The phonological representation of edge tones in Spanish alternative questions

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1. Introduction

A good deal of research on intonation following the tradition set by the Autosegmental-Metrical Theory *(AM Theory)* proposes T- as one of the structural elements in the phonological representation of utterances from Spanish (Nibert 2000, Hualde 2002). However, there are also numerous accounts in the literature which, even within the AM Theory, exclude T- from the representation (Sosa 1999, Beckman et al. 2002). In this context, we embark on the adventure of studying the adequacy of such tone in the specific case of alternative questions in two dialectal varieties of Spanish, namely, Madrid and Canarian Spanish, since their respective proposals show a conflict in the following terms: Estebas Vilaplana (2007) includes H- as the phonological unit which accounts for the peak at the end of the first disjunct of an alternative question in Madrid Spanish, whereas Cabrera Abreu and Vizcaíno Ortega (2007) resort to H% to account for such a peak in Las Palmas de Gran Canaria (LPGC) Spanish.

In order to solve this conflict, we turn to Cruttenden (1986), who claims that there is a correlation between the duration of nuclear and post-nuclear syllables on the one side, and the end of an intonation group on the other side, in the following terms: the syllables are lengthened before a prosodic boundary. Bearing this in mind, in our research we measure the duration of those particular syllables so that we can determine whether H- or H% stands in the phonological representation.

2. Setting the context

In this section, first, we present briefly a set of proposals which initially seem to be assigning different pragmatic functions to H- and H%, and therefore, justify their presence in phonological representation. However, a closer study of their pragmatic functions reveals that, in fact, they are quite similar, and consequently, the initial motivation for their proposal weakens

considerably. After that, we offer a critical review of the controversial role of T- in the description of a wide range of intonation patterns in English and Spanish, which questions furthermore its role in intonational phonology.

2.1 T- and T% as discourse markers

As far as H- is concerned, Hualde (2002) resorts to this unit as an information-structure marker. He claims that H- signals the end of given information in declarative utterances with a subject-predicate (or predicate-subject) structure in Spanish. In a similar vein, Pierrehumbert and Hirschberg (1990) state that, in the case of English, H- indicates that its domain, together with other intermediate phrases, form a larger interpretive unit. Thus, both proposals have in common the fact that the relevant interpretation of the information being conveyed by the intermediate phrase accounted for by H-, closely depends on other intermediate phrases.

In relation to H%, and also for English, Pierrehumbert and Hirschberg (1990: 305) claim that the information contained in an intonation phrase whose right edge is associated to H% is to be interpreted with respect to a following unit (whereas if the boundary tone is L%, such directionality remains unspecified). In view of this claim, we notice, once more, that the complete interpretation of a unit (in this particular case the intonation phrase) is governed by another unit in the discourse.

In the light of these observations, that both H- and H% share the function to limit domains whose meaning depends on other domains, there seems to be no strong evidence to support their status as different units any longer, at least for pragmatic purposes.

2.2 The controversial role of T-

Whereas the robust status of the rightmost boundary tone (T%) is taken for granted among all scholars working within the AM Theory, there is no consensus about the status of the phrase accent (T-): some authors use it as an obligatory component of the well-formedness of the intonation phrase (Pierrehumbert 1980; Pierrehumbert and Hirschberg 1990; Nibert 2000; Hualde 2002); yet others dispense with it altogether, and defend that pitch movements between the nucleus and the final boundary tone – the domain of T- according to Pierrehumbert (1980) – can be accounted for by resorting to devices like bitonal nuclear pitch accents (Sosa 1999), or rightward tonal spreading of trailing tones (Lindsey 1985).

According to Vizcaíno-Ortega (2003), the controversy of T- within the AM Theory arises from the following issues: (i) the association(s) of T- to landing sites; (ii) its active/passive role in phonological structure; and (iii) its phonetic interpretation.

In relation to (i), we should recall the multiple association of T- to different landing sites. Rather than having a specific anchoring point, first it was considered a 'floating' tone, lodging somewhere between the last pitch accent and the final boundary tone (Pierrehumbert 1980), which means that it was *not* actually associated to any segmental material. Then it was the edge tone of the *intermediate phrase*, a level of prosodic structure smaller than the intonation phrase (Beckman and Pierrehumbert 1986). Eventually, it had a primary association to the right edge of the intermediate phrase, and a secondary association to the right edge of the nuclear word (Pierrehumbert and Beckman 1988).

As for (ii), let us consider, by way of example, one of the alleged effects of the phrase accent as a phonologically active unit: its upstepping property. There is a lack of consensus among intonologists as to the property of T- (more specifically, when its value is H) to step up the phonetic value of the following T%. Cases like Glasgow English are examples of varieties where it has been argued (Mayo 1996) that H- does not trigger the raising of a following L% or H%; instead, there is a drop in pitch in the sequence H- L%, and sustained level for H- H%. Thus, predictions made by theory-internal rules like the *upstep* described above do not prove adequate in the description of the different dialectal varieties of English.

Regarding (iii), Pierrehumbert (1980) herself notes the difficulty in detecting empirically the phonetic value of the phrase accent as distinct from that of the trailing tone of bitonal pitch accents in supposedly different melodic contours such as L* H- L% and L*+H- H- L%. In representations like L* L- L% Pierrehumbert also considers that the transition between the nuclear L* and the boundary tone L% can simply be described as phonetic interpolation, the phrase accent L- being redundant.

If we turn to phonological representations of Spanish – which are closer to our body of data – within the AM Theory, the discussion of some of Nibert's examples (2000) by Beckman et al. (2002) constitutes an illustrative summary of the two opposing views regarding the inclusion of T- in the grammar of intonation. Nibert includes the phrase accent H- in her example *lilas* (H*) *y lirios* (H* H-) *amarillos* (H* L- L%). She claims that, given the rise over the first syllable of *lirios* – which exhibits the alignment of a nuclear syllable – and taking into account that the second syllable of this word undergoes the typical lengthening found before a prosodic frontier, the

second rise perceived at the end of the target word cannot be accounted for by other than a phrase accent. Beckman et al. use T% as the edge tone marking the only level of prosodic structure, for in their view there are inconclusive data in Spanish to distinguish between T- and T%. As for Nibert's example, they call for minimal pairs that contrast the purported intermediate phrase boundary (T-) with a purported full intonational phrase boundary (T%), and conclude that an alternative interpretation that equates the boundary here with a full intonational phrase boundary cannot be ruled out.

Finally, Sosa (1999), who puts forward a cross-dialectal comparison of Spanish, and consequently, a wide range of data, regards T- as unnecessary in the phonological representation of Spanish utterances, and claims that, given the evidence of complex tonal prenuclear accents of the type T*+T in this language, there is nothing that prevents us from using such bitonal pitch accents in conjunction with the boundary tone T% to represent the Spanish nuclear contours.

2.3 Alternative questions in Spanish

Let us now turn to the specific case of Spanish alternative questions. Examples such as *¿Queréis melón o helado? (Would you like melon or ice cream?)*, uttered by a Madrid Spanish speaker, typically show a rising movement at the end of the first disjunct. Such a peak is accounted for by Estebas Vilaplana (2007) as H-. However, in a similar contour for the same utterance in another variety of Spanish, Canarian Spanish, this peak is accounted for by Cabrera Abreu and Vizcaíno Ortega (2007) as H%.

In the light of the context presented here, and with the aim of figuring out which phonological representation (either H- or H%) is most descriptively and explanatorily adequate for the end of the first disjunct in alternative interrogatives in Spanish, in the following sections we move onto measuring the duration of the nuclear and post nuclear syllables in this structural position, since (as already stated in our introduction), according to Cruttenden (1986), those syllables are lengthened before a prosodic boundary.

3. The end of the first disjunct in alternative questions: T- or T%?

The syllables measured in our experiment correspond to the same target words in the following contexts: P1 (at the end of the first disjunct in alternative questions -*¿Eres de Málaga o de Granada? Are you from Málaga*

or Granada?); P2 (in utterance internal position, not followed by T- or T% - *¿Málaga provincia tiene menos emigrantes? Does the province of Málaga have less emigrants?*); P3 (at the end of the utterance, followed by T% - *¿Va a ir a Málaga? Is s/he going to Málaga?*). In order to ascertain whether T- or T% is the best proposal in the context of P1, we test the following set of hypotheses: (i) if syllable duration in P1 were similar to that of P3, then we could propose the same tone, i.e. T%; (ii) if syllable duration in P1 resulted smaller than in P3, but larger than that in P2, then we could assume T-; and (iii) if syllable duration were similar in P1 and P2, then we could suggest absence of an edge tone.

4. Methodology

The ten subjects who participated in our production experiment were all born in Madrid and Las Palmas de Gran Canaria, and their speech is characteristic of the two dialectal varieties of Spanish under study, namely, Castilian and Canarian Spanish. Half the subjects are male, half are female, their mean age being 45. All of them are university lecturers.

The syllables that were measured correspond to the same target words in the structural positions mentioned in the previous section. Since we wanted to measure the syllable duration of the target words in the alternative questions against that of the same words in the two remaining positions, 5 interrogatives were used in P1 as test sentences and other 5 in P2 and P3 respectively served as control sentences. The syllable structure of the target words was CV-CV-CV, always favouring a sequence of voiced segments. The vowels constitute a well-balanced sample of all degrees of vowel height in Spanish (*Málaga; Mérida; dímelo; sinónimo; número*). The entire corpus consists of 300 interrogative utterances: 100 test sentences in P1 and an equal rate of 100 control sentences in both P2 and P3.

The data were gathered as follows: slides displayed on a computer screen were presented to the subjects containing both test and control sentences for them to read out. Different types of distractors – description of pictures and drawings; blank slides; short term memory games – were used in random order to avoid the appearance of two consecutive test or control sentences, and also to prevent the subject from monotonous, mechanic reading. The subjects produced two repetitions of each sentence at normal speech tempo. The speech material was directly recorded into the computer and later analysed with PRAAT 4.3.09 ®. We segmented the target words and labelled the consonants by placing boundaries around them in an interval tier. A Praat script extracted automatically the duration of all the labelled

intervals. Then we added up the durations of the segments to compute the duration of each syllable. Finally, a statistical data analysis was performed using SPSS. Paired t-tests for each speaker were run combining the three structural positions in all possible ways to assess whether the means of syllable duration in each position were statistically different.

5. Results

Figure 1 (Madrid Spanish male speaker) and figure 2 (LPGC Spanish female speaker) are representative examples of the results obtained after the statistical analysis, for all speakers showed an overwhelmingly similar tendency. The mean duration of the target word in milliseconds (ms) is shown on the vertical axis. P1, P2, P3 appear from left to right on the horizontal axis. Both the graphs and the table of values indicate that there is no significant difference in length concerning the mean duration of the syllables in P1 and P3 in any of the dialectal varieties studied (p > 0.01, which demonstrates that 99% of the sample exhibits a similar behaviour). The mean duration of the syllables in P3 is in most cases slightly longer than in P1, though, as already said, never significant. The fact that the mean duration of the syllables in P1 is occasionally longer than in P3 points in the same direction.

On the contrary, the difference in terms of the mean duration of the syllables between P2 and P3 is significant in both Madrid Spanish and LPGC Spanish, as it is also between P1 and P2 again for the two dialectal varieties (p < 0.01, which provides sufficient evidence of the dissimilar behaviour of syllable length in P2 when compared to the rest of the sample).
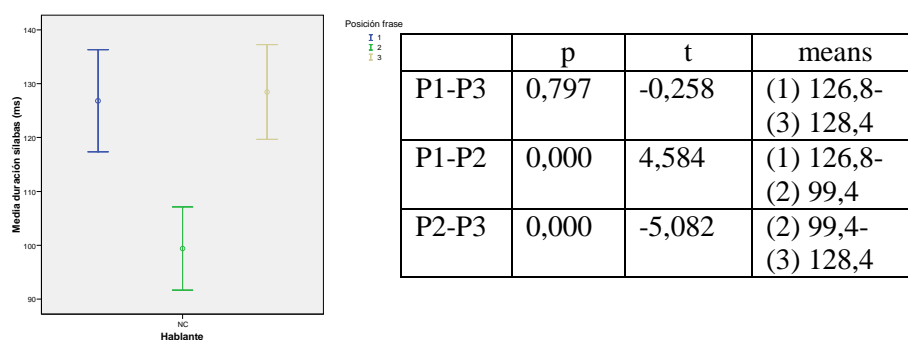

	p	t	means
P1-P3	0,797	-0,258	(1) 126,8- (3) 128,4
P1-P2	0,000	4,584	(1) 126,8- (2) 99,4
P2-P3	0,000	-5,082	(2) 99,4- (3) 128,4

Figure 1. Subject NC (Madrid Spanish).

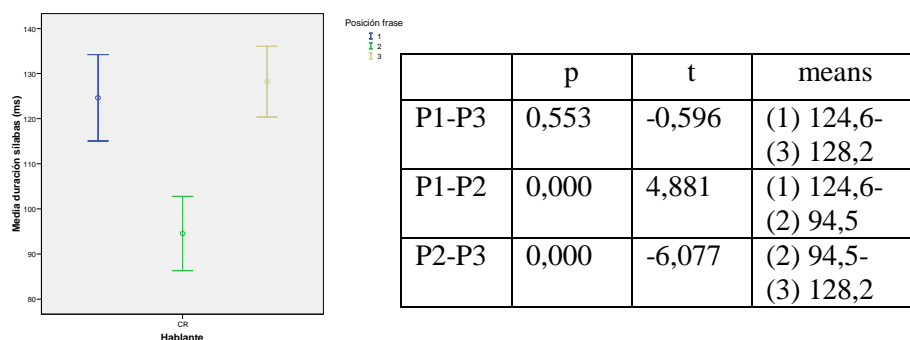|	p	t	means
P1-P3	0,553	-0,596	(1) 124,6-(3) 128,2
P1-P2	0,000	4,881	(1) 124,6-(2) 94,5
P2-P3	0,000	-6,077	(2) 94,5-(3) 128,2

Figure 2. Subject CR (LPGC Spanish).

6. Conclusions and further study

Bearing in mind the results just presented, namely, the similar duration in P1 and P3, we confirm the first of our hypotheses, that is, T% should be the edge tone proposed for both structural positions, for duration does not justify a different phonological representation in the alternative questions studied here. As a consequence, the other two hypotheses are falsified.

Moreover, the robustness of T% against the unstability of T- in the AM Theory leads us to maintain the former as the only tonal unit in charge of representing a prosodic edge.

Further research into the same utterances will contemplate whether F_0 alignment together with intensity provide more evidence in support of these findings. In order to complete the picture of the adequate phonological representation of prosodic edges, future studies should incorporate other utterance types as well as move onto non-lab speech.

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