Modelling final declarative intonation in English and Spanish

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ABSTRACT

The aim of this paper is to clarify the phonological interpretation of the last pitch accent in English and Spanish neutral declaratives within the Autosegmental-Metrical approach of intonational analysis. Whereas in English the last pitch accent of a declarative is described as an H* accent followed by an L% boundary tone, no matter the number of prenuclear accents in the sentence, in Spanish the phonological interpretation varies depending on the number of accents within the utterance. If the sentence consists of only one accent, this is described as H* followed by L%, as in English. If the sentence has one or more prenuclear accents, the final one has a different phonological representation, namely, H+L* followed by L%. In this paper we compare the phonetic and phonological properties of the final accent in English and Spanish declarative sentences and we show that the different phonological interpretations of the final pitch accent proposed for the Spanish declaratives is not adequate. A total of 360 English and Spanish declaratives were recorded containing two pitch accents separated by a different number of intervening syllables (from one to five). The results showed that for both languages the longer the distance between accents (measured in terms of syllables), the lower the F0 of the final accent. The distance effects on the scaling of the final pitch accent indicate that no low target (as in H+L*) is intended in Spanish and therefore the phonological unit that better accounts for the final accent in both languages is H*.

Key words: declarative intonation, downtrends, F0 scaling, final accent.

1. INTRODUCTION

The phonetic behaviour of the final pitch accent in English neutral declarative sentences involves a rising pitch (or F0) movement within the limits of the last accented syllable followed by a falling contour till the end of the utterance. This is illustrated in Figure (1) for a single-accented sentence (*He's <u>iron</u>ing*) and in Figure (2) for a multi-accented sentence (*The <u>nan</u>ny had been <u>iron</u>ing*). In both displays, the first panel contains the speech waveform and the second one the F0 trace. The bottom panel marks the beginning of each syllable. Accented syllables are underlined throughout the paper. According to the Autosegmental-Metrical (AM) approach of intonational analysis and the follow-up Tone and Break Indices (ToBI) framework (Pierrehumbert 1980, Pierrehumbert and Beckman 1988, Beckman and Hirschberg 1994, and Ladd 1995, among many others), this rising-falling pitch trajectory has been described by means of a High (H*) pitch accent associated to the last accented syllable of the sentence and a Low (L%) boundary tone linked to the right edge of the sentence.

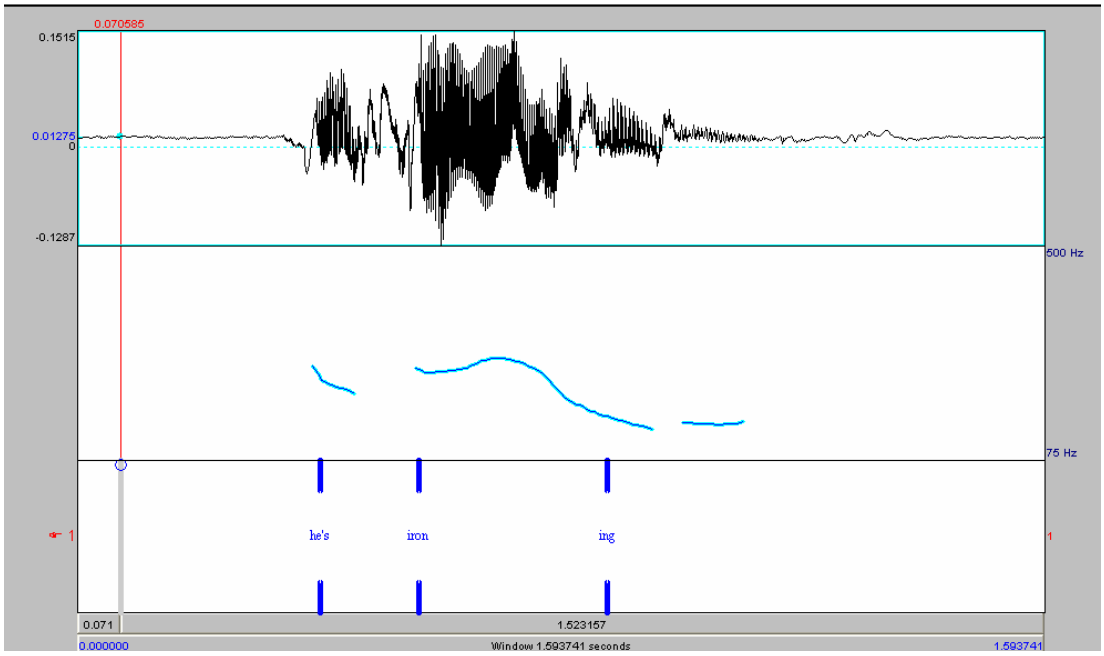

Figure 1. Speech waveform, F0 contour, and syllable boundaries for the English sentence *He's <u>iron</u>ing*, containing one accent.

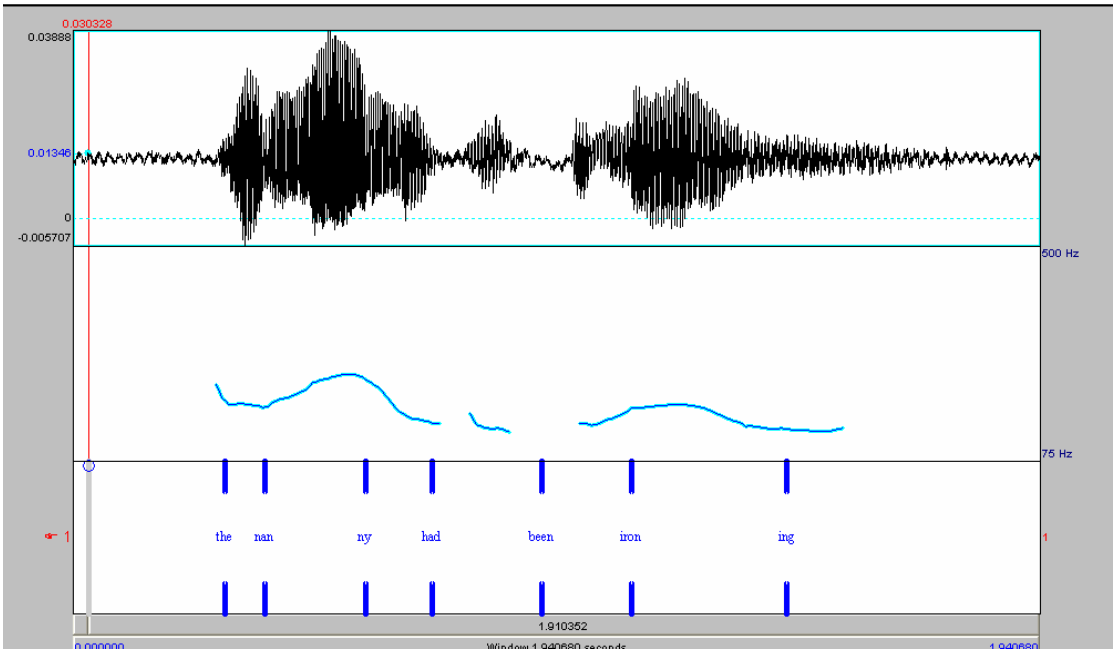

Figure 2. Speech waveform, F0 contour, and syllable boundaries for the English sentence *The nanny had been ironing*, containing two accents.

The modelling of the last pitch accent in Spanish declarative sentences, on the other hand, has always been a matter of controversy. The main difficulty to provide a suitable phonological representation for this accent derives from the fact that its phonetic properties vary according to the number of prenuclear accents observed in the utterance. If a sentence consists of only one pitch accent, the F0 trace shows a rising movement aligned within the limits of the accented syllable and a subsequent fall similar to that observed in English sentences. This is illustrated in Figure (3) for the utterance *Miraba* ([s]he looked). Alternatively, if a sentence has one or more prenuclear accents, the F0 trace of the last pitch accent undergoes a progressive fall which usually starts after the last prenuclear accent and finishes at the end of the utterance. This involves no drastic F0 change within the limits of the last accented syllable, as presented in Figure (4) for the utterance *Marina la miraba* (Marina looked at her). In this Figure, the small bump observed at the beginning of the last accented syllable (*miraba)* is a micro-intonation effect derived from the pronunciation of the tap but is irrelevant in terms of phonological description. The phonological interpretation of the final declarative trajectories proposed by various intonational frameworks involves two different phonemes depending on whether the final accent appears in isolation or is part of a

multi-accented utterance. Martínez Celdrán (2003) examines the final pitch accent of Spanish declaratives within the American structuralist tradition of intonational analysis which describes intonation by means of level pitch phonemes (Pike 1945, Trager and Smith 1951). Based on the phonetic evidence, Martínez Celdrán interprets the pitch accent of a single-accented declarative in Spanish as /2 1/, which involves a fall from a 2 level to a 1 level. Alternatively, the last pitch accent of a multi-accented declarative is described as /1 1/, which indicates a level low tone. Similar interpretations are proposed by Sosa (1999, 2003) and Hualde (2003) within the AM approach of intonational analysis. According to them, the pitch accent of a single-accented Spanish declarative would consist of a High tone (H*) followed by a Low boundary tone (L%), as in English. The last pitch accent of a multi-accented declarative, on the other hand, is described as H+L* followed by the same boundary tone (L%). The H+L* accent involves a low pitch target on the final accented syllable preceded by a high pitch. This tonal category has also been proposed by McGory and Díaz-Campos (2000) and Beckman, Díaz-Campos, McGory and Morgan (2002) for South-American Spanish within the ToBI framework.

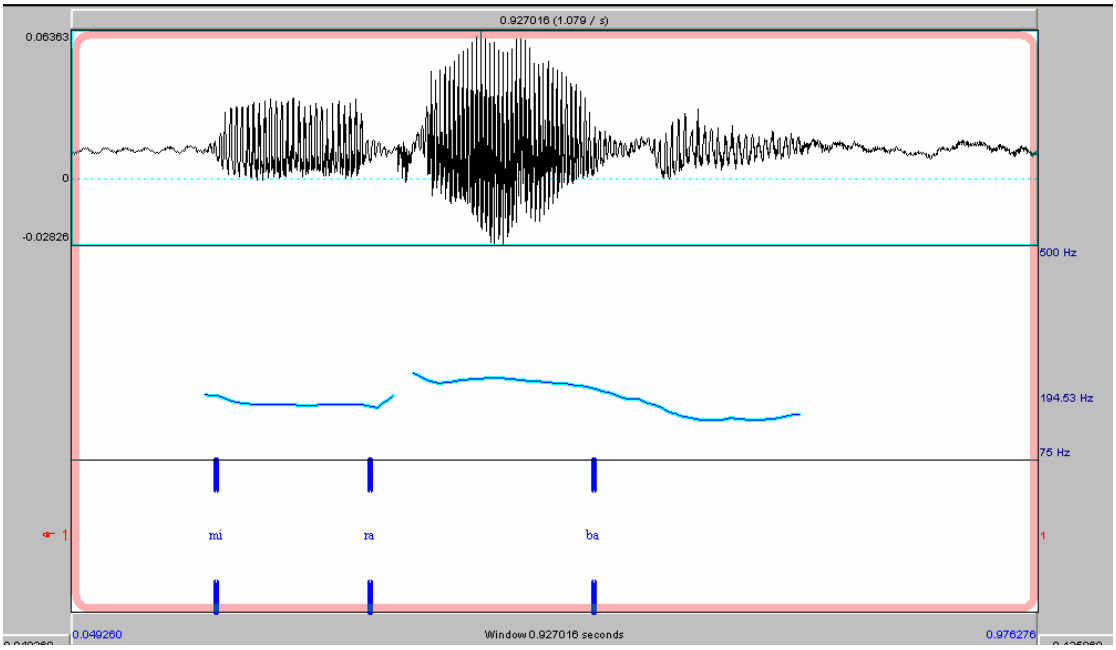

Figure 3. Speech waveform, F0 contour, and syllable boundaries for the Spanish sentence *Miraba* ([s]he looked), containing one accent.

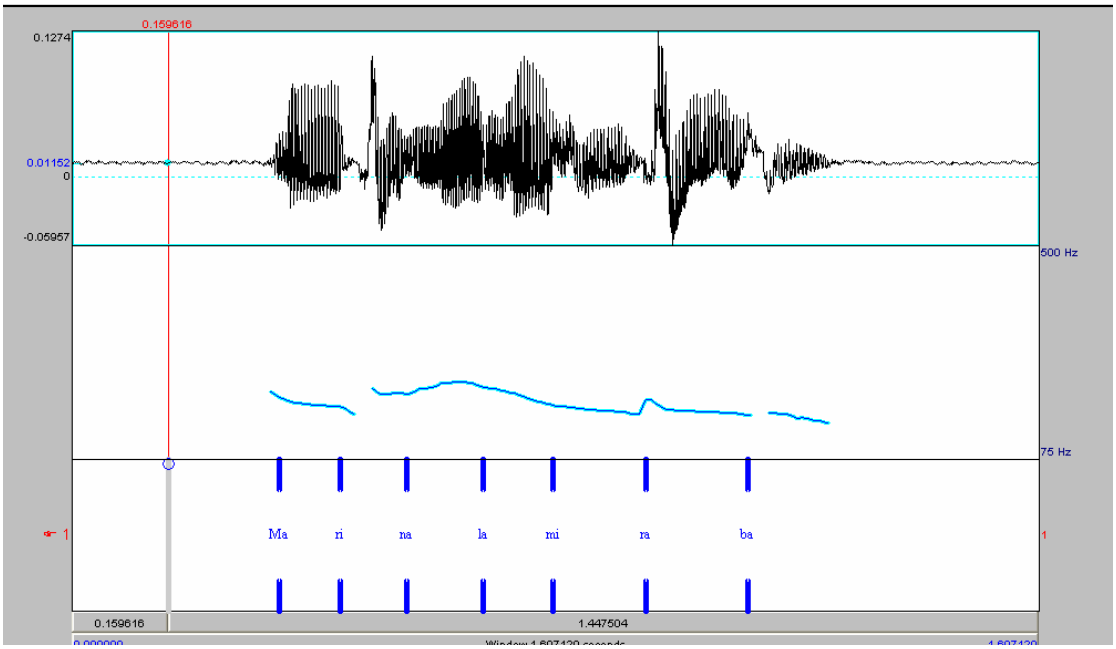

Figure 4. Speech waveform, F0 contour, and syllable boundaries for the Spanish sentence *Marina la miraba* (Marina looked at her), containing two accents.

Even though the different phonological interpretations of the Spanish final accent in declarative sentences are clearly justified by the F0 traces observed in single and multi-accented utterances, we still have to face a phonological problem, namely, the use of two different phonological categories to describe two F0 patterns which do not trigger a contrastive opposition since in both cases the meaning conveyed is that of a neutral, unmarked declarative. This problem has also been encountered in other languages such as Catalan (see Estebas-Vilaplana 2003 and 2004 for more details). Thus, the resolution of using two tonal entities to describe the differences observed in the F0 trajectories of single and multi-accented declaratives in Spanish entails a further and more important phonological problem, that is, the impossibility of having two different phonological categories to describe two pitch contours which are not contrastive in meaning.

In this paper, we investigate the phonological status of the final pitch accent in Spanish declaratives by comparing its phonetic behaviour to that of English declaratives. We expect that a cross-linguistic analysis of the final pitch accent will help us to obtain a more robust decision on its phonological condition. Our hypothesis is that the final accent in a Spanish multi-accented sentence does not differ in essence from the English

one and hence it should be described in the same way as that of a single-accented sentence, that is, H*. We assume that the lack of a clear F0 peak within the limits of the final accented syllable in multi-accented utterances can be explained as the effect of a downtrend mechanism, such as *downstep* or *final lowering*, usually observed in declarative intonation. Several studies on the pitch patterns of declarative sentences have shown that the F0 gradually declines over the course of the utterance (Liberman 1975, Liberman and Pierrehumbert 1984, Fujisaki 1988). Thus, if a multi-accented declarative sentence consists of a series of F0 peaks or H accents, each H is lower than the preceding one. This phenomenon, known as *downstep*, has been reported in several languages such as English (Liberman and Pierrehumbert 1984), Japanese (Beckman and Pierrehumbert 1986), Mexican Spanish (Prieto, Shih and Nibert 1996), German (Grabe 1998) or Catalan (Estebas-Vilaplana 2000). In multi-accented declarative sentences, the final accent has been observed to undergo a more drastic F0 lowering than that of the prenuclear peaks. This is known as *final lowering*. Our proposal is that whereas in English the final lowering effect is manifested by a reduced F0 peak, in Spanish the same effect materialises as no evident F0 peak. According to this hypothesis, the lack of an evident rising trajectory in the final accented syllable of a multi-accented Spanish declarative would not be interpreted as an intended low target but as an H* accent with a low realisation due to a final lowering effect. Furthermore, this assumption treats final lowering as a gradient phenomenon rather than a categorical one, which is subject to a variety of manifestations (from a slight F0 peak to the absence of it).

Thus, in the following sections we will try to clarify whether the lack of an F0 peak in the last accent of a multi-accented Spanish declarative is an intended low target (as in H+L*) or responds to a high target (H*) produced with a low F0 due to a final lowering mechanism. In order to elucidate this problem, we will compare the phonetic behaviour of the last pitch accent in English and Spanish multi-accented neutral declaratives. In particular, we will analyse the scaling of this last accent in relation to the temporal distance (or number of unaccented syllables) between the prenuclear accent and the final accent. If L* is a phonological target, we expect to have a similar scaling irrespective of the number of intervening syllables between the prenuclear accent and the final one. On the other hand, if the scaling of the final accent is affected by the temporal distance or length of the intervening segmental string, that will mean that the

low F0 is not phonologically intended but is the result of an overall downtrend phenomenon affecting the whole utterance. In this case, the last pitch accent can be modelled as a lowered H*.

2. EXPERIMENTAL DESIGN

2.1. Data recording

The data examined in this paper consisted of declarative utterances produced with two accents and with a different number of intervening syllables between the accents. An example is provided in (1) for English and in (2) for Spanish. The number of unaccented syllables varies from one to five, as indicated with the numbers below each sentence. Sentences were designed with the maximum number of voiced segments possible to avoid interrupted F0 contours. Overall 30 sentences were designed for each language. See the Appendix at the end of the paper for the list of sentences used in the experiment.

(1) a. Marina mira (Marina looks)
1
b. Marina miraba (Marina looked)
1 2
c. Marina la miraba (Marina looked at her)
1 2 3
d. Marina la remiraba (Marina looked at her again)
1 2 3 4
e. Mónica la remiraba (Monica looked at her again)
1 2 3 4 5

(2) a. the nanny's ironing
1
b. the nanny's been ironing
1 2
c. the nanny had been ironing
1 2 3
d. the nanny must have been ironing
1 2 3 4
e. the minister must have been ironing
1 2 3 4 5

One RP English speaker (IS) and one Castilian Spanish speaker (DO) read the list of sentences six times. Speakers were asked to produce the sentences in a neutral way, as if they were answers to the question "what happens?". Each speaker recorded 180 utterances. Overall, 360 utterances were gathered.

2.2. Data analysis

Sentences were analysed by means of the *Praat* software (Boersma and Weenik 1992-2001) which allows for a time-aligned inspection of the speech waveform and the F0 trace. For each sentence the following pitch labels were placed:

1. Phrase-initial F0 value (L1)
2. Highest F0 value of the first accent (H1)
3. Highest F0 value of the final accent (in Spanish this point corresponds to the F0 at the beginning of the accented syllable since no clear peak in observed in the contour) (H2)
4. Phrase final F0 value (L2)

An example of the data analysis is provided in Figure 5 for the English sentence *The nanny had been ironing.* The four panels displayed in each graph show the speech waveform, a spectrogram with an overlapped F0 trace, the syllable boundaries and the labels corresponding to the F0 values.

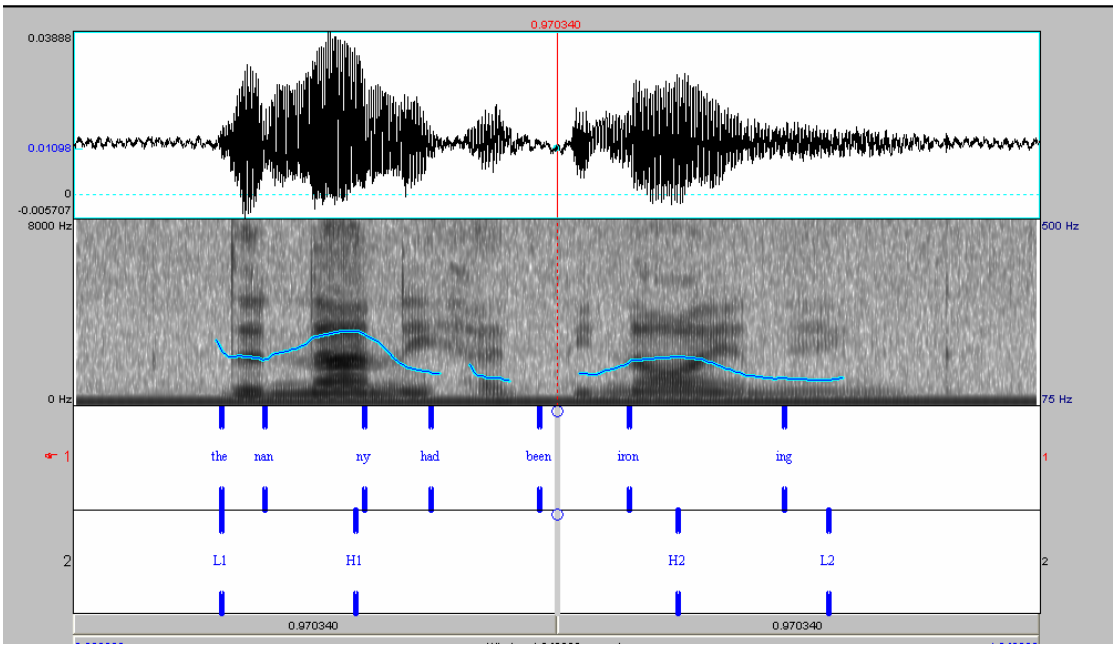

Figure 5. Display of speech waveform, spectrogram and F0 trace, the syllable boundaries, and the F0 landmarks for the English sentence *The nanny had been ironing*.

3. RESULTS

Before analysing the nature of the last accent in multi-accented declaratives in English and Spanish and deciding its phonological status, it was considered necessary to examine two aspects: 1) whether the differences in the number of intervening syllables between accents actually correspond to temporal differences, and 2) whether differences in sentence length have an effect on the utterance initial and final F0 values and on the pitch range with which sentences were produced. Whereas in some studies (Thorsen 1980, Cooper and Sorensen 1981), utterance length seems to have an effect on the F0 range of the first peak (and subsequently of all other peaks), in other studies (Liberman and Pierrehumbert 1984, Prieto *et al* 1996, Estebas-Vilaplana 2000) sentence length does not influence the degree of F0 range in sentences. Since the data consisted of sentences with a different length given the different number of syllables between accents, we first needed to prove that pitch accents are actually comparable and hence that utterance length does not affect pitch range. In order to do so, utterance-initial and utterance-final F0 values were calculated as well as the scope of the first F0 rise (measured as the difference in Hz from the lowest point at the beginning of a contour to

the highest F0 value of the first peak). If the F0 excursion between the initial F0 value and the first peak is the same in sentences with different length, this will show that utterances with a different number of intervening syllables between accents are produced with the same pitch range and hence accents are comparable.

The results will be presented in three sections: 1) number of intervening syllables and its effects on temporal distance, 2) utterance initial and final F0 and pitch range, 3) the effects of temporal distance on the pitch of the last accent.

3.1. Number of intervening syllables and its effects on temporal distance

In this section we examine the effects of the number of intervening syllables between pitch accents on the temporal distance. It is expected that the higher the number of syllables the longer the distance between accents. Figure 6 shows the mean distance in ms between the first pitch accent and the final pitch accent as a function of the number of intervening syllables (from 1 to 5) between accents for both the English speaker (IS) and the Spanish speaker (DO). As expected, for the two speakers, the temporal distance between accents increases as the number of intervening syllables increases. ANOVAs were done for the two speakers and revealed a significant effect of the number of syllables on temporal distance (Speaker IS: $F(2, 179) = 374{,}677$; $p<0{,}001$; Speaker DO: $F(2, 179) = 983{,}019$; $p<0{,}001$). These results confirm the idea that the temporal distance between accents can be measured in terms of the number of intervening unaccented syllables.

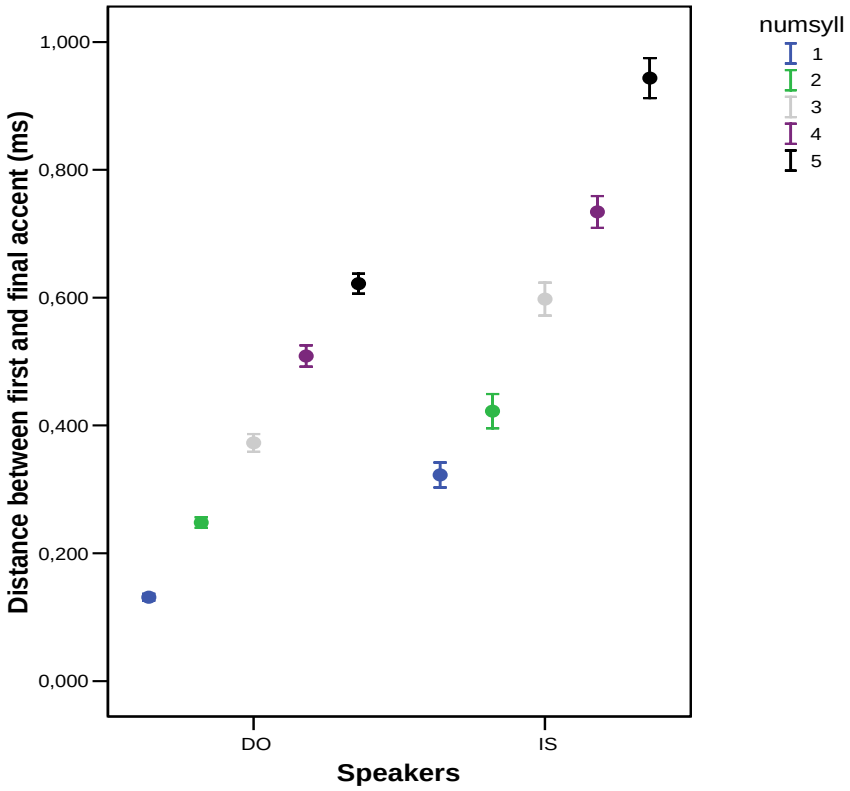

Figure 6. Mean distance in ms between the first pitch accent and the final pitch accent as a function of the number of intervening unaccented syllables (from 1 to 5) between accents. The bars represent the standard errors.

3.2. Utterance initial and final F0 and pitch range

In this section we analyse whether differences in sentence length had an effect on the utterance initial and final F0 values and on the pitch range with which sentences were produced. In order to be able to compare the F0 of the final accent in sentences with different temporal distances between accents we need to have a similar utterance initial and final F0 values and a similar pitch range irrespective of the length differences in utterances. If the F0 excursion between the initial F0 value and the first peak is the same in sentences with different length, this will show that utterances are produced with the same pitch range and hence accents are comparable.

The mean F0 values (in Hz) in utterance initial position for sentences with different length (one to five unaccented syllables between accents) are presented in Figure 7 for

both speakers. The results show no clear effects of sentence length on utterance initial F0 values. For both speakers the ANOVAs revealed no effects of phrase length on the F0 at the beginning of the sentence (Speaker IS: $F(2, 179) = 1{,}36$; p=0,25; Speaker DO: $F(2, 179) = 1{,}038$; p=0,243).

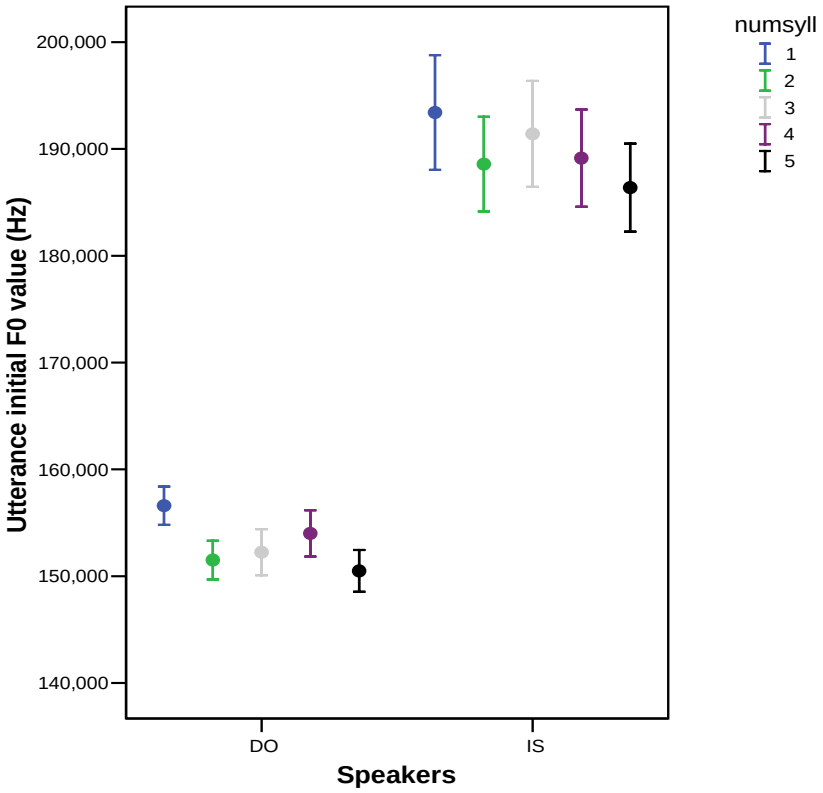

Figure 7. Mean F0 values in Hz in utterance initial position as a function of the number of intervening unaccented syllables (from 1 to 5) between accents. The bars represent the standard errors.

Figure 8 presents the mean F0 values (in Hz) in phrase final position for sentences with different length (one to five unaccented syllables between accents) for both speakers. As before, the results show no effects of phrase length on the final F0 value. This is confirmed by the results of the ANOVAs performed on the data of both speakers (Speaker IS: $F(2, 179)=0{,}535$; p=0,71; Speaker DO: $F(2, 179) = 0{,}179$; p=0,949). Thus, the number of intervening unaccented syllables between accents (and subsequently the sentence length) does not seem to affect the initial and final F0 values.

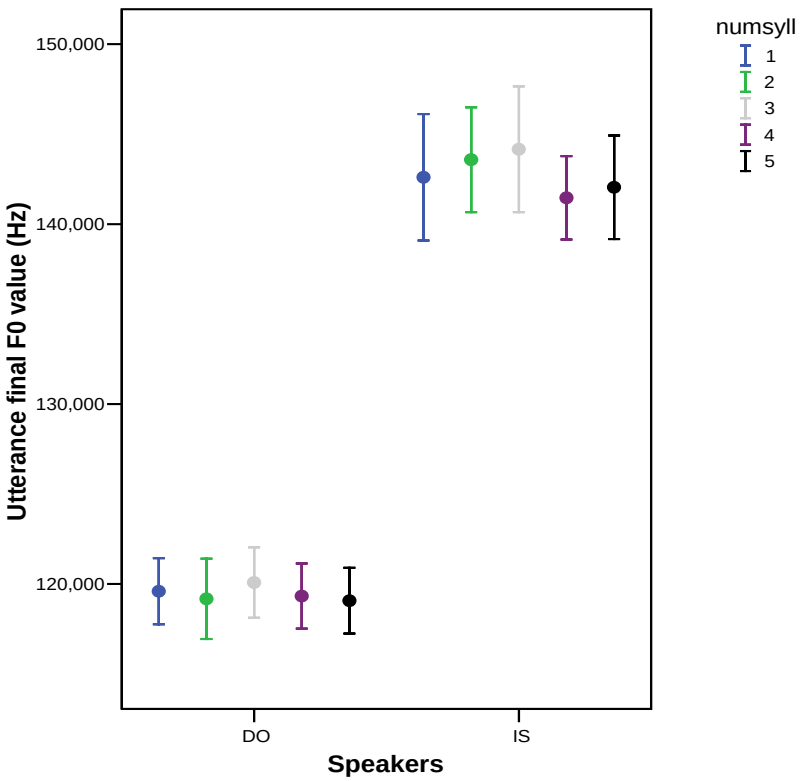

Figure 8. Mean F0 values in Hz in utterance final position as a function of the number of intervening unaccented syllables (from 1 to 5) between accents. The bars represent the standard errors.

Finally, the F0 range (difference in Hz from the lowest F0 value at the beginning of the utterance to the highest F0 point of the first peak) as a function of the number of intervening unaccented syllables between accents is presented in Figure 9. The results show that the pitch range is rather constant in sentences with different length. This is confirmed with the results of ANOVAs performed on the data of both speakers which showed no significant differences in the F0 range with respect to the number of intervening unaccented syllables (Speaker IS: $F(2, 179)=0{,}568$; $p=0{,}686$; Speaker DO: $F(2, 179) =0{,}506$; $p=0{,}731$). Thus, sentence length does not seem to affect the degree of prominence or pitch range with which sentences were produced. These results agree with those of Liberman and Pierrehumbert (1984) for American English, Prieto *et al* (1996) for Mexican Spanish and Estebas-Vilaplana (2000) for Catalan and prove that pitch accents are comparable irrespective of sentence length.

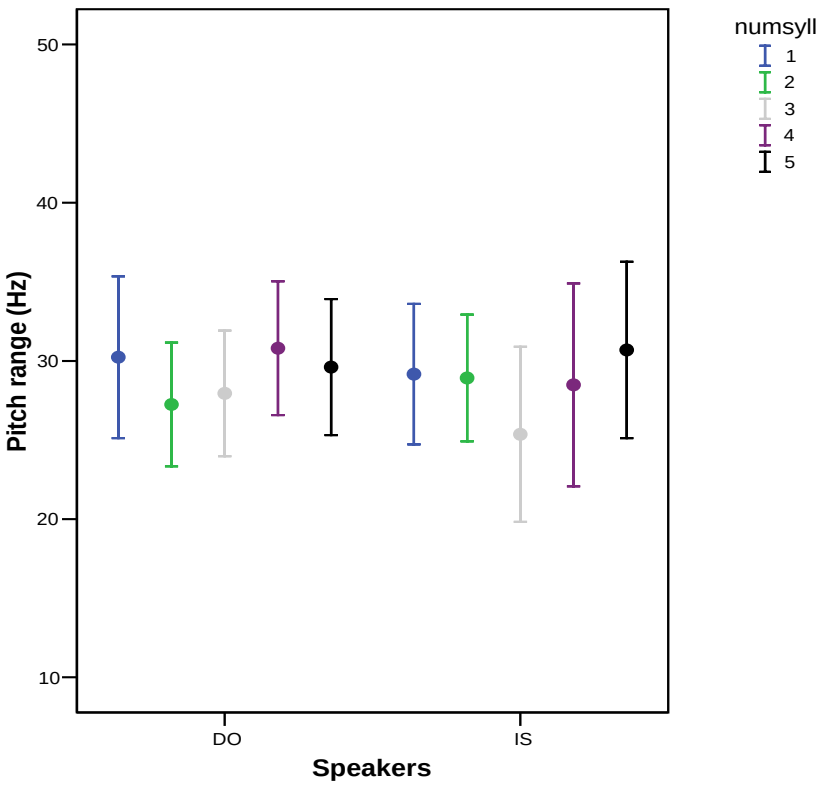

Figure 9. Mean pitch range in Hz as a function of the number of intervening unaccented syllables (from 1 to 5) between accents. The bars represent the standard errors.

3.3. Effects of temporal distance on the pitch of the last accent

Once proved that sentences were produced with a similar F0 in initial and final utterance position and with a similar F0 range, the effects of temporal distance (or number of intervening unaccented syllables between accents) on the scaling of the F0 of the last pitch accent were examined. Figure 10 shows the mean highest F0 value of the final pitch accent in Hz as a function of the number of intervening unaccented syllables between accents for the two speakers. For both speakers the F0 decreases as the number of intervening syllables increases indicating that there is an effect of temporal distance on the scaling of the F0 of the final pitch accent in the two languages. ANOVAs performed on the data of both speakers confirmed these observations since a significant effect of temporal distance on the scaling of the F0 of the last accent was found (Speaker IS: $F(2, 179)=17,942$; $p<0,001$; Speaker DO: $F(2, 179) =7,956$; $p<0,001$).

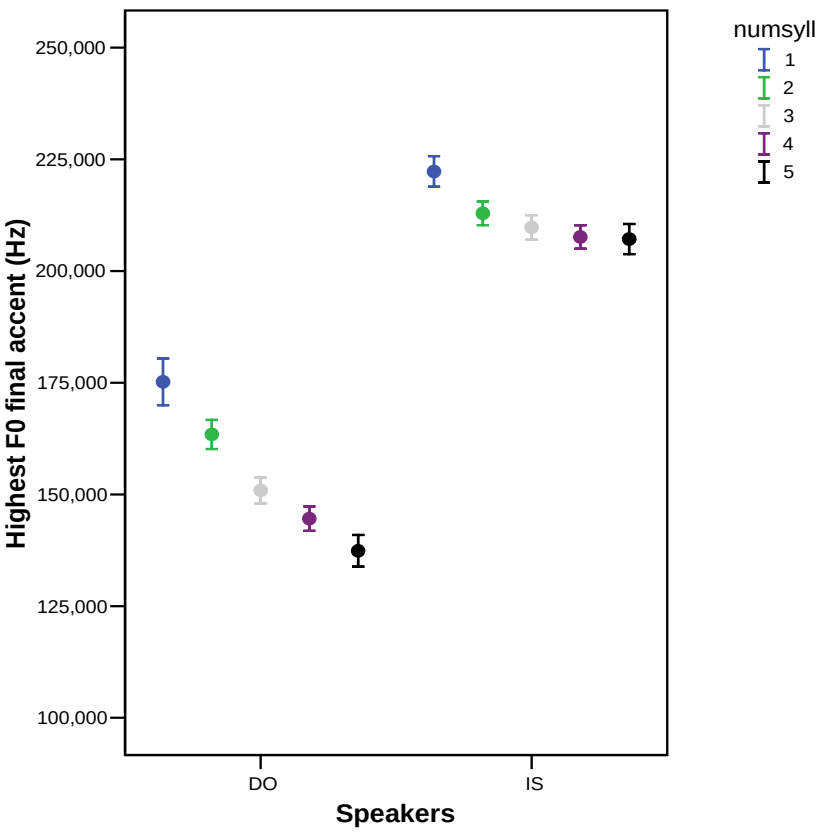

Figure 10. Mean highest F0 value of the final pitch accent in Hz as a function of the number of intervening unaccented syllables (from 1 to 5) between accents. The bars represent the standard errors.

These results show that despite the differences observed in the F0 movements of the final accent in English (presence of an F0 peak) and in Spanish (progressively falling contour), the two accents are subject to the same temporal effects and consequently the phonological status of the two pitch trajectories seems to be the same. In Spanish, if the scaling of the final pitch accent had remained fixed despite differences in the number of intervening syllables between accents, then that would have proved that an L* target was intended. However, the data showed that, as in English, the F0 is affected by the number of syllables between accents and thus we can conclude that the low F0 is not phonologically intended but can be the result of a downtrend mechanism, such as final lowering.

4. DISCUSSION

The results presented in the previous section have shown that both in English and in Spanish the scaling of the final pitch accent of a declarative sentence is affected by the number of intervening unaccented syllables (or temporal distance) between accents, that is, the higher the number of intervening syllables, the lower the F0 of the final accent. The similar temporal effects obtained in the two languages suggest that the same tonal category can account for the final accent of English and Spanish declaratives and subsequently we need to reconsider the phonological entity proposed by the AM model (Sosa 1999, 2003 and Hualde 2003) and the ToBI framework (McGory and Díaz-Campos 2000 and Beckman, Díaz-Campos, McGory and Morgan 2002) to describe the final accent of Spanish multi-accented declaratives. In all these works, the tonal category proposed to account for the F0 of the final accent in a multi-accented declarative in Spanish is H+L*, indicating the presence of a low target over the accented syllable. However, the differences found in this paper on the scaling of the final pitch accent in Spanish as a function of the number of intervening syllables or sentence length (Figure 10) question the presence of an intended low tone. If we compare these results with those of Figure 8, where the utterance final F0 values are presented, we can see a completely different behaviour. The scaling of the F0 at the end of the utterance is not affected by the length of the sentence. Thus, the final boundary tone of a declarative utterance, both in English and in Spanish, is clearly a low target (L%) since the speakers aim at the same (or similar) low F0, irrespective of the sentence length. Similarly, if the tonal entity of the final accented syllable in Spanish were also a low tone, the same lack of temporal effects would be expected on the scaling of the accent. On the contrary, the progressive lowering in F0 as the number of intervening unaccented syllables increases shows no low pitch objective and hence the differences in the scaling seem to be due to an overall declination effect.

These results suggest that in English and in Spanish the final pitch accent of both a single and a multi-accented declarative is an H* tone which is subject to realisational differences depending on whether the utterance contains prenuclear accents or not. If the sentence is single-accented, the H* will be realised with a clear F0 peak within the limits of the accented syllable. In cases of multi-accented sentences, the same intended H* is realised with a much lower pitch due to the overall declination and final lowering

effects. According to our data, the final lowering phenomenon seems to be a gradient event which can be realised in a continuum of degrees ranging from a low F0 peak (as in English) to no peak at all (as in Spanish). Thus, the findings presented in this paper throw into doubt the proposals of the AM and the ToBI frameworks for treating the final accents of single and multi-accented Spanish declaratives as phonologically distinct and support the idea of analysing the two contours as different realisations of a single tone (H*). This proposal solves the phonological problem encountered in the AM and the ToBI analyses of having two tonal entities (H* and H+L*) to describe two non-contrastive events (i.e. the final declarative intonation in single and multi-accented sentences). In this paper we have shown that the same tonal entity (H*) can account for the two types of pitch trajectories both in English and in Spanish.

5. CONCLUSION

In this paper we have discussed the phonological status of the last pitch accent in English and in Spanish multi-accented neutral declaratives by examining the scaling of the F0 of the last accented syllable as a function of the temporal distance between accents. The results have shown that for both languages the longer the distance between accents (measured in terms of syllables), the lower the F0 of the final accent. The similar distance effects on the scaling of the F0 of the final accent observed in the two languages throw into doubt former interpretations of the final accent in multi-accented Spanish utterances as a low target and advocate for an intended H* tone (as in English) produced with no clear F0 peak due to a final lowering effect.

WORKS CITED

Beckman, Mary and Julia Hirschberg 1994: “The ToBI annotation conventions. Ms. and accompanying speech materials.” Ohio State University. <http:/www. ling.ohio-state. edu/ToBI.6.html>.

Beckman, Mary and Janet Pierrehumbert 1986: “Intonational Structure in Japanese and English.” *Phonology Yearbook* 3: 255-310.

Beckman, Mary, Manuel Díaz-Campos, Julia McGory and Terrell Morgan 2002: “Intonation across Spanish in the Tones and Break Indices framework.” *Probus* 14: 9-36.

Boersma, Paul and David Weenink. Praat: a system for doing phonetics by computer. 1992-2001. <http://www.praat.org>.

Cooper, William and John Sorensen 1981: *Fundamental Frequency in Sentence Production.* Heidelberg: Springer.

Estebas-Vilaplana, Eva 2000: *The use and realisation of accentual focus in Central Catalan with a comparison to English.* Doctoral Thesis. University College London.

____ 2003: "Phonetic and phonological properties of the final pitch accent in Catalan declaratives." *Proceedings of the International Conference on Prosodic Interfaces.* University of Nantes. 35-40.

____ 2004: "Representación fonológica del último acento de una declarativa en español." Communication presented at the *XXXIV Simposio de la Sociedad Española de Lingüística.* Madrid.

Fujisaki, Hiroya 1988: "A note on the Physiological and Physical Basis for the Phrase and Accent Components in the Voice Fundamental Frequency Contour." *Vocal Physiology: Voice Production, Mechanisms and Functions*. Ed. O. Fujimura.. New York: Raven. 347-355.

Grabe, Esther 1998: *Comparative Intonational Phonology: English and German.* Wageningen: Ponsen & Looijen bv.

Hualde, José Ignacio 2003: "El modelo métrico y autosegmental." *Teorías de la entonación.* Ed. Pilar Prieto. Barcelona: Ariel. 155-182.

Ladd, Robert 1995: *Intonational Phonology.* Cambridge: CUP.

Liberman, Mark 1975: *The intonational system of English*. Doctoral Thesis. MIT.

Liberman, Mark and Janet Pierrehumbert 1984: "Intonational Invariance under Changes in Pitch Range and Length". *Language Sound Structure*. Eds. M. Aronoff and R. Oerhle. Cambridge MA: MIT Press. 157-233.

Martínez Celdrán, Eugenio 2003: "Análisis por niveles: la Escuela Americana." *Teorías de la entonación.* Ed. Pilar Prieto. Barcelona: Ariel. 63-96.

Sosa, Juan Manuel 1999: *La entonación del español: su estructura fónica, variabilidad y dialectología.* Madrid: Cátedra.

____ 2003: "La notación tonal del español en el modelo Sp-ToBI". *Teorías de la entonación.* Ed. Pilar Prieto. Barcelona: Ariel. 185-208.

McGory, Julia and Manuel Díaz 2000: "Declarative intonation patterns in multiple varieties of Spanish". Communication presented at the *Fourth Hispanic Linguistics Symposium*. Bloomington, Indiana.

Pierrehumbert, Janet 1980: *The Phonology and Phonetics of English Intonation.* Doctoral Thesis. Bloomington: Indiana University Press.

Pierrehumbert, Janet and Mary Beckman 1988: *Japanese Tone Structure.* Cambridge MA: MIT Press.

Pike, Kenneth L. 1945: *The intonation of American English.* Ann Arbor: University of Michigan Press.

Prieto, Pilar, Cho Shih and Holly Nibert 1996: "Pitch Downtrend in Spanish." *Journal of Phonetics* 24: 445-473.

Thorsen, Nina 1980: "Intonation Contours and Stress Group Patterns in Declarative Sentences of Varying Length in ASC Danish". *Annual Report of the Institute of Phonetics*: 15. University of Copenhagen.13-47.

Trager, George and H. Smith 1951: *An outline of English structure.* Norman, OK: Battenburg Press.

APPENDIX

This appendix contains all the sentences recorded in the production test. The numbers after each sentence indicate the number of intervening unaccented syllables between the first and last accent. Accented syllables are underlined.

English declarative sentences

The barber's murdered (1)
The barber's been murdered (2)
The barber had been murdered (3)
The barber must have been murdered (4)
The fishmonger must have been murdered (5)

My mother's moaning (1)
My mother's been moaning (2)
My mother had been moaning (3)
My mother must have been moaning (4)
My family must have been moaning (5)

The nanny's ironing (1)
The nanny's been ironing (2)
The nanny had been ironing (3)
The nanny must have been ironing (4)
The minister must have been ironing (5)

He mumbles melodies (2)
He mumbles the melody (2)
He modified the melody (3)
He's modifying the melody (4)
He's modifying a few melodies (5)

He models numbers (1)
He models the numbers (2)
He normalised the numbers (3)
He's normalising the numbers (4)
He's normalising a few numbers (5)

She learned the lullaby (1)
She's learning the lullaby (2)
She memorised the lullaby (3)
She's memorising the lullaby (4)
She's memorising a few lullabies (5)

Spanish declarative sentences

Marina mira (1)
"Marina looks"

Marina miraba (2)
"Marina looked"

Marina la miraba (3)
"Marina looked at her"

Marina la remiraba (4)
"Marina looked at her again"

Mónica la remiraba (5)
"Monika looked at her again"

La niña mima (1)
"The girl spoils"

La niña mimaba (2)
"The girl spoiled"

La niña la mimaba (3)
"The girl spoiled her"

La niña la remimaba (4)
"The girl spoiled her again"

Melanie la remimaba (5)
"Melanie spoiled her again"

La nena llama (1)
"The girl calls"

La nena llamaba (2)
"The girl called"

La nena me llamaba (3)
"The girl called me"

La nena me la llamaba (4)
"The girl called her for me"

La nena me la llamaría (5)
"The girl would call her for me"

Bailó Marina (1)
"Marina danced"

Bailó Marinita (2)
"Marinita danced"

Bailó la marioneta (3)
"The puppet danced"

Bailaba la marioneta (4)
"The puppet was dancing"

Bailábale la marioneta (5)
"The puppet danced for him"

Colaba lima (1)
"(S)he drained lime"

Colaba la lima (2)
"(S)he drained the lime"

Colaba limonada (3)
"(S)he drained lemonade"

Colaba la limonada (4)
"(S)he drained the lemonade"

Colábamos la limonada (5)
"We drained the lemonade"

Llenó la lámina (1)
"(S)he filled the sheet"

Llenó la gomina (2)
"(S)he filled the hair cream"

Llenó la laminita (3)
"(S)he filled the small sheet"

Llenaba la laminita (4)
"(S)he filled the small sheet"

Llenábale la laminita (5)
"(S)he filled the small sheet for him"