Prosody and Language Contact: An Experimental Investigation of Interrogative Strategies in Navarro-Labourdin Basque

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Abstract

We report the outcome of a production experiment addressing the intonation of different interrogative strategies in Navarro-Labourdin Basque (a variety spoken in France that has received no attention in the intonational literature so far). We study wh-movement, wh-in-situ and polar questions and show that the final rise associated to wh-in-situ and polar questions is very similar, which gives support to the hypothesis that in certain languages a single intonational Q-morpheme may underlie both types of constructions ([2]). Following [1] we suggest that this property of Navarro-Labourdin Basque may derive from its close contact with French, a language with similar interrogative properties.

Index Terms: interrogatives, intonation, syntax-prosody interface, Basque, language contact

1. Introduction

In this paper, we consider the proposal in [2] that wh-in-situ strategies can be licensed by an intonational morpheme. We explore the validity of this analysis with an intonational production experiment in Navarro-Labourdin Basque (a variety that has received no attention in the intonational literature so far).


[2] explore wh-in-situ constructions in French, illustrated in (1). They observe that they share some properties with polarity (yes/no) questions such as (1), which are marked only by intonation. In particular, both are realized with a rising intonation, unlike regular wh-questions.

(1) a. Jean a acheté quoi?
   Jean has bought what

   What did Jean buy?

b. Jean a acheté un livre?
   Jean has bought a book

   Did Jean buy a book?

Cheng and Rooryck take these similarities to indicate that the two constructions are based on the same licensing mechanism. They propose that French has a Q-morpheme which is underspecified as to whether it has a [wh] or a [yes/no] feature and which is thus compatible both with wh- and polarity constructions. At PF this morpheme is realized with a rising contour (see also [3, 4, 5]).

1.2. Basque: A new in situ strategy in an obligatory wh-movement language

Basque is an SOV language usually characterized as a language with obligatory wh-movement, which results in strict adjacency between the wh-phrase and the verb.

Now, [1] uncovered a new interrogative strategy used by young speakers of the Navarro-Labourdin variety of Basque, which is unavailable to older speakers of this dialect, or in other Basque dialects. It produces constructions in which the wh-phrase and the verb are not necessarily adjacent to each other. For instance, the example in (2), where an element intervenes between the wh-word and the verb, is grammatical for the speakers using this strategy, but not for other speakers:

(2) Nork ura edan du?
   who water drink AUX
   Who drank water?

[1] argue that underlying these cases is an in situ interrogative strategy. They show that no interrogative displacement takes place in these constructions, which share a range of syntactic and semantic properties with French wh-in-situ. These syntactic and semantic similarities lead [1] to postulate that a catalyst for the emergence of wh-in-situ in Navarro-Labourdin Basque is a transfer from French, made possible by other 3rd factor effects like an innate bias for movementless operations, in a situation of language contact.

1.3. Hypothesis

There is a number of reasons that make the analysis in [2] worth considering as an account of wh-in-situ in Navarro-Labourdin Basque. To begin with, it makes sense if [1] are right about wh-in-situ resulting from transfer from French. Furthermore, Basque wh-in-situ has many syntactic and semantic properties in common with French wh-in-situ. Finally, and more importantly, like French, Basque allows polarity interrogatives that only differ from non-interrogatives in their intonational patterns.

The emergence of the wh-in-situ construction in Navarro-Labourdin Basque could be interpreted as follows under the analysis in [2]. Standard Basque has a Q-morpheme which is specified with a [yes/no] feature and which gives polarity constructions their typical interrogative contour. In Navarro-Labourdin Basque this Q-morpheme becomes underspecified, and thus it is also compatible with wh-constructions, hence allowing wh-phrases to remain in situ. If this analysis is on the right track, we expect the wh-in-situ constructions to be realized with the same contour as polar questions.

2. Methods

Our experiment is the first that assesses the prosody and intonation of different types of interrogatives in Navarro-Labourdin. We designed a questionnaire mainly composed by sonorant segments and where the syllables to be compared had to be as similar as possible across items and conditions. We used the seg-
ments /no/-/ni/ on the ergative subject or dative indirect object\(^1\), /li/ on the direct object, and /ra/ on the lexical verb. The questionnaire included three different conditions (\textit{wh-in-situ}, \textit{wh-movement} and polar question constructions). Below is a sample of the test items for the three conditions:

(3) a. Nok liliak eraman ditu? [\textit{wh-in-situ}]
who.ERG flowers take AUX
Who took the flowers?

b. Nok eraman ditu liliak? [\textit{wh-movement}]
who.ERG take AUX flowers
Who took the flowers?

c. Nik liliak eraman ditu? [\textit{polar Q}]
I.ERG flowers take AUX
Did I take the flowers?

6 female participants pronounce these sentences in as natural a way as possible. Each participant produced 3 renditions of each item, which amounts to a total of 162 utterances (6 speakers \times 9 items \times 3 renditions). We measured duration, intensity and F0 maxima, minima and means in each of the accented syllables and F0 maxima of the last two syllables. This amounts to a total of 1404 measurements.

3. Results

Figures 1, 2 and 3 present smoothed pitch contours of time-normalized utterances for each experimental condition (n = 54).

The acoustic measurements on the accented syllables /no/, /li/ and /ra/ attest large differences in F0 across conditions, as can be seen in Tables 1, 2 and 3, respectively.

\(^{1}\)On the first element we took the syllable onset and nucleus as the segment to measure. We did this in order to avoid the “noise” generated by final ergative case markers /-k/.
Table 3: Measurements for syllable /ra/ in wh-in-situ, polar questions, and wh-movement conditions

<table>
<thead>
<tr>
<th></th>
<th>wh-in-situ</th>
<th>Polar Qs</th>
<th>wh-movement</th>
</tr>
</thead>
<tbody>
<tr>
<td>Duration</td>
<td>0.10 (SD=0.01)</td>
<td>0.10 (SD=0.02)</td>
<td>0.10 (SD=0.02)</td>
</tr>
<tr>
<td>Max dB</td>
<td>78.04 (SD=6.13)</td>
<td>78.90 (SD=6.71)</td>
<td>80.59 (SD=6.53)</td>
</tr>
<tr>
<td>Min dB</td>
<td>70.10 (SD=6.49)</td>
<td>70.03 (SD=6.49)</td>
<td>71.27 (SD=7.45)</td>
</tr>
<tr>
<td>Mean dB</td>
<td>78.70 (SD=10.35)</td>
<td>74.34 (SD=32.18)</td>
<td>80.59 (SD=6.53)</td>
</tr>
<tr>
<td>Max Hz</td>
<td>237.34 (SD=32.25)</td>
<td>213.39 (SD=17.93)</td>
<td>228.21 (SD=32.25)</td>
</tr>
<tr>
<td>Min Hz</td>
<td>192.78 (SD=35.79)</td>
<td>206.70 (SD=10.35)</td>
<td>228.21 (SD=32.25)</td>
</tr>
<tr>
<td>Mean Hz</td>
<td>220.78 (SD=35.79)</td>
<td>206.70 (SD=10.35)</td>
<td>228.21 (SD=32.25)</td>
</tr>
</tbody>
</table>

Table 4: F0 maxima rising (in semitones) from the penultimate syllable to the final syllable

<table>
<thead>
<tr>
<th></th>
<th>wh-in-situ</th>
<th>wh-movement</th>
<th>Polar Qs</th>
</tr>
</thead>
<tbody>
<tr>
<td>Hertz</td>
<td>111.17 (SD=55.81)</td>
<td>58.11 (SD=37.02)</td>
<td>122.45 (SD=40.27)</td>
</tr>
<tr>
<td>Semitones</td>
<td>7.50 (SD=3.50)</td>
<td>4.29 (SD=2.53)</td>
<td>7.32 (SD=2.06)</td>
</tr>
</tbody>
</table>

Let us now focus on the sentence-final rise. We measured F0 maxima in the penultimate and final syllables and calculated the difference in Hertz and in the logarithmic scale of semitones. Table 4 gives the mean values and standard deviations for the three conditions.

Figure 5 presents a violin plot displaying the density values for the scale of the final rise (in semitones) across conditions (mean values and the area corresponding to the mean +/- SD appear with a white point range).

A Bayesian MCMC model with 100,000 possible parameters confirmed the difference between the polar question condition and the wh-movement condition as well as the difference between the wh-in-situ and the wh-movement condition. However, it did not reveal a statistically credible difference between the polar question condition and the wh-in-situ condition. As reported in Table 4, the means and standard deviations of these two conditions are very similar, but this does not mean that there

"object-verb inversion", as in (3b).

Figures 1-3 and tables 1-3 show a number of differences between these two conditions. For instance, F0 maxima are sharply divergent, and when plotted together they display crossing paths from the first accented syllable (/no/ in both conditions) to the second one (/li/ in the in situ condition and /ra/ in the wh-movement condition), and again to the third one (/ra/ in the in situ condition and /li/ in the wh-movement condition). A Bayesian estimation of differences using the BEST model by [8, 9] and an MCMC of 100,000 possible parameters assessed the statistical differences in F0 maxima in all positions.

Figure 6 presents a violin plot displaying the density values for the scale of the final rise (in semitones) across conditions (mean values and the area corresponding to the mean +/- SD appear with a white point range).

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In the plot in Figure 4 the first point on the X axis is labeled /no/, but it summarizes the pooled measurements of /no/ and /ni/.

A Bayesian estimation of differences using the Markov chain Monte Carlo model in [8, 9] with a default MCMC sample of 100,000 parameter values revealed the following significant differences in the prosody of wh-in-situ and polar questions: at syllable /no/, F0 maxima, means and minima are higher in the wh-in-situ condition than in the polar question condition. However, at syllable /li/ the situation reverses and F0 maxima are higher in the polar question condition than in the wh-in-situ condition, and F0 means and minima are lower in the wh-in-situ than in the polar question condition.

Comparing wh-in-situ and wh-movement constructions is more complicated, for they have different word orders. For instance, while subject wh-in-situ questions of sentences with transitive predicates such as (3a) have the direct object sandwiched between the interrogative subject and the verbal complex, the corresponding wh-movement constructions have

In the plot in Figure 4 the first point on the X axis is labeled /no/, but it summarizes the pooled measurements of /no/ and /ni/.

The observations by [6, 7] for Northern Bizkaian Basque, and tunes are very different in both conditions. This can be clearly observed in the divergent trajectories of F0 maxima, as represented in Figure 4.
is no difference between them. In fact, the MCMC model comparison estimates a mean of 7.69 for the first group (wh-in-situ) and a mean of 7.1 for the second group (the polar question) with estimated standard deviations of 2.71 and 1.72 respectively; the difference between the means is 0.596, with over 88% possible mean values above zero.

Psychoacoustic studies suggest that a change in 1.5 semitones is at the very lowest bound of the human perceptibility threshold for pitch (cf. [10]). If we take a range of ± 1.5 as a conservative region of practical equivalence (the ROPE, cf. [9]), we see that a substantial part of the highest density interval (HDI) for mean values would fall inside of the ROPE, with a tiny fraction falling outside it. This trend notwithstanding, we do not have enough precision in the estimate of the differences to declare that final rises in wh-in-situ and polar question conditions are equal.

4. Discussion

Wh-in-situ constructions have a very marked pitch accent on the wh-word, followed by a sharp drop in F0, and a final rise. Wh-movement questions are also characterized by the major stress being on the wh-word, similar (albeit lower) F0 values in the following verb, and a smaller final rise. And polar questions have smaller pitch excursions throughout the sentence until a marked final rise, which is close to that of wh-in-situ questions.

All in all, the results of the experiment show sharp differences between wh-in-situ and polar questions. However, our findings converge with those found by [3] in French, in that wh-in-situ questions are typically accompanied by a final rise, similar to that of polarity questions. Both conditions have different tunes overall, but we must consider that other prosodic phenomena are also present in wh-in-situ constructions (see also [4]). Therefore, the fact that [2]'s proposal does not assume transfer of whole tunes from one construction to the other, but just the extension of use of a Q morpheme which surfaces as a final rise, give plausibility to this explanation for the Navarro-Labourdin Basque pattern.

5. Conclusion

[2] argue that wh-in-situ in French is licensed by prosody; the typical rising tune of an information-seeking polar question is what licenses the wh-in-situ strategy. We have conducted a production experiment in Navarro-Labourdin, a dialect of Basque displaying both wh-in-situ and wh-movement questions, and shown that even though the overall intonational contours of wh-in-situ and polar questions differ sharply, their final rises are very similar (and different from wh-movement questions). This gives plausibility to [2]'s analysis of the licensing of wh-in-situ, as well as [1]'s analysis of the emergence of wh-in-situ in Navarro-Labourdin as a result of contact with French.

6. Acknowledgements

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7. References