José Torregrosa-Azor* and Dolors Font-Rotchés

# Melodic patterns of absolute interrogative utterances in northern German spontaneous speech

**Abstract:** The present paper deals with the description and characterization of the melodic patterns of absolute interrogative utterances in northern German spontaneous speech from an intonation and semantic-pragmatic point of view. This research has been carried out based on 246 absolute questions from spontaneous speech settings by multiple speakers of different gender, age, and education by applying the Melodic Analysis of Speech (MAS) method developed by Cantero (2002, *Teoría y análisis de la entonación*. Barcelona: Ediciones de la Universidad de Barcelona.). As a result, we found five intonation patterns for absolute questions in German: *falling final inflection, rising final inflection, rising-falling final inflection, high nucleus final inflection* and *rising body and final inflection*. The first three have been previously defined by researchers using the ToBI method, while the fourth and fifth patterns had not, to date, been described in this context. In addition to defining the melodic features of each one in spontaneous speech, we have also contributed to providing the different pragmatic meanings discovered in the various contexts in which each pattern appears.

**Keywords:** Melodic Analysis of Speech (MAS), German intonation, spontaneous speech, melodic patterns, absolute questions

# 1 Intonation of absolute interrogatives in German

In this article we deal with the intonation characteristics of absolute interrogatives utterances in northern German language. By absolute interrogatives we mean a category of questions in which the answer to the question is either yes or

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no. Three grammatical types of absolute questions are considered and were taken from a data corpus of spontaneous speech. The first type includes those characterized by an inversion of subject (S) and verb (V) followed by the object (O), and complements. This type of question is quite common in the German language and the syntactic structure is VSO, e.g., *Bist du schwul*? 'Are you gay?' The second type of absolute questions taken into account in our data, are those known as "queclaratives" (Sadock 1974) or "intonationally marked" (Petrone and Niebuhr 2014). This type of absolute interrogatives is characterized by a declarative structure, SVO, e.g., *Der glücklichste Moment in meinem Leben?* 'The happiest moment of my life?' Finally, the third type consists of utterances comprising only a few words that follow neither the syntactic structure VSO of syntactically marked questions nor the syntactic structure SVO of queclaratives questions, e.g., *Buddhist?* 'Buddhist?' or *Brot?* 'Bread?'.

Absolute interrogatives in German have been analyzed and described based on various methodologies, but above all using the autosegmental-metrical system, initially described by Pierrehumbert (1980). From this system, a labeling convention known as *Tones and Break Indices* (ToBI) was developed for the English language. In the context of German, its own labeling convention has been developed, *German Tones and Break Indices* (GToBI), explained in Grice et al. (1996).

Specifically, through the application of this intonation analysis model, in Grice et al. (2005) four different intonation patterns for absolute interrogatives in German are considered, based on the description given in Moulton (1962), von Essen (1956 [1964]), Féry (1993) and Ladd (1996) and adapting the description to the labeling system of the autosegmental-metrical analysis methodology.[1] Three of the four patterns have a rising final inflection with variations in the expression of the nucleus, from which the final inflection is developed: (a) L*H-^H% (or L*H according to Kügler 2004), which is described as a neutral absolute interrogative or echo question; (b) L*L-H%, an absolute interrogative pattern characteristic of answering the telephone and (c) (L+) H*H-^H%, which describes absolute interrogatives called follow-up questions. The fourth pattern of absolute interrogatives given also presents a final rise, but is preceded by a fall that is not found in the other three patterns: (d) H*L-H%, corresponding to a type of absolute interrogative used to express a polite offer.

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**1** Diacritics: "L" is the conventional symbol to refer to a low tone. "H" is the conventional symbol to refer to a high tone. "*" refers to a nuclear accent. + represents a combination of two tones. - refers to an edge tone or phrase tone. % indicates a boundary tone. ^ indicates an upstepped H tone. → indicates that the tone does not differ from the tone that immediately follows.

Uhmann (1991) defines four patterns for the intonation of interrogatives in German. The patterns L*+HH% and H*+LH% correspond to the intonation of absolute interrogative or *I-Fragen* type utterances, while H* + LL% and L*+HL% describe the intonation of pronominal interrogative utterances or *II-Fragen* type patterns.

Kügler (2004) describes the same intonation patterns as Uhmann (1991), however none of them corresponds to pronominal interrogatives but to absolute interrogative utterances. While the four intonation patterns, L*HH%, H*LH%, H*LL% and L*HL% are described as part of Swabian German, a southern German linguistic variant, only L*HH% and L*HL% are found in Upper Saxon, a linguistic dialect found in the Leipzig area.

Peters (2005) describes different intonation patterns for absolute interrogative utterances taking into account the four types of nuclear accents for German, according to the GToBI system (falling pitch accent, high accent, rising accent and low accent) and semantic variants according to different boundary tones. For absolute interrogative utterances with a falling nuclear pitch accent, he describes four different patterns: H*L→L%; H*L→H%; H*LH% and H*LL%, although this last pattern could appear in pronominal interrogative utterances. Within the group of high pitch accent contours there are two different patterns: H*H% and L + H*→H%. A third pattern, L + H*LH%, is described although he adds that this last pattern would be less acceptable than the previous two. In the group of contours with a rising nuclear pitch accent there are two patterns: L*H→H% and L*HH%. Finally, in the group of interrogative contours with a low nuclear pitch accent there are also two patterns: (L)L*→H% and (L)L*HH%.

In short, we find discrepancies with regard to the description of intonation of absolute interrogative utterances in German. Whilst for some authors absolute interrogatives only have a final rise (Uhmann 1991), the majority of authors consider both a final rise and a final fall. We also find that as research on intonation in German progresses and further analysis is made of utterances, developments in the melodic configuration have also been made, which are translated with the addition of new diacritical elements in the labeling system and that result in a complex development of the marking system. Finally, another aspect that we have observed, is the limited use of speakers (Ambrazaitis 2008), for which gender is generally not indicated (Kügler 2004) and a protocol of recordings under laboratory conditions that minimizes the spontaneity factor. One of the premises we established at the beginning of the research was to obtain samples of spontaneous speech in order to subsequently carry out the melodic analysis. Taking into account the teaching applicability of the results of this research, we believe it would be more appropriate to provide melodic models obtained by natives of the language under study in a natural

context instead of offering melodic models of intonation in German taken from a semi-spontaneous source or from recordings done in a laboratory of readings of a series of sentences.

This paper adopts a different perspective. We apply the *Melodic Analysis of Speech* (MAS) model, developed by Cantero (2002), revised and applied in Font-Rotchés (2007), and established as a protocol in Cantero and Font-Rotchés (2009),[2] for analyzing the intonation of utterances of spontaneous speech by multiple speakers of different gender, age, and education. The MAS model of intonation analysis allows better precision in determining the different melodic contours using the relativization and standardization protocol of the tonal values of vowel segments, but also of the different semantic and pragmatic aspects associated with each one of the intonation patterns in a specific linguistic variant.[3]

The objective we propose for this research consists in defining the linguistic description of intonation patterns for absolute interrogative utterances in northern German in spontaneous speech and its acoustic characteristics and semantic and pragmatic meanings, using the Melodic Analysis of Speech method.

# 2 Materials and analysis method

## 2.1 Data corpus

The data corpus selected for this research consists of 246 absolute interrogative utterances taken from audiovisual recordings issued by 56 speakers, 28 women and 28 men, of ages between 17 and 75. Data recordings were made from several German television programs, such as talk shows or interviews held on the street,

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**2** There is an English version in Font-Rotchés and Cantero (2009).

**3** The method has been tested with positive results in several papers about mainland Spanish (Cantero and Font-Rotchés 2007) and some of its linguistic variants, such as northern Spanish (Ballesteros 2011), southern Spanish (Mateo 2014) or Colombian Spanish (Estupiñán 2015); about Catalan (Font-Rotchés 2007; Font-Rotchés 2011) and some of its linguistic variants, such as in the Balearic Islands (Pons 2011; Pons 2014) or the Catalan variant *Pallarès* (Rius-Escudé and Pérez-Peitx 2012), which is spoken in North West Catalonia; and also about absolute questions in Brazilian Portuguese (Cantero and Font-Rotchés 2013; Araújo 2014; Mendes 2013), Spanish (Font-Rotchés and Mateo 2013) and Catalan (Font-Rotchés 2008). The method has also been used to describe models of intonation for speakers of other languages who learn Spanish, such as the case of speakers of Chinese (Liu 2003), Swedish (Martorell 2010; Martorell 2014), Brazilian Portuguese (Fonseca 2013), Italian (Devís 2011), Hungarian (Baditzné 2012) and English (Muñoz 2014).

in different towns located in North Germany. These types of programs are particularly suitable for research in which intonation is analyzed based on natural and day-to-day linguistic register, such as that proposed. The reason is that they offer the advantage of obtaining spoken sentences from a large number of subjects, with variables such as age and gender, education, profession, etc., thus guaranteeing the absence of utterances produced by experts in linguistics, such as linguists, actors, writers, or radio presenters, as this factor could influence the results obtained.

## 2.2 Method of analysis

This section presents the Melodic Analysis of Speech method, developed by Cantero (2002) and systematized as a protocol in Cantero and Font-Rotchés (2009), which allows the reliable melodic representation of utterances, taking into account the relevant phonic information contained in the utterances themselves (the $F_0$ of the tonal segments, the vowels) and discriminating that which is not (the $F_0$ of the voiced consonants – except in some cases – and of the glides).

This method of analysis is based on the principle of *phonic hierarchy*, according to which the sounds of speech are not only a mere succession of isolated emissions, but are organized in phonic blocks, the nucleus of which is the vowel segment (Cantero 2002: 147). From this perspective, the elements of the phonic chain are perfectly structured and hierarchical around the vowel sounds, which are the elements that provide the relevant melodic information, achieving an integrating function within the discourse structure.

Therefore, the unit of analysis is the tonal segment, the vowel sound, as this is the element of the phonic chain that has tone and for which F0 can be obtained. Around the vowel segment are the other elements of the phonic chain. Thus, the procedure followed consists in obtaining and recording the absolute frequency values (Hz) of each one of the vowel sounds in the utterance using the *Praat* program (Boersma and Weenink 1992–2013, version 5.3.60).[4]

Figure 1 shows an example of the extraction of frequency values of the utterance *Magst du Berlin?* 'Do you like Berlin?' obtained by using the *Praat* application. The dark areas of the spectrogram correspond to each one of the vowel segments and for each one of them the F0 value in Hz is obtained from the average value of the vowel's F0 (e.g., *-a-, -u-* and *-e-* in Figure 1).

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**4** An autocorrelation extraction method has been used and a pitch range from 75 Hz to 500 Hz was chosen for male and female speakers.
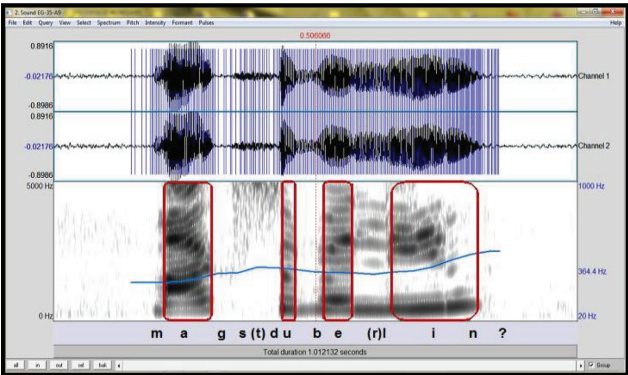
**Figure 1:** Extraction of frequency values of the utterance *Magst du Berlin?* 'Do you like Berlin?'

However, according to Font-Rotchés (2007) and Font-Rotchés and Cantero (2009: 36), when a stressed vowel contains a tonal inflection with a tonal distance of at least 10 % (100 % is equivalent to an octave of the musical scale),[5] a value with two tonal segments is established for the inflection (or three segments if it is a circumflex inflection). This is the case of the segment -*lin*, shown in Figure 1. This means that the syllable has two (or three) values, which are distinguished by an asterisk (*) – one if it is the second value and two if it is the third. These values are calculated using the initial and final extreme values of the inflection (see Table 1).

**Table 1:** F0 values in Hz of utterance *Magst du Berlin?* 'Do you like Berlin?'.

| Syllables | Magst | du | Ber | lin | lin* |
|---|---|---|---|---|---|
| Hz | 309 | 391 | 362 | 366 | 479 |

Furthermore, when the inflection ends with a vowel followed by a voiced consonant with a tonal distance of at least 10 %, this consonant usually constitutes the last tonal segment of the inflection (see perception tests in Font-Rotchés 2007). See the example of *Magst du Berlin?* 'Do you like Berlin?' in Figure 1, in which the last stressed syllable -*lin* contains a rising tonal inflection

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**5** This tonal distance has been verified in different perceptive tests carried out by Applied Phonetics Lab of the University of Barcelona and applied in MAS research since 2011.

with two values (see Table 1): *-lin* (366 Hz) from the vowel and *-lin*★ (479 Hz) from the voiced consonant *-n.*

The final tonal inflection, which begins on the last stressed vowel of the utterance, is characterized by the tonal movement that takes place from the stressed syllable until the last unstressed syllable(s) when the word is paroxytone or proparoxytone, or until the last value of this stressed vowel, if the word is oxytone (see Table 1). In cases where the last stressed syllable of an oxytone word has only one value, the final inflection begins on the previous syllable.

The graph that results after processing the data reflects the frequency variations of the vowel segments and shows the melody of the analyzed utterance. However, the contour still has the individual phonic characteristics of each speaker, and therefore it is still not possible to extract comparable generalizations. Suppose that one male and one female utter the following question composed by two syllables *Berlin?*. The F0 values obtained from the male speaker are, from a real point of view, 100 Hz for *Ber-* and 200 Hz for *-lin?*. The F0 difference between *Ber-* and *-lin?* is 100 Hz, but we observe after applying the relativization formula presented below that the relative distance, calculated in percentage between them is 100 %. On the other hand, suppose that the F0 values obtained from the female speaker are, from a real point of view, 200 Hz for *Ber-* and 300 Hz for *-lin?*. The F0 difference between *Ber-* and *-lin?* is 100 Hz and the relative distance is 50 %.

Although the difference in Hz between both male and female is 100 Hz, the question *Berlin?* sounds really different. However, if the female question has 200 Hz for *Ber-* and 400 Hz for *-lin?* the relative distance is the same as the relative distance obtained from the male question and therefore sounds the same. In this case, we are able to compare these two speech productions, because we are able to consider the melodic skeleton without the individual phonic characteristics of both utterances, even though the questions are uttered by speakers of different gender. We must first obtain configurations that describe only the melodic structure of the utterances, removing individual phonic characteristics. Thus we are able to compare the resulting contours with other melodic copies produced by other speakers and are able to extract and study the common melodic characteristics of a specific linguistic variant.

Obtaining the frequency value of the vowel segments is not sufficient. It is also necessary to carry out a relativization process of this data, which consists in transforming these frequency values into percentage data that reflect the tonal relationship existing between one absolute value and the one immediately after it. These values are standardized using the number 100 as the initial reference data, to which the percentages obtained from the relativization process are applied.

Following is the formula for the relativization of the frequency values and the formula for standardizing the relative values:

Relativization formula:     $VREL_{n+1} = [(VABS_{n+1}\text{-}VABS_n)/VABS_n] \star 100$
Standardization formula:  $VS_{n+1} = VS_n + [(VREL_{n+1} \star VS_n)/100)]$

The variable $VABS_n$ corresponds to the absolute value of the vowel segment of reference. $VABS_{n+1}$ is the frequency value of the vowel segment that occurs at the reference value and from which the relative difference in % with respect to the preceding vowel segment is determined. $VREL_{n+1}$ or the relative value expresses the melodic difference as a percentage between the absolute value of reference and $VABS_{n+1}$ or the value immediately after. Finally, $VS_{n+1}$ corresponds to the standardized value of $VREL_{n+1}$ with respect to $VS_n$. This last value is the standard value that acts as the reference value. The standardized intonation contour is graphically plotted from the resulting algorithm.

The logic of the calculation of the formulas expresses the orderly progression of the successive tonal variations that arise between the consecutive vowel segments of the phonic chain and defines the melodic structure of the analyzed utterances. Table 2 shows the complete table following the processing of the F0 values by applying the relativization and standardization formulas previously indicated. The relative tonal distance is given in the *Perc.* column, expressed in percentages, between the vowel segments of the utterance.[6]

**Table 2:** F0 and standardized values for the utterance *Magst du Berlin?* 'Do you like Berlin?'.

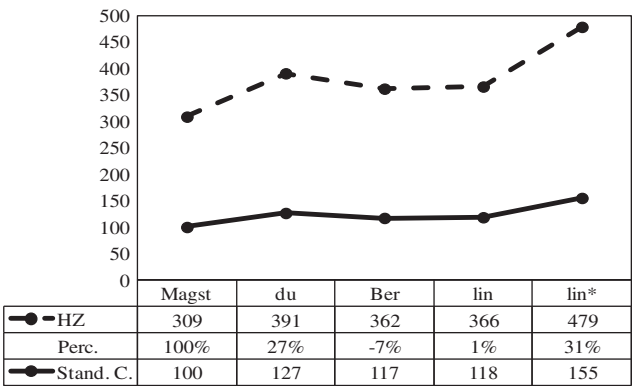| Syllables | Magst | du | Ber | lin | lin* |
|---|---|---|---|---|---|
| Hz | 309 | 391 | 362 | 366 | 479 |
| Perc. | 100 % | 27 % | −7 % | 1 % | 31 % |
| Stand. C | 100 | 127 | 117 | 118 | 155 |

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**6** According to Font-Rotchés and Cantero (2009: 37), "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 standardization formula and with intervals usually expressed in decimals (which does not occur in music, where the intervals are always the same and the minimum unit is the semitone). 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."

Finally, in column *Stand. C.* the standardized values for generating the standard melodic configuration are shown, thus obtaining a melodic contour that can be compared with other melodic copies and is therefore generalizable.

Applying the described procedure provides the standard melodic curve that is objective, comparable, and generalizable from a linguistic point of view. The melodic curve does not correspond exactly to the one generated from the F0 data: both melodies are perceptually identical but with a different pitch range. It is this standardization process that makes a comparison of copies possible, regardless of the pitch range of the speaker.

To establish a visual comparison of the two contours, Figure 2 shows a graph based on the F0 obtained (dotted line) and on the standardized data after calculating percentages and standard values using the relativization and standardization formulas (continuous line), which are shown beneath it.
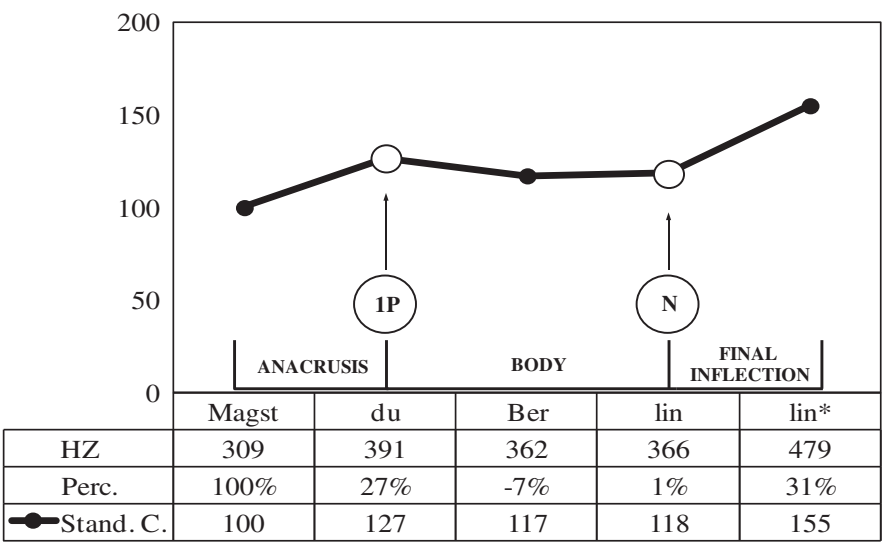


|  | Magst | du | Ber | lin | lin* |
|---|---|---|---|---|---|
| HZ | 309 | 391 | 362 | 366 | 479 |
| Perc. | 100% | 27% | -7% | 1% | 31% |
| Stand. C. | 100 | 127 | 117 | 118 | 155 |

**Figure 2:** Absolute (Hz) and standard values (Stand. C.) of the utterance *Magst du Berlin?* 'Do you like Berlin?'.

Mateo (2010) has developed a semi-automatic procedure using a script for the Praat application that allows the processing of acoustic data by applying the relativization and standardization formulas previously described and the generation of the corresponding graphs based on previously labeling each utterance.

In order to be able to compare contours and the phonetic characterization, the different parts that comprise the contour must be looked at: the anacrusis, the first peak (1P), the body, the nucleus (N) and the final inflection (FI).

The anacrusis is formed by all of the tonal segments that precede the first stressed segment or first peak (1P). The final inflection, on the other hand, is made up of all of the tonal segments uttered after the last stressed vowel or

nucleus (N). Finally, the body of the contour is formed by the tonal segments between the first peak and the nucleus. Figure 3 shows as a graph of the fundamental parts of the contour taken into account when creating the melodic description of an utterance.

| | Magst | du | Ber | lin | lin* |
|---|---|---|---|---|---|
| HZ | 309 | 391 | 362 | 366 | 479 |
| Perc. | 100% | 27% | -7% | 1% | 31% |
| Stand. C. | 100 | 127 | 117 | 118 | 155 |

**Figure 3:** Characteristics of the functional elements of the contour in the utterance *Magst du Berlin?* 'Do you like Berlin?'.

After analyzing all the contours and presenting them graphically, we have classified them into different groups: first, according to the path of the final inflection and second taking into account melodic features of the body and the first peak. Subsequently each group of contours has been organized according to the percentage of tonal movement in the final inflection (falling, rising, rising-falling, among others), from greater to lesser, establishing where the largest number of contours occur. The melodic patterns have been defined from these data, in other words, the melodies commonly used by native speakers of a language in their communicative interchanges. According to the method, the melodic pattern is not a mere representation of a line with rises and falls but an abstraction of the real way of speaking, representative of many melodies with the melodic features included in their dispersion margins (clearly defined and objectively quantified).

As a result, a description is obtained, the product of the acoustic analysis, with exact data of the distinct melodic features obtained from face-to-face

dialogues or from everyday conversations between speakers of the same language. In this research, we have analyzed absolute questions uttered by German people in real communicative contexts that are interpreted as questions by German speakers maintaining the conversation.

Finally, we also looked at the semantic and pragmatic context in which these absolute questions were uttered. To do this, we examined the contexts of the utterances using audiovisual data, classifying them according to the method proposed in Escandell-Vidal (2002) and validating them through tests answered by German people.

# 3 Results

After processing the 246 utterances using the method and tools described in the previous section, we have obtained 5 different melodic patterns used in the absolute interrogative modality that are described below.

## 3.1 Melodic pattern with falling final inflection < 30 %

From a melodic point of view, the pattern shown in Figure 4 is characterized by a final inflection that generally shows a fall of no more than 30 %. In addition to the melodic features of the final inflection, this contour also has two other melodic characteristics, one in the first peak and the other in the body of the contour. With regard to the first peak, the contours of this group show optional anacrusis, which, when it occurs, reveals a tonal rise of between 20 % and 30 % until the first peak. The first peak usually coincides with the first stressed segment of the contour or, in some cases, can be found displaced in the
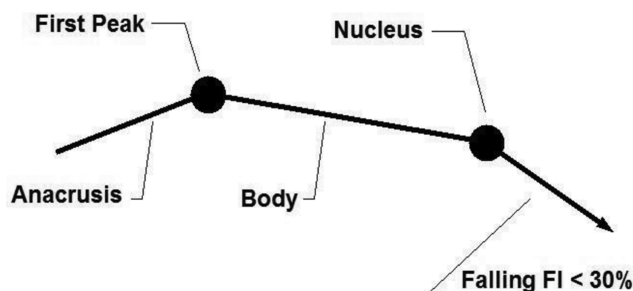


**Figure 4:** Melodic pattern with falling Final Inflection < 30 %.

subsequent unstressed segment. After the first peak, this type of contour shows a flat body or a body with a very gentle fall of no more than 30 %.
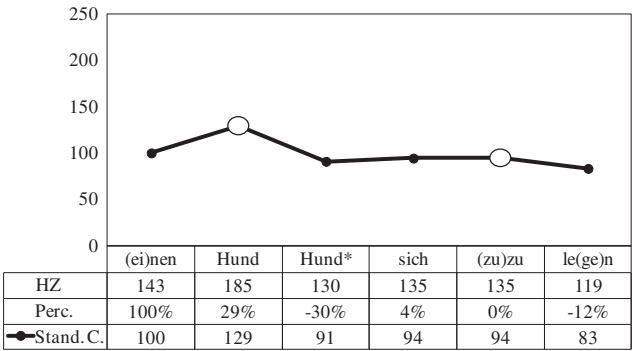
A total of 44 utterances in our data fit the described characteristics for this melodic pattern, 18 % of the total. With regard to syntactic structure, this type of utterance can present VSO, e.g., *Möchtest du mit mir flirten?* 'Do you want to flirt with me?', *Sind die Fingernägel echt?* 'Are these fingernails real?', *Hatten Sie einen schönen Tag?* 'Did you have a nice day?', *Sollten die Deutschen vernünftiger sein?* 'Should German people be more reasonable?', *Kommst du auch aus Münster?* 'Are you from Münster?' and SVO sentence element orders, e.g., *Du lässt dich immer anmachen?* 'You always let someone chat you up?', *Das klappt?* 'That works?', *Du hattest Geburtstag?* 'It was your birthday?', *Sie denken an Ihre Mittagspause?* 'You think about your lunch break?', *Du hast noch einen Kater?* 'You have still a hangover?', but also other utterances that do not have the full syntactic structure. In this last case, these are utterances comprising one or two words and are formed as questions in an interactional context, with a yes/no response. The following are examples: *Echt ja?* 'Really?', *Zwei Baguettes?* 'Two baguettes?', *Badminton spielen?* 'Play badminton?', *So früh?* 'That early?', *Typisch Deutsch?* 'Typical German?'.

This is a neutral pattern that northern Germans usually use to formulate questions of a transactional nature, in other words, with the aim of obtaining information based on varying degrees of knowledge regarding the answer and also to ask for confirmation, e.g., *Ist auch so ein Hobby von dir?* 'It is also a hobby of yours?', *Gab es Luftballons?* 'Were there any balloons?' We have also established that this kind of pattern is used for echo questions, rhetorical questions and requests, e.g., *Typisch Deutsch?* 'Typical German?', *Zur Beringstrasse?* 'To Beringstrasse?', *Badminton spielen?* 'To play badminton?'

Figure 5 shows an utterance from our corpus that is characterized by the melodic features described for the pattern presented in Figure 4.

In comparison with the utterance represented in Figure 6, the utterance *Einen Hund sich zuzulegen?* 'Get a dog?', illustrated in Figure 5,[7] shows anacrusis and describes a tonal rise of 29 % until the first peak, which occurs in the first stressed segment of the contour. Following the emission of the first peak, the
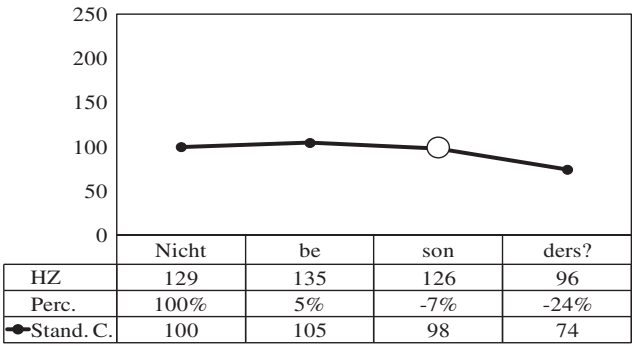
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7 In spontaneous speech, elisions or deletions and assimilations of certain elements of the spoken chain are often observed and such phenomena could be documented by appropriate spectrographic analysis. In our data, we show such phenomena in brackets, to point out that these elements are elided or assimilated and that they do not have an acoustic correspondence in spectrographic analysis. In the utterance *Einen Hund sich zuzulegen?* 'Get a dog?' plotted in Figure 5, we detected this phenomenon in the following segments: (*ei*)*nen*, (*zu*)*zu-* and *-le*(*ge*)*n*.

| | (ei)nen | Hund | Hund* | sich | (zu)zu | le(ge)n |
|---|---|---|---|---|---|---|
| HZ | 143 | 185 | 130 | 135 | 135 | 119 |
| Perc. | 100% | 29% | -30% | 4% | 0% | -12% |
| Stand. C. | 100 | 129 | 91 | 94 | 94 | 83 |

**Figure 5:** Contour with falling final inflection < 30 % of the utterance *Einen Hund sich zuzulegen?* 'Get a dog?'.

body of the contour is developed, which describes a tonal fall of 30 % and a flat body until the nucleus. Finally, the final inflection describes a fall of 12 %.

The melodic line of the contour in Figure 6 has neither anacrusis nor first peak. It then falls very gently until the nucleus and finishes with a falling final inflection of 24 %.

| | Nicht | be | son | ders? |
|---|---|---|---|---|
| HZ | 129 | 135 | 126 | 96 |
| Perc. | 100% | 5% | -7% | -24% |
| Stand. C. | 100 | 105 | 98 | 74 |

**Figure 6:** Contour with falling final inflection < 30 % of the utterance *Nicht besonders?* 'Nothing in particular?'.

## 3.2 Melodic pattern with a rising final inflection < 120 %

The melodic pattern described below and shown in Figure 7 is characterized by a final inflection with a tonal rise of up to 120 % (in MAS method 100 % is equivalent to an octave of the eight-note musical scale) except for some contours
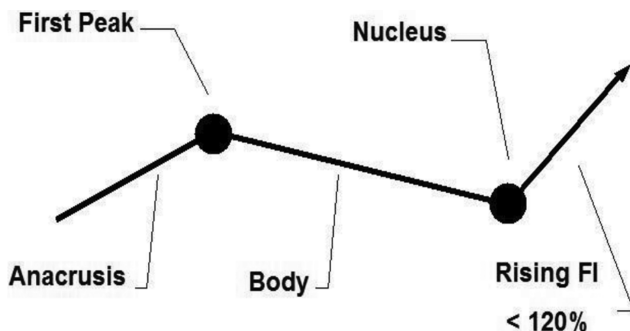
**Figure 7:** Melodic pattern with a rising final inflection < 120 %.

that show a final inflection that can reach 180 % (e.g., *Bacon?* 'Bacon?', 124 %, *Ging das dann schneller?* 'Did that go faster?', 169 %, or *Können Sie das begründen?* 'Can you give reasons for that?', 175 %). With regard to the syntactic structure, the utterances can present VSO and SVO sentence element orders, but also other typologies that do not follow these syntactic structures. A total of 141 utterances in our corpus of data fit the described characteristics for this melodic pattern, 57 % of the total.

Following are examples: *Schon viel Spaß gehabt in der Stadt?* 'Did you have a good time in the city?', *Schon viel Zeit in der Stadt verbracht?* 'Have you spent much time in the city?', *So religiös gefragt?* 'Questions about religion?', *Echt?* 'Really?', *An Alle?* 'Everyone?', *Kein Flirtspruch?* 'No flattery?', *Ne?* 'No?', *Buddhist?* 'Buddhist?', *Ich?* 'Me?', *Der schönste?* 'The nicest?', *Ja?* 'Yes?', *Ihr Lieblingsgebäude?* 'Your favorite building?', *Der Sommer?* 'Summer?', *Frauen?* 'Women?', *Wirklich?* 'Are you sure?', *Futur?* 'The future?', *Essen?* 'Eat?'.

In addition to the melodic features of the final inflection, this contour also has two other melodic characteristics, one in the first peak and the other in the body of the contour. With regard to the first peak, the contours of this group show optional anacrusis, which, when it occurs, reveals a tonal rise of between 20 and 30 % until the first peak, which can coincide with the first stressed segment of the contour or be found displaced in the following unstressed segment.
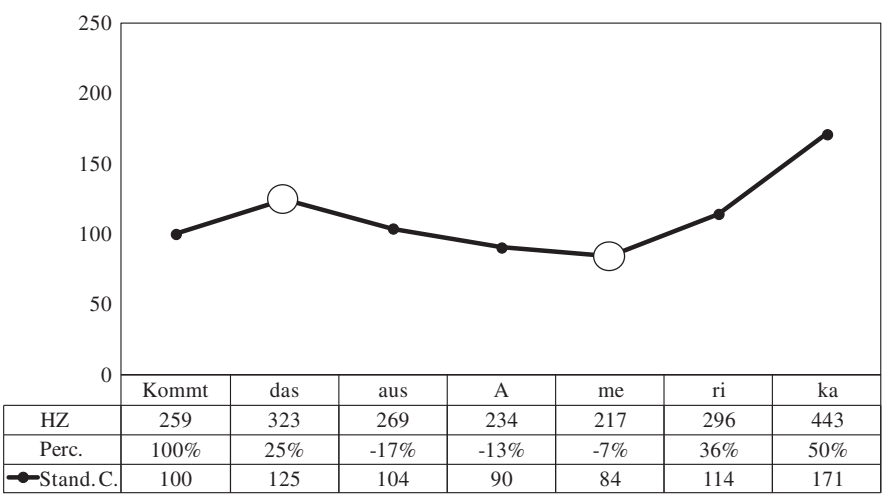
Lastly, from the first peak, the body is developed with a gentle fall until the emission of the segment that registers the lowest value of the contour. This segment generally coincides with the emission of the nucleus.

This neutral pattern, which is the most common and found in 57 % of questions in our corpus of data, appears in the same pragmatic contexts as those described for the previous pattern with falling FI: in the formulation of questions with the aim of obtaining information based on varying degrees of

knowledge regarding the answer and also in echo questions, rhetorical questions, and requests.

From our point of view, the pragmatic difference between the contours with falling FI and the different rising degrees of the contours with rising FI has to do with the communicative context in which they take place. If, from the communicative context, it is relatively easy to interpret that a question is going to be formed, the more likely it is that the question will have a falling FI or a low rise. On the other hand, if it is difficult to establish the relationship between the communicative context and the formulation of a question or simply an isolated question is made, the result will be a greater rising FI. In other cases, when the speaker wished to emphasize the question more – in our corpus of data this only occurs in a few cases – the rising final inflection is more than 120 %.

The *Kommt das aus Amerika?* 'Is this from America?' utterance, shown in Figure 8, has an anacrusis and describes a tonal rise of 25 % until the first peak, which in this utterance is displaced in the unstressed segment after the first stressed segment of the contour.

|  | Kommt | das | aus | A | me | ri | ka |
|---|---|---|---|---|---|---|---|
| HZ | 259 | 323 | 269 | 234 | 217 | 296 | 443 |
| Perc. | 100% | 25% | -17% | -13% | -7% | 36% | 50% |
| Stand. C. | 100 | 125 | 104 | 90 | 84 | 114 | 171 |

**Figure 8:** Contour with rising final inflection < 120 % of the utterance *Kommt das aus Amerika?* 'Is this from America?'.

As of the emission of the first peak, the body of the contour is developed, which describes a total tonal fall of 33 % until the nucleus, for which the lowest tonal value has been obtained in the contour. Finally, after the nucleus the final inflection is developed, describing a total tonal rise of 104 % (from -*me*, 217Hz,

to -*ka*, 443 Hz) until the last segment of the contour, which is therefore within the margins established for this melodic pattern.

## 3.3 Melodic pattern with a rising-falling final inflection

The following melodic pattern described and shown in Figure 9 reveals a characteristic melodic feature that differentiates it from patterns one and two. This third pattern is characterized by a final inflection with a double direction, rising-falling, and three values, which develop from the emission of the nucleus of the contour. The rise is between 30 % and 60 % until the last segment in tonal rise, after which it begins a tonal fall lower than 50 %.
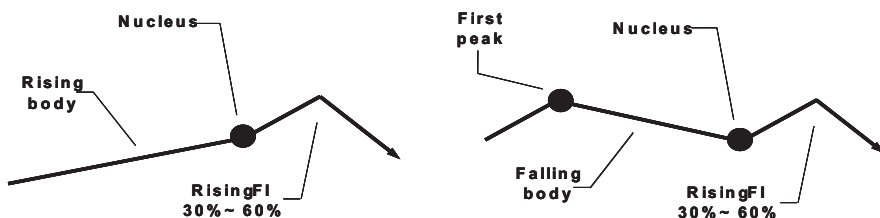


Figure 9: Melodic pattern with a rising-falling final inflection.

With regard to the syntactic structure, the utterances can present a VSO sentence element order and other different typologies, in which they are formed as questions in the interactional context with yes/no answers. A total of 16 utterances in our corpus of data fit the described characteristics for this melodic pattern, 7 % of the total. Following are examples: *Typisch Deutsch*? 'Typical German?', *Brot*? 'Bread?', *Imperfekt?* 'Imperfect?', *Zur Beringstrasse*? 'Towards Beringstrasse?', *Ja?* 'Yes?', *Einen Auflauf?* 'A casserole?', *'N Kasten Bier*? 'A case of beer?', *Der Musik?* 'To the music?'.

This pattern shows two variants with regard to the body. The first is characterized by the absence of a first peak and a body that normally shows a rising progression lower than 40 % until it reaches the nucleus (see Figure 9).
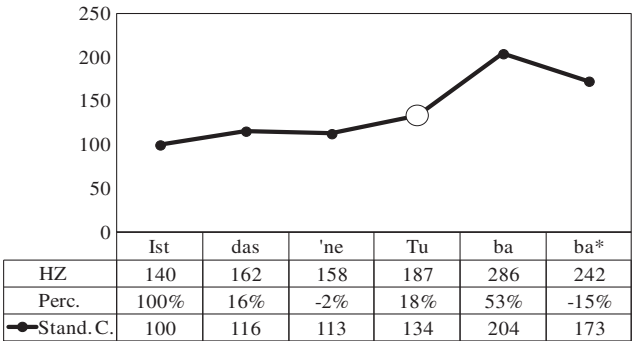
However, we also have examples in which there is a first peak with an optional anacrusis that, when it occurs, shows a tonal rise lower than 20 % and the body develops a tonal fall lower than 30 %.

This is an emphatic interrogative pattern that northern Germans usually use to obtain or confirm information politely, in other words, the question is thus

softened in certain communicative contexts. Unlike the pattern with rising FI, we only found the pattern with rising-falling FI in a few cases, as it is less frequent. Kügler (2003) and Kügler (2004) provide evidence of the use frequency of the tonal pattern L*+HL% in yes-no questions in two German linguistic variants: Swabian German in southwest Germany and Upper Saxon German in northeast Germany. Kügler points out that the use frequency of the L*+HL% pattern is low in both linguistic variants analyzed and particularly low in the northeast linguistic variant.
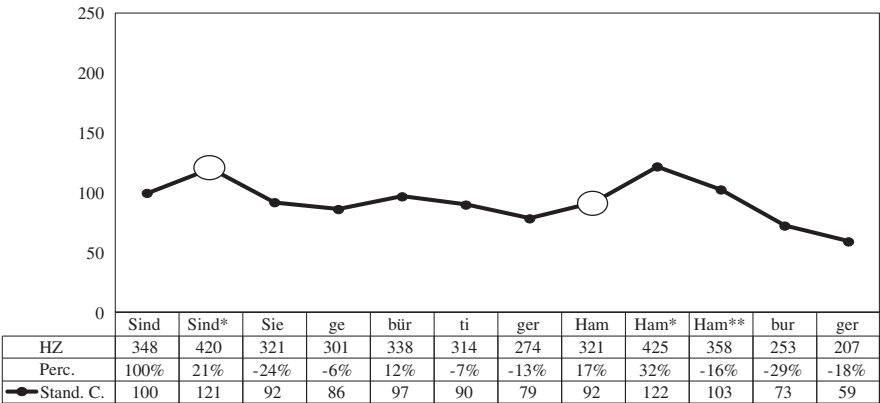
The *Ist das 'ne Tuba?*, 'Is this a tuba?' utterance, in Figure 10 shows no anacrusis and maintains a rising tonal trend until the emission of the nucleus in a rise of 34%. After the nucleus, the rising progression continues until the segment that registers the highest tonal value of the contour and consists of the first section of the final inflection with a rise of 53%. Following this, there is a tonal fall of 15% until the emission of the last segment of the contour.



| | Ist | das | 'ne | Tu | ba | ba* |
|---|---|---|---|---|---|---|
| HZ | 140 | 162 | 158 | 187 | 286 | 242 |
| Perc. | 100% | 16% | -2% | 18% | 53% | -15% |
| Stand. C. | 100 | 116 | 113 | 134 | 204 | 173 |

**Figure 10:** Contour with rising-falling final inflection of the utterance *Ist das 'ne Tuba?* 'Is this a tuba?'

The utterance in Figure 11, *Sind Sie gebürtiger Hamburger?* 'Are you originally from Hamburg?', shows an anacrusis with a tonal rise of 21% until the first peak, which coincides with the first stressed segment of the contour. The body develops the melodic line, showing a tonal fall of 35% until the emission of the segment that registers the lowest tonal value, *-ger*, and then a rise of 17% until the nucleus. There is also an internal repositioning in the body of the stressed segment *bür* with a tonal rise of 12%.

After the nucleus, a rising tonal progression begins until the next segment that registers the highest tonal value of the contour and consists of the first section of the

| | Sind | Sind* | Sie | ge | bür | ti | ger | Ham | Ham* | Ham** | bur | ger |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| HZ | 348 | 420 | 321 | 301 | 338 | 314 | 274 | 321 | 425 | 358 | 253 | 207 |
| Perc. | 100% | 21% | -24% | -6% | 12% | -7% | -13% | 17% | 32% | -16% | -29% | -18% |
| Stand. C. | 100 | 121 | 92 | 86 | 97 | 90 | 79 | 92 | 122 | 103 | 73 | 59 |

**Figure 11:** Contour with rising-falling final inflection of the utterance Sind Sie gebürtiger Hamburger? *'Are you originally from Hamburg?'*.

final inflection, with a tonal rise of 32%. Following this there is a tonal fall that returns the melodic line to a point lower than the start of the contour.

## 3.4 Melodic pattern with a final inflection with a high nucleus

The fourth melodic pattern, shown in Figure 12, describes a distinctive melodic feature that differentiates it from the previous melodic patterns. This melodic feature also refers to the development of the final inflection and consists of the presence of the nucleus at a high point of the contour with a tonal rise between 20% and 50% with regard to the previous tonal segment. Starting with this segment the final inflection is described by a falling path until the last segment and has two values.
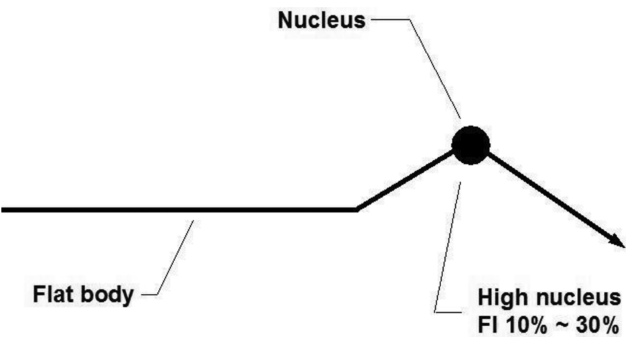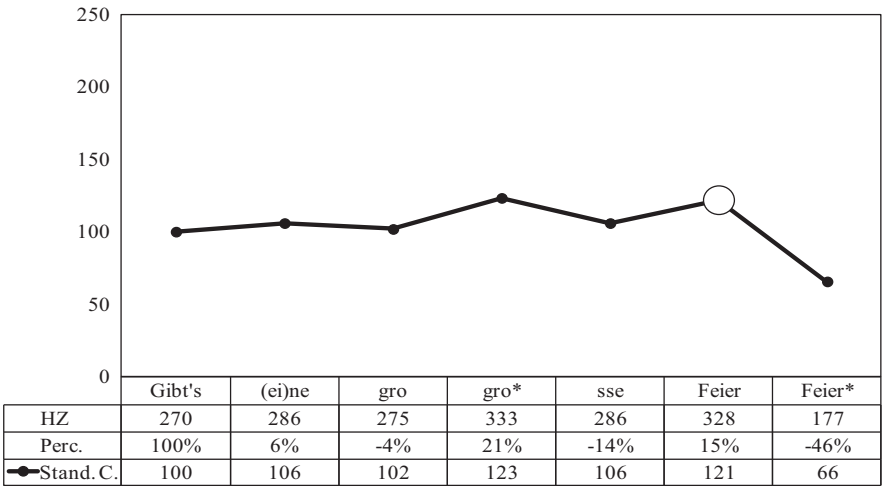
**Figure 12:** Melodic pattern with a final inflection with a high nucleus at Final Inflection.

With regard to the syntactic structure, in our data the utterances included in this melodic group present a VSO order and other different typologies, in which they are formed as questions with yes/no answers in the interactional context. For example, *Ein Bisschen*? 'A little?', *Niederlandistik*? 'Dutch studies?', *Können Sie das Wort denken benutzen*? 'Can you use the word, think?', *Gibt's eine grosse Feier*? 'Is there a big party?', *Ins Fusion*? 'To Fusion?'. A total of 7 utterances in our corpus of data fit the described characteristics for this melodic pattern, 3 % of the total.

In general, the utterances of our corpus have no anacrusis or first peak. The body describes a succession of segments with a tonal value of little contrast. For this reason, the melodic line tends to show a flat or almost flat progression until the segment preceding the nucleus of the contour, after which a tonal rise occurs between 10 % and 30 %.

The 7 utterances obtained that match this melodic pattern are questions used by northern Germans to ask for or confirm information in which the focus[8] is on the last word.

The utterance shown in Figure 13 and which we use as an example of this melodic pattern, has no anacrusis or first peak, and shows a tonal pattern that is almost flat with a tonal inflection on *grosse*, just before the nucleus.

| | Gibt's | (ei)ne | gro | gro* | sse | Feier | Feier* |
|---|---|---|---|---|---|---|---|
| HZ | 270 | 286 | 275 | 333 | 286 | 328 | 177 |
| Perc. | 100% | 6% | -4% | 21% | -14% | 15% | -46% |
| Stand. C. | 100 | 106 | 102 | 123 | 106 | 121 | 66 |

**Figure 13:** Contour of final inflection pattern with high nucleus ≤ 30 % of the utterance *Gibt's 'ne grosse Feier?* 'Is there a big party?'

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**8** A word highlighted with a tonal inflection because of the speaker's intention, in other words, that has pragmatic and contextual factors.

Following, a tonal rise occurs of 15 %, which culminates in the nucleus and as of which the final inflection begins, showing a tonal fall of 46 % until the last segment of the contour.

## 3.5 Melodic pattern with rising body and final inflection

The last pattern shown in Figure 14 has a melody characterized by a rising body and final inflection that has a total rise ranging between 40 % and 140 %. In addition to the described melodic features for the final inflection and body, there is no anacrusis or first peak. A total of 38 utterances in our data fit the described characteristics for this melodic pattern, 15 % of the total.
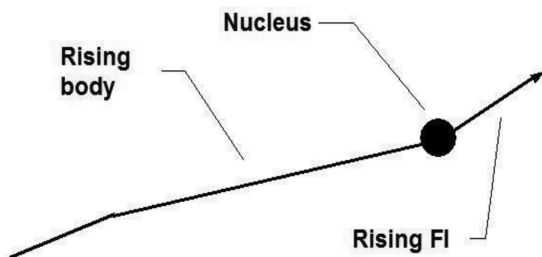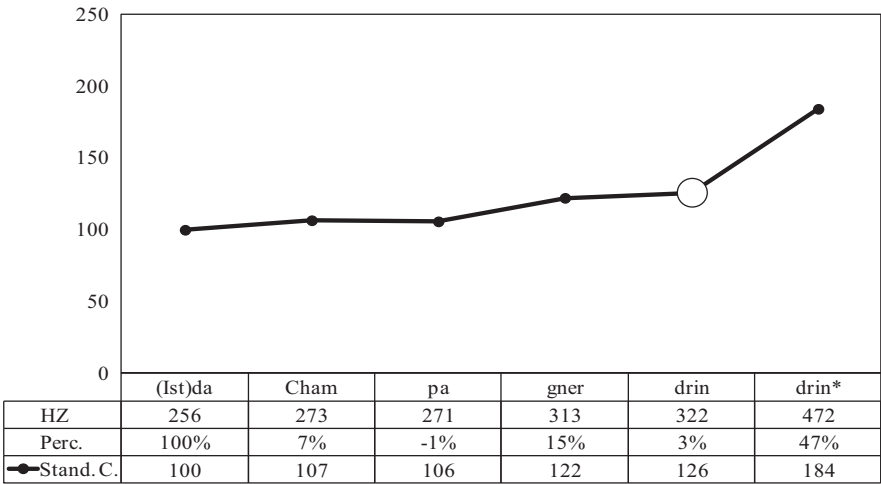


**Figure 14:** Melodic pattern with a rising body and final inflection.

With regard to syntactic structure, the utterances can present a VSO sentence element order, but also other types of utterances that do not follow this syntactic structure. Following are examples: *Sonst noch was?* 'Anything else?', *Schon gefrühstückt heute?* 'Did you have breakfast today?', *Speicherstadt?* 'Speicherstadt?', *Ist da Champagner drin?* 'Is there champagne in there?', *Plusquamperfekt?* 'past perfect?', *Perfekt?* 'present perfect?', *Oder so?* 'Or like that?', *Am Jungfernstieg?* 'At the Jungfernstieg?', *So eine Stunde?* 'One hour?'.

This melodic pattern is typically used in questions that add other meanings, such as interest or surprise, or joined to a question to obtain information or confirmation.

The graph in Figure 15 shows the *Ist da Champagner drin?*, 'Is there champagne in there?', as an example of this melodic pattern. The melodic profile of this utterance has no anacrusis. Instead the body begins as of the first segment of the contour, which is rising and has a total tonal rise of 26 % until the segment *drin*, which is the nucleus of the contour.

| | (Ist)da | Cham | pa | gner | drin | drin* |
|---|---|---|---|---|---|---|
| HZ | 256 | 273 | 271 | 313 | 322 | 472 |
| Perc. | 100% | 7% | -1% | 15% | 3% | 47% |
| Stand. C. | 100 | 107 | 106 | 122 | 126 | 184 |

**Figure 15:** Contour with rising body and Final Inflection of the utterance *Ist da Champagner drin?* 'Is there champagne in there?'.

After the emission of the nucleus, the final inflection is developed, which has a tonal rise of 47 % until the last segment of the contour. In total, a rise of 84 % has occurred.

# 4 Discussion and conclusions

As previously stated in the results section above, we have obtained five melodic patterns that are used to formulate absolute questions in spontaneous speech:
   (i)   (Melodic pattern with a falling FI < 30 %
   (ii)  Melodic pattern with a rising FI < 120 %
   (iii) Melodic pattern with a rising-falling FI
   (iv)  Melodic pattern with a FI with a high nucleus
   (v)   Melodic pattern with rising body and FI

Of the five melodic patterns, (i) and (ii) are those most used to formulate questions of a transactional nature, in other words, questions aimed at obtaining information based on varying degrees of knowledge regarding the answer and also in echo questions, rhetorical questions and requests. These two patterns are the most used by northern Germans, in particular the pattern with rising FI, which occurs in a 57 % of our corpus, while the pattern with falling FI occurs in 18 % of

cases. The difference between them has nothing to do with pragmatic use, but with the communicative context in which the question takes place. The more favorable the communicative context for the question to be interpreted as such (e. g., in a dialogic context where the conversational partner is expecting a question), the lower the tonal rise and in some cases, in view of the formulation of a question, the contour ends with a falling tonal movement (melodic pattern with a falling FI). In contrast, the more difficult it is to interpret that a question is being asked (e.g., when the question is part of the beginning of the dialogue), the more prominent the tonal rise (it can reach 120 % and, in special cases, 180 %).

The pattern with a falling FI is actually typical of neutral declaratives and neutral wh-questions (Uhmann 1991; Grice et al. 2005), although in some communicative contexts (18 % in our corpus) where a question is predictable, northern German speakers use it to ask questions, which is the reason why we decided to take it into consideration.

The melodic pattern with a rising FI and some of the pragmatic uses described, such as neutral yes-no questions and echo questions, have already described by Uhmann (1991), Kügler (2004), Grice et al. (2005) and Peters (2005). However, the melodic pattern with a falling FI has only been described by Kügler (2004) and Peters (2005).

The third pattern, with a rising-falling FI, has only been described by Kügler (2004), L*HL%, as part of Swabian German, a southern German linguistic variant and as part of the Upper Saxon linguistic variant. In our research, we have found it in northern dialects, although it is an unusual melodic pattern found in only 7 % of the cases considered in our corpus of data. In contrast, we did not find any falling-rising patterns, described as H*LH% by all the references considered in this paper (Uhmann 1991; Kügler 2004; Grice et al. 2005; Peters 2005).

The melodic pattern with a high nucleus, which occurs in our corpus in only a few contexts (3 %) and is characterized by the question being focused on the last word of the utterance, was not found by previous researchers. We have described it although we believe that its occurrence in future research should be assessed.

The first four patterns are described based on the direction and percentage of movement shown by the melodic line in the final inflection, whilst the fifth melodic pattern is characterized by its rising body followed by rising final inflection. As in the case of the fourth pattern, this fifth pattern has not been found by previous researchers either.

In our opinion, it is important to note that not all the patterns have the same capacity. The melodic pattern with a rising FI < 120 % stands out with 57 % of the contours, followed by the falling FI < 30 % with 18 % of the corpus, and the pattern with a rising body and final inflection which has a total rise that varies between 40 % and 140 %, and accounts for 15 %. This research is therefore a

contribution because to date and using other methodologies there has been no characterization with such precision of five patterns with such distinctive features and exact values expressed in percentages of rise and fall obtained from utterances by native German speakers.

However, based on the level of linguistic description of the intonation on which our research focuses, it is not possible to determine the phonological characterization of the intonation patterns and the dispersion margins. For this reason, we propose perceptive tests be carried out in future research with native speakers of the language under study in order to culminate the analysis of the intonation in the level of linguistic description and to determine the interrogative contours in north German in spontaneous speech.

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