

# On the relation between intonational phrasing and pitch accent distribution Evidence from European Portuguese varieties

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## General background

Marking of **intonational boundaries** has been associated with **different grammatical aspects**:

- **branchingness of a syntactic phrase** (Selkirk 1984, Nespor & Vogel 1986/2007, Hayes & Lahiri 1991, Truckenbrodt 1999);
- effects of **focus** – in Bengali (Hayes & Lahiri 1991) and Chichewa (Truckenbrodt 1999), the focalized constituent is followed by a prosodic boundary; in Japanese (Beckman & Pierrehumbert 1986) and in dialects of Korean (Jun 1993), focus triggers the placement of a prosodic boundary immediately before the focalized element;
- **prosodic weight** in terms of length or size of prosodic phrases (Hellmuth 2004 for Cairene Arabic; Jun 2003 for Korean; Frota 2000 for Standard European Portuguese (SEP); Elordieta et al. 2003, 2005 for Catalan, SEP and Spanish; Prieto 2005 for Catalan; Sandalo & Truckenbrodt 2002 for Brazilian Portuguese);

**Pitch accent distribution** and **its relation with phrasing** have been **inspected** (Vigário & Frota 2003, Frota et al. 2007, Frota & Vigário 2007 for Northern European Portuguese (NEP) and SEP; Hellmuth 2004, 2007 for Egyptian Arabic) and **two different views** were proposed:

- **correlation** between prosodic factors – fewer phrases, fewer accents (Vigário & Frota 2003, Frota & Vigário 2007);
- **no correlation** between prosodic factors – phrasing and domain for pitch accent distribution are orthogonal dimensions of a prosodic system (Hellmuth 2004, 2007).

## Intonational phrasing and pitch accent (PA) distribution in European Portuguese (EP): SEP and NEP varieties

In previous work (D'Imperio et al. 2005), **intonational phrasing** was compared across Romance languages (EP, Spanish, Catalan, Italian) on the basis of a common corpus adapted for each language – the *Romance Languages Database* (RLD) –, which comprises Subject-Verb-Object (SVO) sentences with varying length in no. of syllables (short and long constituents) and syntactic complexity (presence/absence of branching in S and O).

SEP	NEP
(Vigário & Frota 2003, Frota & Vigário 2007)	
- (SVO) prevails (98%)	- (S)(VO) prevails, even in non-branching cases (53%). It is favoured by:
- (S)(VO) triggered by prosodic length in no. of syllables: becomes relevant (40%) in branching long S; is dominant in double branching long S (94%)	1. length: non-branching long S (vs. non-branching short S)
- length or branchingness of O: not relevant	2. branchingness: branching short S (vs. non-branching long S) ≠ SEP
	3. O length: branching long O (vs. branching short O) ≠ SEP

**Pitch accent distribution** (Vigário & Frota 2003):

SEP	NEP
- only 17-27% of IP-internal stressed syllables are pitch accented – <b>sparse</b> pitch accent distribution.	- 74% of IP-internal stressed syllables are pitch accented – <b>dense</b> pitch accent distribution.

The authors suggest a possible **correlation between intonational phrasing and PA distribution**, as the predominance of (SVO) in SEP seems to be linked to the sparse PA distribution (**fewer phrases >> fewer accents**), contrasting with a higher tonal density in NEP, where (S)(VO) phrasing choices are favoured (**more phrases >> more accents**).

However, data from **Cairene Arabic** (Hellmuth 2004, 2007) show that this hypothetical **correlation is not a general intonational property**: predominance of (SVO) phrasing pattern, as in SEP, but **dense PA distribution**, as in NEP.

**Main Goals:** (i) to explore the relation between intonational phrasing and PA distribution in 2 other EP varieties; (ii) to investigate whether the suggested correlation between intonational phrasing and pitch accent distribution for SEP and NEP extends to other varieties; (iii) to contribute to the characterization of the relevant dimensions of variation in the intonational system, both within and across languages.

## Methodology

### Sample

- Two centre-southern varieties (Alentejo – Ale – and Algarve – Alg), included in the *Interactive Atlas of the Prosody of Portuguese* (Frota & Cruz, coord., 2012-2014 - <http://www.fl.ul.pt/laboratoriofonetica/InABaP/>, Project funded by FCT - PTDC/CLE-LIN/119787/2010.)
- Two female speakers per variety, 20-45 years-old, high-school or university level of education

### Procedure

- reading task (76 sentences), produced twice by each speaker (76x2x4), in loco (total of 608 sentences)
- for each sentence, 3 tiers of analysis were created in *Praat 5.2.2* (Boersma & Weenink 2007): (i) tonal tier for intonational analysis (following the AM approach); (ii) orthographic tier; (iii) phrasing tier, where break indices are annotated reflecting the prosodic structure relevant to intonation
- intonational phrase boundaries were determined according to both perception and acoustic-based measures (presence of a high boundary tone, continuation rise/sustained pitch, pre-boundary lengthening, presence of a pause, pitch reset, realization of the post-stressed syllable).

**Corpus** (RLD database – D'Imperio et al. 2005, Elordieta et al. 2005):

- 76 SVO sentences including constituents with varying length (short = 3, 5 syllables; long = 5 to 15 syllables) and syntactic complexity (non-branching, branching and double branching). The combination of these factors yields 6 conditions, illustrated below:

### Short non-branching phrases (3 syllables)

*A loura<sub>NP</sub> mirava morenos.*  
(The blond girl looked at dark-haired boys.)

### Long non-branching phrases (5 syllables)

*A boliviana<sub>NP</sub> falava do namorado.*  
(The Bolivian girl talked about her boyfriend.)

### Short branching phrases (5 syllables)

*A nora loura<sub>NP+AdjP</sub> falava do namorado.*  
(The blond daughter-in-law talked about her boyfriend.)

### Long branching phrases (10 syllables)

*O boliviano mulherengo<sub>NP+AdjP</sub> memorizava uma melodia.*  
(The Bolivian ladies' man memorized a melody.)

### Short double branching phrases (9/10 syllables)

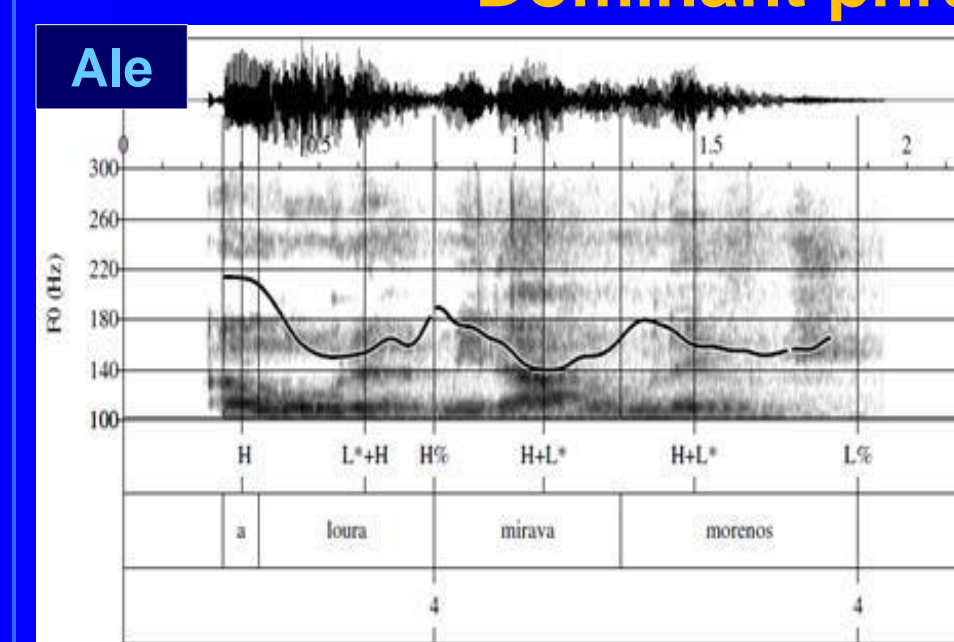
*A nora morena da velha<sub>NP+AdjP+PP</sub> maravilhava meninos.*  
(The old lady's dark-haired daughter-in-law marveled boys.)

### Long double branching phrases (15 syllables)

*O namorado megalómano da brasileira<sub>NP+AdjP+PP</sub> mirava morenas.*  
(The Brazilian's girl megalomaniac boyfriend looked at the dark-haired women.)

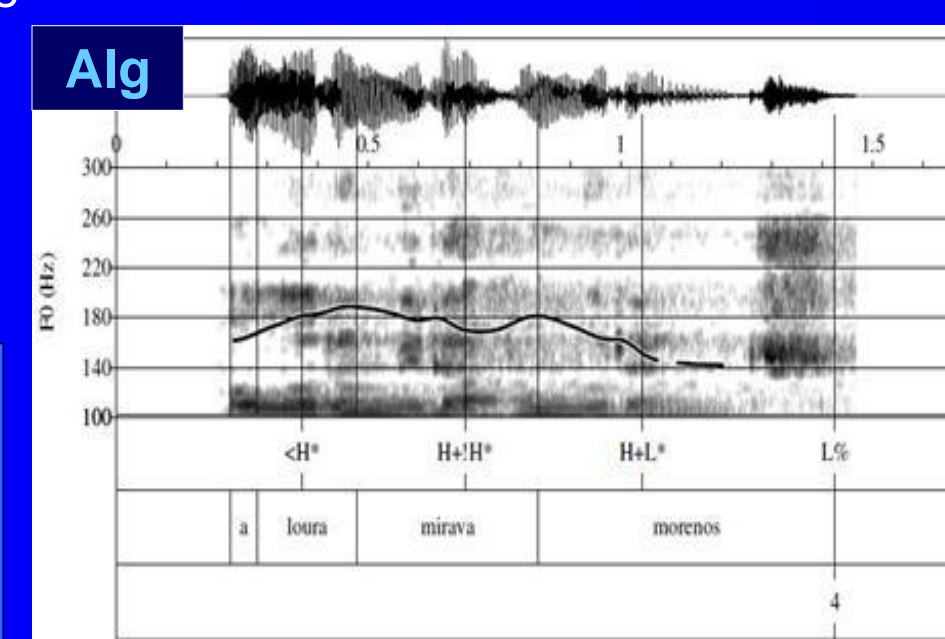
## Results

### Dominant phrasing pattern



**Ale = NEP**  
- (S)(VO) prevails (66%), even in non-branching cases (51%).

Figure 1 - Dominant phrasing pattern in Ale: (S)(VO). Short non-branching S. 'A loura mirava morenos.' (The blond girl looked at dark-haired boys.)



**Alg = SEP**  
- (SVO) prevails. Phrasing pattern in non-branching cases (85%).

Figure 2 - Dominant phrasing pattern in Alg: (SVO). Short non-branching S. 'A loura mirava morenos.' (The blond girl looked at dark-haired boys.)

### (S)(VO) phrasing: the effect of syntactic complexity

Both in Ale and in Alg, sentences with **branching short S** are more frequently phrased as (S)(VO) than sentences with **non-branching long S**.

	Ale	Alg
Long non-branching S	63%	25%
Short branching S	94%	72%

Table 1 - Role of syntactic branching in the (S)(VO) phrasing pattern – Ale and Alg.

Both in Ale and in Alg, **syntactic branching constrains** intonational phrasing (≈ NEP, but ≠ SEP).

	NEP	SEP
Long non-branching S	56%	4%
Short branching S	69%	4%

Table 2 - Role of syntactic branching in the (S)(VO) phrasing pattern – NEP and SEP (Frota & Vigário 2007).

However, branchingness seems to play a **stronger role in Alg** than in Ale: in Alg, non-branching S are phrased together with V and O (SVO), while in Ale **non-branching S already form an IP** apart from VO (Figure 2 vs. Figure 3).

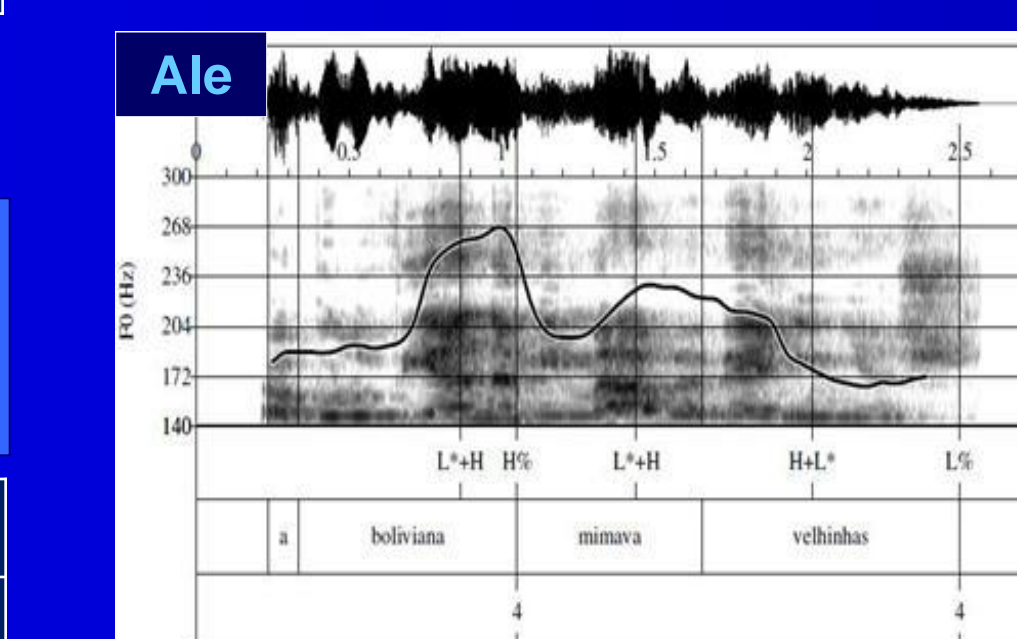


Figure 3 - (S)(VO) in sentences with long non-branching S. 'A boliviana mimava velhinhas.' (The Bolivian girl spoiled old ladies.)

### (S)(VO) phrasing: the effect of length

**Ale**  
- length in no. of syllables also **triggers the (S)(VO) phrasing pattern** (≈ SEP).

	Ale	Alg
Short non-branching S	38%	6%
Long non-branching S	63%	25%
Short branching S	94%	72%
Long branching S	95%	89%

Table 3 - Role of length (in number of syllables) in the (S)(VO) phrasing pattern – Ale and Alg.

**Alg**  
- length plays a **reduced role**: (S)(VO) becomes the dominant pattern only in branching conditions.

### PA distribution: is there a correlation with phrasing?

Previous studies (Cruz & Frota 2010, Cruz & Frota 2011, Cruz in progress) show that both Ale and Alg are characterized by a **dense PA distribution** (≈ NEP, but ≠ SEP).

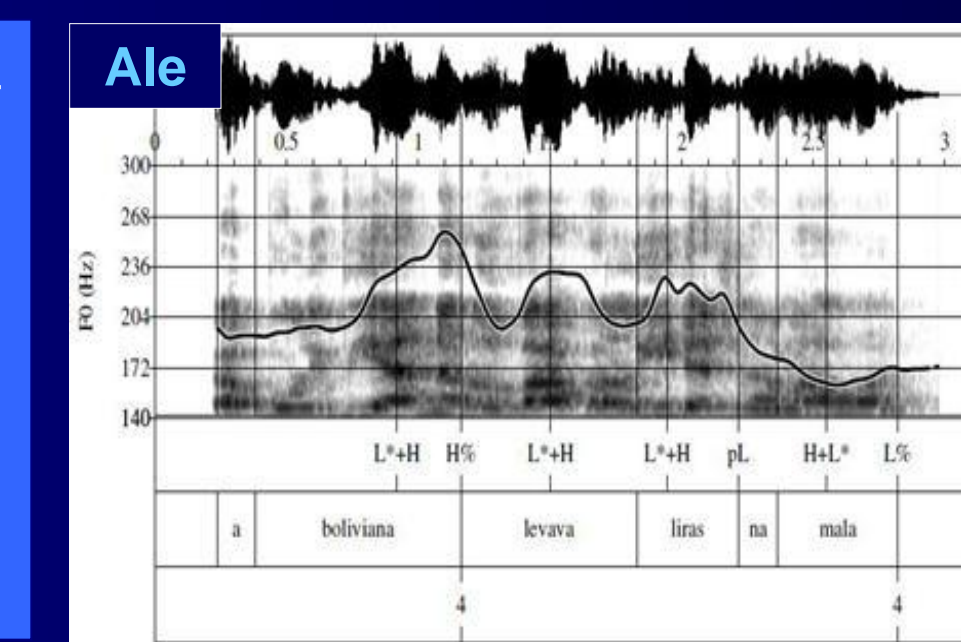


Figure 4 - Dense pitch accent distribution and (S)(VO) phrasing. Long non-branching S. 'A boliviana levava liras na mala.' (The Bolivian girl took liras in her purse.)

Varieties	Phrasing	PA
NEP	(S)(VO)	74%
SEP	(SVO)	17-27%

Table 4 - Intonational phrasing and tonal density in NEP and SEP (Vigário & Frota 2003, Frota & Vigário 2007).

The analysis of PA distribution and its relation with prosodic phrasing reveals that **the two prosodic factors** seem to be **correlated in Ale** (≈ NEP and SEP), but **not in Alg**.

Varieties	Phrasing	PA
Ale	(S)(VO)	100%
Alg	(SVO)	87%

Table 5 - Intonational phrasing and tonal density in Ale and Alg (Cruz & Frota 2010, Cruz & Frota 2011, Cruz in progress).

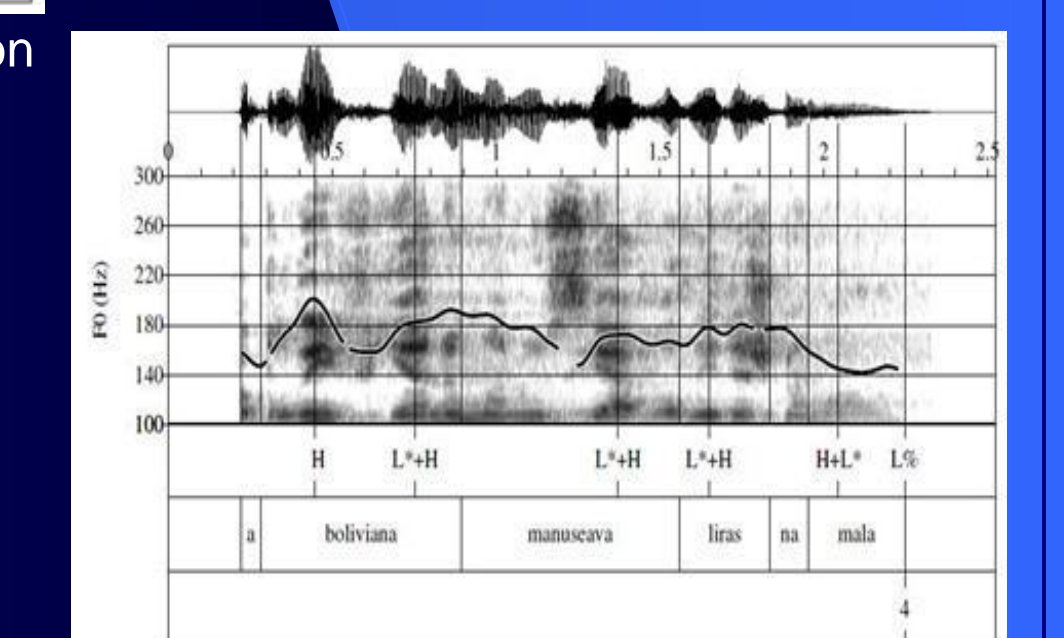


Figure 5 - Dense pitch accent distribution, but (SVO) phrasing. Long non-branching S. 'A boliviana manuseava liras na mala.' (The Bolivian girl handled liras in her purse.)

## Main conclusions

- Two regions of the **same variety** (Interior Center and South) may display **≠ prosodic properties**: preference for the (S)(VO) pattern in Ale (as in NEP), contrasting with the predominance of the (SVO) pattern in Alg (as in SEP) >> **need of mapping within-language prosodic variation**.
- **Syntactic branching and length** trigger the (S)(VO) phrasing pattern in Ale; in Alg, syntactic branching is the relevant factor.
- The interdependence between phrasing and PA distribution that holds in SEP, NEP and Ale was not found in Alg (as in Cairene Arabic).
- In sum, both dimensions are (i) **relevant for the characterization of the intonational system** and (ii) **may vary independently** across languages and **across language varieties**.

## Selected references

- Cruz, Marisa & Sónia Frota (2010) Sentence Types across Varieties of European Portuguese: Production and Perception. Poster presented at *TIE4 – The Fourth European Conference on Tone and Intonation*, Stockholm University, September 9-11, Sweden.
- Frota, Sónia & Marina Vigário (2007) Intonational phrasing in two varieties of European Portuguese. In T. Riad & C. Gussenhoven (eds.) *Tones and Tunes*, Vol. 1. Berlin: Mouton de Gruyter, pp. 263-289.
- Frota, Sónia, Mariapaola D'Imperio, Gorka Elordieta, Pilar Prieto & Marina Vigário (2007) The phonetics and phonology of intonational phrasing in Romance. In Pilar Prieto, Joan Mascaró & Maria-Josep Solé (eds.) *Prosodic and Segmental Issues in (Romance) Phonology*. Amsterdam/Philadelphia: John Benjamins, pp. 131-153.
- Hellmuth, Sam (2004) Prosodic weight and phonological phrasing in Cairene Arabic. *Proceedings of the 40th Meeting of the Chicago Linguistics Society: The Main Session*, pp. 97-111.
- Hellmuth, Sam (2007) The relationship between prosodic structure and pitch accent distribution: evidence from Egyptian Arabic. *The Linguistic Review* 24, 2, pp. 289-314.
- Vigário, Marina & Sónia Frota (2003) The intonation of Standard and Northern European Portuguese: a comparative intonational phonology approach. *Journal of Portuguese Linguistics* 2-2 (Special issue on Portuguese Phonology edited by L. Wetzel), pp. 115-137.