

DSpace da Universidade de Santiago de Compostela

<http://dspace.usc.es/>

Instituto da Lingua Galega

Alba Aguete Cajiao (2015): “The effect of initial-prosodic boundary on vowel aperture in Galician”

[Póster]. *Phonetics and Phonology in Europe 2015*. Cambridge (Reino Unido), 29-30 xuño 2015



You are free to copy, distribute and transmit the work under the following conditions:

- **Attribution** — You must attribute the work in the manner specified by the author or licensor (but not in any way that suggests that they endorse you or your use of the work).
- **Non commercial** — You may not use this work for commercial purposes.

The effect of initial-prosodic boundary on vowel aperture in Galician

Alba Agüete Cajiao (alba.agüete@usc.es)
 Instituto da Lingua Galega
 Universidade de Santiago de Compostela

PHONETICS AND PHONOLOGY IN EUROPE
 29-30 June 2015

Introduction

There is a recent change in the Galician pretonic vowel system. This change is characterized by the adaptation of the mid-pretonic vowels (in word initial non-onset syllable) as mid-open vowels, which contrast to the traditional mid-closed vowels in such position (Veiga, 1976). Despite the fact that there are some studies in which this change is described (Santamarina, 1972; Taboada, 1979; Porto Dapena, 1977; Regueira 2009), not many provide research on the reasons for this change, neither on the acoustic nature of this “new” vowel system. In addition, it seems like this variability is also perceived by speakers. They reveal having a certain degree of uncertainty in their production of pretonic vowels, especially when occurring in words which are newly introduced in Galician.

This behavior diverge from the confidence they have with respect to the opening of stressed vowels, where there is a clear opposition between mid-open and mid-closed vowels. This perception from Galician speakers leads us to consider the possibility that the production of initial vowels could vary depending on prosodic context, and particularly that this change could be triggered by the position of the vowel in an initial prosodic boundary. This idea has its basis in a study made by Fougeron & Keating (1996a, 1996b, 1997) who examine the strengthening in the articulation of vowels in different domains on the prosodic hierarchy.

The hypothesis we propose is that the aforementioned change can be triggered by a prosodic strengthening. This is more specifically an articulatory strengthening in initial prosodic boundary, since, following the idea presented by Fougeron & Keating, this could benefit the strengthening of the syllable and, consequently, the aperture of the vowel.

If our hypothesis is confirmed, we could accept that the position of the vocalic segment on the prosodic domain is an influential factor in the variability of the vowels when they are in the initial-boundary on the pertinent domain.

Methodology

In order to verify our hypothesis a production experiment with 8 native female speakers of Galician has been carried out. Speakers were asked to read a sort of 50 statements where vocalic segments were in initial-boundary position in the different hierarchical prosodic domains. We take into account both mid-open and mid-closed front and back vowels of Galician: /e/~/e/ and /ɔ/~/o/.

We considered the four different domains whose existence is attested in Galician (Fernández Rei 2002): Phonological Utterance (U), Intonation Phrase (I), Phonological Phrase (Φ) and Phonological Word (ω), both in weak and strong positions:

Boundary prosodic domain	Example of statement
Phonological Utterance-Initial	[Dime que queres.] _U [Ofelia]
Phonological Intonational Phrase-Initial	[Dime que tes,] _I [Ofelia]
Phonological Phrase-Initial	[Vimos a María Anxos] _Φ [Ofelia]
Phonological word-Initial	[Dime] _ω [se] _ω [es] _ω [Anxos-Ofelia] _ω

Table 1. Examples of the statements used for the elicitation corpus

Each statement should be read three times by speaker, although some speakers refuse doing all repetitions. There were 1010 sentences in total, but we had to exclude 42 of them because of wrong production (of the expected prosodic boundaries). Thus, the amount of sentences analyzed was 968.

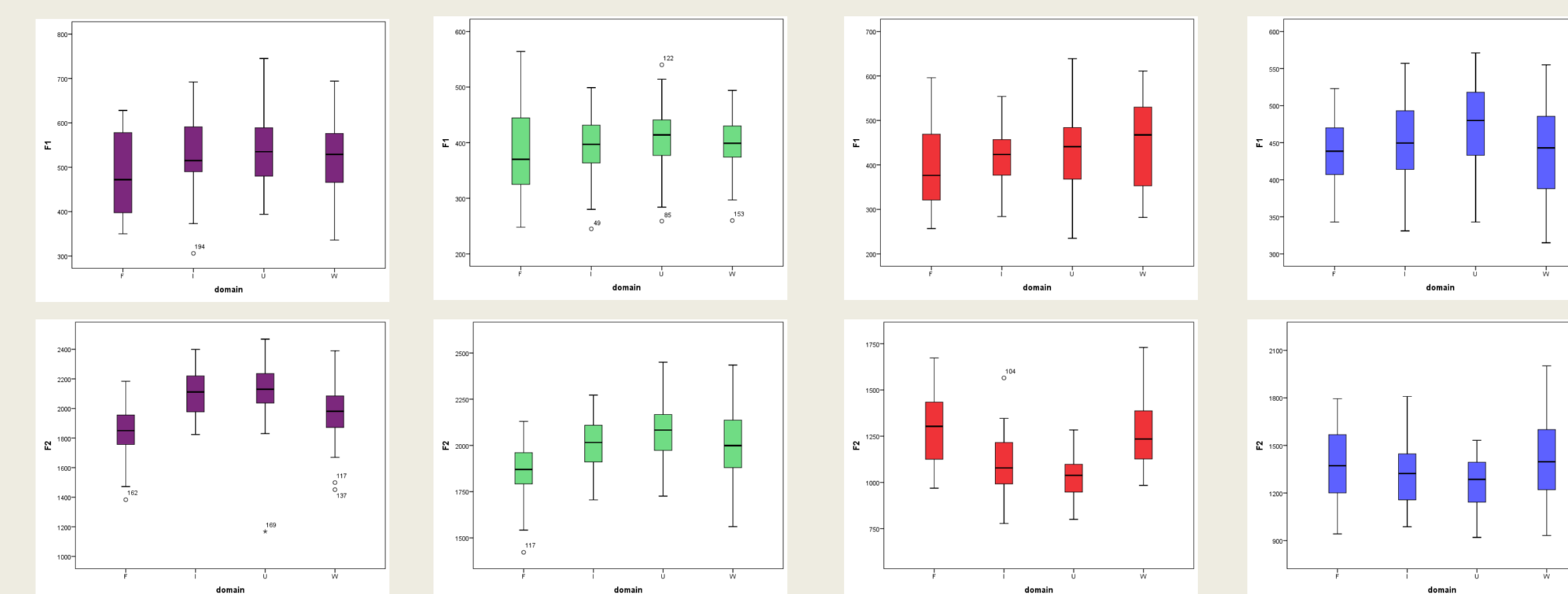
Those vocalic segments were acoustically analyzed, considering F1 and F2 for each vowel, as they are assumed to be the correlates of vowel quality. This allows us to look at the aperture of vowels objectively, and to verify if there is variability due to the initial-boundary position of the vowel on the hierarchy.

All vowels were segmented manually looking at the spectrogram. Formant values and duration were taken from the middle of the vowel, using a script made ad-hoc that uses the Burg algorithm implemented in Praat.

In order to test our hypothesis a GLM-Multivariate analysis was made for each vowel, to testing the effects of boundary prosodic domain (U, I, Φ and ω) and subject (8 speakers) on the three variables studied: F1 and F2.

Results

The following graphs show means and deviations of F1 and F2 for the four vowels in every prosodic domain. As we can see, there is much more variation of F1 for mid-open vowels /e/ (purple boxplots) and /ɔ/ (red boxplots).



Boxplot for F1 (on top) and F2 (bottom) by prosodic domain for each vowel
 From left to right, in different colours: /e/, /e/, /o/, /ɔ/
 Within each vowel boxplot, from left to right: Φ, I, U, ω

The analysis for the back mid-closed vowel /o/ shows a significant effect (sig. < 0.05) of both boundary type and speaker for F1 and F2. Despite this, interaction between domain and speaker was no significant effect. Tukey post-hoc comparisons, with critical significance at $p < 0.05$, reveal an increase of F1 in Utterance-initial position, and a decrease of F2 in Utterance and Intonational Phrase-Initial position.

For the back mid-open vowel /ɔ/, there is also a significant effect (sig. < 0.05) of prosodic domain and speaker. In this case we found a significant effect for the interaction between domain and speaker for F1. Post-hoc test indicates a decrease of F1 in Phonological Phrase position and a rise in Utterance and Phonological Word-Initial position. Considering F2 a significant decrease is found in Utterance-initial position while there is an increase in Phonological Phrase and Phonological Word-Initial position.

These results reveal that there is a different behaviour between back mid-open vowels and back mid-closed vowels when variation is due to the effect of the initial-boundary prosodic domain.

For the front mid-closed vowel /e/ we found a significant effect of speaker for the two dimensions (F1 and F2) and a significant effect of prosodic domain for the F2 (sig. < 0.05). Interaction between domain and speaker was found only for F1. As we could see, there was no effect of any factor for F1, so we didn't take the effect of the interaction into account. Post-hoc analysis indicate that there is a decrease for F2 in Phonological Phrase-Initial boundary.

For the front mid-open vowel /e/ we found an effect of the prosodic domain and speaker for F1 and F2 (sig. < 0.05), while there is not effect of the interaction between domain and speaker. Post-hoc analysis indicate a decrease of F1 in Phonological-Phrase. For F2 there is a decrease in Phonological Phrase, whereas a rise for Intonational Phrase and Utterance-Initial positions.

Vowel	F1	F2
/e/	a)F (1.811) ns b)F (9.007) sig. < 0.05 c)F (3.396) sig. < 0.05	a)F (25.524) sig. < 0.05 Φ < ω, I < U b) F (20.292) sig. < 0.05 c) F (1.492) ns
/e/	a)F(6.695) sig. < 0.05 Φ < U, I, ω b) F (50.053) sig. < 0.05 c) F (0.956) ns	a)F (46.758) sig. < 0.05 Φ < ω < U, I b) F (30.427) sig. < 0.05 c) F (1.153) ns
/o/	a)F (5.416) sig. < 0.05 U > ω, I, Φ a)b) F (26.242) sig. < 0.05 c) F (1.260) ns	a)F (16.348) sig. < 0.05 U, I < Φ, ω a)F (33.517) sig. < 0.05 b)F (1.228) ns
/ɔ/	a)F (3.890) sig. < 0.05 Φ < U, ω a) F (17.369) sig. < 0.05 b)F (1.477) ns	a)F (46.138) sig. < 0.05 U < I < Φ, ω a)F (16.707) sig. < 0.05 b)F (2.033) sig. < 0.05

Table 2. Summary of results of the GLM-Multivariate by vowel. For each one of them:

a) Effect of prosodic domain and direction of the difference between domains; b) Effect of speaker; c) Effect of the interaction between prosodic domain and speaker.

Conclusion

The aim of this approximation was to investigate whether initial-boundary prosodic position was a factor related to the variation existing in pretonic mid-vowels of Galician, and how is the behaviour for each vowel in every initial-boundary prosodic domain.

The results obtained allow us to confirm that they are differences between formant values (F1 and F2) within each vowel related to the position on the prosodic hierarchy, even though the direction of prosodic domain for changes in F2 is similar for each pair. Despite the differences between speakers, we can assume that there is a decrease of aperture for mid-open vowels /e/ and /ɔ/ in Phonological Phrase position, since F1 values decrease in this position. In the other hand, there is a strengthening of the mid-closed quality of /o/ in Utterance-Initial position.

Nevertheless, this study is just a first approximation, and it become essential some new research, for taking into account duration of segments –since duration can be related to vowel quality-, or making experimental designs where every vowels were tested.

References

- Fernandez Rei, E.(2002). *Regras fonolóxicas posléxicas e regras precompiladas de alomorfa sintagmática, dominios prosódicos (Unpublished PhD dissertation)*. Santiago de Compostela: Universidade de Santiago de Compostela
- Fougeron C.-Keating, P. (1996a). The influence of prosodic position on velic and lingual articulation in French: Evidence from EPG and airflow data. *First ETRW on Speech Production Modeling*, 93-96.
- Fougeron, C.-Keating, P. (1996b). Variations in velic and lingual articulation depending on prosodic position: results for 2 French speakers. *UCLA Working Papers in Phonetics*, 92, 88-96.
- Fougeron, C.-Keating, P. (1997). Articulatory strengthening at edges of prosodic domains. *Journal of the Acoustical Society of America*, 101 (6), 3728-3740.
- Georgeton, L.-Fougeron, C. (2014). Domain-initial strengthening on French vowels and phonological contrasts: Evidence from lip and spectral variation. *Journal of Phonetics*, 44, 83-95.
- Nespor, Marina- Vogel, Irene (1994). *La prosodia*. Visor Distribuciones: Madrid.
- Porto Dapena, A.(1977). El gallego hablado en la comarca ferrolana. Verba, Anexo 9. Universidade de Santiago de Compostela
- Regueira, X. L. (2009). Cambios fonéticos e fonolóxicos no galego contemporáneo. *Estudos de Lingüística Galega*, 1, 147-167.
- Santamarina, A.(1972) El habla del Valle del Suarna (Unpublished PhD dissertation).
- Taboada, M.(1979). El habla del Valle de Verín. Verba, anejo 15. Universidade de Santiago de Compostela
- Veiga, A. (1976). *Fonología gallega*. Valencia: Bello.