

Prosodic Consequences of Sarcasm Versus Sincerity in Mexican Spanish*

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This study compared the prosody of sarcastic and sincere attitudes in Mexican Spanish in terms of three sentence-level factors (i.e. fundamental frequency (F0) mean, F0 range, and speed of speech) and three word-level factors (i.e. stressed syllable duration, F0 movement, and stressed vowel intensity). For F0, the connection between utterance-final activity and attitude was also examined. Acoustic and statistical analyses comparing both attitudes based on gender and relative communicative importance of words revealed that across speakers, sarcasm resulted in decreases in speech rate and F0 mean and increased stressed syllable length in attitudinally relevant words. In expressions of sarcasm, males significantly decreased F0 range and movement in relevant words and stressed vowel intensity in all words. They also displayed evidence of an utterance-final circumflex F0 configuration, namely in cases of sincerity. These results expand our knowledge of attitude's effects on prosody, in general, and of Mexican Spanish prosody, in particular.

Key words: sarcasm, sincerity, duration, F0, intensity, Mexican Spanish

1. Introduction

Work on Spanish prosody in the past three decades has examined issues such as the intonational patterns of declaratives and interrogatives, manifestations of broad and narrow focus, and stress, among others (Quilis 1993, Prieto et al. 1995, 1996, Prieto 1998, Sosa 1999, Face 2000, 2001a, 2001b, Beckman et al. 2002, Face 2002, Hualde 2002, Face 2003, Willis 2003, Face 2006, Hualde 2006, Rao 2006, Henrikson 2010, Prieto & Roseano 2010, among many others). Contributions by the aforementioned scholars have discovered that the following trends are characteristic of the majority of Spanish dialects: broad focus intonation (i.e. no emphasis on any one item) contains gradual fundamental frequency (F0) peak decay (i.e. downstepping) and pre-final F0 peaks in post-tonic syllables, as well as F0 suppression (i.e. final lowering), lengthening of constituents, and decreases in intensity toward the end of phrases or utterances; narrow focus intonation (i.e. highlighting specific elements) is signalled through increased peak height, earlier peak alignment, and increases in duration and intensity; categories of interrogatives distinguish themselves based on final F0 rises, falls, or rise-fall movements; and F0 rises through stressed syllables and, to a lesser degree, increases in duration and intensity, can acoustically signal lexical stress.

Mexican Spanish is a particularly intriguing variety of the language because, while it does share the aforementioned features common to most dialects of Spanish, it has been documented as displaying some unique prosodic tendencies. For example, Velázquez's (2010) dialectal study, utilizing spontaneous speech corpora containing

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various utterance types (e.g. declaratives, exclamatives, interrogatives, suspended utterances) produced by males and females, demonstrates that Mexicans speak with elongated syllables (and therefore, a slower speech rate), reduced intensity and increased variation in F0 movement when compared to speakers of Castilian Spanish. However, he leaves in-depth pragmatic considerations of such differences aside. Another noteworthy characteristic of Mexican Spanish is its circumflex (i.e. final rise-fall) intonation in a variety of utterance types such as declaratives, interrogatives and exclamatives (De la Mota et al. 2010). Particularly in declaratives, this pattern is different from most dialects, where the previously mentioned final lowering of F0 is typical. While other dialects (e.g. Caribbean and Canarian) exhibit circumflex movement in some utterance types, the pragmatic range of this contour appears to be wider in Mexican Spanish (De la Mota et al. 2010). In particular, a small body of work has associated this type of final configuration with emphasis and heightened levels of emotion and has claimed that age, gender, and level of education all influence variation in its use (Quilis 1993, Butragueño 2004, Willis 2005, Butragueño 2006, De la Mota et al. 2010, Orozco 2010).

Overall, it is apparent that Mexican Spanish possesses curious trends concerning F0, duration, and intensity. To date, there is much room for further exploration of the pragmatics behind these peculiarities, especially concerning one particular notion -- attitude -- for which there is a general lack of previous prosodic work related to Spanish in general. The current study, using the body of work mentioned to this juncture as a point of departure, delves into the prosody of two attitudes in particular: sarcasm and sincerity. In order to do so, recent experimental work carried out on other languages is used as inspiration. For example, Cheang & Pell's (2008, 2009) studies on Cantonese and English are highly relevant because they show sarcasm's (and other attitudes') effects on prosodic factors such as duration, F0, and intensity. In sum, the goal of the current study is to shed light on the prosody-pragmatics interface at the language- (and dialect-) specific and cross-linguistic levels.

The remainder of this paper is organized as follows: Section 2 gives an overview of relevant literature on the notion of sarcasm, as well as its prosodic correlates in a variety of languages, both of which motivate the approach to the current study; Section 3 outlines the methods and materials used for data elicitation, collection, and analysis; Section 4 details the empirical results and illustrates F0 contours from the data set; and Section 5 discusses the implications of the study and provides directions for future research.

2. Background

2.1 Conceptualizing sarcasm

Sarcasm communicates an attitude of 'I don't mean this' in which a speaker intentionally ridicules or conveys distaste for another person or perspective that really 'does mean this' (Haverkate 1984, Gibbs 2000). Those such as Capelli et al. (1990) use the terms *sarcasm* and *irony* in a very similar sense, however, Haiman (1998) teases them apart by stating that the former must be communicated by people and must involve intention, while the latter may deal with situations and can lack intention. Moreover, the term *attitude* is a key part of the definition of sarcasm, and

must be distinguished from *emotion*. The former is conveyed in an indirect manner through cues in speech, thus requiring a linguistic investigation of contextual and textual information, intonation, pragmatics, and semantics, while the latter is interpreted directly through speech signals (Wichmann 2000).¹ According to Haiman (1998), sarcasm is a play on words that also involves aggression. The negativity and aggression of this attitude may be directed toward another speaker involved in the current conversation, someone who is not physically present, or can be a general perspective or attitude about a person or object. Sarcasm has also been tied to humor, especially in situations of parody (Haiman 1998). Furthermore, from a politeness perspective, sarcasm is clearly a form of impolite speech that is utilized with the intent of being perceived as offensive (Culpeper 2005). However, the offensive nature is communicated through an utterance that would normally be polite or sincere. Therefore, sarcasm is a type of *mock politeness*, or a meta-strategy that employs politeness to communicate impoliteness (Leech 1983, Culpeper 2005). Its indirect nature has led to it being termed impoliteness that is *off record* (Bousfield 2008). Overall, sarcasm is widespread in interaction because it is often not perceived as being as rude or harsh as more direct forms of criticism (Gerrig & Goldvarg 2000, Cheang & Pell 2008).

2.2 Prosodic manifestations of sarcasm

One of sarcasm's main cues is a 'sarcastic tone of voice,' which makes it an *intonational misfit* in which prosodic features are influenced by the negative spin that a speaker wishes to put on his/her message in order to distinguish it from what could otherwise be literally interpreted as positive and sincere (Cruttenden 1984). This sarcastic tone of voice falls under the category of *attitudinal intonation*, which cues us into speaker behavior (i.e. intentions and perceptions) in a context (Wichmann 2000). Haiman (1998) asserts that both segmental and suprasegmental features are altered when speakers opt for sarcasm over sincerity. These signals, which can vary across languages, dialects, and registers, and may at times combine with other features like word or phrase level semantic cues, include durational modifications, nasalization of sounds, and flattening or exaggerating F0 rises and falls. Contextual cues that are non-verbal in nature, such as eye movement and facial expressions, can also be modified in the expression of sarcasm (Rockwell 2000a, 2005).

In terms of specific production studies on the prosody of sarcasm, Fonagy's (1971) work on Hungarian shows drastic increases in stressed syllable duration, intensity and F0 range in sarcastic speech. Such durational increases, leading to a reduced speech rate, are relatively consistent across totally unrelated languages (e.g. Adachi 1996 for Japanese, Haiman 1998 for English, Greek, Russian and Tagalog, Culpeper 2005 for British English, Cheang & Pell 2008, 2009 for Canadian English and Cantonese). Furthermore, a specific type of sarcastic intonation that is contemptuous in nature occurs when F0 is relatively suppressed in the stressed syllable of particular words that are key to conveying sarcasm (Winner 1988). This

¹ Other reviews of *attitude* and *emotion*, some of which include a discussion of prosody, include Ajzen & Fishbein (1980), Leech (1983), Morlec et al. (1997), Moraes (2011), and Rilliard et al. (2012).

idea of low, flat F0 movement through the stressed syllable occurs in sarcasm in order to offset the enthusiasm that positive words normally convey. However, conversely, sarcastic messages containing increased F0 excursions are observed in Attardo et al. (2003) and Laval & Bert-Erboul (2005). Such complexities are enhanced by Haiman (1998), whose English data illustrate high-low F0 movement accompanied by increased intensity in echo statements of sarcasm. He attests similar F0 activity in sarcastic messages in which duration and intensity may actually signal a literal, more sincere interpretation. Additionally, Ladd's (1978) comments suggest that exaggerations in F0 may be employed in order to put a sarcastic twist on a predictable or boring message. Taking a different approach, Rockwell (2007) compares acoustic and perceptual approaches to sarcasm and finds that prosodic cues distinguish sarcastic from non-sarcastic utterances in a slightly stronger fashion acoustically.² Regarding the acoustic analysis, F0 movement, F0 range, sentence length, and total sound in the sentence significantly differ between sarcastic and non-sarcastic situations. Finally, Bryant (2010) is one of the first investigators to describe prosodic contrast between neighboring phrase units through a detailed acoustic analysis. He claims that this is an important step because such contrasts are crucial to better comprehending how undertones with intent are communicated in speech. Overall, the mixed findings regarding the prosody of sarcasm in studies to date are summarized effectively by Cheang & Pell (2008, 2009): a comparison of various languages confirms that many of them employ prosody as a means to convey meanings that are not to be interpreted literally, but the way in which such prosodic parameters are implemented seems to vary between languages.

2.3 Research agenda

The body of research mentioned to this point helps motivate the research question of the current study: How do acoustic measures (e.g. duration, F0, intensity) vary based on changes between sarcastic and sincere attitudes in native Mexican Spanish speaking males and females? Acoustically and empirically analyzing a data set with utterances representing each of these two attitudes will allow us to answer this question in terms of both the peculiarities of Mexican Spanish, as well as cross-linguistic perspectives. As we have seen, communicative nuances are often conveyed via prosodic modifications to particular portions of utterances. Therefore, the present analysis gives particular attention to the prosody of words that play a crucial role in distinguishing sincere (i.e. literal and positive; 'I do mean this') and sarcastic (i.e. not literal and negative; 'I don't mean this') attitudes. Finally, an understudied area of sarcasm is the influence of gender, which has been, to some degree, included in previously cited work on Mexican Spanish. As such, tying gender in with expressions of sarcasm attempts to address a research gap as well.

² For exemplary perception-based investigations, see Bryant & Fox Tree (2002, 2005), Rockwell (2000b, 2007), and Voyer & Techentin (2010).

3. Methodology

3.1 Participants

Five native speakers (two males and three females between ages 30-45) originally from the Mexico City area participated in the study. They all lived in Mexico until their 20s, when they moved to the United States to earn advanced university degrees. Despite the fact that a couple of the speakers have lived in the United States for over ten years, all participants maintain Spanish as their dominant language both at home and at work. None of the speakers were previously trained in acting, and therefore, brief definitions of sarcasm and sincerity were provided as pre-task information (following Cheang & Pell 2009). However, they all were familiar with the intonation of Spanish, which is important when considering comments in studies that have taken a similar experimental approach (e.g. Hualde 2002, Rao 2006).

3.2 Materials

A controlled data elicitation task was developed to obtain sarcastic and sincere speech samples. The task contained 30 hypothetical contexts to which speakers could respond sarcastically or sincerely.³ For each task item, speakers first read background details about an imagined situation, along with information on whether their interpretation should be positive or negative. They were then shown a short response, which they produced in a sarcastic or sincere manner based on the aforementioned contextual information.⁴ 15 such responses each appeared twice (15 x 2 = 30 contexts) in lexically and syntactically identical forms, once in a positive context and once in a negative context. The hypothetical hearers of all responses were specified as either friends or siblings (i.e. emotionally and socially close). A pair of sample task items, which were randomized when presented to participants, is illustrated below in (1) and (2). A list of all 15 responses, as well as relevant contextual information, is given in Appendix 1. All data recording was done in a quiet room using Praat phonetics software (Boersma & Weenink 2011), a head-mounted microphone, and a laptop computer.

(1) Eliciting sarcastic speech

The speaker sees:

Tu amigo te dice: "Allí está el instructor de tu clase de literatura."

(‘Your friend says, “There’s the instructor of your literature class.”’)

³ In order to ensure that the hypothetical contexts were influencing participants’ productions, they all also read the 15 responses in a neutral fashion, without context. Prosodic measures in these iterations were significantly different from those of both attitudes across the board. Overall, neutrality demonstrated what one would anticipate in the majority of Spanish declaratives: downstepping and final lowering.

⁴ While this may appear as an artificial way of collecting data, Hualde (2002) and Face (2003) defend such an approach by claiming that it does lend itself to obtaining short fragments of natural speech that can inform us about where to begin when investigating spontaneous speech. Others defending ‘acting’ protocols for collecting prosodic data include Mozziconacci (2002) and Campbell (2004).

Additional context seen by the speaker:

No te gusta la clase y no te llevas bien con el instructor.

(‘You do not like the class and you do not get along well with the instructor.’)

The speaker sees and produces:

Es el mejor instructor del mundo.

(‘He’s the best instructor in the world.’)

(2) Eliciting sincere speech

The speaker sees:

Tu amigo te dice: “Allí está el instructor de tu clase de literatura.”

(‘Your friend says, “There’s the instructor of your literature class.”’)

Additional context seen by the speaker:

El instructor te inspira y te motiva y por él vas a seguir estudiando la literatura.

(‘The instructor inspires and motivates you, and due to him, you are going to continue studying literature.’)

The speaker sees and produces:

Es el mejor instructor del mundo.

(‘He is the best instructor in the world.’)

Following the completion of the data collection process, a validation task was carried out using another native Mexican speaker’s perceptual judgments. After receiving an explanation of what the data elicitation procedure entailed and seeing specific contexts used to set up sarcastic and sincere responses, the judge listened to all produced utterances in a random order, and for each one, reported whether it would be appropriate for a situation in which sarcasm or sincerity were to be communicated (i.e. a type of forced choice task, along the lines of Cheang & Pell 2008). Due to the controlled nature of the data collected, this was a crucial methodological step that helped verify that speech samples actually did convey the two attitudes in question.

3.3 Analysis

After listening to all recordings of each pair of identical utterances, lexical items that were deemed most crucial to differentiating a sarcastic versus a sincere attitude were tagged as ‘relevant,’ and all other words were labelled ‘not relevant.’ For example, in (1) and (2), *mejor* (‘best’) was considered ‘relevant’ because it was the main word that functioned to either communicate a genuine feeling or a sense of ridicule. Next, the 150 responses (15 sincere/15 sarcastic x 5 participants) were acoustically analyzed. Motivated by previous work on the prosody of Mexican Spanish, as well as by work specifically on sarcasm in other languages, acoustic variables were measured at either the level of individual words or entire utterances. Measurements of sentence level phenomena included speech rate (i.e. total syllables in a sentence/total utterance duration in seconds (s)) and F0 mean and range. At the word level, measurements of stressed syllable duration, F0 movement through the stressed syllable, and stressed vowel intensity of all content words were taken.⁵

⁵ Function words (e.g. prepositions, conjunctions, clitic pronouns) were not measured for any of these variables because they are metrically less prominent, or unstressed, in Spanish (Quilis 1993, Hualde

Specifically regarding F0, utterance-final position was examined for evidence of either a circumflex configuration or final lowering. In order to distinguish the former from the latter, both rising and falling F0 movement needed to satisfy a 7 hertz (Hz) threshold (O'Rourke 2006, Rao 2009) in order to be classified as forming part of a circumflex configuration.

Samples of measurement procedures are provided in Figure 1, displaying the F0 contour of a sincere rendition of *Siempre me divierto allí* ('I always have fun there'), as produced by a male speaker in response to an invitation to go to the gym.⁶ Concerning sentence level factors, the speed of speech is 5.6 syllables/s because there are 7 syllables in the utterance and the total duration of the utterance, as seen on the horizontal axis, is 1.26 s. The F0 range was calculated by subtracting the minimum value (63.9 Hz; arrow 1) from the maximum value (203 Hz; arrow 2). In this case, it is 136.1 Hz. Finally, the F0 mean was taken from a Praat command (132.2 Hz). At the word level, syllables were isolated in Praat, using changes in oscillograms associated with different types of segments, and then measured from beginning to end in milliseconds (ms). A sample measure of *vier*, the stressed syllable of the verb *divierto* ('I have fun'), can be seen in this figure (132.4 ms; arrow 3). Finally, F0 movement through stressed syllables was measured by subtracting the low value at the beginning of a syllable from the following peak value. Using this technique, once again in *divierto*, we get a value of 41.1 Hz (131.6-90.5 Hz; arrow 4). Furthermore, in final position, the rise-fall movement associated with the terminal lexical item clearly indicates the presence of a circumflex configuration in this example.⁷ Lastly, for intensity, maximum values in stressed vowels were retrieved via an intensity command in Praat (detailed examples are provided in the subsequent section).

2006). Although Hualde (2009) provides evidence of context and emotion creating prominence in such words, this issue is left out of the present discussion.

⁶ In Spanish, given a normal flow of speech, adjacent vowels across word boundaries generally diphthongize (Hualde 2005). This is not always the case with combinations of mid (i.e. /o, e/) and low (i.e. /a/) vowels, however, in fast speech, mid-mid and mid-low combinations do often diphthongize. As such, the sequence 'oa' from *divierto allí* is phonetically realized as [wa]. This point about mid and low vowels is valid both within words and across boundaries and is consistent throughout the present data set.

⁷ A preliminary analysis quantifying specific final rise-fall values in Hz in sarcastic and sincere speech did not prove to be advantageous, and as such, the present analysis uses the aforementioned threshold value of 7 Hz to categorically classify utterance-final movement (e.g. circumflex, final lowering).

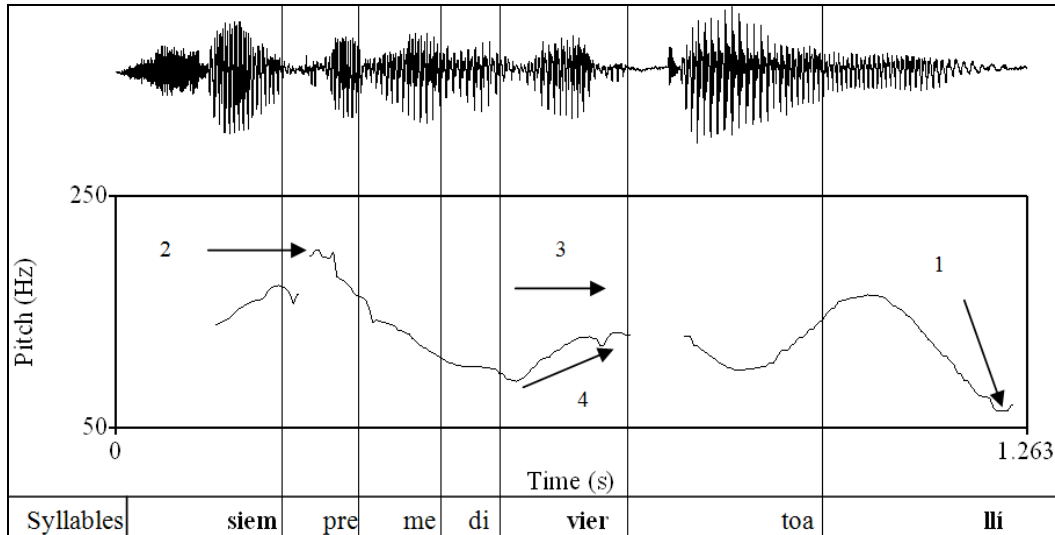


Figure 1. Techniques used to measure F0 range and movement, and stressed syllable duration. Stressed syllables are bolded.

Finally, mean and standard error (SE) values for all sentence and word level dependent variables were calculated. Based on these calculations, a series of paired t-tests were run in order to compare each variable in the two attitudes produced by each speaker. This test was fitting because for each measurement, there were two nominal variables of interest (i.e. two attitudes). The statistical outputs either supported ($p > .05$) or rejected ($p < .05$) the null hypotheses that there is no prosodic difference between sarcasm and sincerity in the productions of speakers.

4. Results

This section first presents a series of tables detailing the empirical results of prosodic measures at the sentence level, and then does the same at the word level. Before delving into the production-based results, it is worth mentioning that the perception test validated 92% of the data set, meaning intended attitudes were appropriately perceived for the majority of task items. Items for which the intended attitude was not properly communicated were discarded. For each prosodic variable under scrutiny, findings are presented for the overall data set and are also broken down according to gender. Finally, the end of this section illustrates F0 (and, in some cases, intensity) contours that support the empirical findings.

4.1 Sentence level findings

Recall that the three sentence level issues compared between sarcastic and sincere attitudes are speech rate, F0 mean, and F0 range. Concerning speech rate, Table 1 provides mean values for all speakers combined, as well as for males and females. As per the corresponding p values, the findings in all three groups show that attitude type does indeed have a significant effect on speech rate. Right away, it is apparent that further dividing the results by gender is advantageous, as it permits us to note the group from which stronger effects arise. It is clear that across speakers, sarcastic

speech leads to producing fewer syllables per second, or a slower speech rate (row three). However, the effect of an attitudinal difference is stronger in males than females, as seen by the lower p value in row two.

Table 1. Mean (SE) and p values for speech rate (syllables/s)

Group	Sarcastic	Sincere	P
Female	5.8 (.1)	6.2 (.1)	.01
Male	5.0 (.2)	6.0 (.1)	<.0001
Overall	5.5 (.1)	6.1 (.1)	<.0001

When looking at the results for F0 range, in Table 2, the importance of examining the data according to gender is further highlighted. While overall effects of attitude are significant (row three), those within the group of female speakers are not (row one). The raw data demonstrates that females slightly reduce their F0 range in sarcastic speech, but the p value indicates that the difference between the two attitudes does not reach significance and is more inconsistent, as indicated by the higher SE values. On the other hand, male speakers significantly suppress their F0 range in sarcastic speech, where their mean value is 24.5 Hz lower than that of sincere speech (row two). Crucially, if the data had not been teased apart by gender, the overall results in row three would have been somewhat misleading.

Table 2. Mean (SE) and p values for F0 range (Hz)

Group	Sarcastic	Sincere	p value
Female	108.9 (6.6)	112.5 (5.2)	.65
Male	53.4 (3.3)	78.9 (4.0)	<.0001
Overall	85.4 (5.3)	100.9 (4.3)	.006

Regarding F0 mean, Table 3 shows that differences between sarcasm and sincerity are highly significant across all groups. In general, sincerity is linked with a higher F0 mean than sarcasm. For anatomical reasons, F0 mean values are naturally lower in males than females (thus the higher overall SE in row three), but the disparity in mean values (15-17 Hz, in rows one and two) between attitudes is very similar across both genders. Joining these findings with those of Table 2 suggests important gender based differences in how F0 is used at the utterance-level to communicate sarcasm versus sincerity in this data set: females lower their tonal level but maintain a similar difference between maximum and minimum values, while males lower their tonal level in conjunction with shrinking their maximum-minimum distance.

Table 3. Mean (SE) and p values for F0 mean (Hz)

Group	Sarcastic	Sincere	p value
Female	209.1 (1.7)	224.3 (2.6)	<.0001
Male	100.9 (2.1)	117.9 (3.8)	<.0001
Overall	164.1 (6.8)	180.0 (6.6)	<.0001

4.2 Word level findings

Here, stressed syllable duration, F0 movement through stressed syllables, and intensity of stressed vowels are considered in words that are central to the communication of a sarcastic or sincere attitude, as well as in those that are more peripheral and simply help establish a context. Those assumed to be the most communicatively relevant are predicted to be prosodically marked in order to cue one attitude or another. Based on these issues, in the following series of tables, values for each prosodic variable corresponding with the overall data set are labeled as ‘R’ (i.e. relevant) or ‘NR’ (i.e. not relevant). These two labels are also specifically applied to the data of females and males: ‘FNR’ (female, not relevant); ‘FR’ (female, relevant); ‘MNR’ (male, not relevant) ‘MR’ (male, relevant).

The results for stressed syllable duration are presented in Table 4, where it immediately becomes apparent that the relevance distinction is key, in terms of both mean and variability.⁸ We observe longer values for sarcasm across the board, regardless of the relevance of words. The overall data suggests that there are significant effects in both relevance conditions, with attitude demonstrating more robust effects in relevant words (46.6 ms difference, row six) than in those that are not (13.6 ms difference, row three). Sarcasm increasing stressed syllable length in relevant words is consistent across both genders, however, the effect is stronger in males, where the average difference between the two attitudes is 64.7 ms (row five). The effect of attitude is not as substantial in less relevant words, and in fact, as displayed in the first row, is not even significant for females. Therefore, sarcasm yields general syllabic lengthening in males, but more localized lengthening in females, targeting words carrying more weight in the expression of ridicule.

Table 4. Mean (SE) and p values for stressed syllable duration (ms)

Word Classification	Sarcastic	Sincere	p value
FNR	141.0 (6.4)	133.1 (5.5)	.10
MNR	170.5 (6.8)	149.1 (6.6)	.0005
NR	153.8 (4.8)	140.2 (4.2)	.0003
FR	252.1 (10.4)	218.4 (8.6)	.001
MR	269.2 (13.4)	204.5 (7.2)	<.0001
R	259.2 (8.3)	212.6 (5.8)	<.0001

The findings for F0 movement once again emphasize the importance of dividing the data by gender and relevance. In general, as seen in Table 5, there is more variation in movement in relevant words than in those that are less relevant. The overall results for both sarcasm and sincerity for relevant words are almost identical, while those that are not as relevant show a significant difference, with increased excursions occurring under conditions of sincerity. The average of less than 7 Hz in

⁸ The higher SE values for stressed syllable duration are at least in part attributable to the data set’s inclusion of both open and closed syllables, as well as consonant sounds that show natural differences in length (e.g. stops and fricatives). However, valuable insight is still gained by pairing productions of identical utterances/words (that only differ in attitude) when analyzing results across the data set.

row three for sarcasm suggests severe F0 suppression. Interestingly, the suppression in these less relevant items only reaches significance in females (row one). However, this effect is borderline significant, as the p value almost reaches .05. On the other hand, only males generate significant results in relevant words (row five). In these cases, the mean value goes up by 11.6 Hz in sincere productions. In sum, Table 5 shows that the two attitudes yield differing manipulations of F0 in males and females, with relative attitudinal weight of words playing a key role.

Table 5. Mean (SE) and p values for F0 movement (Hz)

Word Classification	Sarcastic	Sincere	p value
FNR	4.6 (2.0)	9.7 (2.1)	.049
MNR	8.8 (1.5)	11.6 (1.8)	.20
NR	6.5 (1.3)	10.5 (1.4)	.02
FR	35.0 (6.2)	25.7 (5.2)	.14
MR	9.6 (2.9)	21.2 (3.3)	.005
R	24.4 (3.9)	23.8 (3.3)	.89

We now specifically turn our attention to utterance-final F0 movement in order to see if a circumflex pattern or final lowering are linked more to one attitude than the other. Table 6 provides a breakdown of final configurations based on results for all speakers, as well as those for males and females.⁹ In general, the frequencies in this table demonstrate that final lowering is the most common trend in all speaker/attitude comparisons, with the one exception being sincerity in males, where circumflexion has a slightly higher result (row four). On the other hand, when circumflex movement is observed in females' productions, albeit at overall lower frequencies, it is more commonly associated with sarcasm than sincerity (rows one and two). In order to attempt to better understand final movements and their connection with the two attitudes in question, an in-depth examination focusing on identical pairs of utterances in which attitude led to differences in final movement was undertaken (45% of all pairs). Interestingly, in such cases of pairwise differences, males convey sincerity using circumflex movement at a 73% rate, while females exhibit the exact opposite trend; they employ circumflex configurations at a frequency of 63% to communicate sarcasm. However, the fact that differing final configurations are not observed in 55% of pairwise comparisons can lead one to question what exactly is influencing cases where there are differences. An even closer look at the data reveals that 74% of cases with differences place attitudinally relevant lexical items in utterance-final position. Therefore, there appears to be a link between communicatively important words and circumflex intonation, with gender influencing the attitude signaled by these utterance-final rise-fall excursions.

⁹ All 'other' configurations were observed as rising movement without a final fall, either as a continuous rise or a rise to a high plateau.

Table 6. Frequency of utterance-final F0 configurations

Speakers	Attitude	Circumflex	Final Lowering	Other
Female	Sarcastic	33%	53%	14%
	Sincere	18%	68%	14%
Male	Sarcastic	24%	62%	14%
	Sincere	52%	41%	9%
Overall	Sarcastic	29%	58%	13%
	Sincere	32%	58%	10%

Finally, outputs for intensity, outlined in Table 7, yield significant effects for both relevance categories. As seen in rows three and six, stressed vowels in sincere utterances are produced louder than those of sarcastic cases. However, regarding gender, intensity generates perhaps the most clear acoustic distinction between males and females. Males are louder under sincere conditions, and most significantly in relevant words (+3.1 dB, row five). Conversely, intensity is not a variable that is significantly influenced by the attitude difference under examination in females' speech. Overall, this table, in addition to the previous three, sheds light on the importance of looking at prosody at the word level according to both gender and communicative importance. This analytical point is highlighted by the fact that each of the tables in this subsection showed different types of effects on the dependent variables.

Table 7. Mean (SE) and p values for intensity (dB)

Word Classification	Sarcastic	Sincere	p value
FNR	59.6 (.6)	60.1 (.5)	.14
MNR	61.0 (.5)	62.6 (.4)	.001
NR	60.2 (.4)	61.1 (.4)	.002
FR	60.0 (.8)	60.7 (.7)	.20
MR	59.5 (.6)	62.6 (.6)	<.0001
R	59.9 (.5)	61.5 (.5)	<.0001

4.3 Sample sarcastic and sincere contours

This section supplements the empirical findings through images extracted from both the sarcastic and sincere data of the present study. One pair of identical utterances, produced with both attitudes, is presented for a male and a female in order to highlight the aforementioned sentence and word level prosodic distinctions. Some noteworthy comparisons between members of pairs of utterances are: for all speakers, slower speech rate and reduced F0 mean with sarcasm; additionally, for sarcasm in females, increased stressed syllable duration in relevant words, a higher possibility of circumflex activity, and reduced F0 movement in less relevant words; and for sarcasm in males, decreased F0 range, increased stressed syllable duration, decreased F0 movement through stressed syllables of relevant words, decreased likelihood of circumflex movement, and decreased stressed vowel intensity. Rather than pointing out every difference in the upcoming contours, the most prominent ones with previous empirical support are discussed.

Figures 2 and 3 represent female data of the utterance *Siempre me divierto allí* ('I always have fun there') in response to a context in which a friend invites the speaker to go to the gym. In the sarcastic production of Figure 2, the speaker assumes a negative disposition toward the gym. The key words conveying her sarcastic attitude are *siempre* ('always') and *divierto* ('I have fun'), because in reality, her feelings are the opposite of 'always have fun.' On the other hand, in Figure 3, the same two words function to express the speaker's genuine love of exercising. Based on the times given on the horizontal axis of each figure, we clearly see that the Figure 2 iteration is produced slower. The speech rate in this figure translates to 5.1 syllables/s (7 syllables/1.381 s), which is slower than the 6.7 (7/1.045) rate shown in Figure 3. At the word level, but connected to overall velocity, we note that the stressed syllable durations of the two relevant words, *siempre* and *divierto*, measure 376.2 ms, and 214.3 ms, respectively, in Figure 2. These durations are longer than their sincere counterparts in Figure 3, which are 206.8 ms, and 171.6 ms in length, respectively. In terms of F0, the sarcastic mean in Figure 2 is 206.4 Hz, or 49.9 Hz less than that of the sincere production in Figure 3. Finally, the rise-fall movement of over 7 Hz at the end of Figure 2's contour suggests a circumflex movement, which is a feature not seen in Figure 3, where terminal movement is completely flat.

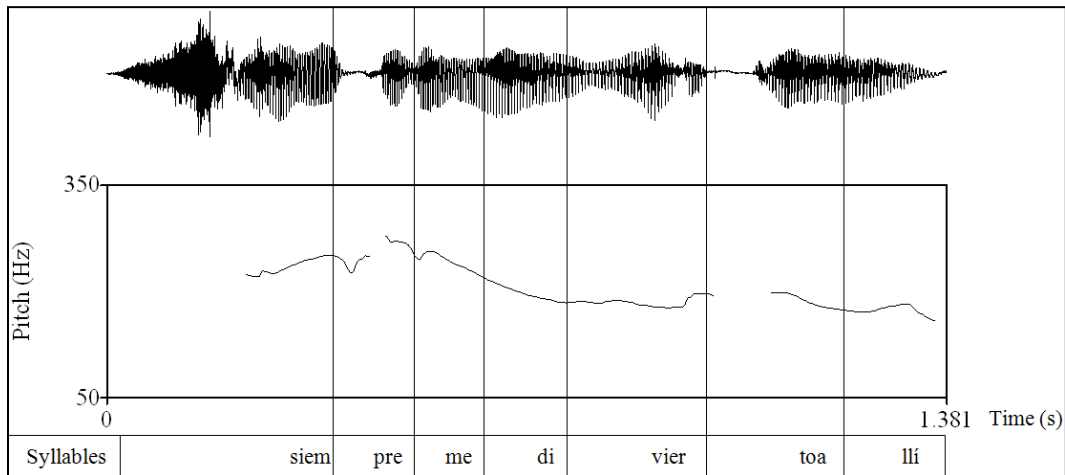


Figure 2. An F0 contour of *Siempre me divierto allí* ('I always have fun there') corresponding with a female's sarcastic production.

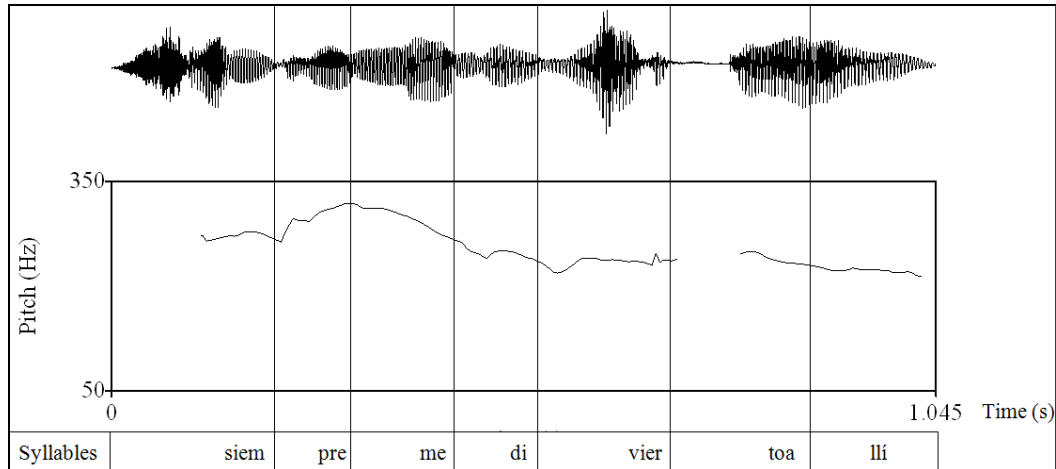


Figure 3. An F0 contour of *Siempre me divierto allí* ('I always have fun there') corresponding with a female's sincere production.

Figures 4 and 5 illustrate attitude-based changes in a male speaker's productions of *Eres un chico muy talentoso* ('You are a really talented guy'). The rendition in Figure 4 is a response directed at the speaker's brother, with whom the speaker plays catch. The brother continually throws the ball inaccurately, and as such, the speaker does not believe he is talented. Conversely, Figure 5 represents the speaker's response to his brother after he sees him throw a ball with perfect form and precision. Comparing the two iterations shows that *muy* ('very') and *talentoso* ('talented') are the words upon which attitude hinges. This comparison shows a slower speed in the sarcasm of Figure 4 (4.4 syllables/s, versus 5.9 in the sincere version). Also, the F0 mean in Figure 4 is 25.5 Hz lower than that of Figure 5. The main durational difference occurs in *talentoso*, where the sarcastic production of the stressed syllable, *to*, is 439.1 ms, while its sincere equivalent measures just 200 ms. Interestingly, out of the two relevant words, *muy* shows slightly increased F0 movement in Figure 4, but *talentoso* displays much more in Figure 5, as expected. The rise and subsequent low final F0 trace in Figure 5 demonstrate a circumflex contour, which, relatively speaking, shows the most connection with sincere male productions, particularly when communicatively important words are in utterance-final position, as is the case here. Finally, for intensity, stressed vowels in the two relevant words are at least 1.5 dB louder in the sincere example than the sarcastic one.

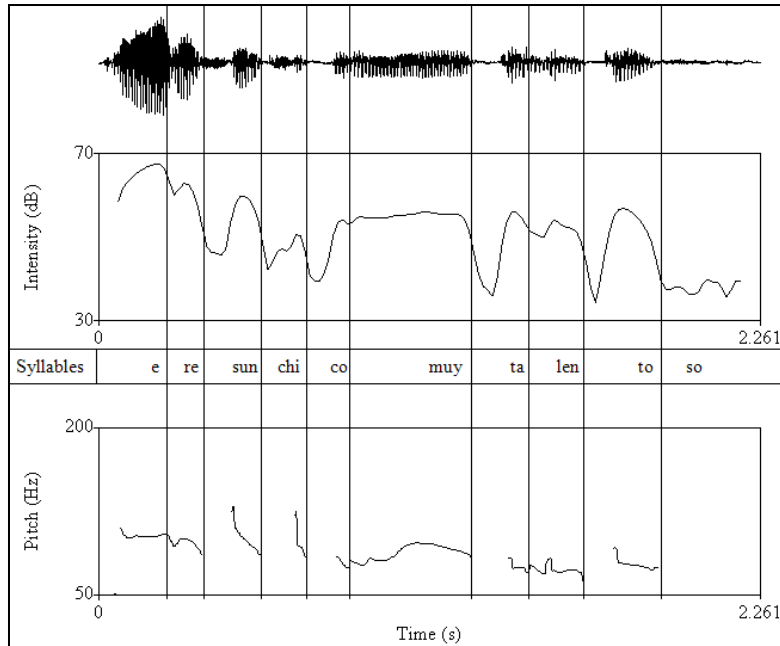


Figure 4. F0 and intensity contours of *Eres un chico muy talentoso* ('You are a really talented guy') corresponding with a male's sarcastic production.

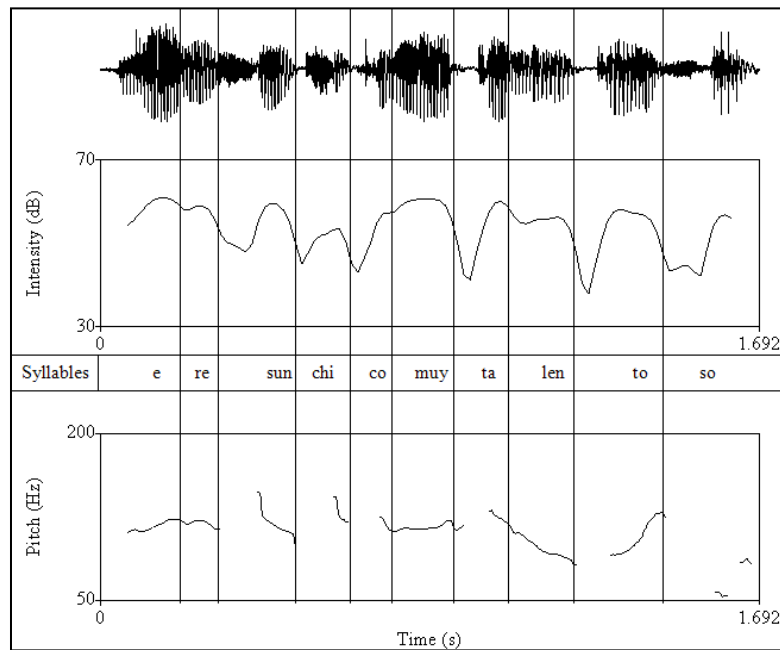


Figure 5. F0 and intensity contours of *Eres un chico muy talentoso* ('You are a really talented guy') corresponding with a male's sincere production.

5. Discussion and conclusions

The results in the previous section contribute to the expanding body of literature on the prosody-pragmatics interface. In particular, this experimental approach has filled a research gap for Mexican Spanish, as well as Spanish in general, because to date, little to no work on the acoustic correlates of sarcasm (or attitude in general) exist for the language. This section summarizes methodological points that were crucial to successfully carrying out the study, and addresses the main empirical findings and their implications. The latter is done through both language-specific and cross-linguistic lenses. Finally, since questions raised for the future are often just as important as answering current research questions, this section also interweaves encouragement of certain points of departure that will lead to a better overall understanding of prosody's connection with the communication of attitudes in Spanish and other languages.

From a methodological standpoint, using a sincere attitude, connected with a more literal meaning (corresponding with common interpretations of words), as a baseline helped shed light on the changes evoked by the non-literal, intentional use of aggression, impoliteness, ridicule and mockery contained within a 'sarcastic tone of voice.' That is, without incorporating productions indicating 'I'm saying this and I mean it' as a point of comparison, it would have been difficult to thoroughly document the acoustic properties of communicating 'I'm saying this but I don't mean it.' Also, since sarcasm and sincerity are seen as attitudes couched within a context, including hypothetical situations for speakers was deemed more effective than, for example, an alternative approach of simply requesting that speakers read isolated sentences sarcastically or sincerely. On a related note, even though data was elicited in a controlled fashion and not in a naturally occurring context, the sarcastic and sincere samples analyzed demonstrated clear prosodic effects of attitude. These effects were largely tied to (at least) gender and communicative weight of individual words. The fact that we are now more aware of variables to further explore in work on sarcasm in more spontaneous speech styles is a key contribution of this experimental-pragmatic approach.

To recap, significant effects across all speakers were found for speech rate, F0 mean, and stressed syllable duration of relevant words. Therefore, we can conclude that an initial, general characterization of Mexican Spanish intonational misfits, which intentionally ridicule or mock someone or something through 'not really meaning something,' involves slowing down speech, in part by extending prominent syllables, and shifting F0 downward. Additionally, male speech showed a wider scope of effects of attitude at both the sentence and word levels involving duration, F0 and intensity. Interestingly, the influence of sarcasm on intensity has not received much attention, and when it has (in perception studies), results have been quite mixed. As such, the significant results for intensity in males were noteworthy. On the other hand, females' attitudinal differences were either insignificant or less salient than those of males for F0 range, overall duration, F0 movement in relevant words, and overall intensity. Lastly, final lowering was more common than circumflex configurations, but when the latter was present, females and males exhibited opposing preferences regarding its use.

In Velázquez's (2010) comparative study, which included data from both females and males, similar prosodic trends to those found here were documented, but pragmatic explanations were not provided. The present data extends upon this earlier work on the prosody of Mexican Spanish by identifying particular attitudinal pragmatic functions of previously cited patterns, as well as how such functions associate with gender differences: the previous finding of Mexican speech rates being slow can now be tied to conveying the attitude of sarcasm (among other possibilities); and previous results for F0 and intensity increases can be linked to sincerity, particularly in males. Furthermore, from a broader perspective, upon specifically considering speed, duration, and F0 mean, we note that the present results match those of previous work on many unrelated languages, providing increased support for slower, drawn out constituents realized at a lower F0 level as cross-linguistic characteristics of communicating sarcasm. Moreover, many of the effects found to be significant for males were cited, or at least alluded to, in the previously reviewed work on a variety of languages. In particular, sarcastic speech in the males of the current study demonstrated several prosodic reductions that can be viewed as ways of toning down what could be, in a more literal interpretation, an enthusiastic comment, in order to ridicule or show contempt toward someone or something in a more indirect, less animated, 'off record' or 'under the breath' fashion (see Bousfield 2008). The lack of as many significant findings for females suggests that sarcasm is an attitude more acutely and authentically expressed by males through prosody; females may prefer other verbal or non-verbal means of mockery or ridicule that, if empirically tested, may show stronger disparities from sincere expressions. In sum, an overarching implication of these gender-specific comparisons is that in conveying sarcasm, and possibly even attitude in general, males rely more on manipulating the speech signal (in addition to contextual information), while females may depend only partially on acoustic correlates due to increased use of non-verbal strategies (see Rockwell 2005). However, this suggestion arising from our findings is preliminary, and further research is needed to make the gender distinction in the use of verbal and non-verbal cues to attitude more clear.

Another important finding related to F0 that is specific to Mexican Spanish deals with commentary on the pragmatics of utterance-final movement. The results here demonstrated an overall preference for final lowering, regardless of communicated attitude. Therefore, in many cases, terminal movement did not appear to cue attitudinal differences, but rather the conclusion of a thought, which is final lowering's main function in general. In these situations, it is more than likely that the other prosodic correlates examined distinguished one attitude from the other, especially since many of such situations involved relevant words located earlier in utterances. However, focusing on situations in which circumflex movement was attested at relatively higher rates (especially when it distinguished attitude in identical utterances) was valuable, as it gave us a preliminary account of the association between attitude/gender and utterance-final movement, thus expanding upon previous work on Mexican Spanish (e.g. Butragueño 2004, Willis 2005, Butragueño 2006, De la Mota et al. 2010). In sincere productions, males favored circumflex movement over half the time. On the other hand, they exhibited a clear preference for final lowering in expressions of sarcasm, a finding that seems fitting given the general F0

suppression shown in the sarcasm of these speakers. When females exhibited circumflex activity, it was slightly more associated with sarcasm, with final lowering appearing as a clearer trend in sincerity. Therefore, when circumflex intonation is present, the somewhat opposing utterance-final gender-based pattern implies that males employ such movement to convey literal meaning (i.e. ‘I mean this’) in contexts calling for enthusiasm, positivity, and support, whereas females show some evidence of using this type of final movement as a strategy to communicate a non-literal (i.e. ‘I don’t mean this’) meaning when choosing to mock, ridicule, or show aggression or contempt toward someone or something. For females, as alluded to before, perhaps final movement is not as crucial to communicating sincerity due to the potentially heightened use of non-verbal signals to display enthusiasm. Finally, the fact that males manipulated acoustic correlates in ways that parallel more previous accounts of each of the attitudes in question leads us to propose an interesting hypothesis, which can be tested in future work: circumflex intonation in Mexican Spanish is a strategy of communicating sincerity, but it is employed as a type of intonational misfit by females to convey ‘I may *sound* supportive but I’m actually communicating mockery’ (i.e. ‘mock-sincerity,’ analogous to the ‘mock politeness’ previously mentioned).¹⁰

Furthermore, in approximately $\frac{3}{4}$ of all cases in which speakers distinguished terminal F0 movement in identical utterances solely differing in attitude, such movement corresponded with an utterance-final communicatively salient lexical item. Under such circumstances, a high degree of circumflex movement was observed, which supports De la Mota et al.’s (2010) comments on the circumflex configuration’s affiliation with emphatic functions. While the previous body of studies on Mexican Spanish do touch upon the relationship between gender and circumflex movement, the variation here, combining both attitude and gender, suggests a further widening of the pragmatic scope of one of the most curious aspects of Mexican Spanish intonation. Surely, additional evidence is needed to confirm gender-based pragmatic differences in circumflex productions, possibly through perception tests. Finally, an issue that remains unanswered regarding utterance-final movement in the data set is what factors contributed to final lowering being consistently manifested in certain productions, while circumflex (or other F0 activity) movement was interspersed in others. Most likely, this variation was a byproduct of differences between the hypothetical contexts of the elicitation task. However, the relationship between prosody and further levels of contextual detail are left for future work.

The division of relevant and less relevant words also complements past work on focus in Spanish declaratives (Face 2000, 2001a, 2001b, 2002, Kim & Avelino 2003, among many others). These studies have shown that duration, F0, and intensity (to a lesser degree) are the acoustic correlates most affected by the broad versus narrow focus distinction, in which the latter leads to increases in all acoustic measures. Extrapolating these ideas to the current data suggests that the speakers here employed

¹⁰ The perceptual test generated comments along these lines as well. That is, specific female productions in which circumflex movement was present generated feedback such as, ‘The enthusiasm in her voice is laced with sarcasm’ and ‘She sounds positive but seems to be making fun of someone at the same time.’

narrow focus, or emphatic prosodic strategies, with more relevant words in both sarcastic and sincere conditions, but in different ways; via mainly duration in the former attitude, and through F0 in the latter. However, similar to previous points of discussion, the male data reflected these findings in a stronger fashion, while also showing a strong attitude effect on intensity. Based on these comments on focus, we have extended upon previous work by showing that: certain correlates of narrow focus prosody can be used to communicate key points of an attitude; different attitudes may require different narrow focus strategies in Spanish; and the specific correlates used seem to depend on gender. Once again, perceptual studies would help provide additional support for these ideas.

Additionally, the F0 reductions in words of sarcastic utterances, which suggest instances of deaccenting (i.e. the lack of pitch accents, or phonological targets), can combine with previous work (e.g. Rao 2006) in order to tie this prosodic feature with variation in both attitude and emotion. The fact that we are able to make a preliminary connection with deaccenting extends the discussion from the phonetic to the phonological level. That is, a sarcastic attitude, with suppressed F0, may result in reduced phonological targets across an utterance. Combining this thought with F0 differences based on relevance, which may result in distinct phonological pitch accents, relates to Bryant's (2010) comments on irony-based contrast in neighboring units. Thus, the phonetic findings here motivate further analyses addressing attitude-based phonological contrast. When taking up such future endeavors that may tie F0 lows with sarcasm, it is also important to consider that certain communicative contexts and language-specific differences have actually shown F0 increases associated with sarcasm (e.g. Attardo et al. 2003, Cheang & Pell 2009).

In terms of further research directions, in order to better understand distinctions dealing with the prosodic variables examined here, focusing on the potential effects of specific contextual factors (e.g. emotional distance between interlocutors, social situation, investment in topic discussed, etc.) is another area that can be expanded from this study. Here, all sarcastic responses uttered involved aggression, mockery, and ridicule. However, other situations that could also provoke sarcasm, such as boredom, were not included and, quite possibly, could produce unique results. Furthermore, the majority of contexts in this study elicited sarcasm targeting a third party or a situation. Comparing sarcastic expressions directed at these targets versus those directly targeting the hearer could also lead to diverse prosodic trends. Finally, future work should attempt to include more speakers, dialects, and attitudes, as well as increased variation in utterance length.

Overall, this study is just one step in better understanding the prosody-pragmatics interface in Spanish and cross-linguistically. The hope is that it will spark related work in the near future.

Appendix 1. Utterances from Data Elicitation Procedure

The following is a list of the 15 utterances produced with both sarcastic and sincere attitudes. Prior to each recording, speakers saw contextual information that helped elicit each attitude.

1. *Siempre me divierto allí* ('I always have fun there'; responding to a friend's invitation to go to the gym).
2. *Pero es un empleado tan valioso para la empresa* ('But he's such a valuable employee for the business'; responding to finding out that a co-worker will be fired).
3. *Ese restaurante tiene comida buenisima* ('That restaurant has really delicious food'; responding to where he/she and his/her friend are going to dinner).
4. *Ese resultado me sorprende mucho* ('That result really surprises me'; responding to finding out the outcome of his/her favorite team's game).
5. *Eres un chico muy talentoso* ('You are a really talented guy'; responding to his/her brother's ability to throw a ball).
6. *Es el mejor instructor del mundo* ('He's the best instructor in the world'; responding to seeing his/her literature instructor).
7. *Es el mejor ejemplo de un estudiante trabajador* ('He's the best example of a hard-working student'; responding to seeing a student from his/her biology class).
8. *Esa pared es una obra de arte* ('That wall is a work of art'; responding to his/her brother showing him/her a wall that he painted).
9. *Es un resultado impresionante* ('It's an impressive result'; responding to someone's finish in a race').
10. *Van a encontrar muchos productos baratos* ('You're going to find many cheap products'; responding to his/her friend about a store where he/she and other friends want to shop).
11. *De repente tengo mucha hambre* ('All of a sudden I'm really hungry'; responding to meal-time on an airplane).
12. *Seguro que le damos una oportunidad aquí* ('Surely we'll give him an opportunity here'; responding to viewing a job candidate's application materials).
13. *Tienen mucho que celebrar* ('They have a lot to celebrate'; responding to the animated state of cheerleaders at a game).
14. *Es un hombre muy generoso* ('He's a really generous man'; responding to a donation made by a man).
15. *Es una mujer tan desinteresada* ('She's such a selfless woman'; responding to a favor his/her friend's mother did for his/her friend).

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