

# The global interrogative intonation as a social index in the Parma linguistic community

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## Abstract

This paper reports findings regarding the perception of the intonation of global interrogative sentence in Parma local variety of Italian, obtained within the AMPER theoretical framework. The experiments investigate three main aspects of the perception of language intonation: the affirmative *vs* interrogative intonation of native speakers; diatopic differences in interrogative intonation in varieties of Parma and other cities, and the diastratic dimension of variation. The presence of geoprosodic indices and of sociophonetic indices emerges from the perceptual analysis carried out in this study. Prosodic-only audio stimuli were created and manipulated by means of software developed in MATLAB® environment.

## 1. Introduction

This study deals with the production and perception of the global interrogative in the local variety of spoken Italian in Parma and was conducted within the theoretical framework of the AMPER project (*Atlas Multimédia Prosodique de L'Espace Roman*, see [1], [2] and [3]). This framework, inspired by the superpositional approach introduced in [4], allows prototypes of affirmative and global interrogative intonational patterns to be identified through the collection and analysis of a previously defined set of isolated sentences. Informants produce the sentences combining words represented by images proposed by the interviewer. The syntactic structure of the sentences is SVO, with O being a Noun or a Noun + Adjective group with different accentual structure (proparoxytone, paroxytone and oxytone: see Table 1).

La pàpera mangia la fràgola. La pàpera mangia la patata. La pàpera mangia la maracà.
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Table 1: Examples of SVO AMPER corpus sentences, without adjectival expansions in O.

The prototype of the global interrogative of Parma features a rising-falling base-structure, where a V-shaped bi-tonal falling-rising fundamental frequency contour occurs on the last stressed vowel (henceforth, LSV). Due to the particular movement centered on the LSV, the ToBI-like representation for Parma global interrogative sentence involves a tri-tonal notation, as already proposed in [5] and in [6] for the variety of Torino. The TOBI-like representation for the global interrogative sentence, respectively for proparoxytone, paroxytone and oxytone structures of final nouns, is (H+L+H)\*+H (where H is a trailing-tone) followed by a L% final tone, (H+L+H)\*L%, and (H+L+H)% (see an example in

Figure 1). The global interrogative *intoneme* is characterized by three main *allotones* which are judged by the informants as equally representative of their local variety. They differ in the first part of the bi-tonal falling-rising fundamental frequency contour of the LSV.

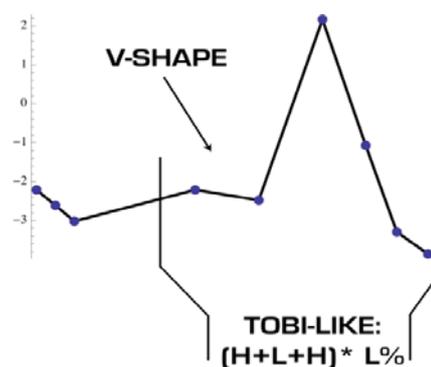


Figure 1: Prototypical global interrogative intonation contour (paroxytone final noun / adjective).

On the contrary, the ToBI-like representation of Parma intonational contour of the affirmative sentence is L\*L% in all accentual structure types of final nouns (or adjectives). The AMPER acoustic-perceptive framework also required identification tests to validate the prototypes (see [7]).

## 2. Technical Remarks

The acoustic prosodic-only global interrogative prototypes, one for each structure in the fixed set of isolated sentences (as described in § 1), are obtained calculating the arithmetic mean of at least three repetitions produced by the informants. The prosodic prototypes are composed of a sequence of generic vowel-like harmonic sounds. These sounds, one for each vowel of the sentence they represent, feature, at their initial, medial and final point, the arithmetic mean of fundamental frequency and intensity extracted by the vowels of actual repetitions. The duration of each sound is the mean of the duration of each vowel. In order to produce the material used in perception tests, the prosodic stimuli, a MATLAB® (© The MathWorks, Inc.) script was developed: it receives as input AMPER-formatted text files containing the prosodic data extracted from the recordings and enables the user to perform manipulations of the duration of the single vowel and of fundamental frequency, both on a large scale (e.g. resetting to a specified Hertz value the mean fundamental frequency of all the sentence) and on a small scale (e.g. changing the F0 contour of a single vowel, operating with semitone scale values). The outputs of the script are AMPER-formatted text

files, containing the modified data (which can be reused as input for the script thus generating further modifications) and the wave sound files used in perception tests (see Figure 2).

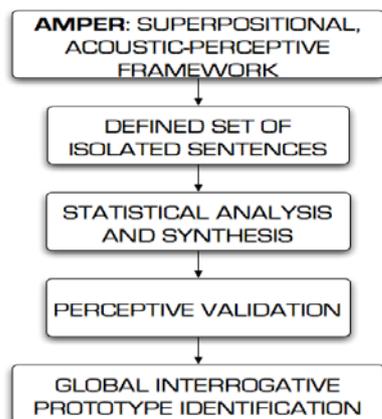


Figure 2: AMPER-based prototype creation and identification process.

### 3. Perception Experiments

In this study three perception experiments were carried out in order not only to validate the prototype, but also to identify geoprosodic and sociophonetic indices. The performed tests, based partially on previous works ([8], [5]), involved multiple forced-choice identification tasks and were intended to survey, using only language intonation features, the listeners' personal judgments of and attitudes towards their own language variety both by itself and also in comparison with other close or distant varieties; thus this work unifies acoustic analysis with the study of linguistic attitudes and stereotypes. This aspect puts the present study closer to perceptive dialectology, or folk linguistics, following definitions in [9], [10] and [11]. Perception tests were performed by 40 subjects (listeners) born and living in Parma with different gender and age characteristics; subjects were divided in two groups of 20 subjects: young (18 to 30 years old) and adult (60 to 80 years old). The 40 listeners are distinct from the 15 subjects that produced the data corpus. These last subjects (informants) were selected according to sociolinguistic criteria: gender, two age ranges (18 to 30 years old and 60 to 80 years old), two levels of educational achievement (high and low) and two social network groups (broad and narrow). The tests were performed according to the following guidelines: fundamental frequency of the stimuli was normalized to 150 Hz in order to avoid possible age or gender connotations; the tests feature stimuli constructed from repetitions of sentences with the same syntactic structure and without adjectival expansions (this last constraint reduced to a minimum the duration of the stimuli and, consequently, of the tests); the tests, composed of a maximum of 30 prosodic stimuli, feature pauses; each stimulus is applied to the listener 3 times, in random order but never twice in a row. Due to the limited number of listeners, no statistical corrections were applied to the results, and were performed only simple arithmetic means and occurrence count.

#### 3.1. Modality Experiment

The grammatical modality experiment aims to identify which part of the intonational contour carries the F0 and duration

information related to modality differentiation. All the tests were preceded by "familiarization pre-tests". During the familiarization modality pre-test almost all the informants (97%) proved to be able to recognize correctly the two modalities, affirmative and interrogative, both in their native variety and in other varieties. In the second phase of the modality experiment hybrid stimuli (e.g. with all the syllables of one modality except the last two, of the other modality) were applied and informants asked to report whether they had heard affirmative or interrogative. In addition, in some stimuli with the last two syllables of interrogative modality, the duration of the LSV was reduced to the figures of affirmative modality duration. These tests suggested clear indications of the importance of the LSV in carrying modality-related information of the entire sentence. Moreover, it appears that the first part of sentence contour, corresponding to the first noun phrase (NP), is not perceived as salient by the listeners in order to obtain modality-related information. Indeed, despite the fact that affirmative can be acoustically represented by the TOBI-like sequence (L+H)-, while global interrogative by the sequence (H+L), almost all the listeners (98%) were able to identify the modality correctly using only the final intonational contour (Modality Final Contour, henceforth MFC, that is, LSV plus the following vowel) without the contribution of duration (for more details see [12] and [13]). This result emerged also in the third phase of modality tests, in which the informants listened to isolated intonational contours extracted from the first and second (MFC) intonational phrase of one sentence and were asked to identify the correct modality and position (that is, to report whether it is the first or the second part of an affirmative or interrogative sentence). Listeners identified only isolated contours extracted from the MFC of both modalities. The results obtained from modality perception experiment indicate that the phonological information about modality is probably conveyed exclusively by MFC. The same indications prompted the researchers to work on MFC also in the following diatopic and diastratic experiments.

#### 3.2. Diatopic Experiment

The diatopic experiment was conducted with a dual purpose: firstly, to investigate the degree of sensitivity of the listeners when they are asked to identify their own variety of language versus other varieties, and secondly, to verify if F0 only, duration, or a combination of both can be considered to be a geoprosodic index. The experiment consisted of two tests, in which only global interrogative stimuli were applied (in literature interrogative modality is considered to be a more reliable indicator of geographical origin than affirmative. In the first test (the familiarization pre-test), informants were asked to listen to a number of prosodic-only sounds extracted from speech of some northern Italian cities (Parma, Piacenza, Reggio Emilia, Modena, Pavia, Milano, Torino, Verona), and say whether these sounds were from their (Parma) language community or not. The researchers modified the duration of the LSV of Parma prototypes in some stimuli, either shortening (down to the 30% of the original value) or lengthening it (up to the 200%). The choice of modifying the length of LSV comes from the observation that Parma variety features an average length of LSV (in GI modality) of about 200ms: approximately two times longer than an average LSV from other northern Italy varieties. Two important results emerged (cf. Figure 3). First, the informants were able to

identify prosodic-only sounds of their own community from those extracted from other geographical areas with an accuracy percentage of 83% (although a number closer to 100% might be expected, this figure is in fact typical due to the fact that speakers, especially those who have little contact with other varieties, lack awareness of the marked features of their own variety, see [11]). Second, listeners are unable to identify their own variety if the LSV is shortened down to 70% of the original value while they correctly recognize stimuli with LSV lengthened up to 200% (e.g. quite unnatural stimuli with LSV lengthened to 150% of the original figure were still correctly identified by the 70% of the informants).

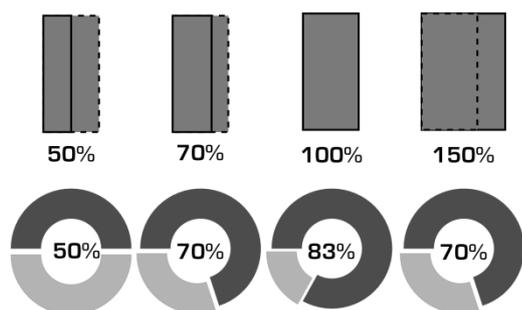


Figure 3: LSV length modifications and community acceptance percentages.

In the second diatopic test the informants listened to a number of synthetic sounds and were asked to identify Parma sounds. Synthetic stimuli were created as follows: the LSV Parma prototypes were modified through the insertion of the values of F0 first, then of duration, and finally of both; the same was done on the LSV preceding and following vowel. The values of F0 and duration were those peculiar to neighboring and distant regional varieties. These progressive modifications allowed the researchers to analyze the F0 and duration acoustic correlates both in isolation and in combination, in order to identify any parameters which might represent geoproisodic indices for the community. The test suggested that while F0 alone was sufficient for the discrimination of varieties featuring opposite movements in the MFC, the additional information yielded by duration created the typical speed of local variety (for more details about results of the diatopic experiments see [12] and [13]). Thus, whereas the stimulus of Parma with the MFC of Turin (varieties presenting the same final configuration of F0 and bitonal termination of LSV), for example, is considered to be Parma by the majority of listeners, the percentages (70%) invert if the duration in LSV is added. As a consequence, the interaction between F0 and duration in MFC (the speed of F0 movement) could be considered as a geoproisodic index for the local community.

### 3.3. Diastratic Experiment

Experiments in the sociolinguistic dimension of diastratic variation were again composed of two tests whose aim was to give empirical support to researchers' observations about the different intonational contour of speakers featuring different gender, age and social network as emerged in [12] and [13]. The stimuli applied in this test were the mean production of all the 15 informants, included those stimuli with modified LSV lengths (ranging from 30% to 200% of the original value, as in the diatopic experiment). In the first test informants were

asked to attribute to the stimuli a "degree of Parma typicality" chosen from a closed list of 4 cases ("absolutely Parma typical", "Parma typical", "Parma, but not typical", "absolutely not from Parma"). In the second test, intended to verify the reliability of the first one, the informants were asked to repeat the task, this time with the synthetic sounds featuring a flattened F0 profile on all the vowels (monotonised F0), except those in the MFC.

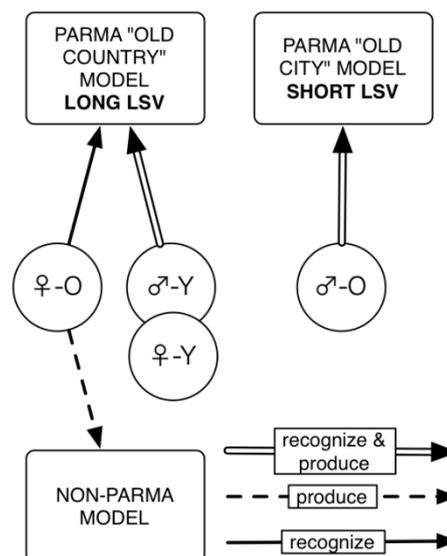


Figure 4: Sociolinguistic groupings and global interrogative intonation models ("Y" stands for young group, "O" stands for old group).

The diastratic experiment yielded the following results: two different prototypes for the global interrogative intonation structure seemed to coexist in the same linguistic community: one was considered prototypical by the "young" (18 to 30), both male and female group and by the "old" (60 to 80) female group of listeners, and corresponded to the production of the young informants with narrow social networks. The other was considered prototypical by the "old" (60 to 80) male group of listeners and corresponded to the productions of the "old" male informants with narrow social networks. These prototypes differ mainly in the MFC typical F0 and duration combination. The first prototype corresponds to Parma "old countryside dialect model" that is characterized by a very long LSV: young male and female informants use it as their Parma identity-related model, while "old" female listeners consider it as a stereotype that characterize speakers who are part of lower socioeconomic classes and groups with low levels of educational achievement. As a consequence, while young people produce this prototypical intonation, old female groups avoid it in their production. The old male group considers the intonation of old Parma "city model" as the most typical and prestigious, featuring a shorter LSV duration, and the old male speakers use it in their production (see Figure 4). The perception experiments also showed that informants' social networks influence the behavior of speaker with respect to intonation. While the informants with narrow social networks tend to use more conservative intonational patterns (referring to the model of their sociolinguistic group), those who feature broad social networks use innovative, non-prototypical patterns: informants with narrow social networks produce an intonation final contour which is judged to be "absolutely Parma typical" and "Parma typical" by the listeners, while speakers with broad social network produce an intonational

contour which is judged to be from "Parma, but not typical" to "absolutely not from Parma" (depending also on gender and age of both listeners and speakers, see figure 4 for details). Finally, the researchers observed that the more the length of LSV is artificially increased, the more the whole structure is judged as typical of the local variety by the listeners (especially by older female listeners, who judge the stimulus lengthened up to the 200% to be "absolutely Parma typical"). As a consequence the duration of the LSV, which was considered a typical feature of Parma linguistic community both from an acoustic-objective and diatopic points of view, can also be considered a sociophonetic index. Again, perception tests confirm the importance of the MFC not only as the main carrier of modality and diatopic information but also of social-related information.

#### 4. Conclusions

In conclusion, this analysis of the global interrogative in Parma corroborates the validity of AMPER as a prosodic research framework. AMPER prosodic-only synthesized and normalized sounds, although not directly accessible to the conscious competence of the speakers, appears to be well accepted and recognized as a good representation of actual speech intonation in perception experiments. In particular, Multiple Forced Choice perception tests contributed to verify sociolinguistic hypotheses while giving empirical support to the identified prototypes. Furthermore, the analysis suggests that certain acoustic features, especially those extracted from the LSV and the neighboring vowels, behave as carriers not only of modality, but also of diatopic and social status-related information. From a perceptual point of view, a geopro-sodic index and a sociophonetic index were identified for the Parma community in a typical Italian situation where clear interaction between social and geographical dimensions is present. The long duration of the LSV and F0 ascending-descending configuration with bi-tonal break were perceived as Parma typical by all the listeners but avoided in production by the old female subjects: this group, from sociolinguistic literature, is the most sensitive to language use with regard to prestige and social status.

#### 5. References

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