control fixed effects pattern as expected



Probabilistic fixed effects have little to no effect



A puzzling null result

- Segmental probabilistic reduction is missing entirely in both models
- Lack of effect for segment frequency and informativity likely due to small number of target segments—*not enough coverage of the distribution*
- Local predictability result suggests fundamental difference in bilingual speech

Take home points

- Findings from monolingual speech do not transparently apply to bilingual speech
- Unclear if/how probabilistic reduction operates in bilingual speech
- I'm currently pursuing this in dissertation research

Thank you!

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Selected references

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