The phonological status of initial peaks in European Portuguese[*]

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Abstract

This paper investigates the phonology of initial peaks in European Portuguese intonation. Evidence is presented for two types of peaks: an accentual peak, that is consistently aligned relative to the first stressed syllable; and a phrasal peak, that is aligned relative to the left-edge of the intonational phrase and within the limits of the first prosodic word. The former is best represented as an H* accent, whereas the latter is a phrasal H tone with a peripheral association to the left-edge of the I-phrase and a secondary association with the first ω. This secondary attachment precludes the phrasal H and a pitch accent from co-occurring at the left periphery of the contour. By offering a new account of initial peaks, the present study contributes to a better understanding of the options available at the left periphery of the Portuguese intonational system.

Key words: peaks, pitch accent, phrasal tone, alignment, association.

1. Introduction

The description and analysis of initial peaks in the intonation of European Portuguese (hereafter EP) has been a topic of debate for a decade. Even researchers that follow the basic autosegmental metrical approach to intonation do not agree on the phonological status of the first peak of the intonation contour. The main difficulty resides on the interpretation of the facts, as it is well-known, at least since Frota (1991), that the endpoint of the initial rise shows variability. It may align with the first stressed syllable of the intonational phrase, with a following poststressed syllable, or even with a preceding prestressed syllable. These facts have nourished various analyses of the initial peak — from an edge or phrasal tonal event to a pitch accent — but none of them has so far been supported by convincing evidence.

This paper addresses the initial peaks' issue by means of an experiment designed to tackle the problem, so that a better understanding of the left periphery of the

intonation contour can be achieved. After discussing previous analyses of initial peaks in EP (Section 2), the methods of the experiment carried out for the present study are presented (Section 3). Section 4 describes the results obtained, with emphasis on the phonological factors that may promote peak alignment variability. In section 5, the competing phonological analyses for initial peaks are evaluated on the basis of both the 'old' data given in the literature and the 'new' data offered by this study. Finally, the role played in the intonational system by the patterns of alignment variation is interpreted within a larger view of the left periphery of the intonational phrase.

2. Previous analyses of initial peaks

Two main types of phonological analyses of EP initial peaks have been proposed in the literature: the accentual analysis and the phrasal tone analysis. The view that the initial peak is best treated as a pitch accent has been argued for in Frota (1997, 2000) and Grønnum and Viana (1999). The arguments put forward in my previous work are those summarised in the following paragraph.

As the association of the peak with the first stressed syllable is a structural relation that only predicts its alignment in the *vicinity* of the stressed syllable, the actual temporal alignment of the peak is expected to vary. In addition, proximity to prosodic boundaries is among the factors that have been shown to affect alignment in various languages, namely *initial* peaks are known to tend to be late aligned (cf. Silverman and Pierrehumbert 1990 for American English, Nolan and Farrar 1999 for British English, Prieto et al. 1995 for Mexican Spanish, and de la Mota 1997 for Standard Peninsular Spanish). The late alignment of initial peaks in EP, which is the most common pattern described in Frota (1997, 2000) and Vigário (1998), could thus be accounted for by an H* analysis, similarly to what was proposed for English and Spanish by the authors mentioned above. The properties that the initial peak shares with (other) prenuclear accents, discussed in Frota (2000), also support the accentual view: namely, the presence of the initial peak is optional, depending on the properties of the segmental string; its prominence is secondary; and, despite its alignment variability, it tends to be linked to a stressed syllable and is realised in the vicinity of that syllable. Although an explanation for the possible alignment of the peak *before* the stressed syllable is not provided in my previous work, it would not be unreasonable to suggest that, like late alignment, early alignment may also be due to independent factors affecting the realisation of the peak, such as stress clash, tonal environment, or upcoming prosodic boundaries (as proposed for various languages, e.g. Silverman and Pierrehumbert 1990, Prieto et al. 1995, Arvaniti et al. 1998, 2000). However, none of the putative relevant factors was systematically controlled in Frota (1997, 2000).

In the first study that examines initial peak alignment resorting to controlled speech data, Grønnum and Viana (1999) have also found variable alignment, but only when the utterance begins with the stressed syllable. In this case, the peak may (but not must) be aligned with the poststressed syllable. No cases of early peaks are reported. These results can be seen as providing additional support for the H*

analysis. Nevertheless, it is important to note that the materials used in this study include only 2 and 3 syllable non-words with initial, penult and final stress, and the weighing of different proposals was never at stake. So, the authors assume that the initial peak *has* accentual status, following Frota's analysis, and factors like the distance of word and phrase boundaries from stress, among other potentially important prosodic factors for the alignment issue, are not investigated.

Vigário (1998) proposes an analysis of the initial peak as some sort of phrasal tone that signals the beginning of the intonational phrase. It is the tendency to late alignment of the peak, together with the fact that it is reported never to align beyond the edge of the first prosodic word of the intonational (I) phrase, that support this view. In addition, Vigário claims that the constituent bearing the peak is not perceived as prominent, contrary to when it bears prenuclear accents such as L*+H. In Frota (2000), it is also observed that despite sharing properties with prenuclear accents the distribution of the peak has peculiarities. Unlike other prenuclear accents, that may occur in I-intermediate position, the peak is restricted to I-initial position. Differently from other prenuclear accents (e.g. L*+H), the peak is never preceded by the optional initial I-boundary tone %H. As Frota notes, these properties can be seen as arguments in favour of Vigario's phrasal tone analysis (Frota 2000: 306). It should also be made clear that the notion of phrasal tone is being used in the sense it was used by Beckman and Pierrehumbert (1986) and Pierrehumbert and Beckman (1988) in their description of Japanese intonation: an initial delimitative mark of a prosodic phrase, whose position is defined relative to the phrase edge, but which may have an association to another element of the string.

Clearly, then, there is evidence in the literature supporting *both* analyses and little basis for choosing between them. This state of affairs certainly calls for a specific and detailed intonational study addressing the issue.

3. Methods

Following a general assumption within the autosegmental metrical approach to intonational phonology, I take target alignment as a reflection of phonological association (e.g. Pierrehumbert and Beckman 1988, Pierrehumbert and Steele 1989, Hayes and Lahiri 1991, Grice 1995, Arvaniti et al. 1998, Grice et al. 2000). This view does not entail that a phonological description has to be exactly mirrored by its phonetic manifestation, or that a phonological category uniquely determines the phonetic realisation. It is known that the same phonological category may show realisational differences both across languages and within the same language (e.g. Ladd 1996, Nolan and Farrar 1999). However, this view does entail that alignment patterns, when systematically studied, should cue the phonological status of the tonal target at stake (cf. D'Imperio 1999, Frota 2002a, Face 2001, Ladd and Schepman 2002). In this approach, alignment relative to (but not necessarily with) the stressed syllable is an indication of an accentual target, whereas alignment relative to some prosodic edge is an indication of an edge-related tone or a phrasal tone. These considerations set the framework for the design of the experiment and the interpretation of its results.

To investigate the patterns of peak alignment under various prosodic conditions a corpus of 29 sentences was created. While segmental factors were controlled and the position in the discourse, utterance and intonational phrase fixed to initial, the prosodic context preceding and following the first stressed syllable was systematically varied. Three factors were manipulated: (i) the distance of the stressed syllable of the target word both from the left and the right edge of the prosodic word (ω); (ii) the size of the interval between the first stressed syllable and the next stressed syllable; and (iii) the nature of the prosodic boundary between the target word and the next word. The first stressed syllable was preceded by between 1 and 3 prestressed syllables up to the left-edge of ω (that coincides with the left-edge of the phonological phrase and the intonational phrase, due to the initial position of the target word) and followed by between 0 to 2 poststressed syllables up to the right-edge of ω.[1] The interstress interval may consist of 0 to 4 unstressed syllables. Finally, the prosodic boundary next to the target word may be just a ω-boundary, i.e. the target word and the next word are contained in the same phonological phrase (ϕ), or a ϕ-boundary, that is the target word and the next word belong to different ϕs. The examples in (1) illustrate the manipulation of factors (i), (ii) and (iii) for a target word with one prestressed syllable (here as elsewhere, ωs are enclosed within curved brackets and ϕs are delimited by square brackets; stressed syllables are given in capitals).[2]

(1)   [(o MAR)]   enroLAva-se   na areia
       the sea   rolled-itself   on the sand
       'The sea rolled on the sand.'

      [(o MAR) (enroLAdo)]   provocou   o naufrágio
       the sea dangerous   caused   the shipwreck
       'The dangerous sea caused the shipwreck.'

      [(o MÁRmore)]   amareLOU   com facilidade
       the marble   turned-yellow   with easy
       'The marble became yellow easily.'

      [(o MÁRmore) (amareLAdo)]   é barato
       the marble   yellowish   is cheap
       'Yellowish marble is cheap.'

The contrast between (1) and (2) illustrates the manipulation of the distance between the first stressed syllable and the left prosodic edge. The entire corpus is given in the Appendix.

1.   Prestressed and poststressed are used in this paper in the sense of preceding and following word stress, respectively.
2.   In EP, proclitics (such as the article 'o') are phrased together with the following word into a ω-domain (for details on the prosodization of clitics, see Vigário 2003).

(2) [(o marMElo)] da EuROpa   é pouco saboroso
　　　the quince   from-the Europe is little   tasty
　　　'Quince from Europe has no taste.'

　　　[(o marMElo) (amaRElo)] é o mais   doce   de todos
　　　the quince   yellow   is the most sweet of all
　　　'Yellow quince is the sweetest of all.'

　　　[(o marMElo)] amadureCEU demais
　　　the quince   grew ripe   too-much
　　　'The quince became too ripe.'

　　　The sentences were recorded twice, each time in a different random order, by 3 female native speakers of European Portuguese (Lisbon variety). The speakers were all in their thirties. They were instructed to read the sentences as naturally as possible and were free to repeat them in case they considered their reading not fluent or unnatural. A total of 174 utterances for analysis were obtained (29 x 2 x 3).[3]

　　　The recordings were made on audiotape in a sound treated room. Digitisation and analysis of the recordings was done using the Sensimetrics SpeechStation2 software package. The F0 contour within the stretch of the first two words of each utterance was examined and labelled. The location of the first peak was marked, as well as the location of any valley either before or after the peak. When the contour showed plateaus, the location of the peak (or valley) was marked at the edge of the contour immediately after (or before) the F0 rise.[4]

　　　Speakers were not asked to produce or imitate any particular kind of contour. It is thus expected that some variation in the contours produced may occur, and that in some cases the initial peak contour does not obtain. It is thus critical to identify all initial peaks and separate them from the cases where other tonal events are manifested. The contour under observation has been described in the literature as a pitch rise through (or before) the stressed syllable up to a turning point where the pitch starts to gradually fall or is sustained (e.g. Frota 2000).[5] This is very different from a rising contour where the pitch does not rise until a good portion of the stressed vowel is attained ($\geq$ 50% of V in most cases) and then rises into the next syllable. In the latter case, the first stressed syllable bears an L*+H accent which has a similar phonetic manifestation in EP to that described for English (cf. Ladd 1996, Ladd and Schepman 2002). An example of an initial L*+H is shown in (3).

3.　Two utterances were discarded later due to hesitations in the production of the target word.
4.　In this regard I follow other authors such as Face 2001, despite the probability of perceived peaks not to correspond exactly to the elbow of the contour, as shown in D'Imperio et al. 2000.
5.　This contour should also not be confounded with the %H contour described in Frota (2000). The occurrence of %H seems to be restricted to particular cases, like utterances with internal parentheticals, and the peak is always realised on the second syllable of the I-phrase.

(3)
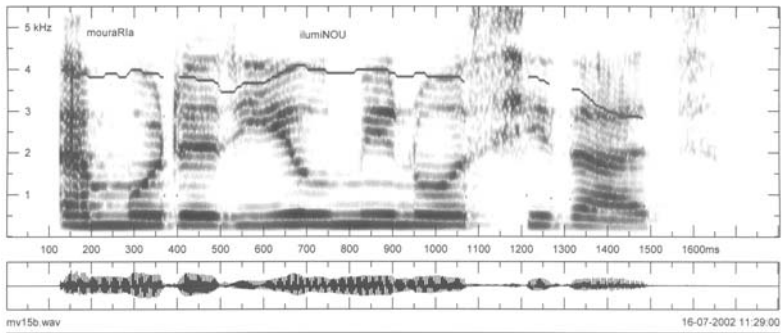
      A mouraʀɪa   iluminou   a cidade
               |
          L*+H
      the Mouraria (an old-part-of-the-city) brightened the city
      'The Moorish Quarter has brightened the whole city.'

The initial peak contour is also very different from the falling contour where the pitch rises before the stressed syllable and then falls through the stressed vowel. This is the phonetic manifestation of the H+L* accent in EP, well-established in the literature (Frota 2000, 2002a, 2002b). An example of an initial H+L* is given in (4).

(4)
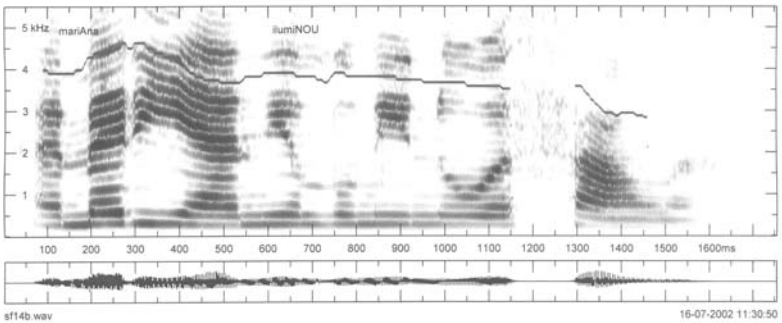
      A Mariɐna   iluminou   a sala
         |
       H+L*
    the Maryanne brightened the room
    'Maryanne was the life of the room.'

Cases such as those in (3) and (4) were thus excluded from the analysis of initial peak alignment, as discussed in the following section.

4. Results and discussion

4.1. Patterns of peak alignment

Table 1 presents the occurrence of initial peaks and other initial tonal events for the three speakers.

Table 1. Tonal events in the target string. Percentages and number of cases (in parenthesis).

Speaker		Initial peak		L*+H		H+L*	
MM	(55)	54.5%	(30)	23.6%	(13)	21.8%	(12)
MV	(58)	81.0%	(47)	3.4%	(2)	15.5%	(9)
SF	(59)	76.3%	(45)	10.2%	(6)	13.6%	(8)

The data shows two different patterns: for speaker MM, the frequency of initial peak contours is lower, and the initial peak clearly alternates with the pitch accents L*+H and H+L*; for speakers MV and SF, by contrast, the frequency of initial peaks is much higher and the presence of the rising and falling pitch accents reduced.
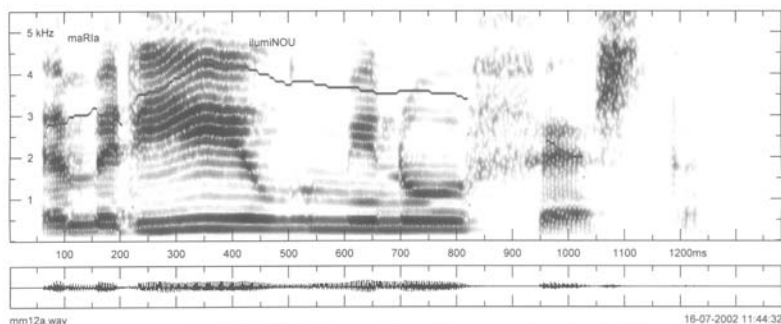
The results in Table 2 confirm that the speakers show two types of behaviour. The speaker that alternates between the initial peak and the rising and falling accents exhibits a consistent alignment of the peak with the stressed syllable, whereas for the other two speakers peak alignment is variable. I will call these two patterns robust alignment and variable alignment, respectively.

Table 2. Patterns of peak alignment ('σ indicates the stressed syllable and σ an unstressed syllable; the peak aligns with, after or before 'σ, as signalled by the underlined position).

Speaker		'σ		'σ σ		σ 'σ	
MM	(30)	70.0%	(21)	26.7%	(8)	3.3%	(1)
MV	(47)	51.0%	(24)	25.5%	(12)	23.4%	(11)
SF	(45)	20.0%	(9)	57.8%	(26)	22.2%	(10)

Example (5) illustrates the robust alignment case and example (6) is an instance of variable alignment.

(5)


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A Maʀɪa          ilumiɴOU          a festa
        |
        H
    the Mary brightened the party
    'Mary was the life of the party.'
```
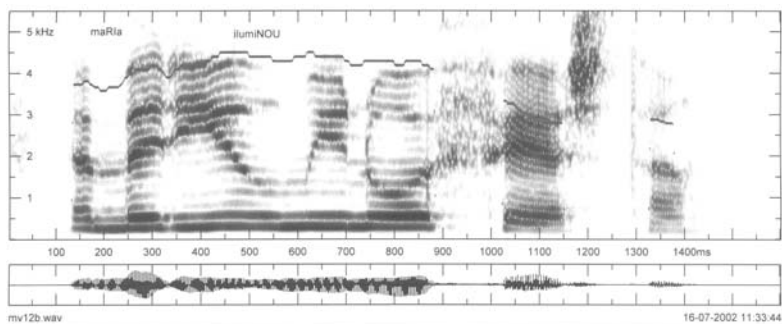
(6)

A MaRɪa iluminou a festa
|
H
the Mary brightened the party
'Mary was the life of the party.'

The fact that the initial peak aligns with the stressed syllable and alternates with (other) pitch accents for speaker MM suggests that the peak has accentual behaviour. By contrast, the prevalent variable alignment of the peak in the data of the other speakers may be an indication of its non-accentual status for these speakers. Should these two types of behaviour be confirmed by other facts, they not only would be consistent with the previous descriptions found in the literature but would provide an explanation of why researchers have proposed either the accentual analysis or the phrasal tone analysis.

4.2. Distributional properties of the peak

The examination of the contexts of initial peak occurrence with regard to prosodic constituency and presence/absence of a pitch accent in the second word of the utterance shows, again, systematic differences between the two groups of speakers.

Within a framework such as intonational phonology, in which the distribution of tonal events is governed by the edges and prominence relations established on the basis of prosodic structure, if only a word in a multi-word ϕ-phrase is pitch-accented this word must be the head of the phrase. Once the ϕ-head is pitch-accented, any other prominent element may bear additional accents within the ϕ-phrase (cf. Frota 2000:186-189). As in EP ϕs are right-prominent in neutral utterances, this predicts that the configurations in (7a-b) are ok, but the configuration in (7c) is out. However, if the tonal event at stake in configuration (7c) is *not* a pitch accent (i.e. a T*), there is no reason to exclude a tonal manifestation (T) in ω1 in (7c).[6]

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6. Note that in EP I-internal ϕ-phrases are unaccented in the unmarked case (e.g. Frota 2000, 2002b) and therefore accentless ϕs are common in the language. This issue is extensively discussed in Frota (2000).

(7)   a. [ω1   ω2   ]φ   b. [ω1   ω2   ]φ   c. [ω1   ω2   ]φ
               ---   T*   T*   T*   *out* T*   ---
                                                                         ok   T   ---

In the data from speaker MM, cases like (7c) are absent. In the configuration [ω1 ω2]φ, when the initial peak contour occurs in the first ω the next ω always bears a pitch accent. This adds to the accentual behaviour of the peak for this speaker. Speaker MV, however, shows 27.3% of cases like (7c), indicating that the presence of the initial peak is not constrained by the co-occurrence of a following pitch accent. Again, this suggests that the initial peak has no accentual status. The case of the third speaker is not as straightforward. On the one hand, the distribution of initial peaks for this speaker patterns like that found for MM, a result which is inconsistent with the results reported in section 4.1. On the other hand, the data from this speaker shows the only cases where the initial peak *and* a pitch accent co-occur as distinct tonal events in the same prosodic word (which is ω2 in all cases - 7.7%). As cases of double accentuation have never been reported in EP to my knowledge, I take these data to support the non-accentual status of the peak in line with the results reported in the previous section.

To sum up, the distributional properties of the peak are not uniform across speakers. While two speakers allow for initial peaks without the following word within the same φ being pitch-accented or an initial peak plus a pitch accent in the same word, one of the speakers does not. The lack of these two patterns in the data from speaker MM could well be seen as an accidental gap. Nevertheless, it is worth noticing that the gap is there and that the potential accentual status of the peak for this speaker predicts it.

4.3. Phonological factors behind peak alignment variability

The conditions under which peak alignment may vary will now be inspected in detail.

As shown in section 4.1, the main factor behind the robust alignment case (speaker MM) is word-stress. However, even with robust alignment with the stressed syllable, there is a margin for fluctuation of the peak, in particular between the stressed syllable and the poststressed syllable (see Table 2). An examination of all instances of late alignment shows that 87.5% of them occur whenever there is only one unstressed syllable between the left-edge of the utterance and the stressed syllable. This result highlights the importance to peak alignment of the presence of preceding unstressed syllables, in line with previous results for EP and other languages (e.g. Grønnum and Viana 1999 and Nolan and Farrar 1999, respectively). In the present case, the canonical conditions which allow for a 100% stable alignment pattern with the stressed syllable involve 2 unstressed syllables between stress and the left-edge of the utterance.

Robust alignment and variable alignment were shown to differ not only in the relative amount of synchronisation of the peak with stress but also in the clear presence of peaks in prestressed position in the variable alignment case (see section

4.1). Additionally, variable alignment is characterised by examples of different location of the peak in sequences with the same segmental string. This is shown in (8) and (9) for the two speakers that have variable alignment.

(8)   a.
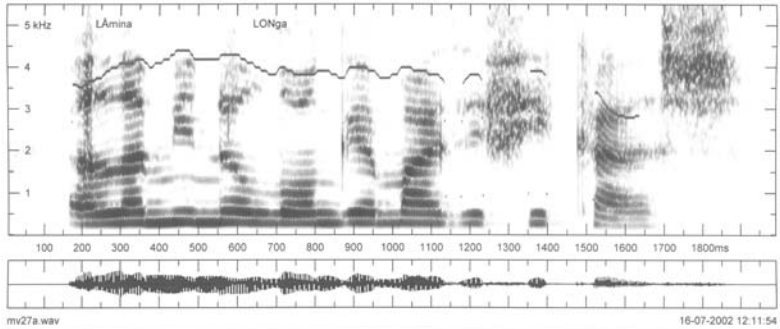
A Lâmina   LONga   é mais   eficaz
     |
     H
the blade long is more efficient
'A long blade is more efficient.'

b.
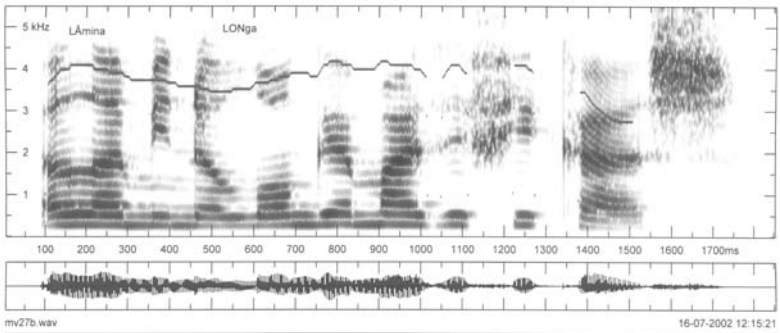
A Lâmina   LONga   é mais   eficaz
    |
    H   L*+H

In (8a) the peak aligns with the poststressed syllable, whereas in (8b) it aligns with the stressed syllable. The examples in (9) show alignment with a prestressed syllable (9a) and with the poststressed syllable (9b). A quick observation of these examples could suggest that the differences in alignment are simply due to the presence/absence of a pitch accent in w2. However, if this were the case, such an

accent would induce early peak alignment in (8b), but late peak alignment in (9b), which is a rather unexpected and perhaps even awkward result. Moreover, the tonal crowding cases reported in the literature to constrain peak placement always involve either a stress clash situation or just a syllable between the two accented syllables (e.g. Prieto et al. 1995, Arvaniti et al. 1998, Face 2001). Neither of these conditions holds for the examples in (8-9), where the interstress intervals consist of at least 2 syllables. These cases are an illustration of the complexity that seems to characterise variable alignment.

(9)   a.
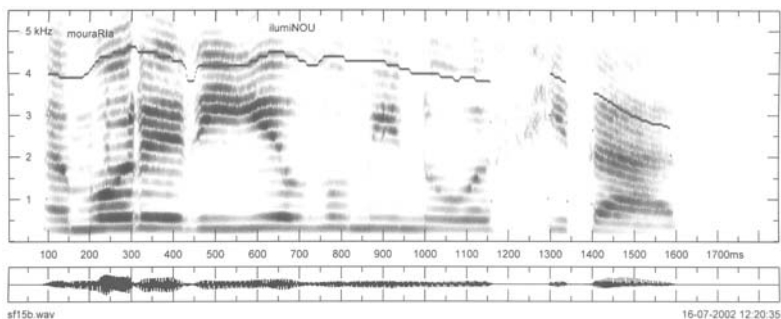
A Mouraria   iluminou   a cidade
      |
      H
the Mouraria (an old-part-of-the-city) brightened the city
'The Moorish Quarter has brightened the whole city.'

b.

A Mouraria   iluminada   é uma dança de luzes
      |
      H   L*+H
the Mouraria lighted-up is a dance of lights
'The light-up Moorish Quarter is a dance of light.'

So that a better understanding of variable alignment could be achieved, the role played by the various factors manipulated in this study was analysed using ANOVAs with peak alignment as the dependent variable and 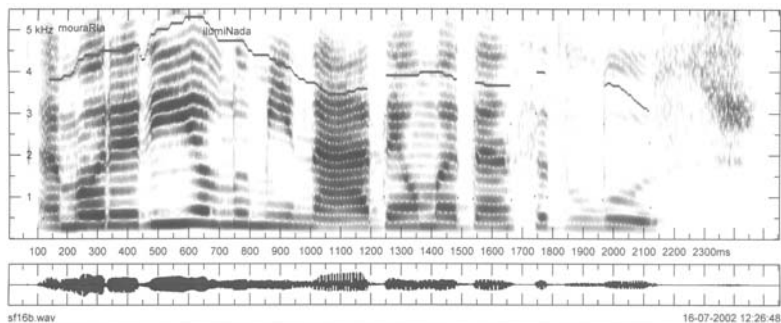stress location, interstress interval, distance from the left-edge of ω/phrase ('['), distance to the right edge of ω (')'), presence/absence of following accent ('Accent2') and type of boundary after the target word as factors. Individual ANOVAs were conducted on each factor. The data for each speaker was analysed separately and the results that yield $p \leq .01$ are considered statistically significant and marked with a '*' ('**' indicate a $p \leq .005$ and '***' a $p \leq .001$). The ANOVAs results are summarised in Table 3.[7]

Table 3. ANOVA results per speaker.

	Stress	**Interval**	**[**	**)**	**Accent2**	**Boundary**
MM	F(1,27)=10.7 **p<.003	F(3,25)=3.2 p<.04	F(2,26)=3.8 p<.04	F(2,26)=.3 p<.78	F(1,27)=.8 p<.38	F(1,27)=.3 p<.62
MV	F(1,45)=1.9 p<.17	F(4,42)=.7 p<.63	F(2,44)=24.6 ***p<.000	F(2,44)=.6 p<.58	F(1,45)=2.9 p<.09	F(1,45)=.9 p<34
SF	F(1,43)=.2 p<.69	F(4,40)=2.6 p<.05	F(2,42)=4.5 *p<.01	F(2,42)=1.8 p<.18	F(1,43)=93.9 ***p<.000	F(1,43)=8.6 **p<.006

As one could expect on the basis of the results reported in the previous sections, there are two types of speakers. For speaker MM, the only significant main effect is Stress. This supports the accentual behaviour of the peak in the data from this speaker. By contrast, Stress is not a significant factor for the other speakers. For them, there is instead a significant main effect of the distance from the left-edge. A detailed analysis of this effect shows that when the distance from the left-edge to the stressed syllable comprises 1 syllable there is peak lag, when it amounts to 2 syllables the peak tends to align with the stressed syllable and, finally, when the distance increases to 3 syllables there is early peak alignment. By and large, the major trend is peak alignment with the second or third syllable of the phrase (80.4%) This result supports the non-accentual nature of the peak and argues for a phrasal tone analysis whereby the peak is defined relative to the left-edge of the phrase. The data for speaker SF requires a further comment. For this speaker, besides the significant effect of the distance from the left-edge, Accent2 and Boundary also show significant effects. A detailed analysis of the Accent2 effect confirms the unexpected behaviour noted above: if there is no following accent, the peak aligns earlier; if an accent follows, the peak seems to be attracted to the end of the target word and thus aligns later (see (9) above). Post Hoc comparisons (Scheffé) show that the Boundary effect is merely a result of the Accent2 effect: there is no significant contrast between ω and φ when an accent follows, and the result is simply due to the fact that in the ω condition Accent2 is always there and thus

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7.   For speaker MM the factor Interval has only 4 levels due to the non-occurrence of the initial peak contour in utterances with an interstress interval of size 3. Details on the levels observed for each factor were given in the Methods section.

alignment is late while in the φ condition Accent2 may or not be there and the alignment of the peak varies accordingly.[8]

Overall, two trends are evidenced by the results. Either the factor word-stress is prevalent, or the distance in number of syllables from the phrase left-edge determines the location of the initial peak. The former corresponds to what I have called robust alignment with the stressed syllable; the latter to variable alignment with regard to the stressed syllable. It is now clear that the stressed syllable is a crucial factor only in the first pattern. If measured relative to the phrase left-edge, and not relative to stress, the so-called variable alignment is as 'robust' as that shown in the first pattern. In short, there are two strategies for initial peak alignment in EP: one depends on the position of the initial stress; the other is determined by the distance from the left-edge of the phrase, regardless of stress.

5. General Discussion

5.1. Evaluation of the competing analyses for initial peaks

As described in Section 2, the literature has offered two different phonological analyses of initial peaks in EP: the accentual analysis and the phrasal tone analysis. Both proposals were seen to be supported by the data reported in the various works that addressed the issue. Therefore, for some authors the peak has accentual status (Frota 1997, Grønnum and Viana 1999), while for others it is analysed as a phrasal event (Vigário 1998). In Frota (2000) the two proposals are weighed against the evidence available, and although the H* analysis is preferred, it is acknowledged that the data seems to be compatible with both phonological representations of the peak.

The results of the present study show that the previous analyses are simultaneously right and wrong. They are right in the sense that they capture the non-uniform behaviour of initial peaks. However, they are wrong because they fail to grasp that not all initial peaks are accentual tones, in the same way as not all initial peaks are phrasal tones. One of the major contributions of the present study is the demonstration that there are *two* types of peaks that are neatly distinguished by their alignment patterns: one aligns relative to the stressed syllable, whereas the other aligns relative to the initial phrase edge. This consistent difference in phonetic manifestation, which is also supported by distinct distributional properties of the two types of peaks, is best interpreted as a reflection of the realisation of different phonological categories (along the lines of other alignment studies within the autosegmental metrical approach — e.g. Bruce 1977, Pierrehumbert and Steele 1989, D'Imperio 1999, Caspers 1999, Frota 2002a, Face 2001, Ladd and Schepman 2002). In EP, the initial peak contours under study may thus result from the presence of a pitch accent or the presence of a phrasal tone.

8.   An explanation of why Accent2 should constrain peak alignment in this way is left for future research.

5.2. The accentual peak

Once it is established that there is a type of initial peak that has accentual status, the next question to be dealt with is its phonological representation. All the proponents of the accentual analysis have always assumed an H* accent. However, other alternatives could be put forward, namely those that represent rising accents. These alternatives are discussed below, on the basis of what is known about the intonational lexicon of EP and the phonetic properties of both the rising accents and the accentual initial peak. Analyses of rising accents and/or initial accentual peaks in other languages are also considered, given that comparable contours in different languages should be analysed in a consistent way (cf. Ladd 1996).
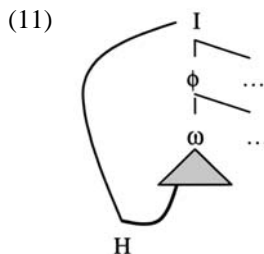
As we are dealing with *initial* peaks, the peak contour usually corresponds to a rising contour. Unlike what has been proposed for Spanish (e.g. Sosa 1999, Face 2001), this initial rising contour cannot be represented by an L*+H accent whose phonetic manifestation is different from that found in English, for example. The main arguments against this analysis for EP are the following: (i) EP has a rising accent which is indeed similar to the phonetic instantiation of L*+H in English, as described in Section 3 above (see, also, Frota 2002b), and hence different from the initial peak contour; (ii) the accentual peak is usually aligned with the first stressed syllable in EP (70% - cf. Table 2), unlike in Spanish (17% according to Face 2001, Table 2). The L*+H alternative can thus be straightforwardly dismissed.

Since it is clear that the accentual peak contour comprises an H*, we are left with two other options: the monotonal H* accent and the bitonal L+H* accent (a pitch accent which has not been proposed as part of the EP intonational lexicon so far). Deciding between the two is a much harder task, as shown in Ladd and Schepman (2002) where the distinction between H* and L+H* in English is addressed. Ladd and Schepman propose to collapse the H* rising accent and the L+H* rising accent into a single category (L+H)*, which is phonetically described as follows: a «pitch accent rising across the accented syllable and involving clearly distinct L and H targets». They reserve H* for accents that do not involve a local rise. This proposal cannot be tested with the EP data, because Ladd and Schepman examine *medial* peak contours, where the rising/non-rising difference may obtain. The present study, in turn, looks at *initial* peak contours, where a rise always obtains. The only cue for the proposed distinction that the initial peak data may offer is thus the behaviour of the beginning of the rise: does it correspond to a «clearly distinct L (…) target»? Apparently, it does, as the beginning of the rise aligns with the beginning of the consonant on the onset of the stressed syllable (75% against 25% of alignment with the beginning of the stressed vowel). This suggests the adequacy of the (L+H)* analysis over the H* analysis. However, a detailed phonetic study is needed to measure the putative L alignment with more precision before the presence of an L target in the accentual peak contour is ascertained.

5.3. The I-initial phrasal tone

The second type of initial peak evidenced by the results realises a phrasal tone. Again, the next question to be dealt with is the phonological representation of this

phrasal tone. In Vigário (1998), it is suggested that the phrasal tone is an intonational (I) phrase initial tone that associates to the right-edge of the first prosodic constituent within the I-phrase. No decision is made whether this constituent is the phonological phrase (ϕ) or the prosodic word (ω), due to lack of data. However, in Vigário (2003) it is explicitly suggested that such constituent is ω and not ϕ, as shown by its alignment with the right-edge of the first ω in multi-word initial ϕs. In what follows, a new analysis of the phrasal tone is put forward which builds on the basic insight of Vigário's proposal while making a crucial use of Pierrehumbert and Beckman's notion of phrasal tone (Beckman and Pierrehumbert 1986, Pierrehumbert and Beckman 1988) and Grice's (1995) proposals concerning tonal association.

The results described in Section 4 have shown that this type of initial peak aligns relative to the left phrase edge, regardless of the position of the first stressed syllable. In particular, it tends to align with the second or third syllable of the I-phrase (80.4%). Moreover, the location of the peak never goes beyond the edge of the first ω, confirming Vigário's observations. This means that the peak may be realised up to the beginning of the first syllable of ω2, which still is segmental material at the edge of ω1, but not in the second syllable of ω2 or further apart from the edge of ω1. The examples in (10) illustrate these points.

(10) a. [(o MAR)] enroLAva-se   the sea rolled-itself
            H
       or   H   (by speaker MV)

      b. [(o MÁRmore)] em África   the marble in Africa
            H
       or   H   (by speaker SF)

      c. [(o marMElo)] amadureCEU   the quince grew ripe
            H
       or   H   (by speaker MV)

      d. [(a LÂmina) LONga]   the blade long
            H   (see (8a) above)
       or H   (see (8b) above)

On the one hand, the alignment of the peak relative to the left edge is evidence of its status as an initial delimitative mark of the I-phrase. On the other hand, the way in which the domain of realisation of the peak is bound by ω suggests an association of the peak to the I-initial prosodic word. Both these patterns of behaviour are akin to the description of phrasal tones in Japanese and captured by Pierrehumbert and Beckman's definition of phrasal tone given in Section 2 above and repeated here for ease of exposition: a delimitative mark of a prosodic phrase, whose position is defined relative to the phrase edge, but which is not associated with that edge and may have an association to another element of the string. Following Grice's (1995) work on tonal association, I propose that the phrasal tone of EP has

a peripheral association to the left-edge of the I-phrase and a secondary associa-
tion to the first ω, as depicted in (11).

(11)

This proposal not only accounts for the alignment patterns shown by the data,
but also offers an explanation of why the phrasal tone and a pitch accent never co-
occur in the first word. Secondary association can only take place between a periph-
eral tone and an unattached segmental string (Pierrehumbert and Beckman 1988,
Grice 1995). Thus, if the first ω bears a pitch accent, the domain of association of
the phrasal tone is no longer available. If it is further assumed that an unattached
peripheral tone is not phonetically realised, this explains the complementary dis-
tribution between the phrasal tone and an initial pitch accent already noted in
Vigário (1998). By contrast, the phrasal tone and a pitch accent may be realised in
the second ω, in case the phrasal tone is phonetically manifested at the beginning
of ω2, that is on segmental material at the edge of ω1, as in (10a) (the results of
speaker SF, reported in section 4.2, illustrate such a case).

In Vigário (1998), the phrasal tone is represented by means of an H. I have kept
the same representation in (11) above. The question of whether there is or not an L
target as well in the phrasal initial peak contour is beyond the scope of the present
study. For the moment I can only add that the starting point of the rise usually
occurs within the limits of the consonant at the onset of the second syllable (as can
be seen in examples (6) and (9) above), irrespective of the location of the peak
within its domain of association. This is an issue left for future research.

5.4. A new look into the left periphery of the I-phrase

A better understanding of the left periphery of the intonational phrase is another
major contribution of the present study. It is well-known that the right-edge of the
I-phrase is signalled by a boundary tone and, in neutral contours, this boundary
tone is preceded by a nuclear pitch accent on the last stressed syllable (e.g. Frota
2002a, 2002b). It is also known that the prenuclear contour, in particular the stretch
intermediate between the initial peak and the nuclear accent is usually accentless
(see the examples in (6) and (8a) above; cf., among others Grønnum and Viana
1999, Frota 2000). Thus, a clearer picture of the left periphery of the contour is an
important piece that can now be added to our knowledge of the intonational system
of EP.

The main intonational properties of the left periphery of the I-phrase are summarised in Table 4.

Table 4. The left periphery of the intonational phrase in EP.

Left periphery	Phonetic description	Phonological status	Phonological representation
Rising	Low pitch into a good portion of 'V + rise into next σ	Pitch accent	L*+H
Rise-falling	Pitch rise before 'σ + fall through 'V	Pitch accent	H+L*
Rising	Pitch rise through 'σ, peak attained in 'V	Pitch accent	H*
(High)Rising	High beginning + small rise into 2nd σ	Boundary tone	%H
Rising	Pitch rise through the first σs, peak attained in 2nd or 3rd σ	Phrasal tone	H

As described in the previous sections, there is a free choice between the three initial pitch accents for those speakers that mark the beginning of the I-phrase resorting to an accentual tone, although H* is at least twice as frequent as the other accents. The accentual peak and the phrasal peak are mutually exclusive: the presence of an accent on the first word would prevent the association of the phrasal tone and thus the two tonal events are predicted not to co-occur, according to fact. The same cannot be said about the initial high boundary tone and an initial pitch accent. In all the examples given in Frota (2000), %H is followed by a pitch accent. This is not unexpected under the assumption that %H has a secondary attachment to the 1st or 2nd syllables of the I-phrase. As long as none of these is the stressed syllable of the first ω and thus pitch-accented, %H can freely link to it. The present knowledge of the properties of the phrasal peak should allow the relative distribution of H and %H to be tested. If the analysis proposed in this study is correct, H and %H should not co-occur. There are two reasons why the presence of one would preclude the other: one the one hand, they are *both* delimitative marks of the left I-phrase edge with a peripheral association with this edge; on the other hand, their co-presence would be excluded on the same grounds as the simultaneous occurrence of H and an initial pitch accent. Naturally, these predictions should be tested in future research.

To sum up, the intonational system of EP allows two major options at the left periphery of the I-phrase. Either the beginning of the I-phrase is signalled by a pitch accent, or by a phrasal tone. If a pitch accent is chosen, a boundary tone can be optionally inserted as well (in certain contours, such as those involving parentheticals - cf. Frota 2000). A last point that must be raised concerns the nature of the option between these two sub-systems of the left periphery. My results suggest that the speaker is the key factor, that is these are two choices available to speakers and thus free variation across speakers is what to expect. However, the fact that this study included few speakers makes it advisable to consider this interpretation with

caution. It may well be the case that the two sub-systems are stylistically governed in the sense that one corresponds to a more formal reading style and the other to a more informal style. An extension of this research with more speakers, and including speech style as a factor, is thus called for.

6. Conclusion

On the basis of the data presented here, there is evidence for *two* types of initial peaks in European Portuguese intonation, with distinct phonological status: an accentual peak and a phrasal peak. This is at odds with previous analyses of the initial peak contours, which have either defended one or the other type of tonal event as part of the intonational system. It was shown that the accentual peak is consistently aligned relative to the stressed syllable, while the phrasal peak is aligned relative to the left-edge of the I-phrase. Both the alignment patterns and the distributional properties of the two types of peak support a proposal whereby the former is represented by an H* accent, whereas the latter is an H tone with a peripheral association to the left-edge of the I-phrase and a secondary association with the first prosodic word. The peripheral association accounts for the importance of the distance from the left-edge to peak alignment, irrespective of stress location, and the secondary association accounts for peak alignment which may only vary within the limits of the ω-domain. This secondary attachment also explains why the phrasal H and a pitch accent are excluded from co-occurring at the left periphery of the contour. The present results point to the conclusion that the intonational system of EP comprises two sub-systems at the left periphery: one is triggered by the choice of an initial pitch accent, the other by the choice of a phrasal tone. The factors that may govern this choice are among the empirical questions left for future research.

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Appendix

1. [(O MAR)] enroLAva-se na areia.
2. [(O MAR) (enroLAdo)] provocou o naufrágio.
3. [(O MAR)] da EuROpa é frio e escuro.
4. [(O MAR)] de LuANda era revolto.
5. [(O MAR) (NORte)] ilumina os quadros de Goya.
6. [(O MÁrio)] ilumiNOU a sala.
7. [(O MÁRmore)] amareLOU com facilidade.
8. [(O MÁRmore) (amareLAdo)] é barato.
9. [(O MÁRmore) (Ágata)] é difícil de encontrar.
10. [(O MÁRmore)] em África é fácil de encontrar.
11. [(O MÁRmore aBERto)] não serve para nenhuma aplicação.
12. [(A MaRIa)] ilumiNOU a festa.
13. [(A MaRIna)] ilumiNOU a festa.
14. [(A MariAna)] ilumiNOU a sala.
15. [(A MouraRIa)] ilumiNOU a cidade.
16. [(A MouraRIa) (ilumiNAda)] é uma dança de luzes.
17. [(A MouraRIa) (MÃE)] é o coração da cidade.
18. [(O marMElo)] amadureCEU demais.
19. [(O marMElo) (maDUro)] dá uma óptima geleia.
20. [(O marMElo) (amaRElo)] é o mais doce de todos.
21. [(O marMElo)] de LuANda apodrecia facilmente.
22. [(O marMElo)] da EuROpa é pouco saboroso.
23. [(O marMElo)] da Ásia não tem sabor nenhum.
24. [(O marMElo) (LOUro)] tem o melhor sabor.
25. [(A LÂmina) (amaRЕla)] era a mais cortante de todas.
26. [(A LÂmina)] da MaRIa partiu-se.
27. [(A LÂmina) (LONga)] é mais eficaz.
28. [(A minha LÂmina) (NOva)] corta bastante bem.
29. [(A minha LÂmina)] CORta todo o tipo de materiais.