

Intonation theory: Autosegmental vs. Phonosyntactic

Part 3. Some intonation facts in Portuguese

This lesson will examine some intonation facts of Portuguese (European and Brazilian) in the light of two very different approaches: autosegmental and phonosyntactic. This exercise should provide a better and deeper understanding of differences that might exist between both theories, and should illustrate as well how apparently clear theoretical distinctions lead to very different interpretations of similar phenomena.

INTRODUCTION

Three interesting observations can be made about sentence intonation in Portuguese, pertaining to:

- 1) The initial rising contour;
- 2) The subject Noun Phrase final contour;
- 3) The first and the final stress contour in a subject Noun Phrase.

We will attempt to show how the same data can be interpreted in very different ways using two theoretical approaches, namely autosegmental-metrical and phonosyntactic. We will also demonstrate the superior explanatory power of a hypothetical-deductive process on a loose interpretation of empirical data.

The data used in this discussion resulted from the acoustical analysis of recordings made by 4 female speakers, 2 Brazilian (BP1 and BP2) and 2 Portuguese (EP1 and EP2). The speakers read 20 sentences with the same NP VP structure, with NP containing one or two stressed syllables. Every sentence was read 3 times by each speaker, to obtain a total of 240 sentences. The acoustic analysis - essentially pitch curves - was performed with the WinPitchPro software package (www.winpitch.com).

Initial rising contour

As a first example, Fig. 1 shows the fundamental frequency (Fo) curve of the sentence *A modernização foi satisfatória*, read by Brazilian speaker BP1. This sentence contains only one stressed syllable in the subject Noun Phrase *A modernização* (“*ção*”) and a last stressed syllable (“*tó*” in *satisfatória*) ending the sentence.

In this figure, the melodic contours of the two stressed syllables are circled: the first stressed syllable is rising, whereas the final stress is realized with a falling contour. Another rise, in dotted circle, appears on the first (unstressed) syllable.

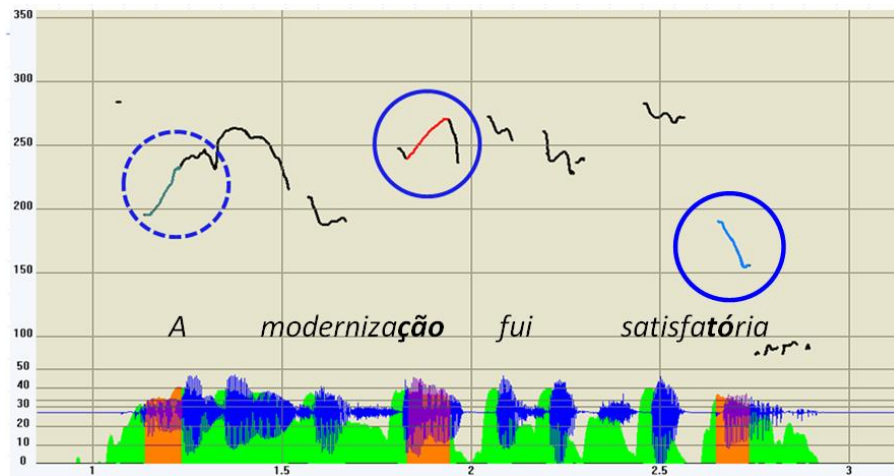


Fig. 1. “*A modernização foi satisfatória*”
 “The modernization was satisfactory” BP1 speaker

Fig. 2 shows another example, read by speaker BP2, with a similar syntactic configuration “*O investigador já revolveu o dinheiro*”, with two stressed contours appeared in a plain circle and the first unstressed syllable circled in dotted line.

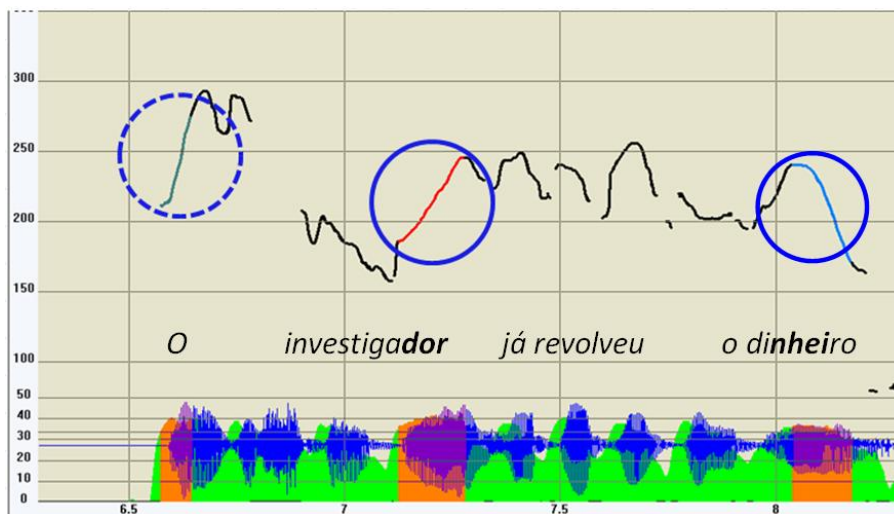


Fig. 2. “*O investigador já revolveu o dinheiro*”
 “The investigator already gave back the money” BP2 speaker

The European speakers EP1 and EP2 reading the same sentence use comparable melodic contours, as shown in Fig. 3 and Fig. 4:

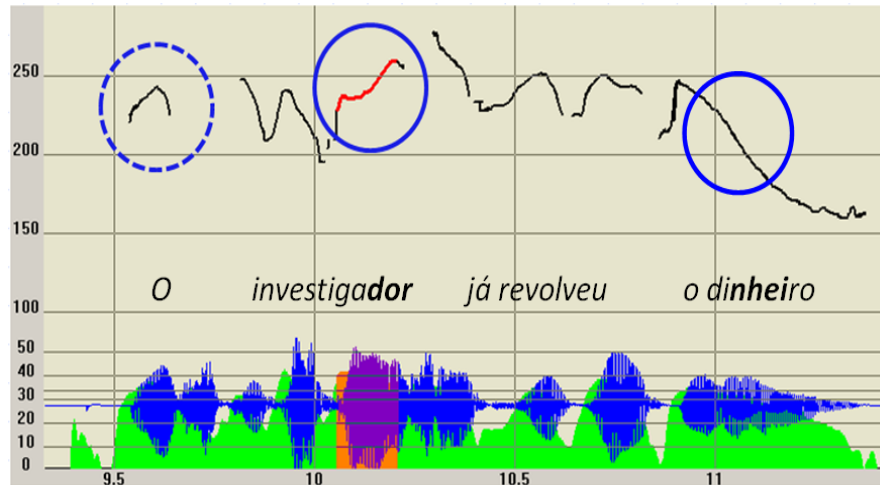


Fig. 3 “*O investigador já revolveu o dinheiro*”
“The investigator already gave back the money” EP1 speaker

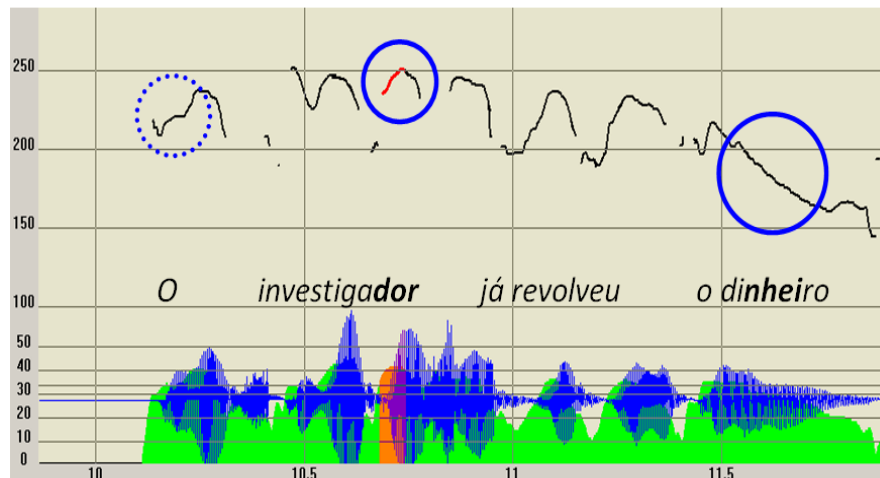


Fig. 4 “*O investigador já revolveu o dinheiro*”
“The investigator already gave back the money” EP2 speaker

Although the amplitude of melodic variation and the absolute height of the contours located on stressed syllable can vary for each speaker, the rising or falling directions are the same, maintaining an essential contrast (i.e. rise vs. fall) between contours corresponding to different nodes in the prosodic structure.

In a paper published in 2003, S. Frota (2003) discusses in detail the status of the initial rising contour, which can actually be observed on the first syllable, whether stressed or not, and on the first stressed syllable, whether located on the first syllable of the sentence

or not. Transcribed in ToBI notations, these prosodic events appear as %H (rising tone on the first sentence syllable) and H* (rising tone on the sentence first stressed syllable). Therefore in Frota's view, we either have an initial rising phrase accent %H, or an initial rising pitch accent H*, implying that the first rising phrase contour has a phonological role.

Analog facts have already been described by Martin (1999), the melodic rise located on the first stressed syllable being interpreted as a possible marker of the beginning of a sentence. This hypothesis seems to be reinforced by the apparent presence of this rising contour if the subject NP of the sentence contains 1 to 4 stress groups... However, reexamining data, it rather appears that the first syllable of these examples is not even always rising in a convincing way as not perceived as remarkable in any way, as show Fig. 5 to Fig. 8, analyzing the production of BP (Fig. 5 and Fig. 6) and EP (Fig. 7 and Fig. 8) speakers. Not only the first phonologically non stressed syllable is not perceived as remarkable in anyway, but the first contour is often falling or flat when the sentence become more complex as in Fig. 6.

NP with 2 stressed syllables

Now if we consider sentences with 2 stressed syllables in the subject NP, things become more complicated as contours located on the first stressed syllable are now rising for Brazilian speakers, and falling for European speakers! This is shown for example in Fig. 5 and Fig. 6 for BP, and Fig. 7 and Fig. 8 for EP. Again the stressed syllables are highlighted by plain circles in these figures. For convenience, we can refer to these patterns by NP rise-rise for BP and NP fall-rise for EP.

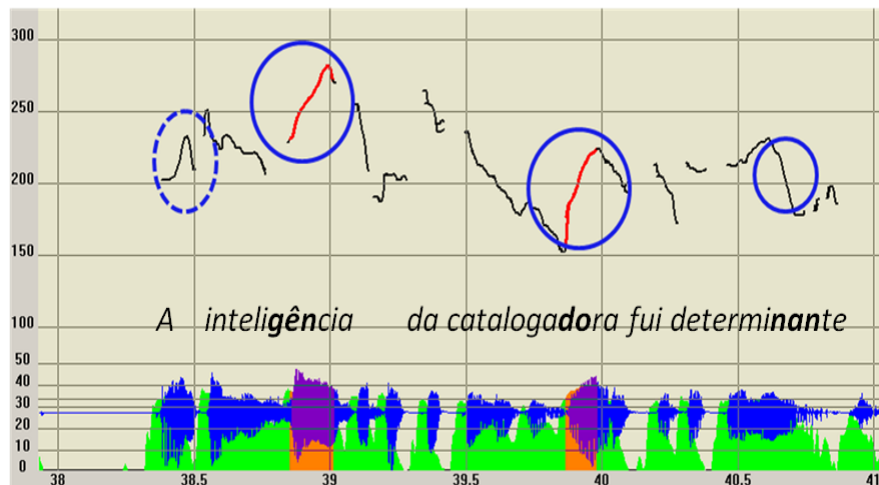


Fig. 5 “A *inteligência* da *catalogadora* foi determinante”
“The intelligence of the cataloguer was crucial” BP1 speaker,
with a NP rise-rise melodic pattern

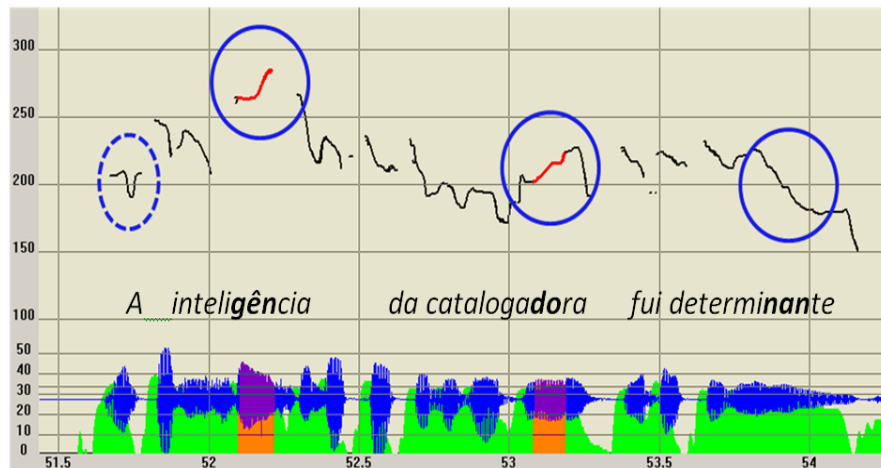


Fig. 6 “A *inteligência da catalogadora foi determinante*”
 “The intelligence of the cataloguer was crucial” BP2 speaker,
 with a NP rise-rise melodic pattern

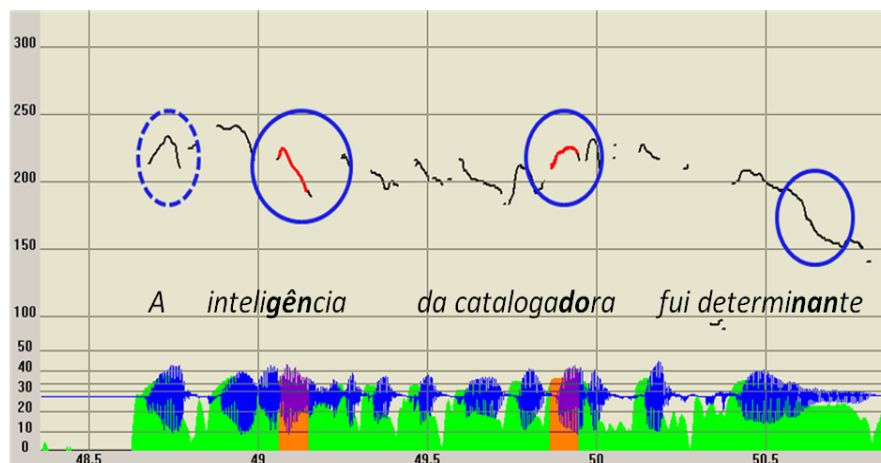


Fig. 7 “A *inteligência da catalogadora foi determinante*”
 “The intelligence of the cataloguer was crucial” EP1 speaker,
 with a NP fall-rise melodic pattern



Fig. 8 “A *autoridade* do *governador* *diminuiu*”
 “The governor’s authority decreased” EP2 speaker,
 with a NP fall-rise melodic pattern

In the autosegmental-metrical framework, these differences may appear puzzling, unless they are relegated to the so-called alignment process, where any contour, whether rising or falling, can be described as H*... If aligned at the end of the syllable, H* denotes a rising contour, if aligned at the beginning of the stressed syllable, H* denotes a falling contour (Fig. 9).

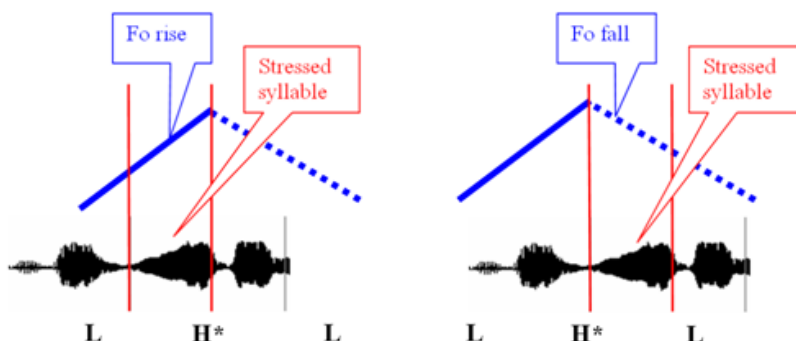


Fig. 9. Using a ToBI transcription, a H* high tone can correspond to a rising melodic contour if aligned at the end of the stressed syllable, and to a fall if aligned at the beginning of the stressed syllable.

It is of course even possible to position H* somewhere inside the stressed syllable, resulting in a convex melodic contour.

This hocus-pocus scheme obscures considerably the melodic events taking place, to the apparent benefit of keeping intact the H* feature necessarily (and ideologically) given to stressed syllables. We proposed another – possibly much better – interpretation of these data, simply by assuming as others that a prosodic structure exists and is associated to the

syntactic structure of the sentence. If such a structure does exist, prosodic markers must also exist somewhere to ensure the indication of the structure. For simple examples as the ones analyzed here, we can safely admit that the prosodic structure is congruent to the syntactic structure, i.e. that the hierarchy of stress groups does correspond to the hierarchy of the corresponding syntactic groups.

Therefore, the crucial question pertains to the existence of the prosodic structure as a hierarchy of stress groups. As a hierarchy, the structure must be indicated by prosodic markers which encode the various levels of the structure. In particular, realizations of prosodic markers, usually under the form of melodic contours, imply specific properties of duration and possibly intensities, which must enter a network of contrasts differentiating every level in the prosodic structure.

Assuming that prosodic markers are located on or around stressed syllables, it follows from this that the melodic instantiations of the stressed syllables must contrast in some way with each other, in particular that there must be a contrast between the first and the second contours attached to the first and second stress syllables in 2 stress NP (the contrast with the final contour is clearly established by its falling and low nature).

The interpretation of the differences systematically observed between BP and EP realizations becomes then much simpler, and possibly much more satisfactory: BP speakers favor a contrast in height, keeping the amplitude of melodic movement similar on both stressed syllables, whereas EP speakers favor a contrast in melodic slope (falling vs. rising), keeping the height on the contours similar on both stressed syllables (Fig. 10).

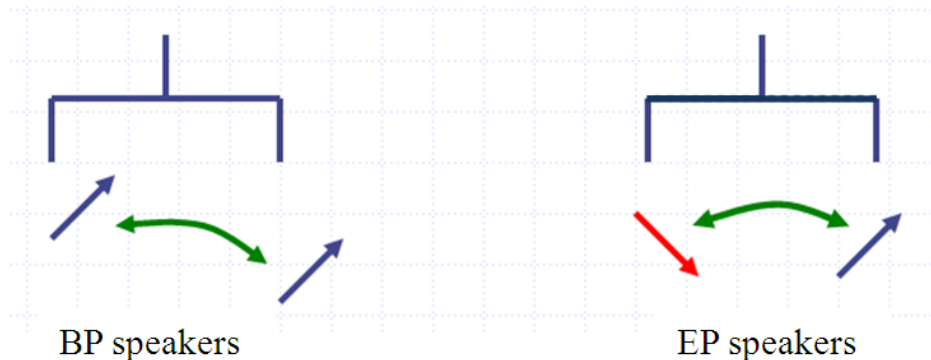


Fig. 10. BP speakers (left) tend to use a contrast in height with the same amplitude if rise, whereas EP speakers (right) favor a contrast in melodic slope, keeping the same height for both contours.

NP final contour

The next point pertains to the events located at the end of the subject NP. Fig. 11, 12 and 13 show examples with different realizations of the final NP contour. In Fig. 11 the contour is actually spread between the stressed (and non final) syllable (slightly falling) and the final not stressed syllable (sharply rising).

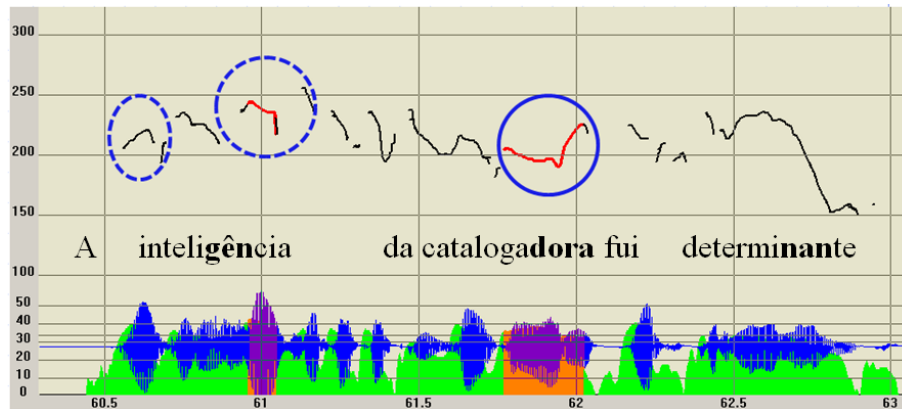


Fig. 11 “*A inteligência da catalogadora fui determinante*”
“The intelligence of the cataloguer was crucial” EP2 speaker,
with a fall-rise melodic pattern on the last stressed and the last syllable of NP

In Fig. 12 however, the contour is sharply rising on the stressed syllable, and falling on the last unstressed syllable.

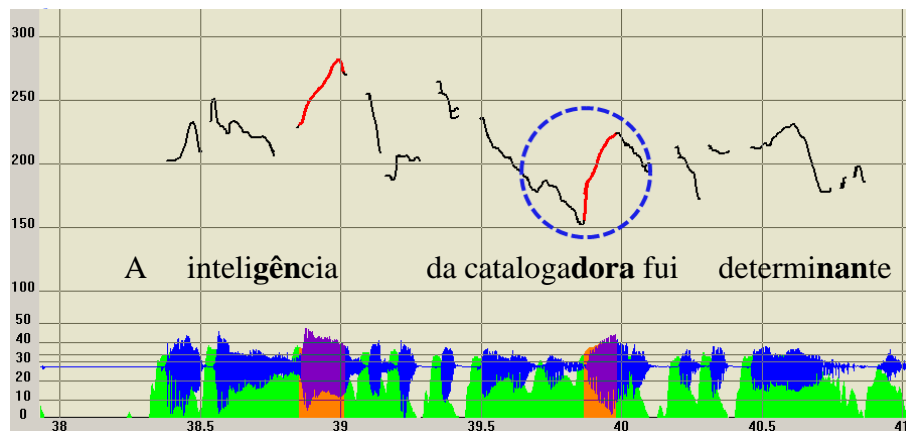


Fig. 12 “*A inteligência da catalogadora fui determinante*”
“The intelligence of the catalog agent was decisive” BP1 speaker
With a rise-fall melodic pattern on the last stressed and the last syllable of NP

Finally, in Fig. 13, the contour is rising on the stressed syllable as well as on the last unstressed syllable.

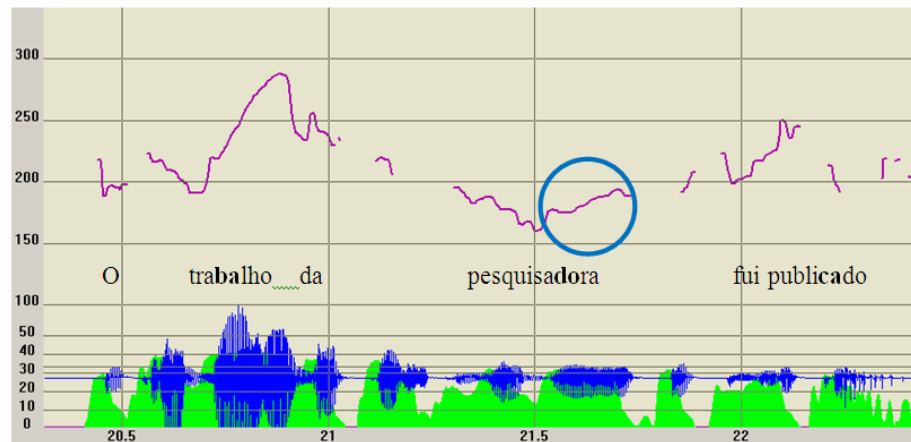


Fig. 13. “O trabalho da pesquisadora foi publicado”
 “The work of the researcher was published” BP1 speaker

With a rise-rise melodic pattern on the last stressed and the last syllable of NP

We have thus 3 different patterns observed on and around the final NP stressed syllable.

Traditionally in the autosegmental-metrical framework, these events are described either as a rising melodic contour on the stressed syllable, noted H*, followed by L% falling contour on the last syllable, at the boundary of the NP segment. Indeed, other data suggest that this NP final melodic marker can be instantiated by 2 contours, flat or slightly falling on the stressed syllable and sharply rising on the last syllable or by a sharp rising contour on the stressed syllable, and a non pertinent Fo movement on the last syllable. When the last syllable is stressed, both contour merge, and either a complex falling rising contour can be observed on the stressed (and final) syllable or simply a rising contour on the NP last and stressed syllable (Martin, 1999, 2004).

Actually, Fig. 12 and Fig. 13 show that the contour on the last unstressed syllable is not pertinent to encoded the prosodic structure, and pertains to purely phonetic facts. Indeed it can be shown that the phonological role to ensure in this case solely by the rise located on the stress contour.

The puzzling aspect of this relies in the apparent free choice that the speaker has to realize one of the two possible contours. In Martin (2004), it is suggested that the use of one or the other possibility of realization is linked to the NP complexity, i.e. its number of stressed syllable. In this view, as the prosodic structure must be indicated by a system of contrasts between prosodic markers, which implies that the final NP contour must contrast with the other contours located on the stressed syllables. If there is only one stressed syllables, the contour has only to contrast with the other contours found after the subject NP boundary.

It was assumed (as a working hypothesis) in Martin (2004) that the so called complex contour with a fall-rise pattern was linked to the highest levels of the prosodic structure (excluding the final contour, root of the prosodic hierarchy), but only if its complexity compared to a simple rise, was felt necessary by the speaker. In a 2 stress groups sentence therefore, there is no need to use a contrast with the final contour using a fall-rise pattern. Conversely, a 3 stressed syllable NP offers enough need for contrast to imply the necessity to use a complex fall-rise contour. In this latter case, the final NP contour must contrast with the first and second contours; the second has to contrast with the first and the last, etc.

The analysis of our data does not clearly exhibit this mechanism, as the structure of the NP in the corpus is not complex enough. Table 1 shows the distribution of both fall-rise and rise patterns for 1 stress and 2 stressed syllable for BP and EP speakers.

Subject NP	Fall-rise pattern	Rise pattern	
1 stressed syllable	5	19	Brazilian Portuguese
2 stressed syllables	5	21	
	Fall-rise pattern	Rise pattern	European Portuguese
1 stressed syllable	12	11	
2 stressed syllables	11	6	

Table 1. Distribution of fall-rise and rise patterns for 1 stress and 2 stressed syllable in subject NP read by BP and EP speakers

It follows that there is not clear correlation between the syntactic complexity of NP and the type of final NP contour used by the speaker. Indeed, EP speakers seem to favor fall-rise contour over simpler rise melodic contour more frequently used by BP speakers.

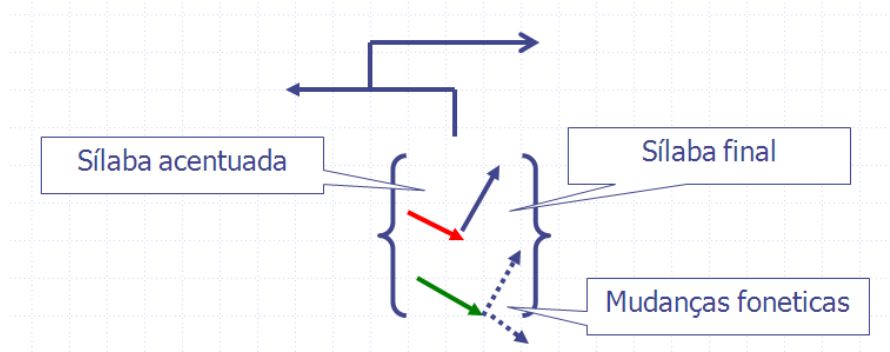


Fig. 14. Alternate realizations of NP final contour. When the stress syllable is also the final syllable, the complex fall-rise normally spread on two syllables is instantiated on one syllable.

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References

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