THE ROLE OF PITCH RANGE IN REALISING PRAGMATIC CONTRASTS – THE CASE OF TWO QUESTION TYPES IN ITALIAN

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ABSTRACT

In Bari Italian, the same pitch accent is used in two different question types – those seeking information and those challenging what has been said. However, they differ in their pitch range. A perception study was carried out, consisting of a semantically motivated identification task. Results provide preliminary evidence for the categorical perception of pitch range variation in questions.

Keywords: Intonation, pitch range, categorical perception, Italian, peak scaling

1. INTRODUCTION

In the field of intonation, the role of pitch range in establishing categorical contrasts is controversial. Whereas traditional approaches typically assign a paralinguistic function to pitch range variation (see e.g. [1]), the distinction between what is categorical and linguistic on the one hand, and what is paralinguistic and gradient on the other has been called into question in the Autosegmental-Metrical (AM) literature. Ladd [2] proposes an intermediate category between what he calls "intrinsic" and linguistic and what is "extrinsic" and paralinguistic, arguing that some aspects of pitch range variation could be appropriately described as categorical but at the same time "extrinsic", i.e. "orthogonal to the tonal string" ([2] p.283).

A number of studies have already investigated the role of pitch height and pitch range in establishing categorical contrasts in English (see [3] for normal vs. emphatic stress, [4] for interpretation of rise-fall-rise as incredulity vs. uncertainty), and more recently both for other languages (see for example [6] on Majorcan Catalan interrogatives), and using novel methodology (see for example [5], which involves reaction time measurements). These studies point to the need for a treatment of pitch range in phonological terms.

2. YES-NO QUESTIONS IN BARI ITALIAN

In our previous studies based on the analysis of Bari Italian Map task dialogues, we described two different types of yes-no questions, sharing the same tonal analysis but conveying two different pragmatic meanings [7], [8]. The first type is information-seeking questions, classified as QUERIES in the Map Task annotation coding scheme [9], where the information sought is new to both participants. The second type challenges the interlocutor's assumption that information is shared, i.e. that it is given [7], [8]. This is an OBJECT (as in 'objection') in the same scheme. Such questions have also been referred to as "echo questions" as they (partially) repeat what has previously been said by the interlocutor, and they can also signal "[…] varying shades of incomprehension, doubt, or surprise" ([10] p.158), or as "challenges" where there is "an element of enquiry" as to whether the interlocutor is sure of what s/he has said [11]. OBJECTS are different from another type of echo questions - CHECKS in the same Map Task coding scheme - where confirmation is requested without any challenge.

QUERIES and OBJECTS both have a rising pitch accent followed by a terminal fall, which has been described as L+H*L-L% [7], [8]. Even though both categories share the same tonal structure, a difference in terms of pitch range has been observed. It is more compressed in QUERIES than in OBJECTS, as shown in Figures 1a and 1b (which are plotted on a linear scale). Note that such a difference cannot be captured in the current phonological description.

This paper aims to test the hypothesis that pitch range variation is responsible for the difference between these two pragmatic categories: plain requests for information (QUERIES) and challenges to what has been said (OBJECTS).

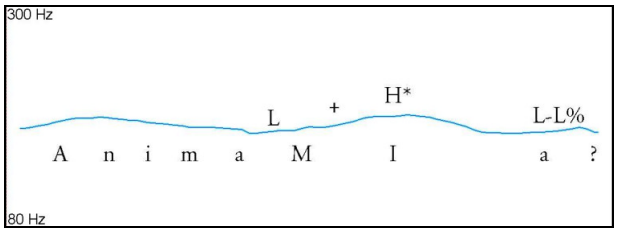

Figure 1a: Spontaneous rendition of the QUERY "Anima MIa?" (*My Soul?*) by a female Bari Italian speaker.

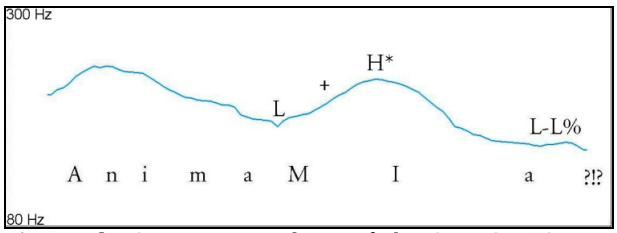

Figure 1b: Spontaneus rendition of the OBJECT "Anima MIa?!?" (*My Soul?!?*) by the same Bari Italian speaker as in Figure 1a.

3. PERCEPTUAL EXPERIMENT

A perceptual experiment was carried out consisting of a semantically motivated identification task, in which subjects were asked to judge a number of stimuli created along a phonetic continuum as belonging to one of the two question types. Such a continuum was created by increasing and decreasing, in equal steps, the F0 peak of a base stimulus derived from a naturally produced utterance in a mid pitch range. According to the classical Categorical Perception (CP) paradigm, if the curve of the function representing the number of responses for each category is S-shaped, first evidence of categorical perception is provided.

3.1. Preparation of the stimuli

The natural utterance "a miLAno?" (*in Milan?*) was produced – with one pitch accent mid-way between a QUERY and an OBJECT – by a trained female speaker of Bari Italian. A stylised version of this utterance was used as the base stimulus for creating a phonetic continuum of 12 different versions, by systematically varying the peak height of the pitch accented syllable. Starting from the base stimulus (F0 peak=235.6 Hz), 4 stimuli were obtained by decreasing the peak height in 15Hz steps, and 8 stimuli were produced by shifting upwards the peak height, also by 15Hz steps. This procedure resulted in a continuum of 13 stimuli, as shown in Figure 2, where the base stimulus is represented by a continuous line. F0 manipulation was performed by using the PSOLA resynthesis programme implemented in the PRAAT software package for speech analysis and resynthesis [12].

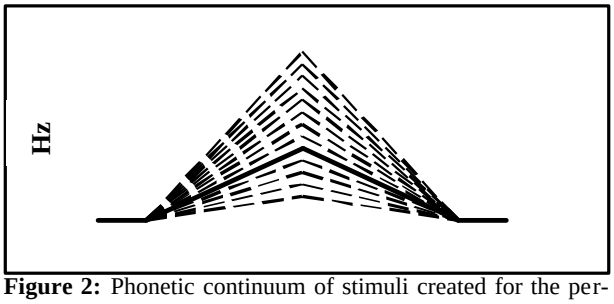

Figure 2: Phonetic continuum of stimuli created for the perceptual test. The base stimulus (solid line) has an F0 peak of 235.6 Hz. Remaining stimuli (dashed lines) were produced by systematically decreasing and increasing the peak height by 15 Hz steps.

3.2. Presentation of the stimuli

Three differently randomised lists – plus an additional one which was used as a training set – were produced, for a total amount of 52 stimuli. Stimuli were presented in groups of 13, each group preceded by 2 warning tones and followed by 10 seconds of silence. Each stimulus was preceded by 1 warning tone and followed by 4 seconds silence for answering. Before starting, informants were given written instructions presenting two different possible contexts for the utterance "a Milano" to be produced. The two dialogues as they appear in the instruction sheets, along with the English translation, are the following:

DIALOGUE 1:

A: "La prossima riunione dei G8 si farà in Italia" (*The next G8 meeting will take place in Italy*)

B: **"A Milano?"** (*in Milan?*)

A: "Sì, a Milano" (*yes, in Milan*)

DIALOGUE 2:

A: "Stamattina a Milano c'erano 45 gradi" (*This morning there was 45 degrees in Milan*)

B: "**A Milano?!?** Ma cosa dici, non e' possibile!" (*in Milan?!? What are you saying, it isn't possible*)

A: "Sì, a Milano, ti dico" (*yes, in Milan, I'm telling you*)

Explanations of the two contexts were also provided, as follows:

- "in the first dialogue participant B is asking a question aiming at obtaining some information, typically by a negative or positive answer. In this case, B wants to know whether the next G8 meeting will take place in Milan or not;
- in the second dialogue, on the other hand, B is not simply asking for a piece of information, but with that question is doubting the preceding statement expressed by A. In this specific case, B does not believe it is possible that the temperature in Milan could reach 45 degrees".

Informants were asked to judge whether each stimulus produced by B was in the first or in the second dialogue, by crossing the appropriate box on an answer sheet. Stimuli were presented on an audiotape over headphones. The experiment was carried out in a quiet laboratory and the experimenter was always present but did not interfere during the task. The task lasted approximately 15 minutes.

3.3. Informants

Twenty-three Bari Italian volunteers, aged between 20 and 41, participated in the experiment. They were all recruited among staff and students of the two local universities (mainly from the Faculty of Engineering). None had a background in phonetics or prosody.

3.4. Results

Figure 3 shows the percentage of judgments for each stimulus in the phonetic continuum for all informants. Results show the typical S-shaped curve which is to be expected according to the CP paradigm. A full crossover from one category to another is reached by both categories in 5 steps, namely from 9% to 96% for OBJECT, and from 4% to 91% for QUERY. A chi-square analysis (standard residuals) confirms the statistical significance ($p<0.05$) of the expected answers for stimuli H-4 to H-1 and from stimuli H3 to H8, whereas for stimuli H1 and H2 there is no statistical significance. In other words, informants are consistent in their judgments of an utterance as a QUERY for stimuli H-4 to H-1, and as an OBJECT for stimuli H3 to H8, whereas they are inconsistent when asked to judge stimuli H1 and H2 which are in the middle of the phonetic continuum.

The base stimulus, H0, constitutes a special case. The statistical analysis shows that the number of judgments for OBJECT is significantly higher than for QUERY ($p<0.05$).

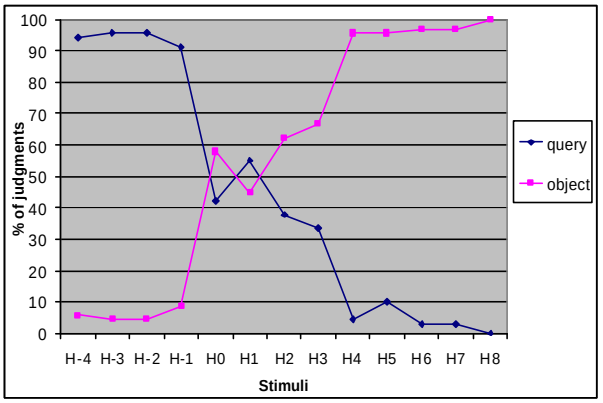

Figure 3: Percentages of judgments for both QUERY and OBJECT categories for all informants. H0 is the base stimulus (peak=235.6Hz), all stimuli leftwards have F0 peak decreased in 15Hz steps (H-1 – H-4), all stimuli rightwards have F0 peak increased in 15Hz steps (H1 – H8).

This counter-tendency in the listeners' judgments curve can be explained by an order of presentation effect. In fact, a closer a posteriori look at the randomised sequences of stimuli presented to the informants revealed that the stimulus H0 was preceded once by H-3 and twice by H-4, i.e. by stimuli with the lowest peak height in the phonetic continuum. Considering that the perceptual distance between H-4 and H0 is 5.08 St, and that between H-3 and H0 is 3.66 St, it is reasonable to hypothesise that the influence of a preceding very low pitch peak stimulus may have triggered relatively more "Object" answers. Of course, such influence was particularly effective in the case of H0, as it is one of the stimuli in the middle of the phonetic continuum, and thus prone to ambiguity. Significant order of presentation effects have been already reported in previous works on categorical perception of pitch range variation (see, for example [6]).

Note that it could be argued that an affective meaning is involved in the interpretation of OBJECT, especially the element of surprise. If this is the case, it is even more surprising that listeners interpreted the results in a categorical way.

4. DISCUSSION AND FUTURE WORK

This study provides preliminary evidence that pitch range variation plays a role in the identification of two different pragmatic meanings in Bari Italian. It also provides further evidence that pitch range can be perceived in a categorical way, thus strengthening the arguments for its treatment in phonological terms as an independent feature, as already put forward for other languages ([3], [5], [6]). Further experiments need to be carried out in

order to confirm these findings. A successive step could be the replication of the presented identification experiment followed by a discrimination task, following the classical CP paradigm, but taking into account recent works on this topic. Besides some heuristics for dealing with inter-subject variability by using regression analysis in discrimination tasks [13], more radical suggestions are presented, for example by Chen [5], who claims the CP paradigm is not suitable for investigating discreteness in intonation, as it relies on the incapability of the listeners to perceive differences between stimuli belonging to the same category, whereas it has been shown that they are indeed able to detect finer distinctions in F0 across a phonetic continuum. The alternative method proposed is recording the Reaction Time of responses, with the assumption that judging two stimuli as belonging to the same category imply the same amount of cognitive load, and therefore similar RT mean values, whereas identification of stimuli belonging to different categories would trigger larger RT mean values (see [5] for English, [14] for Majorcan Catalan, [15] for European Portuguese).

Another experimental approach has been explored by Odè [16] in a discrimination task. Instead of the classical same-different type of judgment, subjects were asked to judge pairs of stimuli as being "a passable imitation" of each other or not, where stimuli in one pair were always produced by two different speakers. If the two stimuli were perceived as passable imitations, and therefore as "perceptually equivalent", that is taken as evidence that they share the same phonological representation; if not, their differences could be accounted for as phonetically-based. According to Gussenhoven ([17]), the method based on "perceptual equivalence" is more promising for studying categorical perception in intonation, as it appeals to listeners' linguistic knowledge, whereas the CP paradigm relies more on the general competence of discriminating between objects on an acoustic basis.

Future work on categorical perception of pitch range variation in Bari Italian will therefore take into account such suggestions, with the aim of both confirming the preliminary results of this first study, and also of contributing to the testing of the above mentioned approaches.

5. ACKNOWLEDGEMENTS

We would like to thank Mario Refice for help with carrying out the perception experiment, and Andrea Bosco for useful hints on statistical analysis. We are also very grateful to Carlos Gussenhoven, Ajou Chen, Taehong Cho, and the participants at the Nijmegen-Cologne Prosody Workshop, and to the anonymous reviewers for useful comments and suggestions.

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