Computing segmental and suprasegmental information in lexical decision

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24th mfm

Today

Lexical decision & stress

Speakers take longer to recognize words if stress coincides with the segmental point of recognition.

- **Hypothesis:** when crucial segmental and suprasegmental information need to be processed at (nearly) at the same time, reaction time slows down

Known segmental effects on lexical access

Cutler et al. 1987, Sommers 1996, Luce and Pisoni 1998, Vitevitch and Luce 1998

- Word frequency

  More frequent words → faster RTs
- Neighbourhood density

  Words with sparse phonological neighbourhoods → faster RTs
  (cf. Vitevitch and Rodríguez 2005 for Spanish)
- Phonotactics

  More frequent patterns → faster RTs

- **Stress...?**

  Word-initial stress → faster RTs (Vitevitch et al. 1997)

Stress & lexical access

Word-initial stress in En → faster RTs (Vitevitch et al. 1997)

- **Confound:** positional bias in English (Cutler and Carter 1987)

∴ The relationship between stress *per se* and RT is unclear

Today

Lexical decision task in **Portuguese**

☞ Unlike English, no bias towards word-initial stress

Portuguese stress

General patterns

In Pt, a heavy (H) σ has a coda or a diphthong:

- **Final** stress if H]$_{PWd}$. Else, **penult** stress (a)
- **Antepenult** stress considered 'irregular/idiosyncratic' (b)

Bias: penult stress (*default*)

(a) *caracól* ('snail'), *caválo* ('horse')
(b) *patético* ('pathetic'), *fantástico* ('fantastic')

Auditory lexical decision task

Methods: stimuli

Trisyllabic words ($n = 360$)

Different syllable shapes and segmental qualities

Real ($n = 180$) and nonce words pseudorandomly presented

- Real word → **Final onset** → Nonce word

∴ **Point of recognition (PoR):** onset of final syllable

E.g. mole**t**om ('sweater') → mole**r**om

- Stimuli: article + noun

Auditory lexical decision task

Methods: stimuli

- Recorded by a phonetically trained Portuguese speaker (f)
- No phonetic manipulation
- Response button only available *after* each stimulus

Stimuli preceded by question:

'Is this a real word in Portuguese?'

Auditory lexical decision task

Methods: participants & variables

Participants ($n = 51$): native Portuguese speakers

Cut-off point: 80% accuracy ($n = 37$)

- Variables examined:

  Stress

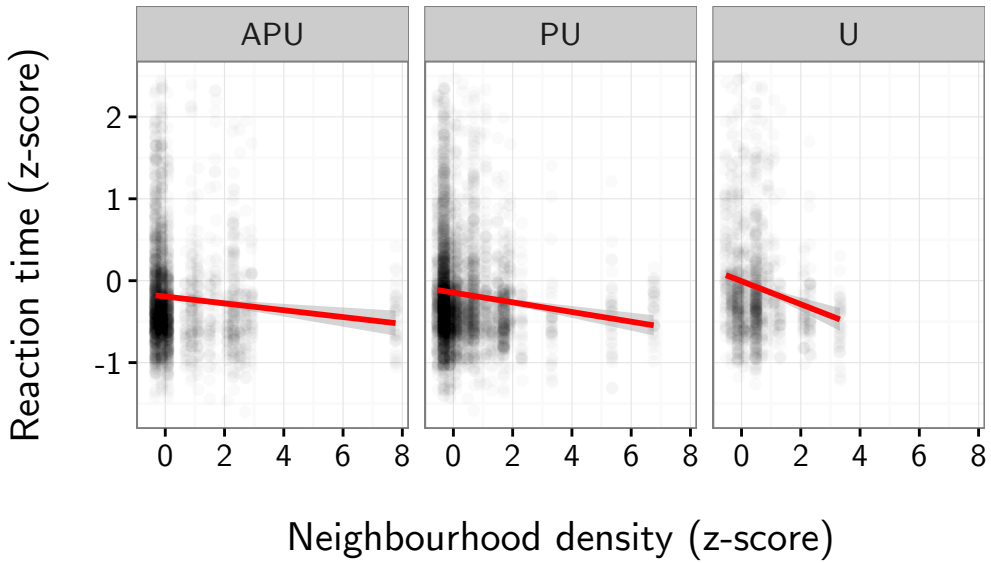
  Bigram probability, neighbourhood density, frequency

- RTs scaled and centred by speaker (z-score)

1. **Hypothesis:** when crucial segmental and suprasegmental information need to be processed at (nearly) at the same time, reaction time slows down
2. Are phonetic cues to stress available early on?

Neighbourhood density

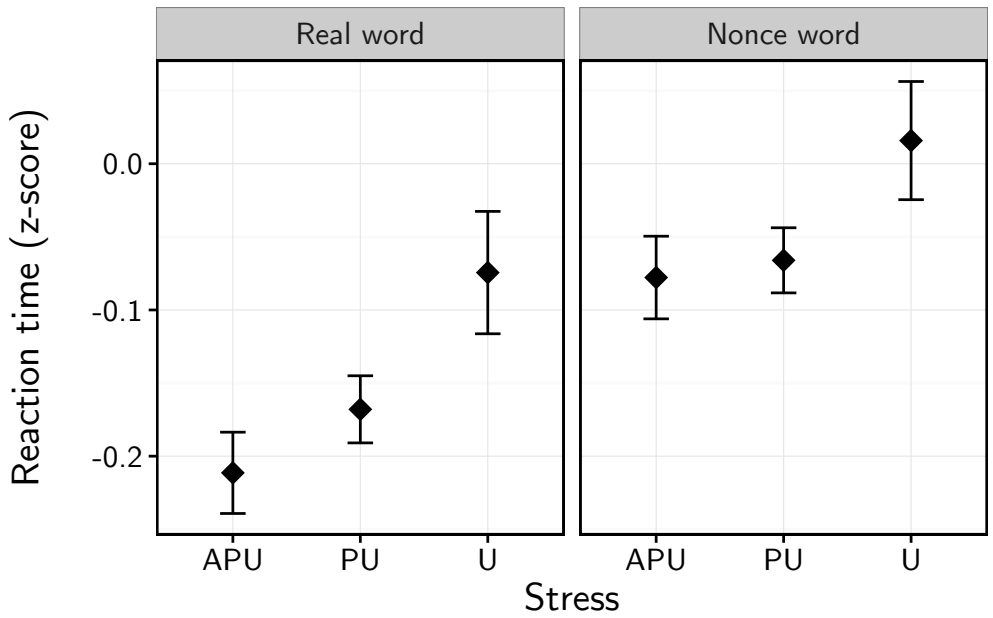
More neighbours = faster RTs



- Unlike English (Sommers 1996)
- But consistent with Spanish (Vitevitch and Rodríguez 2005)

Stress

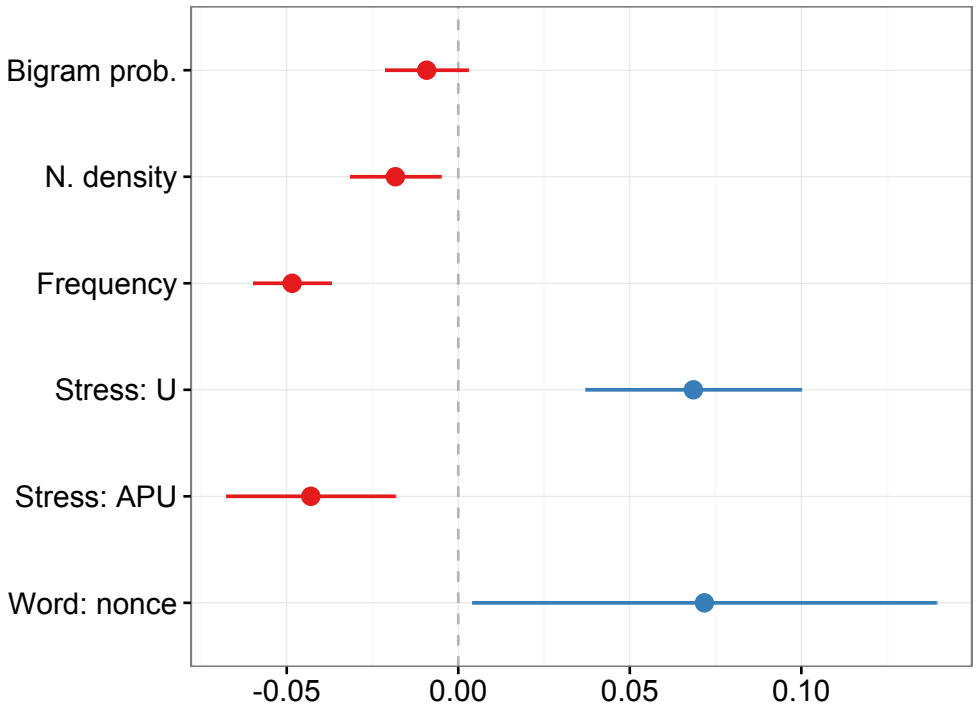
Earlier stress = faster RTs



- Real words = faster RTs, consistent with previous studies

Overview

Multilevel linear regression estimates (fixed effects)



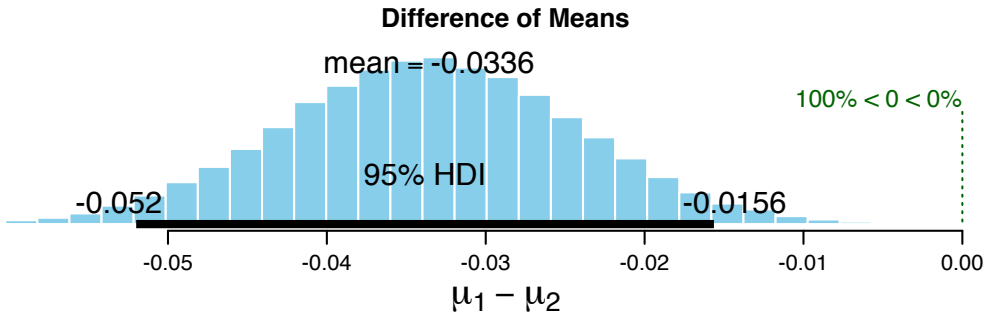
← U slower than PU

← APU faster than PU

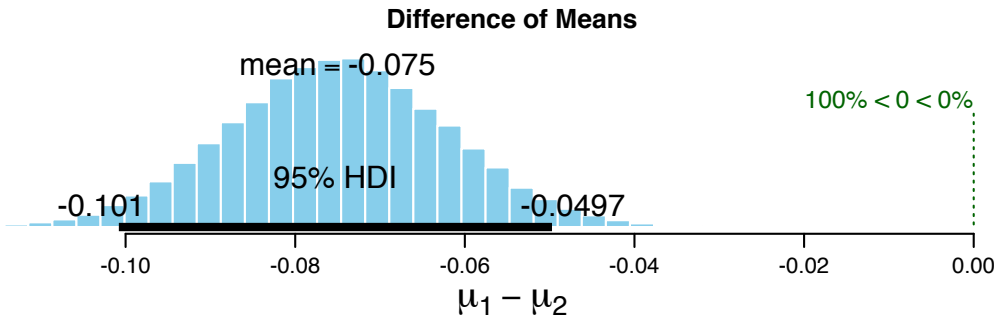
Stress

Bayesian estimation (Kruschke 2013)

APU$_{\mu_1}$ vs. PU$_{\mu_2}$



PU$_{\mu_1}$ vs. U$_{\mu_2}$



Phonetic cues

1. **Hypothesis:** when crucial segmental and suprasegmental information need to be processed at (nearly) at the same time, reaction time slows down

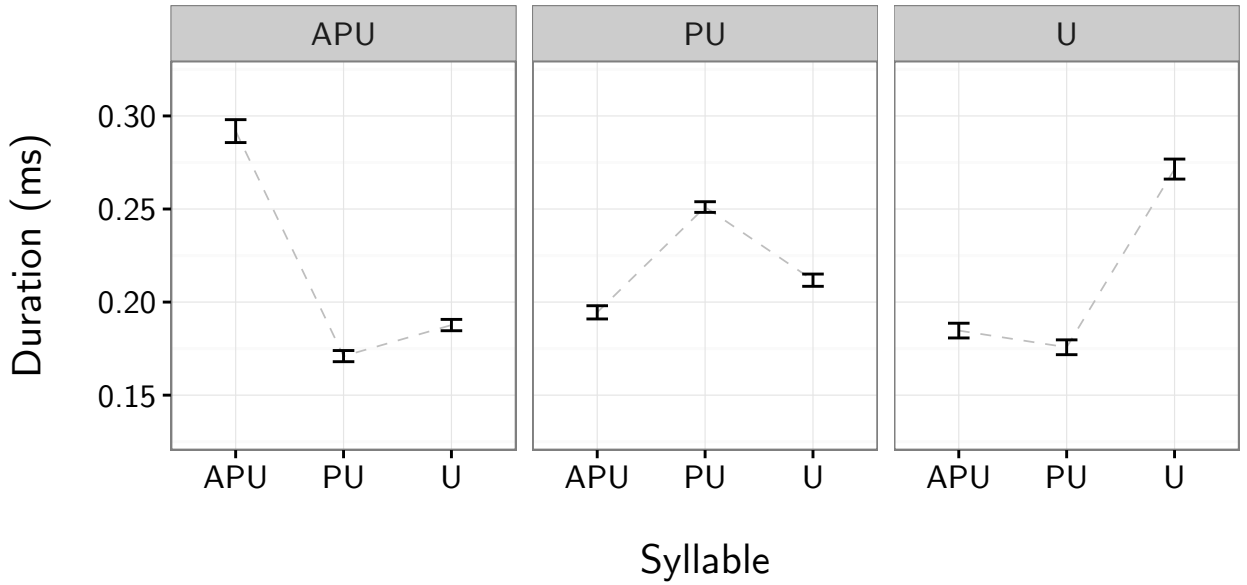
2. Are phonetic cues to stress available early on?
   - Given the relative nature of stress:

   How early can speakers perceive APU stress?

Phonetic cues

Duration

Main phonetic correlate in Pt is duration: (Major 1985)

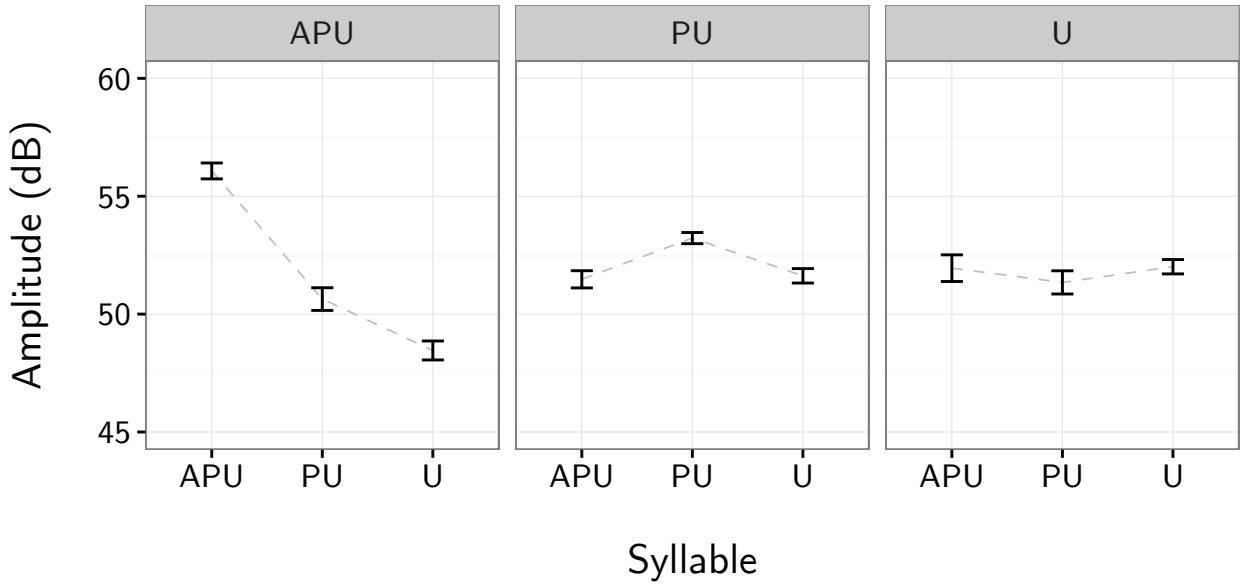


- Overall, stressed syllables are considerably longer

Phonetic cues

Intensity

Besides, note amplitude in APU σs:



$\therefore$ APU stress is phonetically cued **early**

Conclusion

- Results are consistent with the hypothesis:
  U stress 'coincides' with PoR → slower RT
  Stimuli contain sufficiently robust phonetic cues to stress
- Stress plays a clear role in lexical access in these data
- Distance matters: segment vs. syllable?

Next steps

- Prediction: whenever stress is aligned with PoR → slower RTs

  Thus, if PoR is varied *within* each stress pattern:

	APU	PU	U
APU	↗		
PU		↗	
U			↗

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Thank you!

Slides on `guilhermegarcia.github.io`