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# MEXICAN & CHICANO SPANISH PROSODY: DIFFERENCES RELATED TO INFORMATION STRUCTURE

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This study addresses the intonational encoding of new and given information by monolingual Mexican speakers of Spanish and Spanish/English Chicano heritage speakers. Spanish is a so-called non-plastic language, which tends to encode novel information in a speech signal with word order. Meanwhile, English is known as a plastic language, which uses pitch excursions to signal new information. This study compares the acoustic correlates of information structure in a naturalistic corpus of semi-directed interviews in order to evaluate dialectal variation in the prosodic encoding of new information. It was hypothesized that bilingual speakers would use more pitch excursions for new information due to the fact that they also speak a plastic language, namely English. The results conclude that bilingual Chicano speakers do in fact use more plastic, or English-like, pitch excursions to encode new information, as compared to the monolingual speakers. This study is novel in its use of naturalistic language, rather than experimental tasks in examining information structure and in its use of a mixed-effects model to verify the results.

## INTRODUCTION

In order to ease the processing load of parsing a speech signal, speakers resort to different strategies to mark novel information in discourse. In general, languages typically use two ways to signal novel information- either prosodic cues or structural (i.e. word-order) changes to the sentence. This paper addresses the manner in which two dialects of Spanish signal new information. The dialects examined are monolingual Mexican Spanish and bilingual Chicano Spanish. These dialects make for an interesting comparison as the Mexican speakers speak what is known as a *non-plastic language*, i.e. a language that uses word order manipulations, rather than pitch excursions to signal new information. Meanwhile, in addition to Spanish, the Chicano speakers also speak English, which has been described as a *plastic language*, using prosodic cues, intonation in particular, to signal new information. This comparison allows a perspective on the effect of English on the prosodic system of Chicano bilingual Spanish, which could explain general differences in pronunciation compared to monolingual Spanish speakers. The following section will introduce the topic of information structure, followed by a description of the methods used in the current paper, including participants, data, and the statistical evaluation. The results and a discussion of the implications of this study conclude the paper.

## Information Structure

In speech, contents can be divided into *new information* and *given information*. New information is content that is novel to the discourse (akin to the linguistic notion of narrow focus), while given information is content that has already been mentioned in the discourse (akin to the linguistic notion of broad focus). In order to facilitate the parsing of speech for the listener, a speaker will often mark new information, making it more salient, while given information is not similarly marked. Two different strategies are typically used to draw the listener's attention to new information- intonation and word order. Those languages that are said to use the former strategy are called *plastic languages*. For instance, Dutch and English use intonation to mark information status (Vallduví, 1992). Languages that use the latter strategy are called *non-plastic languages.* These languages generally have more variable word order, and thus employ syntactic rather than prosodic cues in the signaling of new information. Languages such as Catalan and Spanish are non-plastic languages (Cruttenden, 1993; Zubizarreta & Nava, 2010).

While Spanish has been described as a non-plastic language, there are few studies about intonation of different varieties of Spanish, although the articles collected in Prieto and Roseano (2010) and Butragueño (2004) do analyze several aspects of intonation in several dialects of Spanish. There are especially few studies about prosodic correlates of information structure in Spanish (e.g. Cruttenden, 1993), and none, as far as we know are based on naturalistic speech; past studies on information structure are based on controlled elicited or read sentences. However, the use of spontaneous speech as opposed to experimental settings provides data that are closer to actual language usage; natural recorded speech is more likely to reflect spoken prosodic patters since "[i]t is well known that there are differences between read and unscripted speech" (Deterding, 2001, p. 220). Furthermore, previous literature about pitch and information structure in Spanish (e.g. Cruttenden, 1993) fails to address dialectal variation or the effects of bilingualism (an aspect also criticized in Arvaniti & Garding, 2007 for English). In comparison, the current study addressed two different dialects of Spanish and the effects of English on the prosodic systems of Chicano bilingual speakers.

## Research Questions

As mentioned above, work on prosodic encoding of new and given information has been carried out mostly with controlled elicited or read utterances. However, we extend current research by investigating naturalistic speech. The current study investigates monolingual Mexican Spanish and bilingual Chicano Spanish in their prosodic encoding of information structure. Our research questions were as follows:

- Would we find evidence of dialectal variation between monolingual Mexican speakers and bilingual Chicano speakers in their use of prosody to signal new information using a corpus of semi-directed interviews?
- Given our study of heritage speakers – i.e. early bilinguals – would we find that these speakers use pitch to signal new information, as is customary in English (but supposedly not in Spanish)?
- What prosodic variables and/or interactions are relevant in the encoding of information structure by Spanish speakers in general?

As mentioned, monolingual Mexican speakers speak a non-plastic language, whereas, bilingual Chicano speakers initially acquire the Spanish prosodic system, but later (usually during primary school) they also acquire the prosodic system of American English, a plastic language. The Chicano Spanish portion of the corpus was comprised of speakers who principally spoke Spanish with their family, only acquiring English at a later age (but always before 8 years of age, although the participants felt that they were dominant in English). It is accepted that the prosodic system is acquired at a very young age. For instance, Nazzi, Bertoncini, & Mehler (1998) showed that infants and neonates can distinguish between their native speech rhythms and non-native speech rhythms. Thus, it is reasonable to assume that the Chicano speakers acquired a complete monolingual Spanish prosodic system. However, as mentioned, they later became dominant in English, a plastic language. The current study hypothesizes that the influence of the English prosodic system will be detectable in the Spanish of Chicano speakers. That is, due to their use of a plastic language, the Chicano speakers will resort to more pitch excursions in the signaling of new information, as compared to the monolingual Spanish speakers.

## METHODS

This section will describe the methodology used to investigate the prosodic encoding of information structure in Chicano and Mexican Spanish. It will describe the participants and data, and the statistical evaluation, including the variables used in the modeling process.

### Participants, Data Annotation, and Analysis

The data was taken from a specialized corpus of naturalistic speech compiled for the comparison of bilingual Chicano English and Spanish to various dialects of monolingual English and Spanish. The corpus consists of a series of semi-directed interviews with participants responding to open-ended questions. Each interview is approximately ten minutes in duration. For the current study, the files of 10 monolingual Mexican Spanish speakers (SpeakerType: monolingual) and 10 bilingual Chicano English/ Spanish speakers (SpeakerType: bilingual) were used in the data tagging process. Each group was demographically equivalent. The Mexican speakers consisted of 5 males & 5 females between the ages of 18 and 25 who were born and raised in the greater Mexico City area. These speakers had never extensively studied a language other than Spanish, nor lived in a foreign country. They were all enrolled in a four-year Mexican university at the time of recording. The Chicano speakers also consisted of 5 males & 5 females between the ages of 18 & 25. These were second-generation Californian Spanish speakers (Heritage Speakers). This means that they were born to Mexican parents in the United States who had emigrated from Mexico during or after adolescence and the participants all indicated that they spoke Spanish with their family. These Chicano participants were all enrolled in a four-year Californian university at the time of the recording.

As mentioned, the corpus is comprised of unscripted speech consisting of subjects' narrative responses to recorders' prompts. This study chose to focus on nouns mentioned two or more times by a speaker. From the relevant corpus files, 420 nouns were manually tagged using

Praat (Boersma & Weenink, 2012) for first and subsequent mention(s) of the noun. The data collected for each mention of the noun included a) whether it was the first time the word occurred in the file or a subsequent repetition; b) whether the noun occurred in utterance final

position, c) whether pitch movement (i.e. a pitch excursion) occurred across the word, d) the duration of the stressed vowel, e) maximum intensity, f) what the word was, and g) who the speaker was. Specifically, this tagging involved two types of variables; namely, fixed effects and random effects. Fixed effects are the so-called independent variables or predictors that may be 'causes' for behavior of the dependent variable. Random effects account for speaker- or lexically-specific variability in the data by adjusting intercepts of the predictors according to the participant and the word. The tagging was performed by trained linguists in the Phonetics Lab in the Department of Spanish and Portuguese at the University of California, Santa Barbara and is summarized below:

Dependent Variable:

- PitchMovement: if speaker displayed pitch movement across the word, yes vs. no;

Fixed Effects:

- SpeakerType: monolingual vs. bilingual;
- SpeakerSex: male vs. female;
- Givenness: if information is new vs. given;
- LogDuration: the logarithmic transformation of the length of the stressed vowel in ms;
- PhraseFinal: if the word is in final position in the intonational unit (IU), yes vs. no;
- Intensity: peak intensity of the word in decibels (dB);

Random Effects:

- Informant: makes adjustments to intercepts according to the speaker to account for individual variation;
- Word: makes adjustments to intercepts according to each word to account for variation;

Given that the focus of this paper is on the use of tone excursions to signal new information, the inclusion of LogDuration, Intensity, and PhraseFinal in this analysis may seem superfluous as they do not directly address tone or givenness. However, they are necessary. Consider LogDuration and Intensity first. It is well accepted that pitch, duration, and intensity often work in conjunction in naturalistic language. For instance, these cues have been shown to increase for lexical stress (e.g. Fry 1958). Thus, it is important to consider that intensity and vowel duration may increase when tone excursions occur (whether to signal new information or otherwise). Thus, these variables may shed light on differences between the prosodic systems of monolingual and heritage speakers of Spanish. More importantly, these variables provide a more accurate model in that any variation due to intensity and duration are not misidentified by the model as being related to PitchMovement and Givenness. In a similar manner, PhraseFinal is important because duration is known to increase in phrase final position. As prosodic cues often work in union, it is important to control for phrase final position within the data in case tone excursions are more prevalent at the end of an utterance.

After the data tagging process, a generalized linear mixed-effects model selection process was performed. A *linear model selection process* means that interactions between two variables and then individual variables were deleted from a maximal model containing all two-way interactions and variables if they did not significantly contribute to the prediction of the dependent variable, PitchMovement. All statistical analysis was performed using R (R Development Core Team, 2013).

## RESULTS

Two predictors were discarded during the model selection process- SpeakerSex and Intensity, leaving a final model with four significant predictors- the three main effects Givenness, LogDuration, PhraseFinal and the significant interaction Givenness : SpeakerType. The final model's performance is intermediately good (*C=0.762; marginal R2=0.22; classification accuracy=71%*).

Table 1

*Significant Variables and Interactions in Predicting PitchMovement (yes or no)*

| Significant predictors | Significant interaction |
|---|---|
| Givenness | Givenness : SpeakerType |
| LogDuration | |
| PhraseFinal | |

The following sections will discuss the interaction Givenness : SpeakerType, then the two significant predictors that do not participate in this interaction, namely LogDuration and PhraseFinal.

### Givenness : SpeakerType

The analysis returned a marginally significant two-tailed *p*-value of 0.0505 for the interaction Givenness: SpeakerType; however, since the hypothesis about the Chicano speakers was directional, this result reflects a significant one-tailed *p*-value of 0.02503. Consider *Figure 1*.

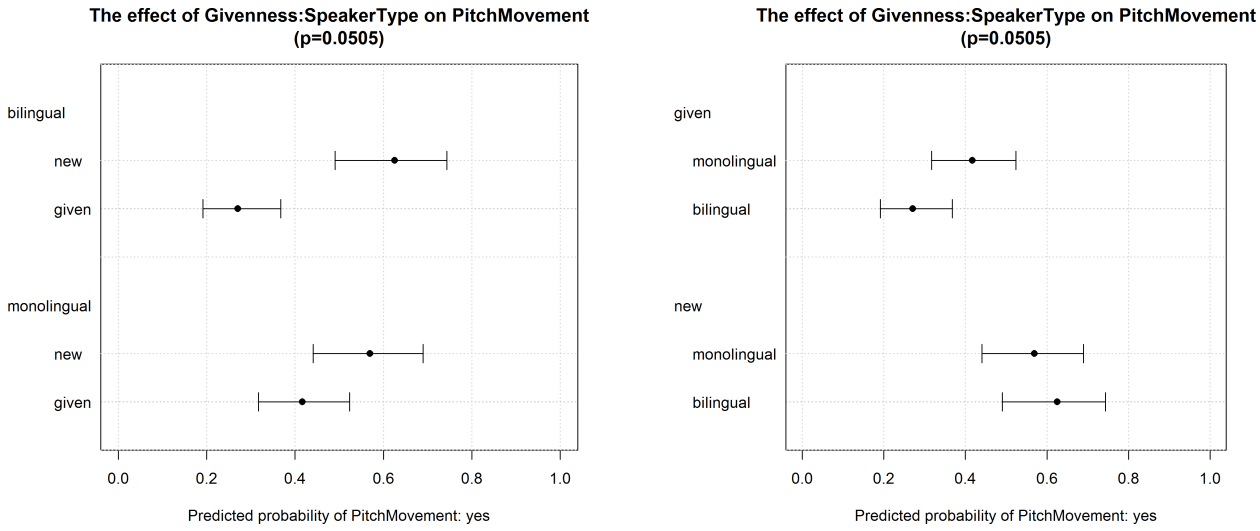


*Figure 1.* The interaction Givenness : SpeakerType. The *x*-axis represents the predicted probability that pitch movement occurs across the word. The left and right panels show different perspectives of the same effect.

This interaction shows that the Spanish of both monolingual Mexican speakers and bilingual Chicano speakers uses pitch movement to signal new information. However, while both speaker types use pitch movement for new information, they do not use pitch movement in the same way. Specifically, Chicano speakers use pitch movement more often for new information, as compared to the monolingual speakers; notice that while the direction of this trend is the same for both speaker types, there is no overlap between the predictions for new and given information for the bilingual speakers, while there is an overlap for monolingual speakers. This is to say that bilingual speakers have a more plastic (or English-like) use of pitch, which is compatible with this study's hypothesis. This suggests that the English prosodic system influences the Spanish prosodic system of bilingual speakers. Furthermore, monolingual speakers not only use more pitch excursions for new information, they also use less pitch excursions for given information. Thus it appears that the English prosodic system not only influences bilingual Spanish by causing more pitch movement for new information, but also causes flatter pitch contours in given information.

### Phrase Final

Whether the word was phrase final or not was a significant predictor of PitchMovement in the model. *Figure 2* shows that both speaker types are more likely to show pitch movement when a word is phrase final.

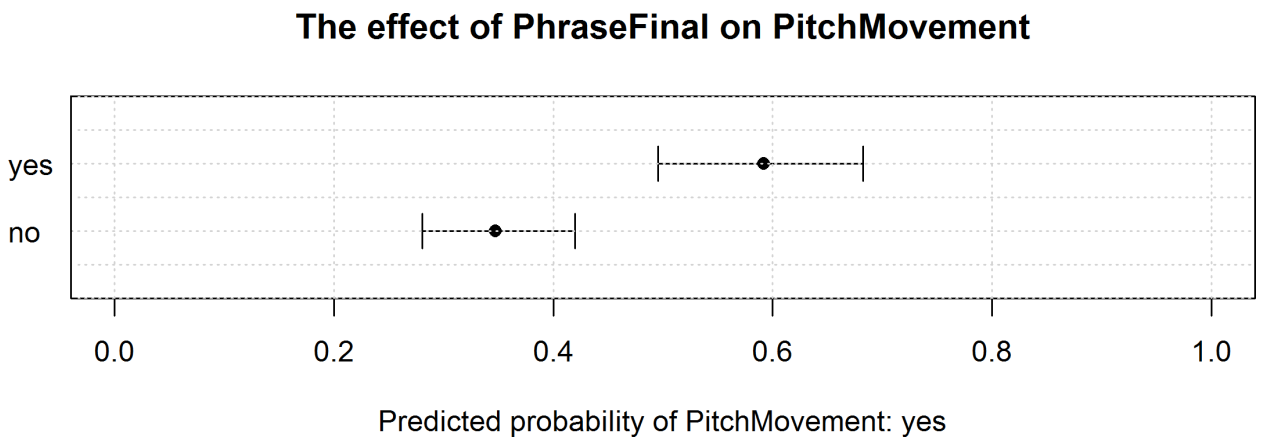


*Figure 2.* PhraseFinal's effect on pitch movement. The *x*-axis represents the predicted probability that pitch movement occurs across the word. The phrase final words are represented higher on the graph while those words that are not phrase final are lower.

In addition to signaling new information with pitch excursions, both Chicano and Mexican Spanish speakers use pitch movement for other purposes. Specifically, this effect shows that both speaker types use pitch movement at the boundaries of intonational units; therefore, the position of the analyzed word within the phrase needs to be controlled for. Thus, we can conclude that pitch movement is also used in Spanish (or at least in the Mexican and Chicano dialects of Spanish) as an indicator of phrase boundaries. This corresponds to previous findings for characteristic intonation patterns of Chicano English (Ericson, 2007), suggesting that the same factors that are present in the intonation of Chicano English are likely also present in Chicano Spanish.

**LogDuration**

The previous two effects have shown that both monolingual Mexican speakers and bilingual Spanish speakers use pitch movement to signal new information and mark the end of phrases. The current effect of LogDuration shows that pitch movement is also correlated with an accompanying increase in the duration of the stressed vowel.

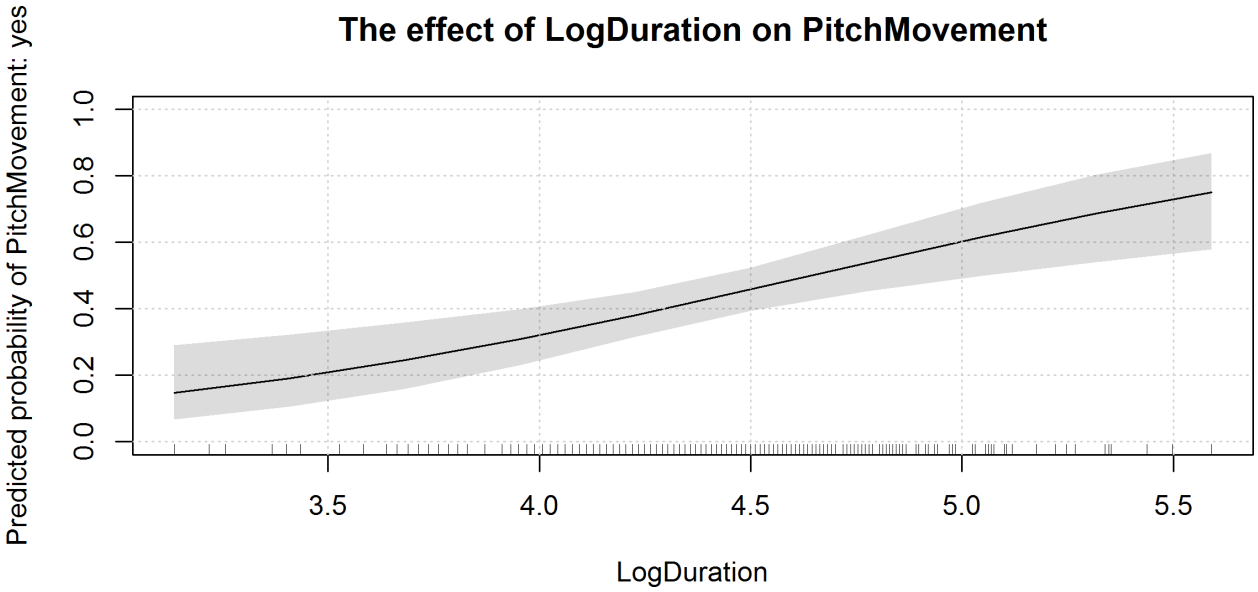


*Figure 3.* The Log of Vowel Duration's effect of PitchMovement. Vowel durations are represented on the *x*-axis, with longer durations to the right and the probability of pitch movement is represented on the *y*-axis.

As *Figure 3* shows, more pitch movement is associated with longer durations of tonic vowels. Thus, it is likely that the participants also employ longer durations to indicate new information in conjunction with pitch movement. This is in agreement with previous literature; as mentioned, increased durations work in conjunction with pitch in order to indicate, for instance, lexical stress (e.g. Fry 1958). It should be noted that Fry (1958) also suggested that intensity works in conjunction with these two prosodic cues. However, intensity was not a significant predictor of PitchMovement in our data. This finding could be in tune with previous literature, according to which intensity tends to be a less dependable prosodic cue. In fact, at least in terms of stress, it has been suggested that intensity is a less reliable correlate as compared to segment duration and F0- it is "generally considered a weak cue in the perception of linguistic stress" (Sluijter & van Heuven, 1996, p. 2471).

## DISCUSSION

This paper set out to compare the use of pitch by monolingual Mexican speakers and bilingual Chicano speakers in signaling new information. The data suggest that:

a) pitch movement is used to indicate new information;

b) pitch movement is also used to mark the end of phrases;

c) speakers increase vowel duration in conjunction with pitch movement;

Our three research questions are therefore addressed in the following way, As for question 1, we found evidence of dialectal variation between monolingual Mexican speakers and bilingual Chicano speakers in their use of prosody to signal new information using a corpus approach

rather than an experimental one. In terms of a) above, it is clear that heritage speakers use pitch differently than monolingual speakers. Most specifically, and addressing question 2, they use pitch excursions more often to signal new information, and therefore encode new information in a more English-like manner, as compared to monolingual speakers. Question 3 was about what prosodic variables and/or their interactions are relevant in the encoding of information structure by Spanish speakers in general. For this question, a) to c) above indicate that duration and pitch movement are correlates of prosody indicating new information for these Spanish speakers; on the other hand, it appears that neither Chicano Spanish-English bilinguals nor Mexican monolingual speakers use increased intensity as a prosodic marker of information structure, given that the variable Intensity was not a significant predictor in the model. Although heritage speakers are more akin to native speakers than L2 learners in many aspects of their prosody (e.g. Harris & Gries, 2011; Miglio, 2011), our data show that their use of English still affects some aspects of their intonation.

In terms of the applications of this study to language teaching, empirical evidence that differences exist in the intonational systems of two closely related dialects of the same language proves important. The fact that it is the influence of English that apparently causes this dialectal variation is notable, especially given the high number of English-speaking students of Spanish as a second language. For L2 (English speaking) learners of Spanish, we should make them aware that word order can be used to indicate focus in Spanish, and is usually manipulated for that purpose by native speakers, as English speakers are likely unaware of this. We should teach information structure to both L2 and heritage learners, who are likely unaware that speakers use various strategies in order to differentiate between new and given information, as well as teaching intonation in other contexts, such as interrogatives sentences, emphasis, or contrastive focus. Furthermore these data are informative of dialectal differences between L1 and heritage Spanish, which lead to a better understanding of heritage Spanish (for language learners and teachers alike). They serve as an example of a unique feature of Chicano Spanish, which should be represented as a valid dialect of Spanish, rather than a substandard hybrid of Spanish and English. In any case, these data constitute an interesting example of the effect that the prosodic system of one language can have on that of another in bilingual speakers.

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