Effects on Deaccenting in Two Speech Styles of Barcelona Spanish

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1. Introduction

While the vast majority of previous work on Spanish intonation has been conducted using a laboratory approach with scripted speech, Face (2003) encourages work on the more natural, and understudied, spontaneous speech (SS). One of the main differences between lab speech and SS that he notes is the higher presence of deaccenting, or the lack of fundamental frequency (F0) movement through stressed syllables, in the latter style. Inspired by this idea, the present study's goal is to investigate eight potential variables that influence this lack of tonal movement in Barcelona Spanish. Data from SS as well as a map task (MT), which approaches natural speech, are examined with regard to deaccenting and what affects it.[1] Though a definition of deaccenting has been established, very little work has uncovered what factors significantly contribute to its occurrence. By focusing on a somewhat mysterious aspect of intonation in speech styles and a dialect that are understudied, this paper aims to address research gaps. The major findings reveal that the following characteristics of a word significantly increase its odds of deaccenting: having fewer syllables (in both speech styles), being an adverb or a verb (in SS), being frequent at a global level (in SS), being recently repeated in discourse (in SS), and being located in initial or medial positions of the phonological phrase (PPH) (in both styles).

1.1 Stress and accent

Ladd (1996) says that *stress* concerns perceived prominence of lexical items in an utterance, whereas *accent* refers specifically to intonational F0 movement, which serves as one possible phonetic cue to the location of perceived prominence. These ideas are also relevant to the Autosegmental-Metrical model (beginning with Pierrehumbert 1980), in which F0 contours are seen as the result of phonetic interpolation between *pitch accents*, which are tonal events that are phonologically specified and associated with lexically stressed syllables (Hualde 2003).

Previous lab speech work on Spanish intonation has informed us that lexical stress can be expressed acoustically in syllables via increases in intensity, duration, and F0. Work in the last two decades, such as Quilis (1993), claims that F0 is the principle acoustic expression of stress and that intensity and duration have a reduced role. In terms of tonal movement, Garrido et al. (1993) and Garrido (1996) posit that a rise in F0, as opposed to its peak, is the most important phonetic signal to a stressed syllable. However, some pitch accents, especially those in nuclear position of declaratives, may show a decrease in F0 through the stressed syllable. Therefore, for the purposes of this study, a stressed lexical item is considered as deaccented when any type of F0 movement is absent from its stressed syllable.[2] An example from the present data of a lack of accent is provided below in Figure 1. In this case, the stressed word, *color* ('color'), in *el mundo es de color de rosas* ('the world is the color of roses'), does not possess any change in F0 and is thus deaccented. In contrast, the other stressed words, *mundo* ('world'), *es* ('is'), and *rosas* ('roses) all demonstrate accent via some degree of F0 movement through stressed syllables.

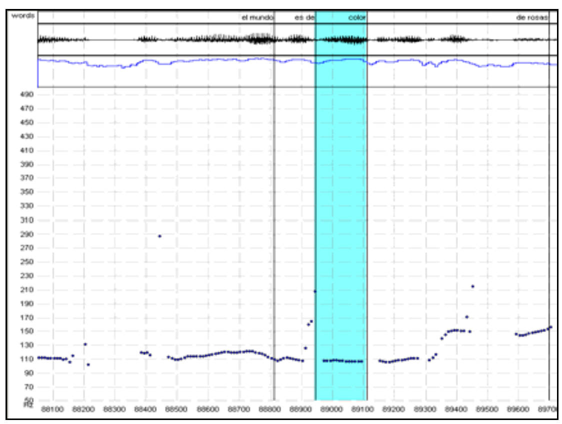

Figure 1: Deaccenting of the word *color* ('color'), belonging to *el mundo es de color de rosas* ('the world is the color of roses').

1.2 Previous studies

The investigation of Face (2003) is among few that have focused on SS in Spanish. In terms of F0 movement through stressed syllables, Face finds that 30% of accentable words in SS in prenuclear position do not have a pitch accent. Of all the deaccented words in this study, the majority are verbs, adverbs, and syntactic determiners. The verbs that are more inclined to deaccent, such as *ser* ('to be'), *haber* ('to have,' 'to have to'), and *estar* ('to be') seem to share the feature of being commonly used. Additionally, Rao's (2006) follow-up to Face reveals that deaccenting is pragmatically associated with low levels of emotion.

Some work on deaccenting in Romance seeks to discover if its occurrence is tied to information structure. Cruttenden (1993) finds that unlike Germanic languages such as English (see Hirschberg 1993; among others), Spanish resists deaccenting of old information. Similarly, Ladd (1996) claims that low levels of deaccenting extend to other Romance languages such as Romanian and Italian. The studies by Avesani and Vayra (2005) and Bard and Aylett (1999), who analyze deaccenting of repeated structures in Italian through dialogue tasks, arrive at a conclusion reflecting that of Ladd. Gussenhoven (2004) echoes this tendency against deaccenting in French as well.

In terms of contexts in which words are more prone to demonstrate deaccenting, de la Mota (1995), Face (2001, 2002), and Prieto et al. (1995, 1996), among others, have shown that it often occurs in cases of pitch reduction, such as final lowering or post-focal situations. Final lowering is often present at the conclusion of ideas. On the other hand, the preference for accenting words to cue stress in nuclear position of the PPH is supported by the fact that this position is the strongest stress position in languages such as Catalan, Italian, and Spanish (see Frascarelli 2000; Prieto 2005; among others). This strength is seen in F0 rises in nuclear position of the PPH that indicate the continuation of ideas.

1.3 Variables of interest

The current study examines the effects of eight independent variables on deaccenting of words in SS and MT data in Barcelona Spanish. The eight variables are shown in (2). Variables (2a), (2b), (2e), (2g) and (2h) are inspired by previous studies, while the remaining three are based on intuition.

(2) Eight independent variables in this study
- a. Repetition in discourse
- b. Recent repetition in discourse
- c. Number of syllables
- d. Stress pattern
- e. Grammatical category
- f. Global high frequency (i.e. generally frequent in Spanish)
- g. Position in the PPH
- h. Position in the IP

The phrase types in (2g) and (2h) derive from Prosodic Phonology (Nespor and Vogel 1986; Selkirk 1984, 1986), which hierarchically organizes constituents in the fashion shown in (3).[3] The top two levels represent ways in which prosody is used to chunk information into units with definite size and internal structure (D'Imperio et al. 2005).

(3) Prosodic Hierarchy (from Selkirk 1984)

IP	Intonational Phrase (Major Phrase)
PPH	Phonological Phrase (Minor Phrase)
PW	Prosodic Word
F	Foot
σ	Syllable

The top three levels are the most relevant to this paper. An IP is a unit that corresponds with a portion of a sentence associated with a characteristic intonational contour or melody. In Spanish, the conclusion of an IP is signaled by a final high (H) or low (L) boundary tone (%) or by a clear pause. A PPH denotes any level of prosodic constituent structure that may include one or more major category words (i.e. Noun, Verb, Adjective, and Adverb). The boundaries of such constituents can be located in Spanish by using cues such as F0 continuation rises ending in the final syllable of a word, final lengthening, large pitch range increases or decreases, and pauses (D'Imperio et al. 2005; Hualde 2003; Prieto 2006; among others). According to Truckenbrodt (1999), the PPH and IP differ in that the former refers specifically to syntactic phrases (XPs), while the latter deals with larger syntactic clauses. A PW is a phonologically relevant idea that plays a metrical role in describing main word stress. Based on the discussion of stress and accent, it is assumed that PWs are prosodically accented, meaning they contain tonal movement through the stressed syllable.[4]

The rest of this paper addresses how the variables in (2) affect deaccenting in the aforementioned speech styles. Specifically, the results of statistical tests will reveal the following: i. which of the variables have significant effects on deaccenting; ii. how the significant variables affect the odds of deaccenting; iii. the interactions among variables; iv. the implications of interactions for deaccenting. Section 2 details data collection and analysis procedures, Section 3 tabulates statistical results and explores their implications, and Section 4 sums up the main findings and suggests avenues for future research.

2. Methods

2.1 Data collection

SS and MT data were collected in Barcelona, Spain, at the *Universitat Autònoma de Barcelona* in a phonetics laboratory. Since Barcelona is a city of constant language contact between Spanish and Catalan, a language history questionnaire helped screen for participants. The data comes from a total of 17 participants; 12 females and 5 males, all between the ages of 19 and 28. For SS, each participant conversed with the investigator about various topics ranging from his/her daily routine to the political situation in Spain. The speakers each produced a total of nine to ten minutes of SS data. The MT was done in pairs. Each speaker had a map of the same city, and each map had numbers of sites to find. The locations of the missing places on one map were given on the other map. The task of each speaker was to ask their partner for directions to six locations. The data comes from the direction-givers.

The collection and analysis of data were done using the PitchWorks software package, a laptop computer, and a head-mounted microphone. In order to minimize the participants' awareness of the microphone, they performed ten to fifteen minutes of other recorded activities prior to the tasks described here.

2.2 Coding scheme for the eight variables

Upon completion of the collection process, the data for both types of speech were transcribed. Since deaccenting applies to words that are stressed, the data sets had to be coded to separate stressed and unstressed words (with the help of Quilis 1993).[5] Each stressed word (henceforth, simply 'word,') was examined for tonal movement through the stressed syllable. Once it was clear which words were deaccented, these items, along with all other stressed words, were further coded in preparation for evaluating the contribution of the variables listed in (2).

It is crucial to clarify how the variables are defined and how words are classified based on different categories of outcomes for each variable. The current method incorporating 'general repetition' in addition to 'recency' was motivated by the fact that previous investigations do not seem to include or specifically define the importance of both of these factors in completely accounting for the relationship between repetition and deaccenting. The definitions of 'general repetition' and 'recent repetition' emerged from the data. Five commonly deaccented words were chosen. For each of these words, the data of each speaker was examined to see how many times the word occurred before it was deaccented, and also how spread apart a deaccented articulation of the word was from its previous iteration. Averaging the results across speakers determined that a word would be classified as 'repeated' if there is one previous occurrence, and as 'recently repeated' if its previous appearance is within the preceding ten PWs.[6] For these variables, words are classified as 'yes' or 'no.'

The remaining variables that do not refer to prosodic constituents were coded in a straightforward manner. Counting the number of syllables in all words led to forming the categories '1,' '2,' and '3+' for SS and '1,' '2,' '3,' and '4' for the MT. The final category for SS collapses all words of more than three syllables in order to facilitate the statistics involved. In terms of stress pattern, words were distinguished as 'oxytone,' 'paroxytone,' and 'proparoxytone.' Words were also grammatically categorized as 'verbs,' 'adverbs,' 'nouns,' 'stressed pronouns,' 'adjectives,' and 'stressed conjunctions.' Furthermore, the value for 'global high frequency' derived from Fuller Medina's (2005) study on verbs, in which this label refers to having at least 2,000 hits in the 20th century in the *Corpus del Español* (Davies 2002).[7] This measure is also a categorical distinction between 'yes' or 'no.'

The final two variables deal with phrasal position of deaccented items, which required dividing the data into PPHs and IPs. Locating each type of phrase boundary was realized by searching for previously mentioned phonetic cues. For PPHs, words were positionally marked as 'initial,' 'medial,' 'final,' or 'single' (a word that is individually phrased in a PPH). At the IP level, words were labeled in the same way. However, in this case, the positional category of each word depends on the location of its PPH within an IP. A representation of this coding scheme is displayed in (4) through a general example. All Ws refer to possible PWs that may or may not be accented.

(4) Coding of the variables 'position in the PPH' and 'position in the IP'

Note: i = initial, m = medial, f = final, s = single, Φ = PPH boundary

	[(W	W	W)Φ	(W)Φ	(W	W)Φ	(W	W	W	W)Φ]IP
PPH category	i	m	f	s	i	f	i	m	m	f
IP category	i	i	i	m	m	m	f	f	f	f

2.3 Statistical procedure[8]

The distribution of words was described by calculating their frequencies across the categories just mentioned of each of the eight variables. Next, a logistic regression with main effects and two-way interactions was carried out. The model was then fit using a generalized linear mixed model with a random effect for subject and a binomial distribution for accenting/deaccenting. The model initially informs us which variables contribute to the probability of deaccenting at significant levels. Finally, odds ratios (or odds multipliers) were generated, indicating the effect of each covariate (i.e. potential influences on deaccenting here) on the odds of deaccenting, with all other things being equal (see Agresti 1996 for details on this type of model). The relationship between odds and probability is shown in the following manner: odds = probability/1-probability.

3. Results

3.1 Spontaneous speech

The process of coding to separate stressed and unstressed words reveals that there are 2,609 stressed words in the SS data.[9] The frequency of deaccented items, 23%, falls in the vicinity of the value documented by Face (2003), 30%. The tables that follow illustrate which variables significantly affect deaccenting, how different categories of the significant variables show effects, and what significant interactions exist between the eight variables.

3.1.1 Are there effects on deaccenting?

The probability that is modeled accounts for the words falling in the 'yes' category of the binary distinction between accented and deaccented words. Table 1 provides the variables and interactions that have a statistically significant effect on deaccenting in SS. Five of the eight variables in question individually have a significant influence: high frequency, number of syllables, grammatical category, recency, and position in the PPH. 'Grammatical category' makes an additional contribution by interacting with both 'high frequency' and 'number of syllables.' This means that one or more of the categories belonging to each of these variables join forces in affecting the odds of deaccenting.

Analysis of Fixed Effects	
Effect	P
High Frequency	.0005
Syllables	<.0001
Category	.0350
High Frequency*Category	.0074
Syllables*Category	.0059
Recency	.0083
Position in PPH	<.0001

Table 1: Analysis of effects ($p<.05$) in SS. Only statistically significant p-values are included.

Table 1 only tells us which variables have some sort of effect on deaccenting. In order to gain a clearer understanding of what is occurring, it was necessary to analyze the effects of each category belonging to the variables in Table 1.

3.1.2 What are the effects?[10]

Describing specific effects is done by obtaining odds ratios that explain these effects in terms of multipliers indicating an increase or decrease in the odds of deaccenting with respect to categories of each variable. In Tables 2-5, the right 'category' column is the reference group while the left column contains an alternate outcome for each variable that either increases or decreases the odds of deaccenting. The repeated columns for 'high frequency' and 'syllables' in Tables 6 and 7, respectively, are interpreted in the same manner, with the right column being the baseline and the left being a substituted outcome.

Table 2 reports how the odds of deaccenting are affected by 'recency' when a word is 'yes' instead of 'no.' From the odds ratio, it is clear that the odds increase when a word is repeated within a ten PW timeframe in that they are multiplied by a value of 1.42. This demonstrates the importance of incorporating the 'recency' component into the more general variable of 'repeated' information, as the former is found to have significant effects, while the latter does not. Since recent repetitions are found to increase the odds of lacking accent, one can posit that they are less prominent and less communicatively important, as they often fail to contain the most common cue to stress in Spanish.

Recency		
Category		Odds Ratio
Yes	No	1.42

Table 2: Effect of recent words on the odds of deaccenting. A recently repeated word increases the odds of deaccenting.

Concerning effects of word length, it is necessary to explain the inability to produce odds ratios associated with the '3+' category. This is caused by zeros in the data structure. Due to the interactions between the 'high frequency,' 'syllables,' and 'grammatical category' variables, the analysis of the former two was broken out by grammatical category. However, 'pronoun' did not yield any words that are longer than two syllables in length, and therefore the '3+' category for the 'syllables' variable has values of zero for the aforementioned grammatical category. Although this problem arose, we can still show the effect of having words of one syllable in length as opposed to two. The comparison in Table 3 demonstrates that when words have one syllable rather than two, the odds of deaccenting increase by a factor of 1.61. Therefore, it appears that shorter words increase the likelihood of deaccenting based on odds. The short length decreases the possible duration for F0 movement to occur, which increases susceptibility to not include a pitch accent. This is especially true in SS, where speech rates are increased when compared to scripted speech styles.

Number of Syllables		
Category		Odds Ratio
1	2	1.61

Table 3: Effect of number of syllables on the odds of deaccenting. Shorter words seem to increase the effects on deaccenting.

In Table 4, it becomes clear that the hierarchy of increased odds of deaccenting based on grammatical category is as follows: verb >> adverb >> adjective >> noun.[11] The first row reveals that an adverb as opposed to an adjective increases the odds of deaccenting while the second reveals that when adjectives are present instead of nouns, the odds increase as well. Therefore, by transitivity, we expect an increase in odds when adverbs are present rather than nouns as well. The fourth row of the table shows just that, as the odds increase in adverb versus noun cases by a multiplier of 1.19. Finally, the third, fifth, and sixth rows of the table point to an increase in the odds when verbs are present instead of any of the other three categories just mentioned. Overall, the findings for verbs and adverbs support Face (2003).

Category of Word		
Category		Odds Ratio
Adverb	Adjective	1.14
Adjective	Noun	1.05
Verb	Adjective	1.33
Adverb	Noun	1.19
Verb	Adverb	1.17
Verb	Noun	1.39

Table 4: Effects of different grammatical categories on the odds of deaccenting. Verbs and adverbs have the strongest effects.

Table 5 suggests a hierarchy of positions in the PPH with respect to effects on the odds of deaccenting. Upon evaluating each row of the table, the ranking that emerges is: medial >> initial >> final >> single. When looking at a word in initial or medial position of the PPH instead of a word that is phrased in its own PPH, the odds in the former two positions increase by immense multipliers over 20. The comparison 'final' versus 'single' also reveals that the former category increases the odds of deaccenting by a considerable factor of 4.80. This propensity to accent words that are individually phrased seems to make sense for two reasons: i. a PPH should contain at least one PW; ii. Face (2002) states that placing PWs in their own PPHs is a strategy of conveying narrow focus, which is definitely not a condition conducive to the absence of a pitch accent. Furthermore, in rows one and two, we observe that a word in initial or medial position rather than final position leads to odds increases by factors of over four in both cases. The preference for accenting words in final position of the PPH supports the claim that this position is the strongest stress position in many Romance languages. Finally, the fourth row conveys that when a word is medial rather than initial, the odds of deaccenting increase by a factor of 1.16. The ratio close to one indicates that the effects are fairly close to equal.

Position in PPH		
Category		Odds Ratio
Initial	Final	4.18
Medial	Final	4.85
Final	Single	4.80
Medial	Initial	1.16
Initial	Single	20.11
Medial	Single	23.31

Table 5: Effects of different positions in the PPH on the odds of deaccenting. Initial and medial positions show the strongest increase in odds.

3.1.3 Effects with interactions

When breaking out 'high frequency' by 'grammatical category' we see that the former variable significantly affects adverbs (p=.0108) and verbs (p=.0009). This is not surprising, as these two grammatical categories possess ratios in Table 4 that establish that they increase the odds when replacing adjectives and nouns. In order to discover the effects of 'high frequency' in this interaction we must obtain odds ratios.

Table 6 provides the odds ratios for significant effects on grammatical categories when a word is 'yes' instead of 'no' with regard to the 'high frequency' variable.[12] The results for adverbs show that when a word is frequent rather than not, the odds of deaccenting increase by a large multiplier of almost 7. Furthermore, when a verb fits in the 'yes' category as opposed to 'no,' the odds increase considerably, by a factor of 2.65. Therefore, the interaction of adverbs and verbs with 'high frequency' produces higher odds ratios than observed in the previous section for these word types. The increased odds of deaccenting caused by global high frequency could be due to speakers failing to signal stress on such words that do not fulfill a communicatively crucial role.

Simple Effect Comparisons of High Frequency*Category by Category			
Category	High Frequency	High Frequency	Odds Ratio
Adverb	Yes	No	6.99
Verb	Yes	No	2.65

Table 6: The effects of 'high frequency' on the odds of deaccenting of words belonging to different grammatical categories. The results for adverbs and verbs are significant. Frequent words increase the odds in both cases.

The second significant interaction is between a word's number of syllables and its grammatical label. The results in Table 7 indicate that deaccenting of adverbs ($p<.0001$), nouns ($p=.0232$), and verbs ($p=.0002$) is significantly affected by the number of syllables in each type of word. Now that we know the domain of significant effects, we will once again employ odds ratios to explain them.

Even though there are overall significant effects of number of syllables on adverbs, verbs, and nouns, there are some cases within each category of word in which the effects are not statistically significant. Only those odds ratios associated with significant effects are illustrated in Table 7. Based on this table, it is apparent that shorter words increase the odds of deaccenting when compared to longer words. For example, when replacing an adverb of two syllables with a word of the same class containing one syllable, the odds increase by a factor of 3.64. When considering two syllable adverbs versus those with three or more, the odds increase by a similar factor of 3.45. The second row, which takes one syllable adverbs instead of those with more than three syllables, reveals that the odds greatly increase by a multiplier of 12.53 (as predicted by transitivity). The increase in odds shown for nouns, in the fourth row of Table 7, provides further support for the idea that shorter words are more likely to deaccent. In this instance the odds increase by a factor of 2.14. When a verb of one syllable in length is present instead of a verb with three or more syllables, the odds increase by around 3. Finally, when a verb with two syllables is produced instead of one with three or more syllables, the odds increase by a factor of 2.28. Overall, due to the results in Table 7, we can posit that shorter, deaccented words may not be perceived as being as informationally salient as longer words with much lower odds of deaccenting.

Simple Effect Comparisons of Syllable*Category by Category			
Category	Syllable(s)	Syllable(s)	Odds Ratio
Adverb	1	2	3.64
Adverb	1	3+	12.53
Adverb	2	3+	3.45
Noun	2	3+	2.14
Verb	1	3+	2.90
Verb	2	3+	2.28

Table 7: The effects of 'number of syllables' on the odds of deaccenting words belonging to different grammatical categories. Shorter words increase the odds across significant grammatical categories.

3.2 Map task

Once the MT data was coded, it was determined that 24% of the 1,340 stressed words are deaccented. This value is almost identical to the frequency for SS, which supports the position that production in MTs much more closely resembles SS than lab speech. The following tables illustrate which variables have significant effects on deaccenting and what those effects are in the MT.

3.2.1 Are there effects on deaccenting?

Table 8 provides the significant effects on deaccenting in the MT data. When comparing this table to Table 1, we notice that the effects here are less complex with fewer variables involved.[13] The picture is further simplified when we see that there are no significant interactions to report. As was the case in SS, the number of syllables and the position in the PPH significantly influence deaccenting in some way. In order to view the exact effects, we must look at odds ratios comparing categories belonging to each variable.

Analysis of Fixed Effects	
Effect	P
Syllables	<.0001
Position in the PPH	.0002

Table 8: Analysis of effects ($p<.05$) for MT data. Only significant outcomes are given.

3.2.2 What are the effects?

With regard to the overall odds ratios in Table 9, we see that the findings support those of SS in that fewer syllables seem to make a word more prone to an absence of accent. The one curious outcome that goes against this trend is found in the first row of the table, when considering cases of one instead of two syllables. However, this should not be too alarming, since the odds ratio is close to one, meaning these two word lengths more or less equally affect deaccenting. In all other rows of the table, when we have fewer syllables rather than more, the odds of deaccenting increase. It is interesting to note that odds ratios are the highest in rows three, five, and six, when comparing four syllable words to those with fewer syllables. This allows for the claim that longer words clearly decrease the odds of deaccenting, possibly because such words are generally important to the content of an utterance.

Number of Syllables		
Category		Odds Ratio
1	2	.88
1	3	1.52
1	4	3.30
2	3	1.72
2	4	3.73
3	4	2.17

Table 9: Effects of number of syllables. In general, shorter words increase the odds of deaccenting.

In terms of position in the PPH, the MT results are similar to those found for SS. After focusing on each row of Table 10, the order of effects on deaccenting that develops is the same as we had for SS: medial >> initial >> final >> single. However, a distinction is made in the MT data, in that medial position separates itself from initial position. When taking medial position instead of any other, as seen in rows two, four, and six of Table 10, the odds of deaccenting increase by about two or more. The ratio in row one, which is very close to one, indicates that initial and final positions almost equally affect deaccenting, which was not the case in SS, where the former much more clearly increased the odds than the latter. Finally, words housed in their own PPHs decrease the odds of deaccenting, as one would expect based on the rationale from the SS data. The strong effect of medial position is further advanced when comparing rows three, five and six. When compared to the ‘single’ category, medial position increases the odds by a multiplier two times as large as that of the other positions. In sum, the hierarchy of increasing the odds is the same in both speech styles, but here medial position is on the top tier, initial and final positions on the middle tier, and single on the bottom. The fact that final position decreases the odds when compared to initial and medial positions still supports the idea that nuclear position is the most salient in PPHs. However, the results hint that initial and final positions could be more closely related than we previously thought.

Position in PPH		
Category		Odds Ratio
Initial	Final	1.07
Medial	Final	2.10
Final	Single	3.07
Medial	Initial	1.95
Initial	Single	3.30
Medial	Single	6.44

Table 10: Effects of different positions in the PPH on the odds of deaccenting. Medial position shows the strongest increase in odds.

4. Conclusion

This paper discussed a detailed empirical study of deaccenting in Barcelona Spanish in SS and a MT. Based on the overall results, we can posit that the following are characteristics of words that significantly increase the odds of deaccenting: having fewer syllables, being adverbs or verbs, being frequent at a global level, being recently repeated in discourse, and occupying initial or medial positions of PPHs. Overall, more factors significantly contribute to the odds of deaccenting in SS than in the MT. Therefore, as we approach SS from other speech styles, the effects on deaccenting become more intricate.

The statistically significant variables point to the fact that a lack of accent occurs more in words that are not central to the meaning of an utterance. This finding is noteworthy because it suggests that there is a communicative function present when speakers do not include accent. That is, through deaccenting words, speakers decrease perceptive salience, thus further distinguishing informationally important words from those that are not.

In future research, we must attempt to answer the following questions regarding the status of deaccenting: Is it the case that a pitch accent corresponding with tonal targets is present and then removed by some phonological process? Or, on the other hand, is a lack of F0 movement in pitch contours only a phonetic correlate to stress? Also, since dialectal variation is common across languages, it would be fruitful to carry out related studies based on Latin American Spanish. Finally, another important covariate to consider in relation to deaccenting is distance between neighboring stresses, which comes to mind based on research on Catalan (Prieto et al. 2001).

In sum, this study contributes to the field of Spanish intonation by reporting new findings on factors that lead to deaccenting in speech styles that have not received much previous attention. Hopefully it will serve as a point of departure for further investigations of accent in Spanish and other languages.

Notes

[1] Face (2003) believes that when compared to other types of data elicitation tasks such as story retelling and dialogue games, MT data most closely resembles SS.

[2] 7 Hz (similar to O'Rourke 2006) was used as a threshold value for tonal movement as a cue to stress. However, as Willis (2002) mentions, stress can be conveyed via intensity and duration (which are not of interest here). In fact, a recent study by Ortega-Llebaria and Prieto (2007) on Castilian Spanish and Catalan finds that speakers rely on duration and intensity to perceive stress.

[3] Early work using this hierarchy also included a Clitic Group level between the PW and PPH. This level has been excluded from the hierarchy in more recent studies.

[4] Quilis (1993) provides an extensive list of types of stressed and unstressed words in Spanish.

[5] Factors such as emphasis and changes in speech rate, which are characteristic of spontaneous speech, can result in pitch accents associated with normally unstressed words. This only occurred a few times in the present study. A couple examples are *pero* ('but') and *porque* ('because').

[6] For repetition, recent repetition, and global high frequency, all conjugations of verbs were classified based on their infinitive form. Thus, if *soy* ('I am') appears five PWs before *somos* ('we are'), the second of these words is considered recently repeated because both come from *ser* ('to be').

[7] We have intuitions about 'high frequency words,' but in order to statistically incorporate such a category, it is necessary to provide a precise definition that can be implemented in a coding scheme. However, Fuller Medina (2005) does not explain why she chose 2,000 as her threshold value.

[8] Thanks to Jerome Braun of the UC Davis Statistics Lab for his help with the statistical analysis.

[9] The frequencies at which words belong to the categories described for each of the eight variables are not given here due to length restrictions.

[10] The fact that pronouns were all found to be 'high frequency' turned out to be a problematic issue because it resulted in zeros in the data structure, since there were no pronouns belonging to the 'no' category of this frequency variable. This was discovered after the first part of the logistic regression was carried out and unfortunately prevented obtaining odds ratios for the 'high frequency' variable. On the other hand, nothing impedes an analysis of the interaction between 'high frequency' and 'grammatical category,' since pronouns were discarded before the final phase of the statistical test.

[11] Many deaccented verbs here are presentational verbs such as *ser* ('to be') and *estar* ('to be'). Blake (p.c.) notes that this makes sense intuitively since such copula are not present in some languages.

[12] This analysis is done using *least squares means*, which estimate the marginal means of specific factors of interest. A mean is considered *marginal* when it concerns only the factor of interest.
[13] Based on intuition and the documented process of final lowering, a variable called 'IP-final' was incorporated in the MT analysis. Results, in the form of large odds ratios, show that this position powerfully influences deaccenting, as one would expect.

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