

# Intonation of Right-dislocations in Catalan

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## ABSTRACT

According to previous work in Catalan intonation, right-dislocated phrases are accented, though they tend to be extremely reduced and subordinated to the main phrase. They might be considered as extreme cases of tonal subordination, verging on deaccenting. This experiment tests the hypothesis that they are accented, by comparing the scaling of syllables under 3 different degrees of prosodic prominence (no stress, secondary stress and primary stress). If the scaling of the target syllable increases proportionally to its metrical weight, the conclusion would be that they have true pitch accents.

The corpus consists of 324 phrases read by 6 speakers of Central Catalan. The results show no statistically significant differences between the 3 levels of stress, and therefore the conclusion is that right-dislocated elements are deaccented in Catalan.

## 1. INTRODUCTION

Previous work in Catalan intonation [1][2][3] made no strong claims about the accentual status of post-sentential or right-dislocated phrases of the type “No les he vist, les nenes” “I haven’t seen them, the girls”. By implication, they have an accentual pattern of their own, though compressed and subordinated to that of the main phrase. However, they are also frequently described as lacking any perceivable prominence.

A previous study tested the hypothesis that these structures (and other similar sentence external elements) were indeed accented [4]. Masking noise was used to elicit an increase in voice volume which in turn induced an increase in pitch, the so-called Lombard effect, e.g. [5][6]. The results showed a significant increase in scaling of the target syllables. It could be argued, though, that all syllables, regardless of their metrical prominence, were equally affected by the raising in pitch.

In this study we address this issue by looking at the scaling of syllables with similar segmental composition but different degrees of stress (unstressed, secondary stress, and primary stress). We expected both types of stressed syllables to be scaled higher than their unstressed

counterparts. But if syllables with primary stress were significantly higher than those with just secondary stress, this would indicate that they are the docking site for pitch accents, not mere “stress bumps”.

## 2. METHODOLOGY

Target syllables were initial in disyllabic words with stress on the target syllable (‘Vila), in words with stress on the last syllable (Vi’la) and finally, in 4-syllable words with secondary stress on the target syllable and primary stress on the last one (‘Vila’malla). The 3 stress conditions were:

Stress 0: Vi’la (a surname) (1)

Stress 1: ‘Vila (short name for “Viladecans”, a football club) (2)

Stress 2: `Vila’malla (a place name) (3)

There were 18 words in total, embedded in right-dislocated objects and subjects, introduced by a question calculated to elicit an out-of-focus interpretation, as in:<sup>1</sup>

- (Va guanyar la lliga, el Viladecans?) (‘Did they win the league, the Viladecans?’)

- Va guanyar-la, el ‘Vila (‘They won it, the ‘Vila’) (4)

In this way, both the information structure, and the semantic/pragmatic context were kept constant for each matching set of 3 phrases.

The corpus is composed of 324 phrases. Three tokens of each of the 18 phrases in random order, interspersed with fillers and distractors, were read by 3 male and 3 female Central Catalan speakers, from Reus and Tarragona.

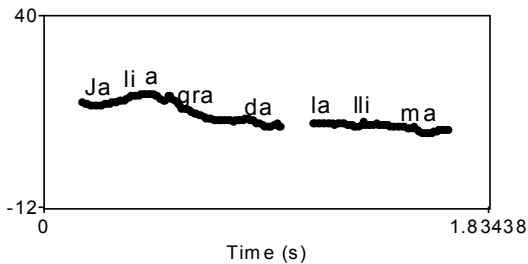
Recordings were made on DAT tape, in a quiet room. The data was digitised and analysed using Praat. Measurements of F0 were taken in semitones at vowel centres. Likewise, duration of the target vowels, and of any pauses, were taken in ms.

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<sup>1</sup> An independent experiment was also designed to look at contrasts in information structure, such theme/rheme, focus/background, and was recorded at the same time. Results are not available yet.

### 3. RESULTS

The results of the analysis do not support the “accenting hypothesis”. Impressionistically, all detached phrases were deaccented. The target syllables were shorter and with less amplitude than they should have had otherwise, and with no perceivable pitch movement. Figure (1) shows an example, the phrase “Ja li agrada, la llima” (‘S/he likes it, lime’), with primary stress on the first syllable, “li”. In Figure (2) we see the phrase “Ja li agrada, la llimona” (‘S/he likes it, lemon’), with primary stress on “mo”, and with the target syllable “li”, unstressed.



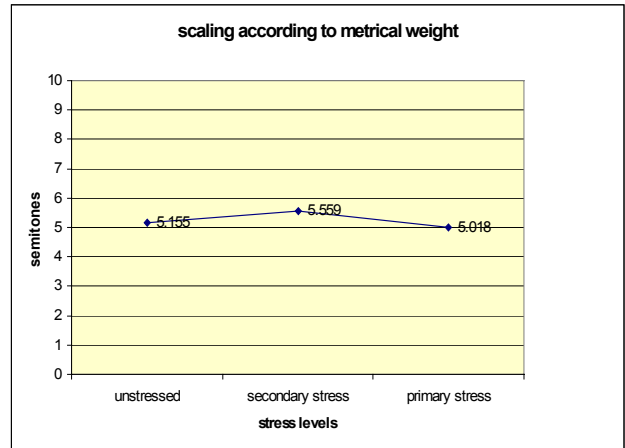
**Figure 1:** pitch trace of the sentence “Ja li agrada, la llima”. Pitch (semitones) is shown on the y axis, and time (seconds) on the x axis.



**Figure 2:** pitch trace of the sentence “Ja li agrada, la llimona”. Pitch (semitones) is shown on the y axis, and time (seconds) on the x axis.

We see that in both cases there is a pause between the main phrase and the dislocated phrase. The latter does not show much tonal movement. The pitch range is rather flat, compared with that of the main phrase.

Quantitatively, the differences between the 3 stress conditions were not statistically significant. Figure (3) shows the average of all pitch measures pooled for all 6 speakers:



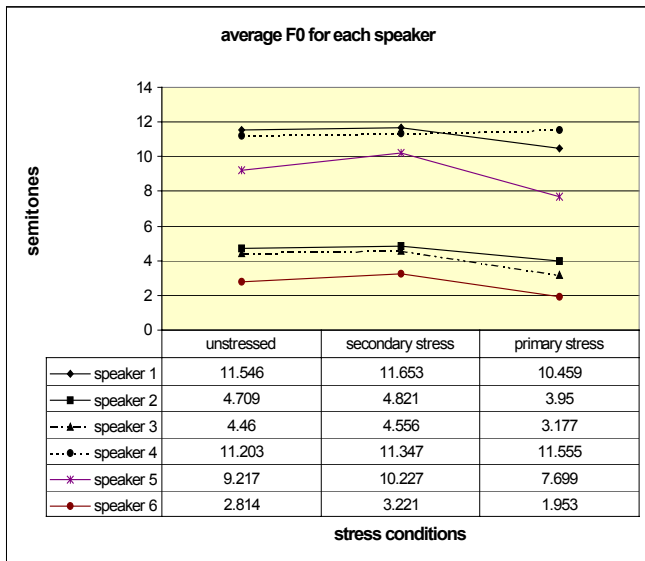
**Figure 3:** Average of all data points for all speakers across the 3 experimental conditions

As expected, there is a narrow difference in the F0 scaling of unstressed, secondary, and primary stressed syllables. On average the difference between unstressed and secondary stressed syllables is 0.40 semitones, and is 0.54 semitones that between secondary stressed and primary stressed ones. Rather counter-intuitively, those with the higher level of stress have the lower scaling. The reasons for this are discussed below.

In general though, the differences between all 3 groups are not significant, as confirmed by a 2-factor repeated measures mixed ANOVA run on the data of all 6 speakers for the 3 stress conditions ((stress (3) x gender (2)). The within-subjects factor was stress level and the between-subjects factors speaker’s gender (gender x (stress)).

There were no significant effects of stress level upon scaling ( $F(2,8)=0.516$ ,  $p=0.615$ ). Gender did have a significant effect, as was expected:  $F(1,4)= 53.018$ ,  $p=0.002$ ). And finally, no interaction of stress and gender was detected.

First, there is some degree of inter-subject variability, as we see in Figure 4, which shows the average F0 of each speaker in each stress condition. In all cases but one (speaker 4) the difference between stress 1 and stress 2 is negative. That is, syllables with the higher degree of stress have the lower F0.



**Figure 4:** average of all data points for each speaker across the 3 experimental conditions

Running ANOVAS on the data of each speaker separately we see that speakers 2 and 5 show a medium to large effect of the stress condition upon scaling ( $\eta^2 = 0.630, 0.702$ ) and this effect is significant. On the other hand, speakers 6 and 3 show a medium effect ( $\eta^2 = 0.607, 0.544$ ) but  $F$  is just above significance level, while speakers 1 and 4 do show relatively small effects ( $\eta^2 = 0.367, 0.237$ ) which are non-significant. We see this in Table 1 below:

speaker	Gender	Eta sqd	Significance
1	Female	0.370	NOT sig: $p=0.158$
2	Male	0.630	Sig: $p=0.019$
3	Male	0.544	Sig: $p=0.043$
4	Female	0.237	NOT sig: $p=0.334$
5	Female	0.702	Sig: $p=0.032$
6	Male	0.607	Sig: $p=0.041$

**Table 1:** Partial results of ANOVA: gender, effect size and significance level (significant if  $p < 0.05$ )

As we see in Table (1), and as is confirmed in the results of the gender x (stress) mixed ANOVA, there is no correlation between gender and effect of the experimental condition.

We think, though, that the use of a logarithmic scale might have emphasized relatively modest  $F_0$  differences, especially in the case of men, at the bottom end of the scale. This appears to be the case, for 1 of the female speakers does show significant differences while the other two do not. Even though the effect of the measurement scale cannot be totally discarded, the reduced size of the treatment conditions effect in these two cases, ( $\eta^2 = 0.370, 0.237$ ) does not suggest that we might find significant differences, if we would increase the size of the sample. And besides, there is a better explanation for these inter-speaker differences.

Inter-speaker differences can be attributed to differences in phrasing brought about by different reading styles. For instance, speakers 1, 4, and 6 read more carefully and slowly and tend to introduce more pauses than H- phrase accents.

Likewise, the lower scaling of all primary stressed syllables may be an artifact of the measurement method. Both observations (speakers who prefer pauses show reduced effects of stress condition, on the one hand, and the fact that counter-intuitively, syllables with the higher stress have the lower scaling) appear to be related.

Measurements were taken at syllable centres. Syllables with primary stress are longer and the centre is later in the utterance and therefore at a lower point in the slope of declination. This effect is more noticeable when the target point is preceded by a H- phrase tone, as is the case of speakers 2 and 5, and to lesser extent 3 and 6. In those cases, the declination slope of the detached phrase is rather steeper and consequently the target points are higher.

Conversely, when there is a pause, as in the case of speakers 1, 4 and 6, the detached phrase has a lower starting point, and an extremely shallow declination tilt. This means that the difference between the longer primary stressed syllables and the slightly shorter secondary stressed syllables reduces to the point of becoming non-significant.

Speaker 6 is an exceptional case, as he tends to use pauses, and still shows a significant difference between the two levels of stress. Perhaps because of this deviant case, no correlation was found between reading pace (fast versus slow readers) and  $F_0$  scaling of the target syllables. However, there is a negative correlation between syllable length and  $F_0$  scaling (Pearson  $r = -0.468, p > 0.001$ ) so the longer the syllable, the lower its  $F_0$ .

#### 4. CONCLUSIONS

Both the auditory and the instrumental analysis of the corpus of right-dislocated phrases confirm that these structures are deaccented in Catalan. There is no support for the “accenting hypothesis” as the differences between the 3 stress conditions are rather modest, and furthermore in a direction opposite to the prediction. That is, secondary stressed syllables are lower in pitch than primary stressed ones.

This rather unexpected outcome is not interpreted as an indication of the existence of low pitch accents. This possibility is discarded, firstly, on auditory bases, and secondly, following the outcome of the statistical analysis that shows no significant differences in scaling under the 3 different stress conditions.

This is not interpreted as a possible side-effect of the logarithmic scale, which would emphasize tiny differences at the bottom end of the scale (male speakers), but rather as a consequence of both a slower reading style and the greater length of the primary stressed syllables.

When reading slowly and carefully, speakers tend to use pauses rather than high tonal boundaries. This means that the overall pitch range of the detached element is narrower, and that the target point is lower. In a speaker-by-speaker analysis we have seen that those who tend to use more pauses also tend to show less differences between secondary stressed and primary stressed syllables. That, is the size of the “stress effect” is smaller.

In addition, we find as well declination effects: the later the measurement is in the phrase, the lower. Syllable length correlates negatively with F0 scaling.

On the other hand, the main finding, that right-dislocated phrases are deaccented, is not surprising. It confirms the intuition – often repeated in the literature – that phrases detached to the right, that is following the main phrase, have no accentual prominence at all. In that, they differ from sentence initial dislocations which always receive a pitch accent.

Quotation-attributions, like “– she said” behave in the same way as right-dislocated sentences, in Catalan [4], and in English [7][8][9]. They are equally deaccented and at the same time, separated by clear pauses. Arguably, this behaviour constitutes a theoretical puzzle for the Autosegmental Metrical model, the most widely accepted framework in intonational studies.

A number of explanations have been proposed so far. It has been argued that they are instances of a different kind of intonational phrase, namely an intermediate phrase characterised by a pitch range extremely reduced and subordinated to that of the main phrase [8]. It has been proposed as well that they contain a special type of accent, a post-focal accent neither intrinsically starred or unstarred, which surfaces as a pitch accent or a phrase tone depending on the metrical structure of the text [9].

Both theories are variations of the “accenting hypothesis”. They are constrained by one of the main tenets in Autosegmental Metrical theory, namely that the minimal intonational units (either IP, intonational phrases, or ip, intermediate phrases, in those versions of the theory that recognise them), are formed by at least 1 pitch accent, delimited by a pauses or another boundary such as lengthening/and or tonal movements. Clearly, the Autosegmental Metrical system has no place for independent deaccented phrases such as the ones discussed here.

Finally, this was a tightly controlled experiment, where both the semantic/pragmatic context and the information structure of the experimental material were kept constant. All the target structures were “old information”, and therefore out of focus. Even though we cannot generalize these results or make stronger claims about the accenting status of post-sentential elements without looking at other possible focal contrasts, we are in need of an explanation for the cases found so far. These cases require some refinement of the Autosegmental Metrical system, a framework that has been successfully applied to a variety of languages for over 20 years.

## 5. ACKNOWLEDGEMENTS

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