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# Proceedings

## *Posters*

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Posters of all sessions

| PDF | (PS) | session | author(s) | poster |
|---|---|---|---|---|
| pdf | | S8 | Blatná, R. | A Corpus-Driven Approach to Czeh Collocations and Collocational Idioms |
| pdf | | S10 | Bogushevich, D. G., Vetoshkina, M. K. | Typology of communicative parts |
| pdf | | S9 | Campos-Astorkiza, R. | Compensatory Lengthening as Root Number Preservation |
| pdf | | S9 | Carrera-Sabaté, J., Fernández-Planas, A. M. | Back Mid-Vowel Differences in Three Catalan Dialects |
| pdf | | S10 | Chang, J. H. | Verbal and non-verbal communication rules: Chinese vs. American |
| pdf | | S10 | Dias, S. M. S. | Analýsés de la reponse perceptive de la parole et le niveau de satisfation avec l' aasi en un groupe des sourds aprés un année d'experience auditive dans la methodologie verbotonale |
| pdf | | S10 | Dobrovol'skij, D. | Corpus-based approach to linguistic analysis of literary translation |
| pdf | | S7 | Heap, D. | Les atlas linguistiques et l'étude de la morpho-syntaxe |
| pdf | | S1 | Ihara, T. | Toward the language peace in the world |
| pdf | | S7 | Ishikawa, M. | An informal look at formal aspects of syntactic drift: A case study in Spanish |
| pdf | | S7 | Kanno, K. | Two-Alternative-Chinese-Character Words in Japanese: Right-hand Head Rule and Left-hand Priority Principle |
| pdf | | S9 | Magro, E. P. | On Some Syntactics and Intonational Features of French and Maltese Spontaneous Speech: a Preliminary Comparative Study |
| pdf | ps | S7 | Mailles, A. | Diachronie morpho-sémantique corrélative en Forez de paradigmes des suffixes verbaux et du pronom personnel sujet ("Qui est le premier de la poule et de l'oeuf ?") |
| pdf | | S9 | Mejvaldová, J., Duběda, T., Dohalská, M. | L'imitabilité des modeles prosodiques en parole spontanée et en parole lue |
| pdf | | S7 | Molle, K. | The Usage of the Definite Article (DA) in Bulgarian and Macedonian |
| pdf | | S7 | Shimamura, R. | The Boundary between Word and Phrase: The Case of A-N Expressions within Compounds |
| pdf | | S9 | Shuk, S. | Prosodic Markers of English Radio Reports Pragmatics |
| pdf | | S10 | Skutta, F. | Réflexions sur l'anaphore conceptuelle et ses rapports aux types de textes |
| pdf | | S10 | Salasoo, T. | The Early Nouns - What Do Children Learning Estonian Talk About? |
| pdf | | S9 | Stockmal, V., Bond, Z. S., Moates, D. R. | Judging Voice Similarity in Unknown Languages |
| pdf | ps | S10 | Tohyama, Y. | A Semiotic Analysis of Verbal and Nonverbal Language in Literature - An Analysis of Henry James' Washington Square - |
| pdf | | S8 | Zabotkina, V. | Conventionality vs creativity in lexicon (pragmatic - semantic interface) |

# BACK MID-VOWEL DIFFERENCES IN THREE CATALAN DIALECTS[1]

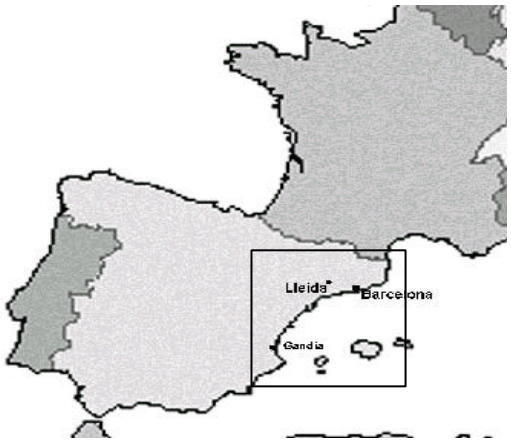
Josefina Carrera-Sabaté (UB & UdL) Ana M. Fernández-Planas (UB)

## 1. INTRODUCTION

Catalan is a Romance language spoken by about seven million inhabitants of Spain, distributed over Catalonia, Valencia, part of Aragon and the Balearic Islands. It is also spoken in Andorra, Rosselló and L'Alguer. Catalan has two major dialectal regions: the Eastern diasystem[2], which comprises the Eastern dialects: Central Catalan, Balearic, «Rossellonès», and «Alguerès»; and the Western diasystem, which contains the North-western and Valencian dialects.

The fundamental vocalic differences between these two diasystems are based on their unstressed vowel system and on a few consonant features (see Veny, 1982). As for their stressed vowel system, the differences among dialects are barely discerned auditorily, although they are present acoustically. Due to the apparent phonetic uniformity of stressed vowels, very few contrastive studies of the stressed vowel system of Catalan dialects have been conducted: only Recasens (1986), Carrera-Sabaté *et al.* (1999, 2000) and Fernández-Planas *et al.* (in press) focus on this area.

The aim of this paper is to present a contrastive analysis of the back mid-vowels: back mid open ([ɔ]) and back mid close ([o]) of three Catalan dialects: Central Eastern Catalan (Barcelona), North-western Catalan or "Lleidatà" (Lleida), and Southern Valencian (Gandia) (see Map 1). The first dialect belongs to the Eastern diasystem, while the other two dialects belong to the North-western diasystem.




Map 1.

The starting point of this study is to analyse whether the dialectal division of Catalan in the above mentioned diasystems can be applied to the acoustic characterisation of back mid-vowels. That is, the objective is to see whether there are fewer acoustic differences in back mid-vowels between North-Eastern Catalan (Lleida) and Southern Valencian (Gandia) than between any of these two dialects and Central Eastern Catalan (Barcelona).

## 2. METHODOLOGY

Data for the study consist of speech samples recorded under optimal conditions for their subsequent analysis. Participants were ten male speakers (three for each Central Eastern and North-western dialectal variants, and four for the Valencian dialectal variant) between the ages of 22 and 30, and whose accent was not especially influenced by Spanish. The speakers came from three specific geographical areas: Lleida (North-western dialect), Barcelona (Central Eastern dialect) and Gandia (Southern Valencian).

The back mid-vowels [o] and [ɔ] were uttered in symmetric CVC sequences. Also, vowels were preceded and followed by consonants with different articulatory characteristics: bilabial stop ([p]), dento-alveolar stop ([t]), alveolar nasal ([n]), alveolar fricative ([s]), trill ([r]) and lateral ([ɬ]). The combination of these consonants and vowels made up a set of stimuli that were uttered within the following carrier phrase: *diu CVC quan vol (S/he says CVC when s/he wants)*. Informants produced each CVC sequence three times.

Acoustic analyses were performed at the Phonetics Laboratory of the University of Barcelona using the CSL4300B. They consisted of making frequency measurements of F2 in the steady-state of the sounds examined by means of Linear Predictive Coding (LPC). Statistical analyses were carried out with

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[2] Diasystem is a group of dialects which share similar caracterisation. (Vid. Veny, 1982).

the package SPSS 10.0 – one part of these analyses was done through a multidimensional scaling (MDS) technique[3].

## 3. RESULTS

Results on the analysis of F2 reveal that the two back mid-vowels of Southern Valencian are more open than those of the other geographical areas. On the other hand, both open and close mid-vowels of the dialects of Barcelona and Lleida have F2 values that are more similar to each other in comparison to the data obtained for the dialect of Gandia (mean F2 values for each vowel of each dialect appear in Figure 1).

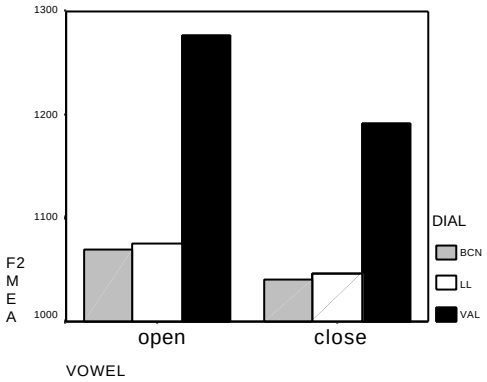


Figure 1. F2 means in open and close “o”.

Scheffé post-hoc comparisons show that the differences in both open “o” and close “o” between Gandia and Barcelona, on the one hand; and between Gandia and Lleida, on the other hand, are statistically significant ($p$=0.000). But differences become nonsignificant between Barcelona and Lleida ($p$=0.930 for open “o”, and $p$=0.943 for close “o”).

Results obtained by means of the MDS technique confirm the findings just reported:

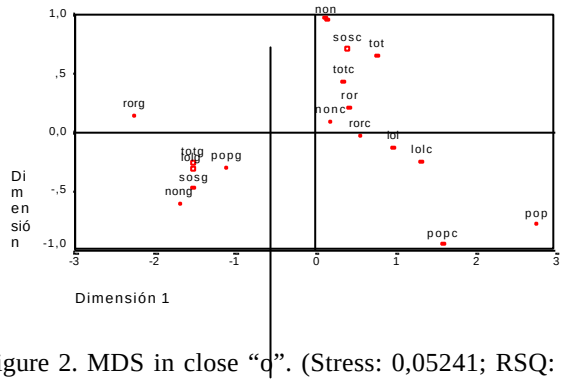


Figure 2. MDS in close “o”. (Stress: 0,05241; RSQ: 0,98988)

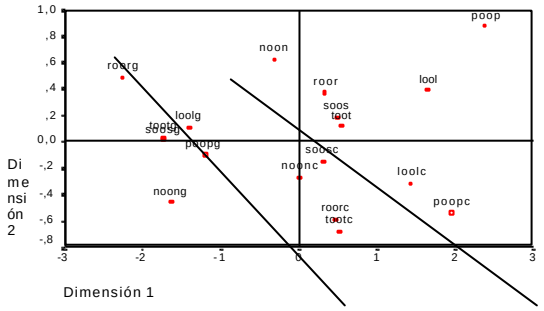


Figure 3. MDS in open “o”. (Stress: 0,02307; RSQ:0,99792)

**Legend**: o: close “o”; oo: open “o”; c: North-western catalan; g: Southern Valencian.

In these two plots (Figures 2 and 3) it can be seen how the space defined by both open and close “o” vowels of Gandia clusters together more closely than the space defined by the vowels of the dialects of Barcelona and Lleida. Moreover, the space defined by [o] and [ɔ] of Gandia is more open, since the

[3] MDS technique is based on the assumption that, for a group of elements, a matrix of experimental proximities can be obtained from which a t-dimensional space is created (where t is equal to the number of dimensions) and the elements are represented in such a way as to ensure that the distances among the obtained points are equivalent to the proximities experimentally found. This technique offers the advantage of making it possible to represent the objects in a geometric space.

horizontal axis seems to coincide with the parameter of openness. In any case, the distinction between a vowel of Gandia and one belonging to the other dialects is clear-cut. As a result, all comparisons yield significant differences. Conversely, it is considerably difficult to distinguish between vowels belonging to the dialects Barcelona and Lleida, although for open vowels there seems to be continuum of openness - namely, Barcelona<Lleida< Gandia.

A more detailed analysis of the consonantal contexts in which back vowels of each dialect were uttered is shown in Figures 4 and 5. This analysis further supports the findings above.

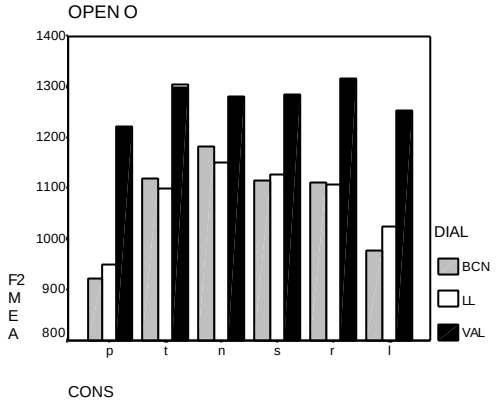


Figure 4. Mean F2 values in open "o"

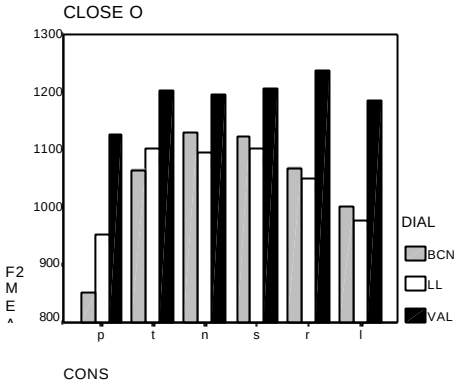


Figure 5. Mean F2 values in close "o"

It should also be noted that t-tests between the dialect of Barcelona and that of Lleida are significant for [o] in the context of [p] only ($t$=-2.829; $p$=0.012), which points to the similarity of medium values displayed by their vowels. However, t-tests between Gandia and Barcelona, and those between Gandia and Lleida show that, for both close and open "o", all contrasts in every consonantal context are statistically significant ($p$<0.05 for Barcelona and Gandia; and $p$=0.000 for Lleida and Gandia). In the three dialects studied, the consonants that lead to a greater frequency slope of the F2 in the vowel (that is, more closeness) are, first, bilabial [p], and then velarised lateral. On the contrary, alveolar and dento-alveolar consonants cause a greater vowel openness (increase in frequency value of F2). To sum up, the consonantal influence from less to more openness on all vowels can be characterised as follows: bilabial consonant<velarised consonant<alveolar and dento-alveolar consonants.

## 5. CONCLUSION

The analysis of the acoustic data obtained under laboratory conditions shows that a well-established openness distinction exists in back mid-vowels between the Southern Valencian dialect (Gandia) and dialects from the area of Lleida and Barcelona. Furthermore, Valencian vowels have an F2 that is systematically higher than that of the other dialects. Contrary to what could initially be expected (e.g., Recasens, 1991), we can affirm that mid-vowels are more open acoustically in Southern Valencian than in North-western Catalan and Central Eastern Catalan.

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