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## Declarative Intonation Patterns in Multiple Varieties of Spanish

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### 1. Introduction

Recent efforts have sought to capture the intonational structure of declaratives in Latin American and Peninsular varieties of Spanish using an autosegmental-metrical (AM) model of intonation (Ladd 1996), like that proposed for English by Pierrehumbert (1980). These include a description by Sosa (1999) of multiple Latin and Peninsular varieties, and also more specific descriptions of Castilian Spanish by Face (in press), of Mexican Spanish by Prieto and colleagues (Prieto, van Santen & Hirschberg 1995, Prieto, Shih, & Nibert 1996, Prieto 1998), and of northern Peninsular and Venezuelan Spanish by participants at the first Spanish ToBI workshop (Mendoza-Denton, McGory, & Díaz-Campos 1999; Hualde 2000).

The gross shape of the intonation pattern of declaratives has been described similarly among these researchers. In a prototypical declarative produced without any particular lexical emphasis, there is a pitch accent on each content word, and every accent after the first is downstepped relative to the preceding accent peak. Also, there is a fall to a low pitch at the sentence boundary, after the last pitch accent. This gives an overall impression of a gradually declining backdrop pitch range, a series of smaller and smaller peaks ending with a final fall in pitch at the end of the utterance.

There is less agreement as to the analysis and number of pitch accent types, about the potential for some content words to be produced without pitch accents, and the number and types of boundary pitch movements. The potential inventory of pitch accents, their location within declaratives, and the inventory of boundary tones is the subject of the current investigation.

Pitch accents are phonological categories that specify the fundamental frequency patterns associated with particular syllables. In Spanish, these associated syllables are stressed. Within an Autosegmental-Metrical (AM) analysis of intonation, pitch accent categories are assigned either a single H(high) or L(low) label or a combination of H and L labels. Falling pitch accents are represented as H+L, rising pitch accents as L+H, and level pitch accents as L or H. Important to these labels is the location of an asterisk that is assigned to either the L or H component of the pitch accent. This asterisk denotes the localization of the tone target that is consistently realized within the stressed syllable. For example, the H target in a L+H\* is typically realized within the stressed syllable. In the case of the pitch accent L\*+H, the L target is aligned with the stressed syllable. Pitch accent categories that potentially exist in some or all varieties of Spanish are rising pitch accents (L+H\* and L\*+H), level pitch accents (L\* and H\*), and falling pitch accents (H+L\* and H\*+L).

The last pitch accent in an utterance is the "nuclear pitch accent"; and those produced before the nuclear accent are then "prenuclear pitch accents". Earlier researchers of Spanish intonation have observed differences between these two positions in the timing of the accentual peak, with the peak typically being after the accented syllable in a prenuclear pitch accent and within the accented syllable of nuclear pitch accents (Navarro-Tomás 1948). Prenuclear and nuclear pitch accents have been classified as belonging to the same phonological category by Prieto and her colleagues (Prieto et al. 1996, Prieto 1998), Hualde (2000) and Nibert (1999). In this "one category" analysis, the observed differences in peak timing are different phonetic realizations of the same phonological pitch accent type. Prieto uses the label H\* to refer to this pitch accent; Hualde and Nibert use the label (L+H)\*. According to these accounts, the location of the pitch accent's peak is influenced by stress clash and tonal crowding. Consequently, pitch accent variants can be described as allotones of a single pitch accent.

Sosa (1999) and Face (2000) have posited that multiple pitch accents exist in Spanish, and this was the consensus also at the first Sp\_ToBI workshop. According to Face (2000), two pitch accents are consistently used in declaratives: L\*+H is consistently produced in prenuclear position while L+H\* is produced in nuclear position. Sosa (1999), on the other hand, posits that there are more than two pitch accents, but he agrees that the inventory of prenuclear and nuclear types differ. These pitch accent types are illustrated in Figure 1.

	Prenuclear	Nuclear	Analysis
Sosa	H*+L, L*+H, L+H*	L+H*, H+L*, H+H*, L*, H*	Multiple Pitch Accents
Prieto and colleagues	H*	H*	Single Pitch Accent
Face	L*+H	L+H*	Two Pitch Accents
Hualde, Nibert	(L+H)*	(L+H)*	Single Pitch Accent
Sp_ToBI participants	L*+H	L+H*, H*, H+L*	Multiple Pitch Accents

Figure 1. The number and type of pitch accents occurring in prenuclear and nuclear positions in declaratives according to different theories of Spanish intonation.

According to this "multiple categories" analysis, the segmental makeup of content words does not affect the realization of tone targets. Instead, differences in the realization of pitch accents are accounted for by there being different pitch accent categories.

Because of the downstepping pattern in Spanish declaratives, the final content word is often produced with a very reduced rise within the stressed syllable, or no visible rise at all. There are three possible explanations that have been posited for the intonational status of this final content word. The difference between a rise and no rise is not contrasted in Face's account and in accounts of Spanish intonation that posit one pitch accent type. The final content word is produced with a nuclear L+H\* pitch accent according to Face (2000), a H\* according to Prieto et al. (1995) and Prieto (1996), and a (L+H)\* according to Nibert (2000) and Hualde (2000). Another possibility is that these differences in the realization of the "reduced" rise in the final content word are due to contrasting pitch accent types. Sosa (1999) posits that there are two types of "reduced" nuclear pitch accents distinguishing between a reduced  $F_0$  rise and no rise, calling the first a H\* pitch accent and the second a L\* pitch accent. It is also possible that content words need not be produced with a pitch accent at all, and instead be deaccented. Participants in the Sp\_ToBI workshop (1999) did not rule out this possibility, and found deaccenting particularly noticeable when an earlier content word was produced with focus.

Why might these different accounts of Spanish intonation exist? All accounts take into consideration the alignment of  $F_0$  peaks relative to stressed syllables yet one group of researchers posits a single pitch accent, while another posits multiple pitch accents. One explanation is that different varieties of Spanish intonation exist and this possibility is great given that investigations of Spanish intonation have concentrated on a particular variety. Prieto has observed Mexican Spanish (1995, 1996, 1998); Face has observed Castilian Spanish (2000); ToBI Workshop members observed productions from Venezuela and Spain; and Sosa observed multiple varieties of Spanish in Argentina, Mexico, Colombia, Puerto Rico, Venezuela, Spain, and Cuba. The questions regarding pitch accents that we ask in this study are (1) How many pitch accent types are

there? (2) Are there separate inventories for prenuclear and nuclear position? And, (3) Can a content word be produced without an accent?

Navarro-Tomás (1948) describes the final pitch contours in declaratives in *Manual de Intonación Española (Manual of Spanish Intonation)*. In this account he describes five different types of pitch movements called *tonemas* 'tonemes' all realized after the last stressed syllable at the right edge of the intonational phrase. Each toneme is associated with a different meaning. The first of these is a falling toneme produced with a steep falling pitch contour. In an emphatic discourse, the pitch fall is more dramatic. According to Navarro-Tomás, this fall indicates the end of a declarative sentence. The second is a rising toneme produced with a steep rising pitch contour. This rise indicates emphasis in the predicate between contrasting concepts. The third is a mid-falling toneme produced with a falling contour that is less dramatic or steep than the falling toneme. The mid-falling toneme indicates uncertainty in a declarative sentence. This contour expresses that the speaker produced a declarative statement with some hesitation. The fourth is a mid-rising toneme produced with a shallower rise than the rising toneme. Navarro-Tomás maintains that the mid-rising toneme indicates continuation and secondary contrasts between concepts. The fifth is a sustained toneme produced in the middle of a person's pitch range. This boundary tone indicates incomplete meaning and an abrupt end without finishing an idea. If we use autosegmental metrical labels to describe the boundary tones proposed by Navarro-Tomás, we can describe both the falling and mid-falling toneme as a low boundary tone, L%; the rising toneme as a high boundary tone, H%; the mid-rising toneme as a rising boundary tone, LH%; and a sustained toneme as a mid boundary tone, M%.

Utterances in more recent accounts of intonation are produced with a limited number of boundary tones. Although all of the pitch tracks that Prieto et al. and Face show have only L% boundary tones, and these authors do not mention rising or sustained tones in their materials, this may be because their materials were read lists of sentences. Our test materials are a connected string of sentences in a longer, coherent discourse, which may give more opportunity for the other boundary pitch movement types noted by Navarro-Tomás (1948). If we suggest here that different pitch accent inventories might exist in multiple varieties of Spanish, then it is possible that different inventories of boundary tones might also exist. Another possibility is that the recording conditions have influenced the use of particular boundary tone types. The utterances that have been observed have for the most part, been produced as single sentences with little or no contextual information. Because of the nature of these utterances, the relationship between phrases that Navarro-Tomás suggests indicating continuation of an idea or the contrast between multiple ideas are not likely to exist in the target sentences in more recent observations. Questions regarding edge tones that we ask in this study are: (1) What is the possible inventory of edge tones in multiple varieties of Spanish? (2) What is the relationship between boundary tone choice and communicative function?

## 2. Methods

Sixteen native Spanish speakers provided the data for the present investigation. We obtained speech recordings from one male and one female speaker for each of 8 different Spanish dialects: Argentina, Colombia, Costa Rica, Chile, Mexico, Puerto Rico, Spain and Venezuela. The recording sessions took place in a sound-attenuated booth located in Cunz Hall within the Department of Linguistics at The Ohio State University. The 16 consultants read a paragraph about cultural and linguistic variability in the Spanish-speaking world written by Patricia Lunn (Michigan State University). We analyzed the most fluent of two repetitions.

To observe the potential relationship between the communicative function of a discourse segment and the choice of boundary tone, we identified the edges of discourse segments within the written text and the prosodic phrase edges from each speaker's productions. To segment the text, we determined the discourse segment (DS) units defined by Grosz and Sidner (1986) as a segment of text with a complete communicative function or purpose. Within each DS, we further divided the text into supporting information of two types. Supporting phrases that were independent units and could be stated alone were considered complete ideas, while those that could not be stated alone were incomplete ideas. This distinction allowed us to label four types of discourse junctures: "word juncture" indicated by spaces between words, the end of an incomplete idea labeled with a single slash "/", the end of a complete idea labeled with two slashes "//", and the end of a complete DS labeled with three slashes "///". This discourse analysis of the text is provided in Figure 2.

Overall Purpose: Discuss similarities & differences among Spanish speaking people
DS1: Describe the population and residence of Spanish speakers <i>Hay más de trescientos millones de personas / que hablan español//</i> <i>principalmente / en España y Latinoamérica//.</i> [There are more than three hundred million people / who speak Spanish // primarily / in Spain and in Latin America//.]
DS2: State that different varieties of Spanish exist <i>Por razones históricas y geográficas / han divergido los varios dialectos de la lengua //.</i> <i>No sólo existen diferentes acentos / sino también diferentes léxicos //.</i> [For historical and geographical reasons / there are various dialects of the language //.] [ Not only do different accents exist / but there also different words //.]
<i>Se dice coche / piso y maíz en España //, auto / apartamento, y choco en Chile //, carro / departamento y elote en México. //</i> [People say coche / piso and maíz in Spain //, auto / apartamento and choco in Chile //, carro / departamento and elote in México. //]
DS3: Describe the cultural similarities among Spanish-speaking countries <i>Sin embargo / las manifestaciones culturales del mundo hispanohablante... /</i> [Nonetheless /, cultural manifestations of the Spanish speaking world... /] <i>arte / cine / deporte / literatura / música y televisión /</i> [art / theater / deporte / literature / music and television /] <i> sirven para compensar la diversidad lingüística //.</i> [serve to compensate for the linguistic diversity //.]

Figure 2. Discourse segmentation of the written text

After completing a discourse analysis of the text, we identified the location and type of each intonational phrase boundary by digitizing the speech and extracting the fundamental frequency contour using the Entropics, Inc., Xwaves signal analysis software. A native Spanish speaker (the second author) listened to each recording and identified the location of a prosodic boundary. Next, we examined pitch tracks in order to classify the type of boundary tone. We labeled the type of tonal movement occurring at the right edge of these phrases using the following criteria:

H%: a rising pitch pattern rising high within the speaker's pitch range; higher than the peak of a rising pitch accent  
M%: a sustained or slightly falling  $F_0$  pattern in the unstressed syllable(s) after a final pitch accent; or a low rising pitch pattern (no higher than that of a rising pitch accent) within the utterance final stressed syllable

L%: a steep fall in  $F_0$  after the last pitch accent  
LH%: a fall in  $F_0$  after the final stressed syllable followed by a short rise to middle of the speaker's pitch range

Example utterances with these edge tones are provided in Figures 3, 4, and 5. The speaker in Figure 3 produced the utterance with two L% tones, at the right edge of *personas* and at the right edge of *español*. The pitch rises within the stressed syllables of these words, and then falls within the speaker's pitch range at the end of each word. The utterance in Figure 4 illustrates the production of a LH% edge tone realized after the word *embargo*. There is a fall after the stressed syllable followed by a slight rise to the middle of the speaker's pitch range. There is no stressed syllable at the edge of this word, and cessation of voicing between *sin embargo* and *las* is evidence for a boundary juncture. This is a clear example of a LH%. The final edge tone in this example is a M%. It was difficult to distinguish between M% and H% edge tones when the utterance final syllable was stressed because the pitch accent and edge tone are realized within the same syllable. A M% target is more clearly seen in the word *manifestaciones* because there is one poststressed syllable in this word. In this production, there is little to no rise in the unstressed syllable [nes] and so we labeled this as a M% edge tone. Figure 5 illustrates the difference in the realization of a M% and H% providing a clear example of how the  $F_0$  continues to rise higher into a speaker's pitch range when producing a H% as can be seen in the last syllable in *España*, as opposed to the leveling or slight falling off of  $F_0$  in the last syllable of *principalmente* produced with a M%. Both words have penultimate stress, yet the  $F_0$  patterns are quite different.

We predicted that the choice of edge tones would differ depending on the location of the intonational phrase within the discourse. We assume, based on the discourse segmentation, that boundary tones will be used to indicate three different general functions: finality at the end of discourse segments, finality or continuation between complete ideas, and continuation between incomplete ideas and words.

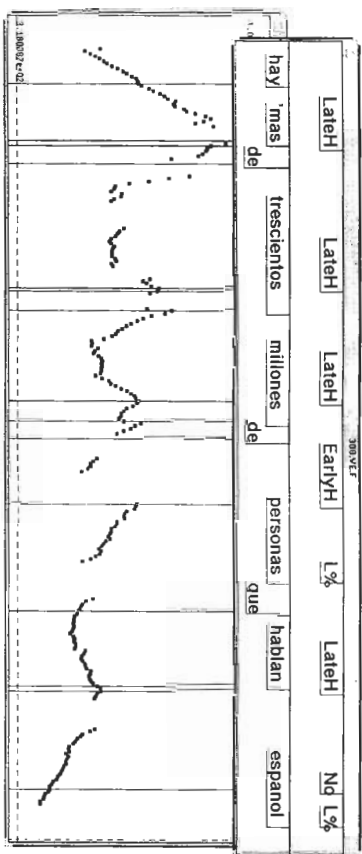


Figure 3. Illustration of L% boundary tones and pitch accents realized with LateH, EarlyH, and NO pitch change in the utterance *Hay más de trescientos millones de personas que hablan español*.

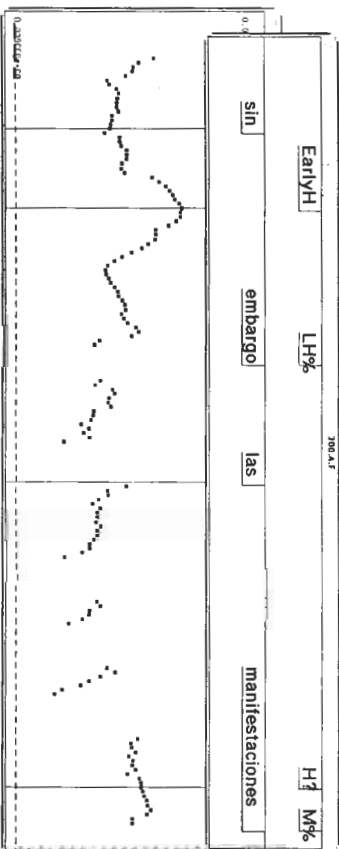


Figure 4. Illustration of a LH% boundary tone in the phrase *sin embargo las manifestaciones*.

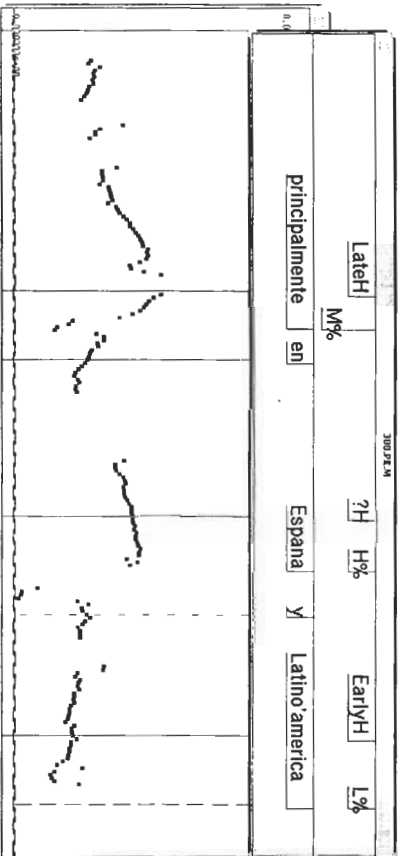


Figure 5. Illustration of M% and H% boundary tones in the phrase *principalmente en España y Latinoamérica*.

In order to isolate the location of pitch accent targets, we analyzed the two final content words in utterances that ended with a pitch fall (L%). It is difficult to separate a H tone associated with a pitch accent from the tone associated with a boundary tone in utterances ending with H% or M%. This is illustrated in Figure 5. The location of a H pitch accent target in *España* is not discernible from the H target of the H% boundary tone. Pitch pattern descriptions based on alignment of L and H tones relative to the end of the stressed syllable were made using the following labels and criteria:

- Early H: F<sub>0</sub> peak is realized inside the stressed syllable
- Late H: F<sub>0</sub> peak is realized after the end of the stressed syllable
- Falling HL: F<sub>0</sub> fall within the stressed syllable starting at stressed syllable onset and ending at offset
- NO: No visual L or H target near or within the stressed syllable; F<sub>0</sub> interpolates between surrounding tone targets

We used the waveform envelope and spectrograms to isolate the stressed syllable edges. Early H alignment is illustrated in Figure 4. In this utterance, the F<sub>0</sub> peak is produced within the stressed syllable [bár] in *embargo*. Late H alignment is illustrated in Figure 3. Each content word at the beginning of the utterance *Hay más de trescientos millones...* is produced with a rising pitch accent whose peak is not realized until after the stressed syllable. The F<sub>0</sub> peak in *más* is realized within the word *de* and illustrates how pitch accent peaks can be realized in a syllable after the accented word. HL alignment is illustrated in Figure 6 below.

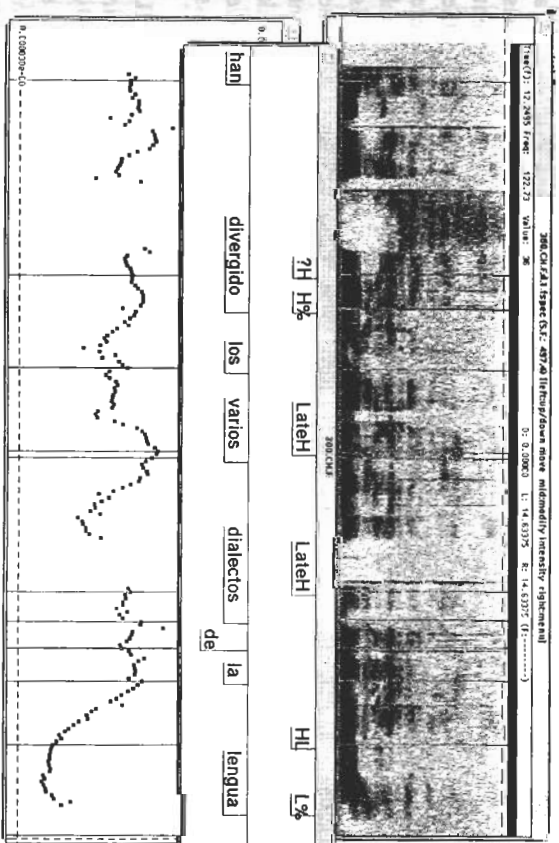


Figure 6. Illustration of a falling HL pitch accent pattern.

The last two content words in the utterance in Figure 6 are *dialectos* and *lengua*. The stressed syllables in these words are separated by 3 unstressed syllables, however the pitch does not sag between the  $F_0$  peak in the third syllable of *dialectos* and the first stressed syllable in *lengua*. We labeled the pitch accent in the nuclear accent as having a falling HL pitch pattern. Finally, we used the label NO when there were no visible  $F_0$  targets within the content word. In these cases, the  $F_0$  pattern within the word was an interpolation between surrounding tone events, as illustrated in Figure 3. The final word in this utterance is *español*. The final syllable is stressed, yet there is no visual low or high tone target produced anywhere near the word final stressed syllable. Instead,  $F_0$  interpolates between the H pitch accent target in *hablan* to the L boundary tone target at the end of the utterance.

### 3. Results: Pitch Accents

#### 3.1. Pitch accents across all speakers

We looked at pitch contours over the last two content words in each intonational phrase. There were twelve distinct patterns observed with varying frequency. We limit our discussion to the combinations of pitch accent types produced in prenuclear and nuclear contexts that were used more than once by at least three dialect groups. These five pitch patterns and the total number of times they were used are listed in Figure 7. We have provided autosegmental metrical labels in parentheses as a description of the potential pitch accent types these patterns represent.

The most commonly used pattern is a pitch rise within the stressed syllables of the final two content words. The first accent is realized with late H peak, and the second with an early H peak. This pattern is what has been described as a prenuclear L\*+H followed by a nuclear L+H\* in a multiple accent analysis (Face 2000; ToBI Workshop 1999). We found these individual pitch accent patterns to occur in other combinations as well. Late peak alignment in the prefinal content word occurs in three of the five pattern types discussed here accounting for 69% of the data. The tendency for pitch accents in prefinal content words to be produced with late peak realization in our data set is consistent with findings by Prieto et al. (1996), Prieto (1998), Sosa (1999), the Sp\_ToBI group (1999) and Face (2000). Late peak alignment was less frequent in the final content word, accounting for only 3% of productions. Early peak alignment was most typical in the final content word occurring in two of the five pattern types discussed here accounting for 45% of the data. It occurred less frequently in prenuclear position, accounting for 16% of the data.

Another pitch accent pattern that was produced frequently was a falling HL pattern in the nuclear accented word. Although HL was not used consistently in other combinations, it nonetheless accounted for 21% of these most commonly produced patterns. We were quite interested in this pattern because Sosa's analysis (1999) is the only one that posits the existence of this pitch accent pattern.

We were unable to identify any pitch target in the final content word in many productions. The second author, a native Spanish speaker, also perceived no sense of prominence on this final content word. The nonexistence of a pitch accent occurred after a LateH pitch accent. Although no other accounts of Spanish intonation have described the final content word as having no pitch accent, we found that no visible tone target was realized in 16% of the most commonly used pitch patterns.

Pitch Pattern	AM description	Times used	% of use
LateH Early H	(L*+H L+H*)	30	32
LateH NO	(L*+H NO)	15	16
LateH FallingHL	(L*+H H+L*)	20	21
EarlyH EarlyH	(L+H* L+H*)	12	13
EarlyH LateH	(L+H* L*+H)	3	3
Other		14	15
Total Utterances		94	100

Figure 7. Pitch patterns types and the number of times used across all subjects.

Two follow-up analyses were completed to observe the potential influence of segmental affects on the realization of the  $F_0$  peak in prenuclear and nuclear rising accents in order to determine if Late H and Early H patterns resulted from tonal crowding, as claimed by Prieto et al. (1995) and Hualde (2000), or were instead distinct pitch accent types, as claimed by Face (2000). A third follow-up analysis was completed to observe the potential influence of stress clash on the realization of the falling HL pitch pattern.

To observe the possible effects of stress clash on peak location in prenuclear rising accents, we observed the frequency of prenuclear Early H and Late H accent patterns followed by a nuclear Late H accents separated by varying numbers of unstressed syllables. These results are provided in Figure 8. The distribution of early and late peak alignment in prenuclear accents is unaffected by stress clash. Both early and late peak alignment occur in the prenuclear accent when there are one to five unstressed syllables between stressed syllables. Contrary to predictions of stress clash, late peak alignment occurs when there is only a single intermittent syllable (13% of occurrences), and early peak alignment occurs when there are five intermittent syllables (in 25% of occurrences). With this evidence, we suggest that L+H\* and L\*+H are separate pitch accent categories.

Unstressed Syllables	One	Two	Three	Four	Five	Total
Late H	4	10	10	4	2	30
Early H	1	5	2	1	3	12

Figure 8. The distribution of late and early peaks in prenuclear rising accents with 1-5 intermittent unstressed syllables.

Second, we considered the possibility that the proximity of the L% boundary tone influenced the location of the peak of the nuclear pitch accent. We observed the distribution of nuclear pitch accents with early peaks and late peaks. Consistent with the stress patterns in Spanish, all utterances in our data set ended with a content word having zero to two poststressed syllables. The number of times a rising pitch accent was produced with early and late accentual peaks in words across these different stress positions is provided in Figure 9. Results indicate that the distribution of early peaks was similar across all stress types. In fact, early peaks were realized most often in words ending in one and two unstressed syllables where there was sufficient room for the peak to be realized later in the post stressed syllable. These results provide additional evidence that L+H\* and L\*+H are separate pitch accents, and the low occurrence of L\*+H in nuclear position also suggests that L+H\* is the preferred nuclear pitch accent.

Proximity of L% boundary	Early H peak (L+H*)	Late H peak (L*+H)
0 syllable	13	0
1 syllable	18	1
2 syllables	17	2

Figure 9. The distribution of pitch accents with early and late peak alignment across all utterance produced with a final L% tone.

The third question we asked was if the production of a falling HL pitch pattern was influenced by the proximity of the prefinal and final stressed syllables. We believe that this pattern is a H+L\* (see Figure 5). The two final content words are produced in the phrase *dialectos de la lengua* in this utterance. A rising pitch accent is evident in the first word *dialectos*. A Late H target is realized in the poststressed syllable [os]. The F<sub>0</sub> remains high through to the beginning of the stressed syllable [léŋ]. At this point a steep fall begins that continues through to the end of the stressed syllable. We posit that this fall in pitch is due to a H+L\* pitch accent. This fall is contrasted to the steep fall in the word *personas* illustrated in Figure 3. The phrase final pitch fall in *personas* continues from the stressed penultimate syllable to the end of the word. We posit that the L% boundary tone is realized at the edge of the word. The pitch fall in the word *lengua* (Figure 5) tapers off at the end of the stressed syllable and remains level until the end of the word. The fall within this stressed syllable is characteristic of a falling H+L pitch accent where the low target is realized near the end of the stressed syllable.

The distribution of nuclear HL is presented in Figure 10. If H+L\* were a phonetic variation of a rising L+H pitch accent, we would expect to see the initial L target of a nuclear L+H pitch accent reappear when stressed syllables between the nuclear and prenuclear words were separated by more and more

unstressed syllables. In other words, the frequency of HL pitch patterns would decrease as unstressed syllables increased. The number of unstressed syllables between nuclear and prenuclear pitch accents did not influence the frequency of falling pitch patterns. A falling pitch pattern occurred when there were between one and five unstressed intermittent syllables, and was most common when there were two intervening syllables. This evidence suggests that H+L\* is a separate pitch accent.

These three separate observations of the potential effects of stress clash and tone crowding lead us to hypothesize that there are at least three separate pitch accents in Spanish. These are L+H\*, L\*+H, and H+L\*. In our discussion of results for individual dialects, we will use these labels to indicate the multiple category status of pitch accents in Spanish.

No. of intermediate syllables	Times an HL pattern occurred
Zero	0
One	5
Two	10
Three	6
Four	0
Five	1

Figure 10. The distribution of nuclear falling pitch patterns with varying degrees of stress clash

### 3.2. Pitch accents within each dialect

Distributions of final and prefinal pitch accents in the utterances of each dialect are provided in Figure 11 and 12, respectively. The accent type produced most often for each dialect is in boldface. Tone targets did not exist in the final content word (labeled "NO") in some productions for all dialect groups, produced most frequently in Puerto Rican Spanish, and never in Mexican Spanish. In these utterances, the prefinal word receives the nuclear pitch accent.

A L+H\* pitch accent is the most common nuclear accent type in productions by all dialect groups except Chile (see Figure 11). Although previous analysis have used different labels to describe this pitch accent, these results are consistent with the pitch accent patterns in Face's and Hualde's analysis of Peninsular varieties of Spanish, Prieto's analysis of Mexican Spanish, and the ToBI workshop's analysis of Peninsular and Venezuelan Spanish. The most common nuclear accent in Chilean speakers was H+L\*, which makes Chilean quite different from all other varieties. The most frequently occurring pitch accent type in the prefinal content word (see Figure 12) was L\*+H, produced by all language groups except Castilian speakers from Spain. Of all dialect groups in this study, we expected that Castilian speakers would be most likely to use pitch

Final content word	L+H*	L*+H	NO	H+L*
Chile	3		1	9
Colombia	6		2	
Costa Rica	2	1	2	
Mexico	5	3		2
Puerto Rico	4	1	6	2
Spain	7	1	2	1
Argentina	8	1	1	5
Venezuela	11		4	4
<b>Total=94</b>	<b>46</b>	<b>7</b>	<b>18</b>	<b>23</b>

Figure 11: The distribution of pitch accent types in utterance final content words produce by speakers of 8 varieties of Spanish

Prefinal Content Word	L*+H	L+H*	NO	H+L*
Chile	13			
Colombia	8			
Costa Rica	2	2	1	
Mexico	6	4		
Puerto Rico	11	2		
Spain	1	7	3	
Argentina	9	3	1	2
Venezuela	18	1		
<b>Total=94</b>	<b>68</b>	<b>19</b>	<b>4</b>	<b>2</b>

Figure 12: The distribution of pitch accent types in penultimate content words produced by speakers of 8 varieties of Spanish

accents with late peak alignment. This result would have been consistent with Castilian productions observed by Face (2000) and the Sp\_ToBI workshop members (1999). However, there was only one rising pitch accent with late peak alignment, and seven with early peak alignment for these speakers. Late peak alignment was characteristic of most productions in the remaining language groups. Chilean, Colombian, Venezuelan and Puerto Rican speakers almost exclusively produced L\*+H pitch accents in this prenuclear context. These results concur with the results of the Sp\_ToBI group for Venezuelan speakers. Sosa (1999) also posited the existence of this accent type in productions by the

multi dialects he observed. Specifically, Sosa points out the use of L\*+H in prenuclear position in the varieties of Spanish spoken in Colombia, Mexico, Puerto Rico, Venezuela, Cuba, and Northern and Southern dialects of Spain.

We identified 9 different combinations of pitch accent types in this dataset. We will direct the discussion to the five most frequently used patterns. These patterns, or tunes, and the number of productions produced by each dialect group are provided in Figure 13. The most commonly used pattern, L\*+H L+H\*, was used by all dialect groups except Castilian and was most frequently used by Colombian and Venezuelan speakers. These results are consistent with observations of Venezuelan Spanish made by the ToBI workshop group. Although Peninsular speakers produced a prenuclear L\*+H and a nuclear L+H\*, they did not use these two pitch accents together in the same tune. Peninsular speakers more typically used a series of two L+H\* pitch accents. A prenuclear L\*+H followed by a H+L\* nuclear accent was the most common tune produced by Chilean speakers and was one of two most frequent tunes produced by Argentine speakers.

Final	L*+H L+H*	L*+H H+L*	L+H* L+H*	L*+H NO	L+H* L*+H*
Chile	3	9		1	
Colombia	6			2	
Costa Rica	1		1	1	1
Mexico	2	1	3		
Puerto Rico	4	2		5	1
Spain			4	1	1
Argentina	4	4	3	1	
Venezuela	10	4	1	4	
<b>Total=94</b>	<b>30</b>	<b>20</b>	<b>12</b>	<b>15</b>	<b>3</b>

Figure 13. The distribution of utterance final tunes in 8 dialects of Spanish.

Similar among all dialect groups is the frequent use of L+H\* as a nuclear accent and a L\*+H as a prenuclear accent. Also, if H+L\* occurred, it was as a nuclear accent. The lack of pitch accent also was far more common in the final content word. The combinations that speakers use are less consistent. This lack of homogeneity may be because different pitch accent combinations are more common in particular dialects, or that these particular speakers preferred a particular combination over another. Another possibility is that speakers were not consistent in their placement of focus. Face (2000) and ToBI Workshop results indicate that L+H\* located in prenuclear position is used to mark focal accent in certain dialects of Spanish. This may account for the nonexistence of L\*+H as a prenuclear accent in Peninsular productions. If these speakers placed

the prefinal word in focus, then they might produce a L+H\* instead of a L\*+H pitch accent. Further investigations need to be completed in order to observe the likelihood of a particular pitch accent used for different types of focus in multiple varieties of Spanish.

#### 4. Boundary tones

##### 4.1. All speakers

The distribution of four boundary tones occurring at four juncture types is provided in Figure 14. The most frequently occurring boundary tone was L%, produced in 43% of the utterances. This edge tone was produced at all four types of junctures, but was overwhelmingly preferred over the other edge tones at the end of complete ideas--accounting for 98% of boundary tones at this type of juncture--and discourse segment--accounting for 90% of boundary tones at this juncture type. The high frequency of L% use in these two contexts suggests that the L% boundary indicates finality and completeness of information. L% boundaries were used less often between words and incomplete ideas accounting for 21% and 32% of boundary tone types used at these junctures respectively. We posit that the boundary used at word junctures indicates continuation of information, or that an idea is not yet complete.

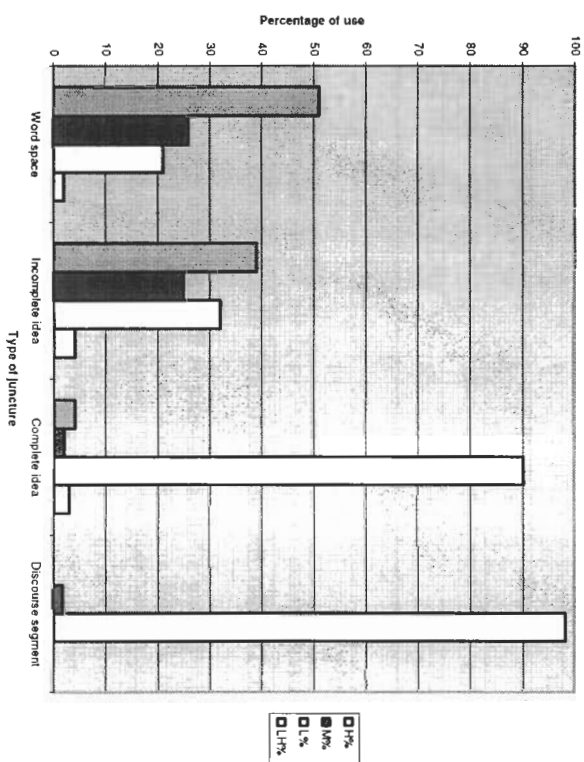


Figure 14. The distribution of edge tone types at 4 types of text junctures.

A rising edge tone, H%, was the most frequently occurring edge tone at word junctures (51%) and incomplete ideas (39%). This boundary tone did not occur at the end of a discourse segment, and represented only 4% of the boundary tones at a complete idea edge. We posit that H% indicates that the information within a phrase is incomplete. This supports Navarro-Tomás' analysis (1948) suggesting that this boundary is associated with incomplete meaning in cases where the listener is expecting the speaker to finish an utterance.

An M% boundary tone was used at the same junctures as the H%, but occurred with less frequency and so we suggest that it has the function of indicating incompleteness as does the H%. LH% boundaries were produced least often in this dataset. They occurred at word boundaries, incomplete ideas, and complete ideas accounting for 2%, 4%, and 3% of edge tones at these junctures, respectively, and never were produced at the discourse segment edge. We cannot posit what this edge tone might indicate given its infrequent use and its similar distribution across three juncture types.

Together, these results indicate that incompleteness or continuation of information is most likely to be indicated with H%, L% and M% edge tones whereas finality is most likely to be expressed with a L% boundary tone. These results are in part supportive of Navarro-Tomás's analysis. While Navarro-Tomás suggests that a falling toneme (L% in our analysis) is used for only finality, we find that it may also be used to convey other types of relationships. He also suggests that a sustained toneme (M% in our analysis) and a rising toneme (H% in our analysis) are used for continuation. Our data concur but also suggest that a mid-rising tone (LH% in our analysis) may also have a similar function. Finally, while Navarro-Tomás posits that a mid rising tones exists, he suggests it is indicates uncertainty. We suggest that a LH% boundary tone may also indicate continuation between information.

##### 4.2. Edge tones across dialects

The frequency and type of edge tones produced by the 8 dialect groups are provided in Figure 15. Three boundary types including L%, H%, and M% occurred in at least some of the productions by all Spanish dialect groups. A L% boundary tone was produced with the highest frequency--in roughly half of the phrases--in 6 of the Spanish varieties including Argentina, Costa Rica, Spain, Mexico, Puerto Rico, and Venezuela. A H% also occurred frequently in productions by these 6 language groups--in roughly a fourth of the phrases. The reverse was true for speakers from Chile and Colombia. The H% was used in about half of their phrases, and L% occurred in about a fourth of the phrases. The M% boundary tone occurred in about a fourth of the productions by speakers from Argentina, Colombia, Spain, Mexico, Puerto Rico, and Venezuela and was produced least often by speakers from Chile and Costa Rica. From the frequency of these three boundary types in productions by the Spanish dialects

we observed, we can posit that the inventory of boundary types in these 8 dialects include a L%, H%, and M%.

What is most interesting from these results is the existence of the LH% boundary tone in 5 of the Spanish varieties. It is produced with much less frequency, but this is potentially influenced by the discourse that the speakers were asked to produce. In other words, the need for a LH% may have been less given the content of the written text. This boundary tone did not occur in any of the utterances produced by Colombian, Costa Rican, and Puerto Rican speakers. It is possible that this mid rising edge tone is not in the inventory of boundary types in these three dialects suggesting that boundary tone inventories may differ among Spanish dialects.

We did not analyze the juncture type where boundary tones occurred for each dialect group. We do not know, for example, if a LH% was produced at the same junctures for speakers using different dialects. Therefore, we cannot suggest that each of the boundary tones has the same function in each of the dialects. We only suggest that the inventory of boundary tones may be different among the dialects that we observed.

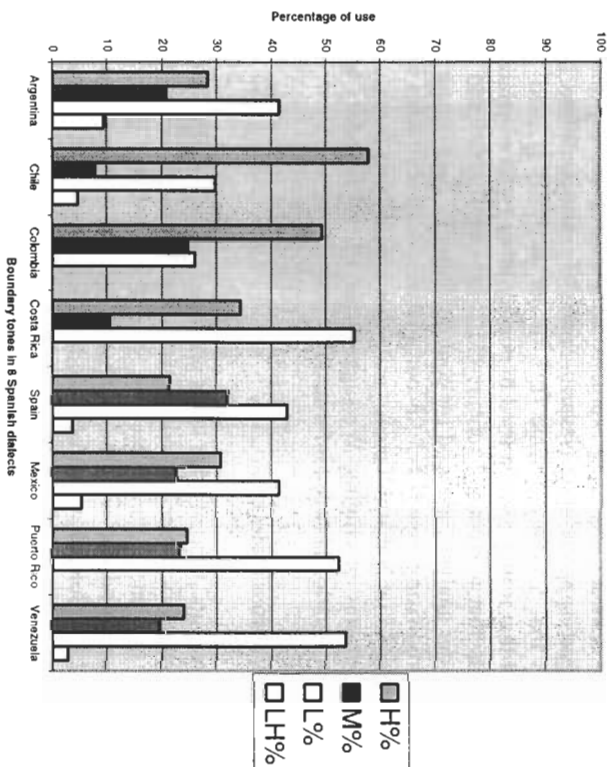


Figure 15. The frequency and type of edge tone in productions speakers of 8 Spanish dialects.

## 5. Conclusion

The present investigation has found multiple pitch accents types in Spanish, whose distribution varies within each dialect. When examining the alignment of pitch patterns within utterance final words, consistent differences in the location of tone targets under conditions of tonal crowding indicate that there are at least three accent types: a L+H\* pitch accent is produced with an accentual peak within the stressed syllable, and a H+L\* pitch accent is produced with an accentual peak in the poststressed syllable, and a H+L\* pitch accent is produced as a fall within the stressed syllable with a H target at the onset of the stressed followed by a fall realized near the end of the stressed syllable. The most frequently occurring combination of pitch accents was a L\*+H followed by a L+H\*. These pitch accents occurred in other combinations as well, but prenuclear L\*+H and nuclear L+H\* were the most frequently used pitch accents. Finally, we were unable to isolate tone targets within the final and prefinal content words in some of the productions for most of the speakers and we suggest that not all content words need to be produced with pitch accents.

There were also differences among dialects suggesting that pitch accent inventories are not the same among Spanish dialects. Notable differences were found in productions by Chilean and Peninsular speakers. For the majority of dialects, L\*+H L+H\* was used most often. However, Chilean speakers were more likely to produce a nuclear H+L\* accent and Peninsular speakers were more likely to use a prenuclear L+H\* pitch accent. This was surprising, given that the tune L\*+H L+H\* L% has been described as prototypical for Peninsular Spanish (ToBI Workshop 1999) and was never used by the Peninsular speakers that we analyzed.

The results of this investigation also reveal that declaratives are produced with multiple edge tone types, and that boundary tone choice is affected by the structure of the discourse. Speakers used an L% boundary tone indicating finality at the edge of informationally complete utterances. It was used almost exclusively at the end of complete ideas and at the end of the entire passage. When the edge of a syntactically complete unit was informationally incomplete, speakers were less likely to use only a L% and multiple boundary types including H%, L%, and M% were produced instead. We also found a LH% boundary tone, one that has not been mentioned in previous analyses of Spanish intonation. This category type did not occur in the productions of all dialects indicating that either the LH% boundary tone is part of only some Spanish dialects, or that the discourse that we analyzed did not require its use.

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## Competence and Performance Differences between Monolinguals and 2nd Generation Bilinguals in the Tense/Aspect Domain

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### 1. Introduction

It has long been observed in the sociolinguistic literature that 2nd and 3rd generation Spanish-English bilinguals in the United States exhibit attrition—loss of language abilities—in many areas of linguistic knowledge, including lexicon, syntax, morphology, and pragmatics. Perhaps due to contact with English, nominal and verbal inflections (gender, agreement, tense, aspect, mood, etc.) are most vulnerable to morphological erosion, simplification, and language loss. According to Lipski (1993), Spanish-English “semifluent” bilingual speakers usually produce errors similar to those of adult L2 learners and child L1 learners of Spanish, yet they appear to have high levels of linguistic competence in other domains, similar to that of Spanish native speakers. Other researchers have also observed that many aspects of first language attrition are more readily observed in production (Andersen, 1982; Dorian, 1991; Seliger, 1983, 1996; Sharwood Smith, 1983). Confirming these observations regarding production or performance errors, Silva Corvalán (1991, 1994) reports that the Preterite/Imperfect morphological distinction becomes neutralized starting with 2nd generation bilinguals, with particular simplification (reduction) of the Preterite with stative verbs; and Zentella (1997) reports instability with the use of the Imperfect tense in the speech of five 2nd generation bilingual speakers of the New York City area, and concluded that their use of tense and aspect markers was very different from that of monolingual Spanish speakers. But because deficits can also show up in comprehension and, indirectly, in competence as well (Seliger 1996, Sharwood Smith 1983), the present study investigates the potential erosion of the Preterite/Imperfect contrast in the Spanish of 2nd generation bilinguals from the perspective of generative grammar, with the aim of characterizing in more formal terms potential divergence in competence and performance of bilingual speakers (see also Sorace, 1999 and Toribio, 2000 for a similar approach).

Within current grammatical theory (Chomsky, 1995) a principled distinction has been made between functional and lexical categories. Lexical categories include verbs, nouns, adjectives, adverbs and prepositions. Functional categories instantiate inflectional morphology or closed-class words (e.g. in English: past and present tense morphemes *-ed*, *-s*, progressive aspect morpheme *-ing*, person and number agreement marker *-s*, relative clause complementizer *that*, etc.), and encode the functional (or grammatical) meanings related to the particular inflectional morphemes, including tense and aspect morphology. Functional