Variable secondary stress and weight-sensitivity in Portuguese

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Annual Meeting of the Berkeley Linguistics Society (BLS)
University of California, Berkeley, Feb 2020
Secondary stress typically not affected by weight (Gordon 2006)

Finnish:

Primary stress is word initial
Secondary stress affected by weight\(^1\) (Lehiste 1965)

\(^1\)Light syllables skipped if followed by heavy syllable

\(^1\)Also see Pater (2000) for English.
a. ká.las.tè.let ‘you are fishing’
b. ká.las.te.lèm.me ‘we are fishing’ skipping with H
c. fí.lo.sò.fis.sa ‘philosopher-INE’ no skipping with H
d. á.te.ri.à.na ‘meal-ESS’ skipping with L
e. pró.fes.so.rìs.sa ~ pró.fes.sò.ris.sa ‘professor-INE’ variation

Sonority & clash avoidance play a role in variation (Anttila 2010)

Lexical ⇔ post-lexical planes (Dresher and van der Hulst 1998)
Portuguese

Primary stress in non-verbs

Trisyllabic domain: $\sigma\sigma\sigma$

Primary stress affected by weight

(Wetzels 2007; Garcia 2017)

Regular stress:

XXH → XXH́

jornal, papel ‘newspaper’, ‘paper’

XXL → XXL

borboleta, cavalo ‘butterfly’, ‘horse’

Irregular stress

XXL

abacaxí ‘pineapple’

XXH

nível ‘level’

XXX

patético ‘pathetic’
Portuguese
Secondary stress in non-verbs

Secondary stress weight-insensitive
Stress every other pre-tonic syllable R-L

a. internacionál
bòrboléta
pàralèlepípedo

‘international’
‘butterfly’
‘block paving’

(Collischonn 1994, p. 45)
Portuguese
Secondary stress in non-verbs

**Variation:** odd number of pre-tonic syllables

b. cæcofonía ~ cacòfonía
   mèlhoraménto ~ melhòraménto

Either *initial* or *peninitial* secondary stress

Could weight affect variation in secondary stress?
Methods

Auditory judgment task in Praat
Nonce words in Portuguese ($n = 120$)
Native speakers of Brazilian Portuguese ($n = 20$)

![Stimuli Diagram]

**Minimal pairs**: initial vs. peninitial secondary stress

àrgadoríste ~ argàdoríste
mòrilânte ~ morìlânte (control)
Methods

Stimuli

☞ Correlate for stress in Portuguese: duration  
(Major 1985; Moraes 2003)

Secondary stress → harder to capture:  
Acoustic evidence not robust for Spanish  
(Hualde and Nadeau 2014)

▶ Similar situation for Portuguese:  
Some (most?) studies point to duration  
(e.g., Moraes 2003)  
Some to intensity  
(Fernandes-Swartman et al. 2008)
Methods

Duration in stimuli: $4\sigma$ (controls)

**Durational** pattern for secondary stress in stimuli

Recorded by native speaker with phonetic training

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**Initial**

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**Peninitial**
Methods

Duration in stimuli: $5\sigma$

- **Durational** pattern for secondary stress in stimuli
  - Recorded by native speaker with phonetic training

![Graphs showing duration patterns](image)
Main results

Initial stress overall favored over peninal initial stress
4- and 5-syllable words: expected difference

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Main results
Hierarchical logistic regression (50% and 95% CIs)

\[ \text{initial } \sim \text{ weight } + (1 + \text{weight } | \text{ID}) \]

\[ \begin{align*}
\text{LL} & \sim -1.5 \\
\text{LH} & \sim -0.5 \\
\text{HL} & \sim 0.5 \\
\text{LL}^* & \sim 1.5
\end{align*} \]

Posterior distribution (\( \hat{\beta} \))

- Positive \( \hat{\beta} \rightarrow \text{initial} \) secondary stress

Results interpreted relative to intercept (\( LL^* \))
Reaction time

Trends

Overall: faster RTs when choosing **initial secondary stress**

**but** even faster for 4-syl words

Speakers also more certain when choosing initial stress
Coda sonority

Trends

- Initial stress preferred when coda contains liquid or nasal
- No clear trend in control items (4-syllable words)

![Graph showing initial stress preference across different sonorities and syllable counts.](image-url)
Summary and discussion

▶ Overall: bias towards initial secondary stress
    **Stronger** bias for $4\sigma$ words (clash avoidance)

▶ Location of $H\sigma$ seems to affect speakers’ judgements:
  \[ \text{\`LLL\`HL} \succ \text{\`LHL\`HL} \]

 hü Lexical $\Leftrightarrow$ post-lexical planes

Why \text{\`LLL\`HL} $\succ$ \text{\`LLL\`HL}?
Summary and discussion

50% ambiguity:
Speakers consistently find both options **good**
Speakers consistently find both options **not so good**

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**Hypothesis**: presence of 2 Hσ seen as less natural

Confound in stimuli given lexical distribution of weight
Summary and discussion

\( \approx 90\% \text{ of all words in Portuguese have } 0/1 \ H\sigma \)  

Same distribution when we control for frequency:

\( (Garcia \ 2014) \)

\( (Tang \ 2012) \)

(Whether or not we examine 4-5\( \sigma \) words vs. all words)
Summary and discussion

*Could duration in the stimuli explain speakers’ preferences?*

A Initial:Peninitial ratio in \(i^{th}\) item with *initial* stress

B Initial:Peninitial ratio in \(i^{th}\) item with *peninitial* stress

Overall ratio A:B shows longer duration for initial \(\sigma\)

**Main results (again)**

**Ratios**
Final remarks and future directions

Next steps:

A. Do we observe the same patterns with LÍLₜ stimuli?
B. Can durational ratios alone explain ÐLLHĽ > ÑLLHĽ?
C. Does production mirror judgements?
Thank you!

This research is funded by Ball State University [19-0214]


Durational differences
Initial vs. peninitial

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