

ANALYZING THE STATUS OF CATALAN SCHWA IN BARCELONA

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ABSTRACT

This paper analyzes the production of Catalan schwa by children and adults in two areas of Barcelona differing in degree of presence of Spanish (which does not have schwa in its sound inventory). The schwa production in different kinds of words or in different positions in the word provides evidence for the status of this vowel.

Keywords: schwa, production, bilingualism, Catalan, phonological status

1. INTRODUCTION

For the last forty years, it has been observed that the usage of schwa in Catalan is decreasing (López del Castillo [7], Veny [13], Payrató [10], Pla Fulquet [11], Herrick [4]). This reduction of the phonological system seems to be due to external (e.g., Spanish influence) or internal factors (e.g., markedness and complexity). The theoretical approaches to the status of schwa consider two or more types of schwa, which could lead to different developments in the production of this segment.

Structuralists like Alarcos [1] and Badia [3] have posited that, since [ə] is only an allophonic variant of /a/, /ɛ/ and /e/ in unstressed position, schwa has the value of an archiphoneme. However, it also has a phonological character given that, in monosyllables, [ə] could be found to constitute minimal pairs contrasting with other vowels (e.g., [əl] *el* - definite masculine article - vs. [al] *alt* - tall -).

Generativist approaches have analyzed two types of schwa, as well: the schwa that alternates with a full vowel, be it /a/, /ɛ/ or /e/, in derived words, where these full vowels become [ə] in unstressed position. In such cases the underlying vowel is easily identifiable. However, in those cases without alternation, it is difficult to decide what the underlying vowel is. On the one hand, Mascaró [8] and Wheeler [15] posit an underlying /a/, whereas Lleó [6] posits an underlying archiphoneme /A/ underspecified as [-high -round]. Avram [2] puts forward the archiphoneme /ə/ in polysyllables. On the other hand, Viaplana and DeCesaris [14] and Recasens [12] posit an

underlying schwa phoneme (the latter author points out that this schwa has the following distinctive features: [medial central-labial]).

Another approach is that of van Oostendorp's Projection Theory [9], based on metrical phonology. According to him, schwa is a defective vowel, with unspecified distinctive features, suitably fitting in weak and in extrametrical positions.

These theories, together with certain assumptions about sound change, make different predictions about the substitution or maintenance of schwa:

a) If non-alternating schwas are maintained more often than alternating schwas, this would argue for the phonological character of non-alternating schwa.

b) Position in the word (Catalan stress system being basically trochaic): If schwa is kept in pretonic (extrametrical) syllables more often than in post-tonic (metrically licensed) ones, this trend would be consistent with Projection Theory.

c) Assuming that sound change tends to simplification, the following predictions would be made: in the case of alternating schwa, substitution should be done by the underlying vowel. In the case of non-alternating schwa there are three possible outcomes: if schwa is maintained, this would reinforce the phonological character of the vowel. If it is substituted by [a], that would support the view of the non-phonological status of schwa and would be consistent with the views of Mascaró and Wheeler. Lleó's proposal would be supported if schwa were substituted by /a/, /ɛ/ or /e/ from the archiphoneme /A/.

d) There will be a greater tendency to produce /a/ in words that are cognates with Spanish words where /a/ is both the underlying and surface vowel.

e) The orthographic form of the lexical items could also affect the substitution of schwa (in adults' productions, not in children's ones).

Markedness should also be taken into consideration. Arguably, schwa is more marked than /a/, as it does not exist in so many languages as /a/. Schwa is also acquired later than /a/, which

is generally the first vowel to be acquired [5]. Markedness could thus play a role in favor of the production of /a/ instead of [ə], especially in children who are in the process of acquiring the language. Therefore, we now examine the production of [ə] by children and adults in two areas of Barcelona.

2. METHOD

2.1. Subjects

Data from the speech of Catalan speakers in two areas of Barcelona were collected. Gràcia/Eixample is the area where the presence of Spanish is at a lower degree, whereas Nou Barris is the district with a high degree of presence of Spanish. Within each area, two age groups were tested: G1) children aged 3 to 5, and G3) adults aged 29 to 45. The different age groups allow us to control for orthography effects in the adults (children do not know how to read and write yet). The sample in each age group across district is comprised of 15 subjects.

2.2. Data elicitation

Data were elicited by questions and picture naming. They contained 59 target items (classified according to the different types of schwa), elicited from each subject. Monosyllables were recorded in a spontaneous conversation with subjects in G3.

2.3. Auditory analysis

The data were auditorily analyzed by two native speakers of Catalan, who provided a phonetic transcription of the data. Another transcription was provided by one of the authors. Transcription agreement was above 76%.

2.4. Acoustic analysis

In the auditory analysis the focus was on the target-like or non-target-like production of schwa. However, because along with quantitative differences, there might also be qualitative differences, those productions which transcribers agreed on as good examples of schwa were acoustically analyzed using the formant tracker function in Praat. The automatic outcome was double-checked by a phonetician. Finally, the formant values were converted onto Bark.

3. RESULTS

3.1. Auditory analysis

If we take the total production of schwa by each group, significant differences are found when comparing the production by children across districts. The children in Nou Barris use another vowel instead of schwa significantly more often than the children in Gràcia/Eixample [$\chi^2(1, N=30) = 83.86; p < .001$]. However, no significant difference is found across districts in the group of adults. Children also substitute schwa more often than adults in each district, especially in the district with a higher degree of presence of Spanish [Gràcia/Eixample: $\chi^2(1, N=30) = 13.82; p < .001$; Nou Barris: $\chi^2(1, N=30) = 140.11; p < .001$].

Figure 1: Overall results (in percentages) of schwa substitution across groups and districts.

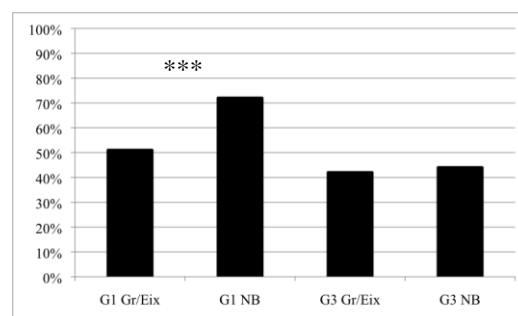
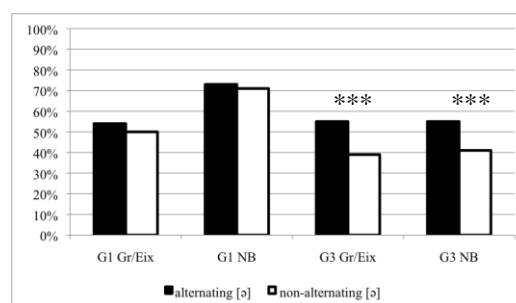


Figure 2: Schwa substitution across groups and districts, classified in alternating and non-alternating schwa.

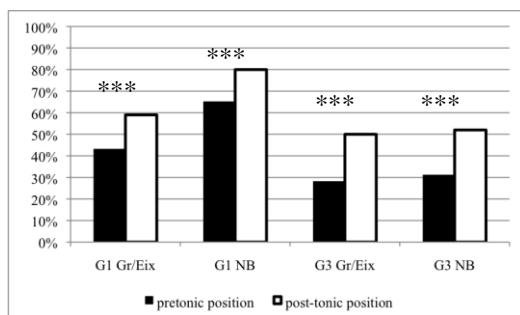


First, let us differentiate alternating vs. non-alternating schwa. Children do not produce more full vowels depending on the kind of schwa in the target word. However, adults do display a difference in substitution rate if schwa is alternating or not. In each district, adults substitute schwa more often in alternating than in non-alternating schwa words [Gràcia/Eixample: $\chi^2(1, N=30) = 13.04; p < .001$; Nou Barris: $\chi^2(1, N=30) = 9.66; p = .001$]. Thus, the alternation with full vowels seems to play a role in the substitution rate in adults. However, there is a general tendency to

produce [a] instead of the underlying /a/, /e/ or /ɛ/ for alternating schwa. Thus, it does not seem to have to do with the orthographic form (which is transparent as to what the underlying vowel is only in the case of /a/). In non-alternating schwa cases there is an overall tendency to produce /a/ instead of [ə]. This general trend supports Mascaró's and Wheeler's claim that /a/ is the underlying form in non-alternating schwa cases.

A higher schwa substitution in alternating than in non-alternating schwa words is consistent with the phonological status of this vowel. This is the case in the production of adults but not in that of children. It could have to do with the fact that the children are so young that they do not have the lexical knowledge to create the link between the phonological and phonetic form of the word yet.

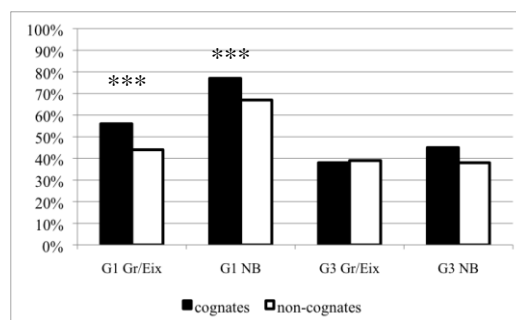
Figure 3: Schwa substitution in pretonic and post-tonic position.



Another factor that could play a role in the substitution of schwa is whether the unstressed syllable appears before or after the stressed syllable. In all groups there are more substitutions in post-tonic than in pretonic position. The difference reaches significance in all groups [G1 Gràcia/Eixample: $\chi^2(1, N=30) = 15.25$; $p < .001$; G3 Gràcia/Eixample: $\chi^2(1, N=30) = 47.31$; $p < .001$; G1 Nou Barris: $\chi^2(1, N=30) = 19.55$; $p < .001$; G3 Nou Barris: $\chi^2(1, N=30) = 33.55$; $p < .001$]. Such outcome is consistent with the predictions by the Projection Theory, as schwa appears more often in pretonic than in post-tonic position (the former being extrametrical, whereas the latter is metrically licensed).

Since Spanish and Catalan share words with a common etymological origin, it is assumed that when schwa appears in a word that has a cognate in Spanish, it is likely to be produced as the full Spanish vowel. In words with no cognate in Spanish this would not be the case.

Figure 4: Schwa substitution in words that are cognates and non-cognates of Spanish words.



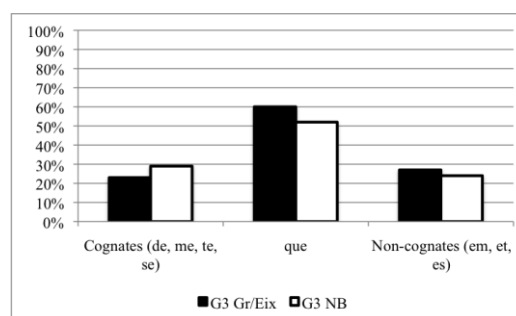
Only the groups of children produce schwa as a full vowel more often in cognate than in non-cognate words [G1 Gràcia/Eixample: $\chi^2(1, N=30) = 9.28$; $p = .002$; G1 Nou Barris: $\chi^2(1, N=30) = 9.07$; $p = .002$]. At a surface level children seem to be influenced by the form of words in both languages, although at a deeper level of analysis they do not produce more substitutions in alternating than in non-alternating schwas.

An extra analysis was conducted for a set of monosyllabic words produced by adults (taken from spontaneous data by the same speakers). Schwa substitutions in monosyllables and polysyllables show no differences across districts.

Table 1: Percentages of schwa substitution by type of words (only groups of adults).

District	Polysyllables	Monosyllables
G3 Gràcia/Eixample	42%	37%
G3 Nou Barris	44%	36%

Figure 5: Schwa substitution in monosyllables (only in group of adults).



Within monosyllables, a further division was done in order to check whether the kind of monosyllable affected the substitution rates. Differences across districts never reached significance - the number of items was small. Among the monosyllables with Spanish cognates, *que* was separately analyzed because of its high frequency in both languages when compared with

the weak pronouns. The substitution rate is higher in *que* than in other monosyllables.

3.2. Acoustic analysis

Given the differences in the auditory analysis, the target-like productions of schwa were acoustically compared to the target-like productions of /a/. Such a comparison provides us with qualitative information about the kind of schwas produced by each group of speakers. Mean values of the F1 and F2 (converted to Bark) for [ə] and /a/ are plotted in figures 6 and 7, along with the standard values.

Figure 6: F1 and F2 of target-like productions of [ə] and /a/ by speakers in Gràcia/Eixample.

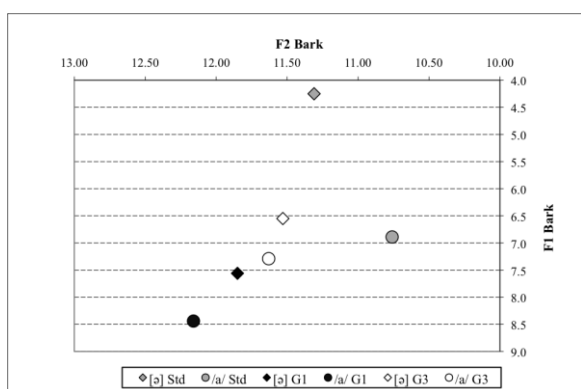
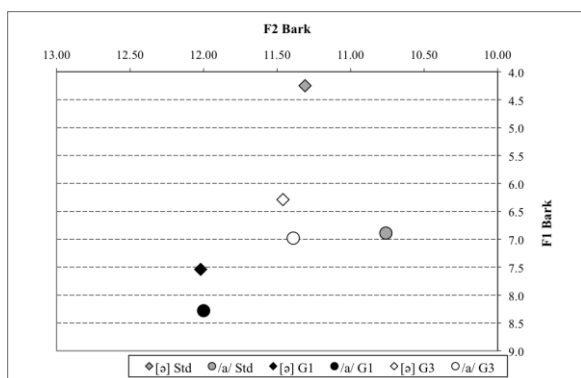


Figure 7: F1 and F2 of target-like productions of [ə] and /a/ by speakers in Nou Barris.



When comparing F1 for each pair of vowels and F2 for each pair of vowels, only the F1 in each pair of vowels is significantly kept apart by all groups in all districts [G1 Gràcia/Eixample: $t(13) = -9.02$; $p < .001$; G3 Gràcia/Eixample: $t(14) = -9.30$; $p < .001$; G1 Nou Barris: $t(14) = -7$; $p < .001$; G3 Nou Barris: $t(14) = -8.55$; $p < .001$]. Differences in F2 never reached significance. Although in Gràcia/Eixample a mirror image of the standard pattern in the F2 dimension is observed, this must be disregarded because the difference in F2 is not statistically significant.

4. CONCLUSIONS

Although quantitative differences are found in the production of schwa, no qualitative differences are shown in target-like production of [ə] by different age groups or in different districts. The higher rate in schwa substitutions in alternating than in non-alternating words supports the view of the phonological status of schwa. The overall production of /a/ instead of schwa rather than /e/ or /ɛ/ in alternating as well as non-alternating cases supports the view that a general superficial process of [ə]-loss in favor of [a] is taking place in the Catalan of Barcelona. Finally, the higher rate of schwa substitutions in cognates than in non-cognates by children but not by adults suggests that children substitute words rather than segments.

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