Binary rhythm and syllable weight in Portuguese

Guilherme D. Garcia
BALL STATE UNIVERSITY

guilhermegarcia.github.io

95th LSA Meeting
Jan 2021
Secondary stress typically **not** affected by weight \[^{1}\]

(Fordon 2006)

---

**Finnish:**

Primary stress is word initial

Secondary stress affected by weight \[^{1}\]

▷ Light syllables skipped if followed by heavy syllable

\[^{1}\] Also see Pater (2000) for English.
Finnish

a. kä.las.tè.let ‘you are fishing’
b. kä.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.ris.sa ∼ pró.fes.sò.ris.sa ‘professor-INE’ variation

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

[acon] 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 $\rightarrow$ XXH$'$  
$jornal, papel$ ‘newspaper’, ‘paper’

XXL $\rightarrow$ XXL$'$  
$borboleta, cavalo$ ‘butterfly’, ‘horse’

Irregular stress

XXL  
$abacaxí$ ‘pineapple’

XXH  
$nível$ ‘level’

XXX  
$patético$ ‘pathetic’
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. căcofoníα ~ cacòfoníα
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 \((n = 20)\)

Minimal pairs: initial vs. peninitial secondary stress

àrgadoríste ~ argàdoríste
mòrilánte ~ morilánte (control)
Methods

Stimuli

Correlate for stress in Portuguese: duration

(Major 1985; Moraes 2003)

Secondary stress → harder to capture:
Some (most?) studies point to duration
Some to intensity

Similar situation for Spanish

(e.g., Moraes 2003)

(Fernandes-Svartman et al. 2008)

(Hualde and Nadeau 2014)
**Methods**

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

**Durational** pattern for secondary stress in stimuli

Recorded by native speaker with phonetic training

**Initial**

Peninitial

---

Garcia

Binary rhythm and syllable weight in Portuguese
Methods

Duration in stimuli: $5\sigma$

Durational pattern for secondary stress in stimuli

Recorded by native speaker with phonetic training

![Graphs showing durational patterns for initial and peninitinal syllables.](image-url)
Main results

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

```
Syllables: 4 (controls) Syllables: 5
HLHL LHHL LLHL HLLHL LHLHL LLLHL
```

Initial stress preference

```
LLL ≠ HLL ≠ LHL
```

Binary rhythm and syllable weight in Portuguese
Main results
Hierarchical logistic regression (50% and 95% CIs)

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

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

\[ \text{Results interpreted relative to intercept (LL*)} \]
Reaction time

Trends

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

- 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)
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:
  \( \text{`LLLHL} \succ \text{`HLLHL} \)

- Lexical $\Leftrightarrow$ post-lexical planes

Why `LLLHL $\succ$ `HLLHL?
Summary and discussion

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

**Hypothesis**: presence of 2 H σ seen as less natural

Confound in stimuli given lexical distribution of weight
Summary and discussion

$\approx 90\%$ of all words in Portuguese have 0/1 Hσ

Same distribution when we control for frequency:

(Whether or not we examine 4-5σ words vs. all words)
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)

<table>
<thead>
<tr>
<th>Initial stress preference</th>
<th>HLLHL</th>
<th>LHLHL</th>
<th>LLLHL</th>
</tr>
</thead>
<tbody>
<tr>
<td>0%</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>25%</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>50%</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>75%</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>100%</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Ratios

<table>
<thead>
<tr>
<th>Initial:Peninitial</th>
<th>HLLHL</th>
<th>LHLHL</th>
<th>LLLHL</th>
</tr>
</thead>
<tbody>
<tr>
<td>1.5</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>1.6</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>1.7</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>1.8</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>1.9</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>2.0</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
Final remarks and future directions

Next steps:
A. Do we observe the same patterns with LLLL[ω stimuli?
B. Can durational ratios alone explain ÐLLLHL > ËLLHL?
C. Does production mirror judgements?
References


Thank you!

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

Initial vs. peninitial

Initial

Peninitial