

The Intonation of Absolute Questions of Brazilian Portuguese

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Abstract In this paper we describe three melodic patterns of absolute interrogatives from a phonetic point of view, obtained from a corpus in Goiás (Brazil). The patterns are: a) Rising Final Inflection (30% to 52%), b) Rising-Falling Final Inflection, c) High Nucleus Final Inflection. These patterns have been established from the acoustic analysis and standardisation of 55 questions and from the verification of their validity in a perception test. We compared them with interrogative patterns obtained in different parts of Brazil and also in two Romance languages, Spanish and Catalan.

Keywords Intonation, Absolute Interrogatives, Brazilian Portuguese, Perception Test

1. Introduction

Absolute questions, also called yes/no questions, are those comprising the entire content of the utterance and are responded to with a 'yes/no' answer (*Você está vendo isso?*, 'Are you watching this?'), unlike partial or pronominal interrogatives, which focus on part of the utterance (*Quantos anos?*, 'How many years?').

The intonation of absolute questions in Brazilian Portuguese has been described by a rising melodic contour (Hochgreb, 1983 [1], Moraes, 1998 [2]). In later research, Moraes (2006) [3] states that the intonation of this type of question is more complex and presents five interrogative patterns which he described as: final rise, delayed rise, double rise, internal rise and falling pattern. The first three types of melodic contours are similar in that they have a rise on the last stressed syllable followed by a final fall (L+H*L%), with variations according to where the rise takes place and to whether it is very sharp or weaker. The fourth and the fifth types, internal rise and falling pattern, show a fall on the last stressed syllable (H+L*L%).

In 2006, Cunha [4], based on a corpus of semi-spontaneous speech from *Atlas Linguístico Brasileiro* (ALiB), described yes/no questions by a final rise pattern. A subsequent study, Cunha *et alii* (2008) [5] compared the

intonation of absolute questions in Brazilian Portuguese with those in Spanish spoken in Uruguay and was based on a question read by 4 female speakers from each place: Brazilians from Santana do Livramento and Rio de Janeiro and Uruguayans from Montevideo and Rivera. It described a falling contour, (L*+HL%) in Santana do Livramento and a falling parabolic contour (L+H*L%) in Rio de Janeiro.

In 2009, Lira [6] described statements and yes-no questions in five cities in the Northeast (Recife, Salvador, São Luís, Fortaleza and João Pessoa) based on the methodological procedures of Project AMPER. Four listeners were contacted in each city over 30 years old. She found a predominant final rise pattern in absolute questions from the first three cities and a high nucleus with a final falling pattern from the last two ones. According to AMPER method, both patterns were also found in Florianópolis and Lages, cities of the state of Santa Catarina (Nunes, 2011 [7]). In addition, Silva (2011) [8] states a rising-falling pattern in Rio de Janeiro and Florianópolis and a rising pattern in Recife and Florianópolis. Paixão & Callou (2011) [9] described a rising-falling pattern in Rio de Janeiro. These studies use laboratory speech. It means that they are based on data from a small group of subjects – two to four – who read some questions that have been previously prepared. In most cases the data of the melodic contours are F₀ values obtained in Praat to which they add phonological features based on Autosegmental model (i.e. Moraes, 2006 [3], Cunha *et alii*, 2008 [5]).

Unlike those studies, the study made by Sena (2013) [10] based on 140 absolute questions spoken by 31 native speakers from the State of São Paulo, within a context of spontaneous speech, following the *Melodic Analysis of Speech* method (MAS), explained in detail in Cantero, 2002 [11] and Font-Rotchés, 2007 [12], describes three interrogative melodic patterns: 1) Rising Final Inflection (20% to 30%); 2) High Nucleus Final Inflection: a. with flat body; b. with rising body; and 3) Rising-Falling Final Inflection.

In this paper we present the results obtained from research on the intonation of absolute questions spoken by native speakers from the State of Goiás, following *Melodic Analysis of Speech* method (MAS). We have discovered three interrogative patterns in total which have been

recognised by native speakers in perception tests and defined by the tonal movement of the final inflection. We have compared them with patterns obtained in other states of Brasil using different methodologies and also we checked if they exist in other romance languages such as Spanish and Catalan.

2. Corpus and Method

This research, which is part of a much larger joint project with researchers from the University of Brasilia, is based on the *Melodic Analysis of Speech* method (MAS) for the acoustic analysis, complemented in a second phase by perception experiments to establish the patterns.

We believe that it is a valid intonation analysis method, for two main reasons:

- It offers an exclusively phonic criterion in speech melody segmentation, independent of any other level of analysis, which can be used to analyze even spontaneous and genuine speech analysis.

It presents an acoustic data processing system that enables us to obtain the relative values that form the melodies in order to compare and classify them, to reproduce them exactly, experiment with them by using voice synthesis, subject them to perception analysis and make linguistic generalizations.

This enables us to use many speakers and a large number of contours with the purpose of establishing language intonation patterns with precise values to be applied in several areas, such as language teaching, voice retraining, speech disorders, voice synthesis, speech recognition and in dialogue systems among others.

The corpus consists of 8 hours of interviews and conversations recorded in Goiás (Brazil) with 17 speakers, 13 men and 4 women, who uttered 55 absolute interrogatives. All are native speakers from the State and come from or work in a rural context: agronomists, rural engineers, farmers and their wives and children, between the ages of 25 and 65.

The method's application, whose protocol is explained in detail in Font-Rotchés & Cantero (2009) [13], is divided into two stages. During the first, acoustic stage, the F_0 value of the vowels (in Hz) is obtained for each utterance using Praat [14]. Following this, the values obtained are standardized, calculating the tonal distance in percentages between one value (in Hz) and the next, starting with an arbitrary value of 100%.

Some authors express this interval using the semitone (st) as a unit, which has the advantage of being a logarithmic unit used to measure musical intervals. In speech melodies, however, using semitones means working with a somewhat complex standardisation formula and with intervals usually expressed in decimals.

The advantage of using percentages is that they are much more intuitive, because they allow us to express a logarithmic phenomenon in a linear way: we calculate (with an easy rule of three) the percentage of the variation of each

absolute value with regard to the previous value, expressing the rise as a positive percentage and the fall as a negative percentage.

The result of this standardisation (see Table 1) is the essential melody of the phrase, clean of irrelevant values (or 'micromelodic variations').

Table 1. F_0 and percentage values of *Dos anteriores?* "Of the previous ones?"

Utterance	Dos	an	te	ri	ores	ores
Hz	228	232	221	228	261	344
Percentage	100%	1.8%	-4.7%	3.2%	4.5%	31.8%

In order to draw the graphic representation of these melodies, we convert the percentages obtained into standard values: starting, for example, with the value 100 (an arbitrary value). By applying (see Table 2) the rise percentage seen in the second segment, 1.8%, we will obtain a second value, 102; to this we apply the fall percentage of the third segment, -4.7% and we will obtain the third value, 97; and so on until the last segment.

From this process, we obtain the following values:

Table 2. F_0 , percentage and standard curve values of *Dos anteriores?* "Of the previous ones?"

Utterance	Dos	an	te	ri	ores	ores
Hz	228	232	221	228	261	344
Percentage	100%	1.8%	-4.7%	3.2%	4.5%	31.8%
Standard Curve	100	102	97	100	114	151

These standardized values enable the melodic line to be represented graphically and, subsequently, these contours can be classified and compared regardless of any variable of both speaker (gender, age) and duration of the utterances or its grammatical structure (see Figure 1 for the different parts of the contour). Mateo (2010) [15] developed a script for Praat and an Excel macro which enables the automation of the gathering and standardisation of data.

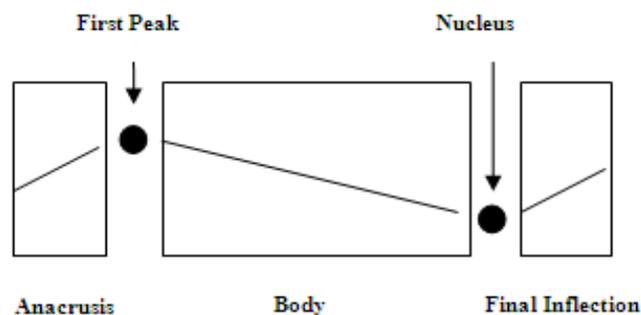


Figure 1. Diagram of the three parts of the contour.

As can be seen in the contour diagram, the anacrusis consists of the existing tonal segments prior to the first stressed vowel of the contour or the first peak. Not all of the contours have this part as on occasion it is nonexistent. The

body begins after the first peak and continues until the last stressed vowel of the contour, the vowel we refer to as nucleus or core. The final inflection is the most important part of the contour and starts at the last stressed vowel and is carried on until the end. The direction of the final inflection (rising, falling, rising-falling, falling-rising, etc.) and the percentage of the tonal movement obtained are the basic criteria which enable us to establish the different types of melodies.

In the perception stage, the results obtained are validated using a perception test based on a synthesized copy of the original utterances (using Praat with the PSOLA method) or the actual utterance itself. According to this, the pitch values of an utterance are erased and then replaced by standardized values. This way they can check if the melodic analysis has been correct and if it reflects the original melody without micromelodic variations and with the normalized values.

In this theoretical pattern, we distinguish between the contours' melodic features (which constitute the intonation's phonetic level) and the phonological features (which allow to establish the *tonemes* or phonological intonation units).

The phonological features are: /± interrogative/, /± emphatic/ and /± suspended/, whose combination allows us to characterize the language *tonemes* (Cantero, 2002) [11]. These phonological features were sufficient for classifying all the contours in a corpus of 2500 peninsular Spanish utterances produced by more than 600 people (Ballesteros, 2011[16], Mateo, in press [17]) and another of 580 Catalan utterances produced by 160 people (Font Rotchés, 2007) [12].

The participants in the experiment (listeners) are asked whether the utterances they hear sound to them as questions or not, that is /± interrogative/, as finished or not, that is /± suspended/ and as exclamations or not, that is /± emphatic/. The listeners determine where the significant changes take place in the melodic features.

The melodic features are, in turn, the characteristics of the contour's functional elements: *anacrusis*, the *first peak*, the *body* and the *final inflection (FI)*. The description of these elements (especially the description of the *final inflection*) allows us to define the contour melody. We can also establish the typical melodic patterns in our corpus (as "typical contours" of the *tonemes*) and their dispersion margins.

This perception stage has enabled us, for now, not only to establish the distinctive phonological values, but the dispersion margins of twelve melodic patterns for Castilian Spanish (Cantero; Font-Rotchés, 2007 [18]) and eight for Catalan (Font-Rotchés, 2007 [12]). Also, four interrogative melodic patterns have been described for Castilian (Font-Rotchés; Mateo, 2011[19]) and three for Catalan (Font-Rotchés, 2008 [20]).

Following this method, we can study the acquisition of Castilian Spanish Intonation by Chinese people, speakers of a tonal language (Liu, 2005[21]), by Italian learners (Devís, 2011[22]), by Brazilian Portuguese learners (Fonseca; Cantero, 2011[23]) or Hungarian learners (Baditzné, in press

[24]), among others.

2.1. Perception Test

After analyzing the 55 absolute interrogatives, which form part of the corpus made up of 145 utterances, we standardize them, represent them on a graph and classify them according to their final inflection, in other words according to the tonal movement in the nucleus or last stressed syllable.

We have established that there are three types of final inflections (FI): 22 with a rising FI between 10% and 56%, 17 with a rising-falling FI between 10% and 75% and 16 with a high nucleus FI between 5% and 115%. Two perception tests were set up including a total of 68 utterances of different types, classified by blocks according to what was being asked.

We selected a total of 26 absolute interrogative utterances (9 with a rise of between 17.2% and 56.8%; 7 rising-falling, the rise between 15% and 75%; and 10 with a high nucleus with a rise of between 5% and 115.5%) which were randomly included in the two tests combined with various utterances. All could be interpreted in a decontextualized way, as any type of utterance: declarative, emphatic, suspense, interrogative, etc., with no type of grammatical or punctuation mark which would make them stand out. For example, "Está lembrado", Do you remember?/You remember it./ You remember it! Moreover, the selected contours included varying rise percentages in the final inflection to establish the minimum and maximum tonal movement margins. If the variety was not sufficient the utterances could be manipulated using the Praat's PSOLA method.

Each test was responded to by 40 participants, undergraduate students at UnB (University of Brasilia), all native speakers of Brazilian Portuguese which come from different states of Brazil. Each student was given a questionnaire with 34 utterances laid out in blocks. In each block interrogative utterances were combined with suspense, neutral and emphatic utterances so that the listener would differentiate between the types of utterance that were being heard.

For the final rise utterances, a dichotomy of the following type was posed: É uma pergunta (?) 'It is a question' / O enunciado não está acabado ainda (...) 'The utterance is unfinished', because we wanted to discover the upper and lower limits of the question's rise. For utterances with a rising-falling final inflection and with a high nucleus the following dichotomy was posed: É uma pergunta (?) 'It is a question' / É uma exclamação (!) 'It is an exclamation' to find out which percentage value of the rising contour correlates with the question and which percentage value correlates with the exclamation. The participants listened to each sound file of each utterance three times and had to mark the option they heard with an "x". If in doubt or if they didn't know, the box was left blank.

Table 3 shows the results obtained for the questions with a final rising inflection. We included 9 questions in the

perception test with contours presenting a final rising inflection of between 17.2% and 56.8%.

According to the results, the participants responded in their large majority (cases highlighted grey), between 80% and 97.5%, that the contour perceived as a question melody presented a final rising inflection in a range of 30% to 52%.

It appears that a lower rise, between 17.2% and 21.9% is not always interpreted as /+interrogative/, nor is a higher one, with a 56.8% rise. Even so, further tests should be carried out when this corpus is increased in order to try to establish the higher limit with more precision, particularly if contours with a rise higher than 56.8% occur, which is the highest we have an example of to date.

Table 3. Questions with a rising FI.

Utterances	% rise	?	%	...	%
Seria 31 de janeiro aqui <i>'That would be 31 January here?'</i>	17.2	24	60	16	40
Nivelar e todinho faltando plantar <i>'Level and completely unplanted?'</i>	21.9	23	57.5	17	42.5
Está lembrado <i>'Do you remember?'</i>	29.7	38	95	2	5
Dos anteriores <i>'Of the previous ones?'</i>	31.8	35	87.5	5	12.5
A energia põe quanto <i>'How much does electricity cost?'</i>	31.7	32	80	8	20
Mas esses que você dá eles valem cinquenta. <i>'But the ones you provide are worth fifty?'</i>	41.8	39	97.5	1	2.5
Você quer levar o negócio das vacas <i>'Do you want to run the cattle business?'</i>	48.4	33	82.5	7	17.5
Duzentos e cinquenta esse bezerro <i>'Two hundred and fifty this bullock?'</i>	51.8	39	97.5	1	2.5
De um a dois anos <i>'From one to two years?'</i>	56.8	24	60	16	40

Table 4. Questions with a rising-falling FI.

Utterances	% rise	?	%	!	%
Você tem alguma dúvida com relação as suas, seus dados <i>'Do you have any queries regarding your details?'</i>	15.3	37	92.5	3	7.5
vinte mesmo <i>'Exactly twenty?'</i>	26.8	38	95	2	5
Está vendo os morrinhos <i>'Are you looking at the hills?'</i>	34.7	38	95	2	5
Você tem o anterior <i>'You have the previous one?'</i>	46.2	40	100	0	0
Do pé de acerola <i>'From the acerola cherry tree?'</i>	48.4	38	92.5	2	7.5
Mais de dois anos é uma <i>'One is more than two years old?'</i>	62.2	28	70	12	30
Tá boa <i>'How are you?'</i>	75	32	80	8	20

With regard to the contours with a final rising-falling inflection, we put 7 questions to the perception test, with contours, in the first part of the final inflection, with a rise of 15.3% to 75% followed by a fall which tended to end at a point lower than where the final inflection began. The results shown in table 4 conclude that in this type of inflection, a rise of 15% is sufficient for the contour to be interpreted as a question melody by 92.5% of the participants. Similarly, the different rises in the final inflection of the melodies included in the perception test and which reached 75%, showed perception levels as a question of between 80% and 100%.

There is only one case, "*Mais de dois anos é uma?*", *One of them is more than two years old?* with a 62.2% rise in the final inflection, which was mainly perceived, by 70%, as a question whilst the remaining 30% perceived it as an exclamation. Even so, we understand that its melody is a question due to the majority of participants responding as such and it is between the two rises, 48.4% and 75% which were also considered /+interrogatives/.

The contours with a high final nucleus followed by a fall are also used by speakers to create questions in Brazilian Portuguese, as shown in table 5.

Table 5. Questions with a high nucleus FI.

Utterances	% rise	?	%	!	%
Em janeiro nasceram <i>'Were they born in January?'</i>	5,1	0	0	40	100
Desse você trouxe da última vez <i>'You brought that last time?'</i>	9,7	33	82.5	7	17.5
Você está vendo isso <i>'Are you watching this?'</i>	10	35	87.5	5	12.5
Já pensou se aquilo lá estourar <i>'What if it blows up?'</i>	11.9	32	80.0	8	20.0
Tem visão aqui <i>'Can it be seen from here?'</i>	16.5	37	92.5	3	7.5
Mas ele não trabalha nada com o gado <i>'Does he really work with livestock?'</i>	25.6	31	77.5	9	22.5
Caiu então <i>'So, it fell?'</i>	29.6	30	75.0	9	25.0
O senhor não tem funcionário aqui não <i>'You don't have civil servants here?'</i>	33.3	39	97.5	1	2.5
O senhor quer ver <i>'Do you want to see it?'</i>	48.5	40	100	0	0
Não é esse <i>'Isn't it that?'</i>	115	22	55.0	18	45.0

This type of contour, as we can see in the next section, is characterized by a fairly flat body and in the syllable prior to the nucleus a rise starts ending in the nucleus itself and followed by a fall. There were 10 utterances in the perception test which were questions, whose melodies were recognized as such in 8 cases with a rise of between 9% and 48.5%. It appears that a lower rise, 5,1% is not interpreted as /+interrogative/. One last contour with a significant rise of 115% (100% is equivalent to an octave on a musical scale) was interpreted by 55% as interrogative and by 45% as

emphatic. It is likely that it contains these two characteristics but this possibility was not planned in the tests. Also in this case, the corpus should be increased to see how contours with rises in the high nucleus of 48.5% are defined.

3. Results and Discussion

Based on 55 questions taken from a corpus of interviews and conversations, which were initially analyzed acoustically, then classified into groups according to their final inflection (rise, rising-falling, high nucleus) and finally validated in perception tests by 40 native speakers, we have defined three patterns for absolute interrogatives in Brazilian Portuguese which we describe below.

In addition, we will take into account the patterns obtained by researchers from different parts of Brazil using different methodologies in order to test if similar patterns have been found in different states or cities. And also, we will compare them with existing interrogative patterns in other Romance language, i.e. Spanish and Catalan, using the same methodology.

3.1. Rising Final Inflection (30% to 52%) Pattern

The *rising FI (30-52%)* melodic pattern (see Figure 2) is characterized by an optional anacrusis, comprising the first unstressed syllables of the utterance to the first stressed syllable or first peak. In this part of the contour a rise could occur between 30% and 50%. Sometimes, the utterance begins at the first peak and does not include this part and other times the rise could be 50% or more, therefore establishing that there is an emphasis on the first peak.

The body, from the first peak to the nucleus, tends to present an almost imperceptible fall. Words with a tonal rise are frequently found in the body.

After the nucleus, the final inflection begins, characterized by a slight rise of 30% and 52%. It is not a particularly marked rise compared to Spanish question melodies which show a rise of over 70% (Cantero; Font-Rotchés, 2007) or to those in Catalan which are over 80% (Font-Rotchés, 2007, 2008).

However, this part of the contour is the most significant and is the one that enables listeners to recognize the type of melody they perceive.

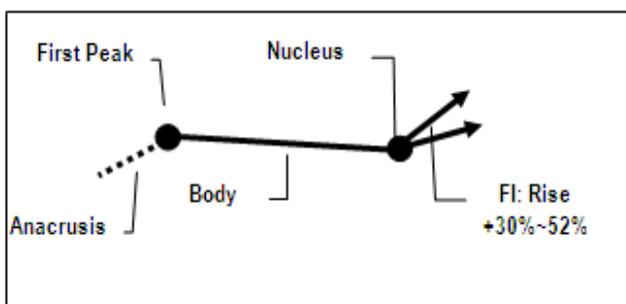


Figure 2. Rising Final Inflection (30% to 52%) pattern.

This melodic contour, found in 17 utterances of the corpus coincide with any of those obtained in Florianópolis (Nunes, 2011; Silva, 2011), Lages (Nunes, 2011), cities of the Northeast, as Recife (Lira, 2009; Silva, 2011), Salvador and São Luis (Lira, 2009), and State of São Paulo (Sena, 2013), as well as of those described by Cunha (2006), based on a corpus of semi-spontaneous speech from *Atlas Linguístico Brasileiro*. The rising pattern obtained by Sena (2013) for São Paulo State is more easily comparable to our results, because like this study, Sena takes percentages to characterize the intonational patterns. In this sense, it is worth noting that Sena (2013) found a slighter rise in São Paulo than the one we found in Goiás: In the first case the rise extends from 20% to 30%, while in Goiás the same pattern presents a rise contour from 30% to 52%.

In Figure 3, the question “*Dos anteriores?*”, *Of the previous ones?*, shows an utterance that does not include the anacrusis and the first peak. It has a flat body and a final rise from the final stressed syllable ‘-ores’ of 31.8%.

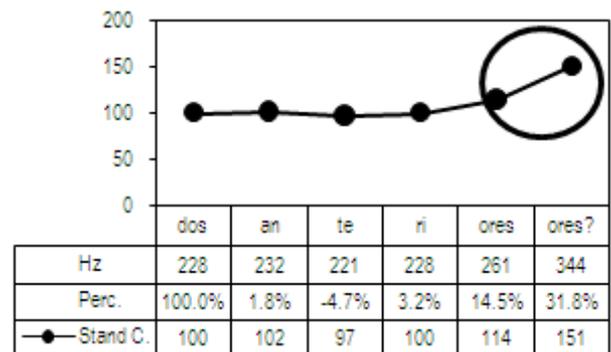


Figure 3. Melodic contour of “*Dos anteriores?*” ‘*Of the previous ones?*’

3.2 Rising Final Inflection Pattern

The rising-falling FI melodic pattern (see Figure 4) is characterized by a flat body with no anacrusis or first peak. Sometimes the utterance has an optional anacrusis with a slight rise, comprising the first unstressed syllables of the utterance until the first stressed syllable or first peak.

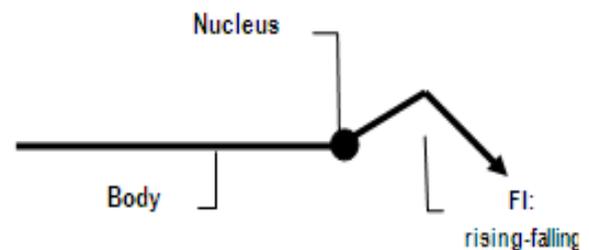


Figure 4. Rising-Falling Final Inflection pattern

The final inflection begins after the nucleus which in this case has three values and is circumflex, rising-falling. The rise that occurs can be between 15% and 75% and the fall tends to reach a point close to where the final inflection began. This melodic contour, found in 15 utterances of the

corpus, which coincides with an interrogative pattern described for Spanish (Cantero; Font-Rotchés, 2007) does not coincide with any of those described by Moraes (2006) but does have a certain resemblance to the Santana do Livramento structure of Cunha *et alii* (2008), to the Rio de Janeiro (Paixão; Callou, 2011; Silva, 2011), to the Florianópolis (Silva, 2011) and the State of São Paulo (Sena, 2013).

Figure 5 shows a typical example with an anacrusis with a slight rise, a flat body and a final rising-falling inflection.

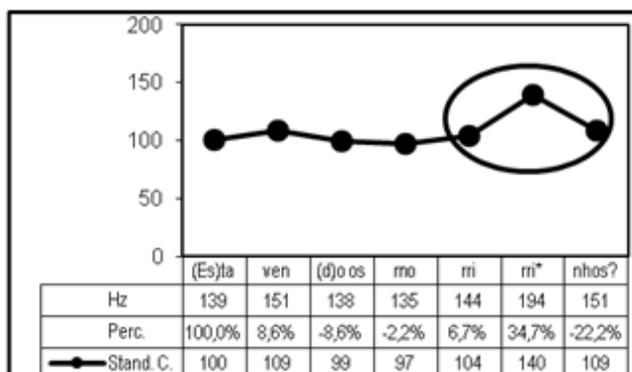


Figure 5. Melodic contour of “Esta vendo os morrinhos?”, Are you looking at the hills?

3.3. High Nucleus Final Inflection Pattern

The high nucleus FI melodic pattern (see Figure 6) is characterized by an optional anacrusis, comprising the first unstressed syllables of the utterance up to the first stressed syllable or first peak. In this part of the contour a rise could occur between 30% and 40%. The body shows a gentle fall until the syllable before the nucleus, where the rise begins, which can be 9% to 48.5% or more and which culminates in the nucleus. The melodic line continues with a fall that ends at the lowest point of the contour.

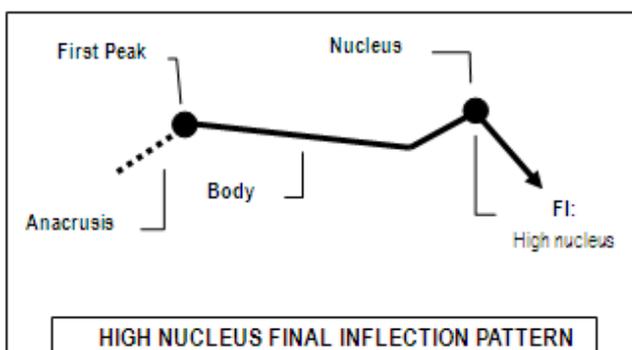


Figure 6. High Nucleus Final Inflection pattern

This pattern is similar to an interrogative pattern in Catalan, although the rise in Catalan in the high nucleus must be at least 50% (Font-Rotchés, 2007, 2008).

This melodic contour, found in 13 utterances of the corpus, is similar to the endings described by Moraes (2006: 118), Cunha *et alii* (2008) for Rio de Janeiro, Lira (2009) for João

Pessoa and Fortaleza, Nunes (2011) for Florianópolis and Lages and Sena (2013) for the State of São Paulo. Sena (2013) describes two varieties in the body of this pattern: it can be rising or with a gentle fall.

In Figure 7 we can see a rise in the contour until the first peak, *Você está* ‘Are you’, of 17.8%, a body showing a gradual fall which changes direction and begins to rise on the pre-tonic syllable and ends in the final stressed syllable, followed by a fall.

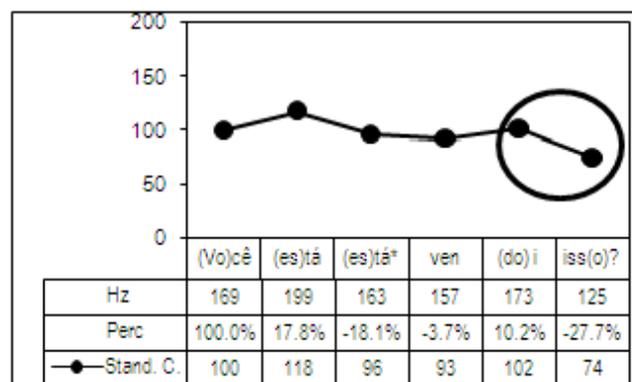


Figure 7. Melodic contour of “Você está vendo isso?”, ‘Are you watching this?’

Spontaneous speakers use the three interrogative patterns in 40 utterances, which are interrogative melodies and which, decontextualized, have been interpreted as such by native speakers in perception tests. The remaining 15 utterances follow other melodies, more in line with other types of utterances (declarative, emphatic, suspense) for emitting the absolute questions. In these cases, the discursive context is the only element that enables us to establish the interrogative character of the utterances. This phenomenon has been observed in Spanish and Catalan (Font-Rotchés; Mateo, 2011 [19], Font-Rotchés, 2008[20]).

4. Conclusions

According to the results obtained from our research, absolute questions in Brazilian Portuguese in the State of Goiás have three different melodic patterns according to their final inflection:

- *Rising Final Inflection (30% to 52%)*. This pattern is characterized by optional anacrusis, first peak in the first tonic syllable, body with a gentle fall and a rise of between 30% and 50% in the final inflection. Similar contours were also obtained in Florianópolis and Lages (State of Santa Catarina), cities of the Northeast, as Recife, Salvador and São Luis, State of São Paulo, as well as in *Atlas Linguístico Brasileiro*. Compared with Spanish question melodies which show a rise of over 70% or to those in Catalan which are over 80% it is not a particularly marked rise.
- *Rising-Falling Final Inflection*. Normally this pattern is described with no anacrusis, although it

sometimes has an optional anacrusis with a slight rise, flat body and a rising-falling final inflection with a rise between 15% and 75%. Contours like these were found in Santana do Livramento, Rio de Janeiro, Florianópolis and in the State of São Paulo. This pattern coincides with an interrogative pattern described for Spanish, but does not coincide with any interrogative pattern of Catalan.

- *High Nucleus Final Inflection*: This pattern is characterized by optional anacrusis, first peak in the first stressed syllable, body with a gentle fall, and a high nucleus between 10% and 40% followed by a fall. They have been found in some studies of different States of Brazil, such as Rio de Janeiro, João Pessoa, Fortaleza, Florianópolis, Lages and the State of São Paulo. This pattern is similar to an interrogative pattern in Catalan, although the rise in Catalan in the high nucleus must be at least 50%. However, it has not been described for Spanish.

The three patterns that had been defined by researchers before us in cities and states of Brazil, in most cases are based on a corpus made by a few number of speakers reading utterances and using a methodology that doesn't offer us exact data in order to compare different contours from a wide range of speakers. These results seem to indicate that it is likely that these patterns exist in general Brazilian Portuguese. We will continue collecting data in other parts of this country using *Melodic Analysis of Speech* method in order to test not only if the three patterns exist but also to define in which sociopragmatic contexts they appear.

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