

The Development of L2 Spanish Intonation During a Study Abroad Immersion Program in León, Spain: Global Contours and Final Boundary Movements

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Abstract

The current study is the first technically-principled examination of second language Spanish intonation as it develops in a study abroad context. As such, it aims to identify patterns of development related to overall F0 contours and final boundary movements by creating individual profiles for each L2 learner at the beginning and the end of their stay abroad. Our data come from 5 English-speaking learners of Spanish enrolled in a study abroad immersion program for 7 weeks in León, Spain. We collected data through a computerized production task that elicited three context-based sentence types: declaratives, absolute interrogatives, and pronominal interrogatives. This task was administered once upon arrival to León and again at the end of the 7-week program (approximately 6 weeks elapsed between tasks). In our analysis, we calculated the initial and final tonal levels in addition to the Low and High tones of pitch accents (when applicable). For each learner the most common strategy employed at each recording time was identified. Our findings show that despite individual variation, most L2 learners modify their intonational patterns (i.e. pitch accent and boundary movements) through an increase in frequency of use of their more dominant intonation patterns and/or changes in their final boundary tone inventory.

1. Introduction

Despite theoretical and technical work conducted on the sound systems of languages such as Spanish and English, the development of second language (L2) phonology remains less studied (see Zampini & Hansen Edwards 2008 for an exception). This is especially true for phonological features beyond the level of the segment. In fact, in a recent overview of L2 Spanish, the chapter on phonology (Elliott 2003) does not cite a single study on L2 intonation. Thus, while recent methodological, analytical and theoretical developments have permitted exciting growth in research on Spanish intonation as evidenced by monographs and dissertations on the topic (Alvord 2007, Face 2002, García Lecumberri 1995, O'Rourke 2005, Simonet 2008, Sosa 1991 and Willis 2003), this 'boom' has yet to extend to L2 Spanish. While research exists on the acquisition of intonation in

English (Cruz-Ferreira 2002/3, Ramírez Verdugo 2005 and Ramírez Verdugo & Romero Trillo 2005), we know of only one study that employs technically-principled methods to measure the development of L2 Spanish intonation by English-speaking learners (Nibert 2005). What this lack of research implies is that the range of questions to be answered is quite broad and that initial studies must make certain choices about how best to begin the examination of the Spanish L2 sound system beyond the level of the segment. To date, we have little evidence to document whether or not learners are even able to modify their intonation patterns over time. If learners can modify these patterns, it may take the form of a change in the general contour, the types of intonation strategies employed (e.g. final rises or final falls), the combination of the strategies employed, or the strength of these strategies. Thus, more focused research on particular details of intonational contours is only possible once certain, more basic questions have been answered. In the current study, we seek to determine whether or not learners modify their global intonational patterns – consisting of boundary tones and pitch accent movements – and, if so, what types of changes are made over time.

In the current study, our goal is to examine the overall process of development of L2 intonation through a careful analysis of a small, relatively homogeneous group of learners. It is our opinion that the best way to arrive at a general understanding of how L2 intonation patterns arise is to develop in-depth profiles of the global features of intonation for a few learners. This research design enables us to find the appropriate level of detail to distinguish general tendencies from individual learner strategies through a multi-feature analysis of multiple utterances. We note from the outset that our efforts to examine a relatively homogeneous and small group of learners, while having the advantage of making our participants comparable within the study, does not necessarily mean that our results will generalize to larger learner populations. Nevertheless, our work examines a series of intonation features over time and enables us to begin to refine the research questions for the field of study so that more generalizeable research can follow.

There are at least two key issues that make the study of L2 intonation in Spanish a particular challenge. The first is the paucity of research on Spanish intonation and the dialectal variation that has been found to exist from one region to another. There is no single model of standard target-like intonation and, thus, it is especially important that similar analyses of native speakers in the very same geographic region are available. Once such data are available, the learner population in a study abroad environment is ideal for investigation because we have an understanding of the features of the input to which each learner is exposed. Outside such a setting, the variability in the input would make distinguishing individual strategies from development toward different target-like norms extremely difficult.

The second key issue is that research on the second language acquisition of intonation requires that two relatively diverse fields reconcile certain assumptions, both methodological and theoretical. For example, it is generally understood in

research on second language acquisition that the first language of a learner is only one of the key factors that may influence development (see Ellis 1999 for discussion). In many cases, the patterns of learner development are much more clearly traced to universal tendencies that are not dependent on the relationship between the first and the second languages (Corder 1967). In contrast, most theories of phonological acquisition begin with the first language as a starting point for development or at least the most influential element in the acquisition process (e.g. Eckman 1987, 2008, Flege 1987, 1995, 1997 and Major 1987). This and other issues will receive greater attention in the discussion section of the current paper. In terms of methodology, second language acquisition as a field has sought to employ tasks that require learners to focus on meaning and that do not place undue focus on the object of study. The goal is that learners produce language that most closely reflects their internal knowledge of the target language. Thus, tasks such as story-telling activities and semi-structured interviews are common means of elicitation, and participant groups are generally fairly large in order to ensure sufficient tokens for analysis. In contrast, studies in Laboratory Phonology that employ an acoustic analysis have specific requirements in terms of the quality of the recording for analysis and the comparability of tokens across items. In the case of the current study, for example, all elicitation items needed to include the same number of nouns and verbs, the same placement of primary stress, the same number of syllables, words consisting exclusively of sonorant or approximant consonants, and so on. The end result is that one has a limited word bank from which items can be written, which in turn limits the naturalness of the speech sample. Moreover, data elicitation methods generally involve a small number of participants reading a relatively limited number of sentences several times during the test session. The authors of the current study have worked extensively to bring together these two traditions and to create a meaning-based task in which tokens are technically comparable across items and from one learner to another. In this way, the particular standards of data elicitation and recording of both fields could be met. Thus, in addition to the contribution we make in terms of establishing a description of the second language acquisition of intonation in Spanish and moving toward more narrowly-focused research questions in the future, we also provide a model for data elicitation and analysis that can be employed in future second language studies.

We begin this paper with an overview of work on intonation in Spanish, including a report of data collected from native speakers in the same region where the current study was conducted. We continue with an overview of what is known about second language phonology and, particularly, about second language intonation. We then turn to a review of work on the effect of the study abroad context on second language development. We focus our discussion on the second language acquisition of Spanish when possible. Following a detailed description of the methods employed in the current study, we present the results of our analysis and contextualize these results within the fields of both second language acquisition

and studies on intonation. Finally, we conclude and suggest directions for future studies.

2. Background

2.1 Intonation in Spanish

Spanish is characterized as a pitch accent language in that pitch, which is the perceptual correlate of the rate of vocal fold vibration also known as fundamental frequency (F0), is used to convey postlexical information such as contrastive focus (Face 2002) and new information (Hualde 2005), as well as irony, surprise, etc.¹ In Spanish, lexically-stressed syllables typically have a pitch movement or excursion associated with them that serves to signal stress as well as a particular intonational meaning. Within the autosegmental-metrical (AM) model as currently applied to Spanish, there are two general types of pitch movements (i.e. changes in F0) associated with stressed syllables called pitch accents. The pitch movement on the final stressed syllable is referred to as the nuclear pitch accent and forms part of Navarro Tomás' (1980) *tonema*. Pitch movements associated with non-final stressed syllables are referred to as prenuclear pitch accents. These distinctions are claimed because the type of pitch movement may be different for a given pitch accent.² In addition to rising or falling, categories of pitch accents are claimed based on specific points where the pitch changes direction with respect to the stressed syllable. This is somewhat similar to the distinction between voiceless and voiced stops. Whereas we describe the difference between /p/ and /b/ in terms of the presence or lack of voicing, since Lisker and Abramson (1964) it has been known that the timing of voicing relative to the stop release is the primary cue for distinguishing these two phones, at least in English and Spanish.³ Similarly with intonation, the starting and ending point of a tonal rise or fall determines a pitch accent type. For example, a prenuclear pitch accent embedded in a broad focus sentence in Peninsular and Mexican Spanish has a Low tone at the onset of the tonic syllable that begins a rise which continues to a peak or High tone in the following syllable. A prenuclear pitch accent associated to a word marked by contrastive focus, on the other hand, has been documented to realize its peak or High tone within the stressed syllable (see Face (2002) for a full review of broad and contrastive focus marking in Madrid Spain Spanish and Willis (2003) for Dominican Spanish). Tonal movements that are associated with some landmark other than a stressed syllable are considered boundary tones and correspond to the edges of a phrase that can be associated with the initial or final syllable of an utterance. For example, it has also been proposed that a boundary tone may exist at the beginning of an utterance and manifest a significantly higher starting level in the case of Spanish interrogatives (Sosa 1999). Intermediate phrase accents are also

documented, and these serve to break a larger intonational unit into smaller portions (Nibert 2000).

Current research on Peninsular and Mexican varieties indicates that a rising tonal movement is the common strategy for a lexically stressed syllable with semantic variations based on the type of pitch movement. Declaratives are typically reported to have a fall or Low tone on the final stressed syllable of the utterance (Face 2002). Although the current study employs the terminology of the AM model (i.e. pitch accents and boundary units), research on intonation within any model can focus on micro or local level issues by examining pitch accent types (i.e. prenuclear versus nuclear, the alignment characteristics of a specific pitch accent, or pitch accent type based on a particular context) and the production of boundary tones (i.e. initial or final). For example, Face & Prieto (2007) report distinct prenuclear pitch accents based on the alignment of the rise (early Low versus late Low), as the late Low pitch accent was found in absolute interrogatives with a narrow focus intent. Other studies have investigated phenomena that reflect on global or utterance level issues such as boundary tones (Nibert 2000 and Willis 2008), pitch scaling (Prieto, van Santen & Hirschberg 1995), downstepping (Prieto, Shih & Nibert 1996 and Prieto 1998) and upstepping (Willis 2003). At the global or utterance level, there is a long tradition of distinguishing between utterance types (e.g. declarative vs. interrogative) based on the relative tonal levels of each pitch accent as well as distinguishing the nature of the final boundary tone(s) (i.e. falling vs. rising) (Navarro Tomás 1980, Prieto 2004 and Sosa 1999) and/or the existence of an initial boundary tone. Some well-known varieties of Spanish, however, employ distinct F0 contours or patterns for questions that are typified as a final falling intonation. This pattern is found in Caribbean and Canary Island varieties and has been referred to as a 'circumflex' intonation contour (Alvord 2007 and Quilis 1987). The production of a final rising contour in an interrogative versus a final 'circumflex' falling contour has also found to vary by sociolinguistic factors (Alvord 2007).

As the current study examines L2 production of Spanish intonation, it is important to consider L1 (i.e. American English) patterns for comparison. American English intonation varies by dialect and utterance type (Cruttenden 1997 and Ladd 1996). Lexically stressed words may contain a pitch excursion, though deaccenting, or a lack of tonal excursion, is frequently reported (Ladd 1996). Pitch accents in English have structural differences in the tones or combinations of tones (Ladd 1996), and these differences have been shown to correlate to sentence type or pragmatic intent. Recent work on the differences between neutral statements and declarative questions in English intonation, similar to the task in the current study, has documented three areas in which declarative statements differ from declarative questions (Liu & Xu 2007 and Liu 2009).⁴ One difference between the utterance types occurs at the first stressed syllable, with questions demonstrating a higher tonal value than that of declaratives. Word focus has also revealed distinctions between the utterance types in the post-focal portion of the F0 contour. Liu (2009)

found that post focal tonal range was compressed in both utterance types, but that declarative statements were falling and declarative questions had a rising contour.⁵ An additional finding was that questions had a greater velocity in the stressed syllable than declaratives (Liu & Xu 2007). The report of a final rise in declarative questions versus a fall in declarative statements in English provides an initial metric for comparison of L2 Spanish intonation patterns.

2.2 Previous work on León Spain Spanish intonation

Willis & Henriksen (2008) report on the native León, Spain Peninsular Spanish intonational strategies for distinguishing between declaratives, absolute interrogatives and pronominal interrogatives. Their findings are based on the speech of six educated female speakers performing the same task described in the current study, that is, a contextualized sentence reading task based on specific discourse contexts. The researchers noted variability in the native speaker production of the F0 contours, and particularly in that of interrogative contours. The most common patterns are shown in Figure 1.

The broad focus declarative shown in Figure 1a is similar to previous reports on Peninsular Spanish with one exception. It was typically produced with a rising pitch accent on the first stressed word with typical peak displacement into the posttonic syllable followed by a falling tone to the onset of the nuclear tonic syllable. At this point there was often a plateau tone through the tonic syllable followed by a tonal fall to the final Low boundary tone as opposed to the rising tonal movement typically documented (Face 2002).⁷ The absolute interrogative, also known as a yes/no question and shown in Figure 1b, was produced with a rising pitch accent on the first stressed syllable followed by a tonal fall typically aligned with the end of the final stressed syllable. Finally, there was a tonal rise that began at the tonic offset. The syntactic structure of the pronominal or 'wh' interrogatives was identical to the declarative and absolute interrogatives sentences with the exception of the additional interrogative pronoun *quién* 'who'. The contour began with a tonal rise on the question word and then had a falling tone until the onset of the final stressed syllable. The nuclear pitch accent was produced as a Low tone throughout the final tonic syllable and then ended with a final tonal rise in the final unstressed syllable as illustrated in Figure 1c. An impressionistic overview of the contours found that the pronominal interrogatives typically started at a higher tonal level than the declaratives or absolute interrogatives, suggesting the presence of an initial High boundary tone as argued elsewhere (Willis 2005, 2006).

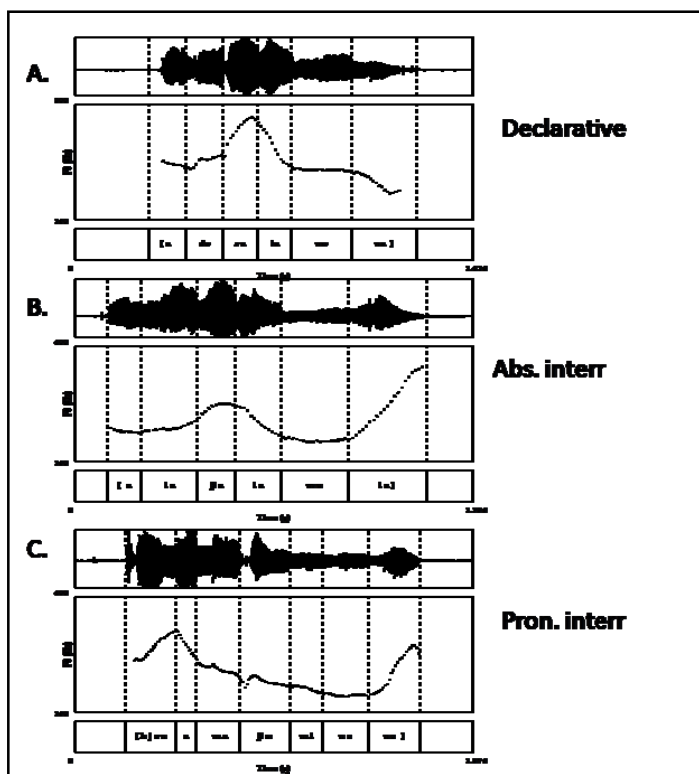


Figure 1. Leon Spanish F0 contours of three utterance types in broad focus contexts⁶

Research on the production and perception of second language phonology has grown extensively during the last twenty years, owing in great part to the initial strides that were made in the 1980's by Flege and colleagues (e.g. Flege 1980, 1987, Flege & Eefting 1988 and Flege & Hillenbrand 1984). A direct consequence of this growth in research was the advancement of a number of theoretical models of second language phonology, each of which held as its ultimate goal to account for the production and perception of non-native phonology by learners of a second language. The most well-known and most frequently cited models include the Speech Learning Model (Flege 1995), the Perceptual Assimilation Model (Best 1995), the Perceptual Magnet Model (Kuhl & Iverson 1995), and the Ontogeny Model (Major 2001). Although the claims put forth in each model are geared toward

understanding second language phonology as a whole, a more appropriate characterization is that they are envisioned to account for the perception and/or production of nonnative (i.e. non-L1) phonetic segments. Regarding the role of prosody in second language phonological acquisition, no explicit predictions are made in any of the models. This is not a surprising fact, given that the majority of work in the field of L2 phonology had focused on L2 segmental issues of both perception and production. To date, however, what little has been done in terms of L2 prosody has shown that the factors that underlie L2 suprasegmental learning are reminiscent of those that underlie the acquisition of L2 segments (Mennen 1998, 2004 and Trofimovich & Baker 2006). In fact, some studies have shown that prosody may contribute to the perception of foreign accentedness more than individual segments (Anderson-Hsieh, Johnson & Koehler 1992, Boula de Mareüil & Vieru-Dimulescu 2006, Derwing & Munro 1997).

One of the reasons that the study of L2 intonation has been left behind in the L2 phonology research is that the instrumental techniques necessary to carry out technology-based, objective investigation were relatively infrequent prior to Pierrehumbert (1980) and the development of the AM model (Ladd 1996, Pierrehumbert 1980, Pierrehumbert & Beckman 1988). For example, it is only in the last decade that the field of L1 Spanish intonation within the AM framework has begun to take off, beginning with Sosa (1991, 1999), followed by the publication of the Sp_ToBI proposal in 2002 (Beckman, Díaz-Campos, McGory & Morgan 2002). As for the body of literature that exists on L2 intonation, the majority of data analysis techniques have relied on auditory interpretation and categorization of learner data. An example is Anderson-Hsieh, Johnson & Koehler (1992), in which the authors asked native speaker judges to provide impressionistic ratings of nonnative speaker prosody, a decision that was made due to the difficulties that the authors had encountered in trying to quantify nonnative intonation without acoustic software. A second complication that has slowed progress in the study of L2 intonation concerns the theoretical framework from which intonation generally has been understood. A review of even the most recent work reveals that not all subscribe to the same framework of intonational phonology or phonetics (see, for example, Cruz-Ferreira 2002/3, Mennen 2004, Ramírez Verdugo 2005 and Ramírez Verdugo & Romero Trillo 2005). Mennen (2006) highlights a number of contributions of the AM framework for the study of intonation in general and L2 intonation in particular. She notes that by differentiating between notions such as phonological representation and phonetic implementation, the AM model allows for comparability with work on L2 segments. Within AM theory, the phonological component consists of series of high (H) and low (L) tones, and these are organized into pitch accents and edge tones. As for the phonetic component, underlying tones are defined on two parameters: scaling, or F0 value, and alignment, or the relative timing of an F0 turning point. Early work in L2 intonation did not consider the

possibility that two levels of analysis could exist in the study of intonation, and that for this reason comparability across data-driven studies was difficult to achieve.

One well-known study on L2 intonation couched within the AM model is Mennen (2004), which examined the production of Dutch L2 learners of Greek. Although Dutch and Greek share the same phonological specification for their prenuclear rising pitch accent (i.e. L*H), their phonetic realizations are somewhat different. In particular, the Dutch tonal rise is marked by earlier peak timing relative to the tonic syllable that is influenced by the phonological length of the stressed vowel (i.e. earlier peak timing in long vowels). Dutch monolinguals, Greek monolinguals, and Dutch-dominant bilinguals were recorded in two language-specific (i.e. one Dutch and one Greek) experimental conditions. In the Greek condition, the majority of the bilingual speakers failed to produce target-like peak alignment patterns, with peaks as early as those of the native Dutch monolinguals. Only one of the five bilinguals produced a rise with Greek native-like values. The second experiment examined Dutch peak alignment values for the Dutch monolinguals and the Dutch-dominant bilinguals. Whereas the monolinguals statistically differentiated long versus short vowel alignment (as expected), the bilinguals had merged this difference, with the exception of one speaker. Mennen claimed that evidence for bi-directional influence was found in both languages for the bilinguals, since 4 of the 5 bilinguals differed in peak alignment values from the native control groups of both languages. She also underscored the importance of conducting speaker-by-speaker analyses in L2 intonation research, given that one exceptional speaker was found to produce native-like timing patterns in both languages.

Atterer & Ladd (2004) found that small timing differences associated to rising prenuclear pitch accents were transferred by German learners of English into their L2. The exact timing of the NS German rise (differing in 25-30 ms from the English rise) was attested in their L2 production data. The fact that the entire prenuclear rise (and not independent L or H tones) had been transferred led the authors to speculate that speakers may identify full pitch movements as permeable for L1-L2 interactions. Simonet (2008), in his dissertation on Majorcan Catalan and Majorcan Spanish intonation in contact, examined production data of 40 Catalan-Spanish bilinguals (20 Catalan-dominant and 20 Spanish-dominant) in absolute interrogative utterances extracted from a question-and-answer game. His research design was guided by the insight that Catalan sentence-final pitch movements are phonologically specified as H*...L% (i.e. final fall), whereas Spanish sentence-final pitch movements are specified as L*...H% (i.e. final rise). Data analysis indicated that younger Spanish-dominant speakers used Catalan-like contours in both languages. Although the phonological category had been transferred from their L2 into their L1, phonetic differences were found between Spanish-dominant productions in Catalan and Catalan-dominant productions in Catalan. Additionally, there was little evidence that Spanish-dominant and Catalan-dominant speakers

were producing different contours in their two languages. That is, both groups of bilinguals seemed to collapse the two systems into one, implying the presence of one merged (i.e. intermediate) category in the common bilingual space.⁸

Of the current body of literature that exists on second language intonation, we know of one experiment designed to analyze second language Spanish intonation by native speakers of American English (Nibert 2005). In this study, L2 speakers judged between potential semantic contrasts in different F0 contours of syntactically ambiguous sentences. Nibert found that advanced L2 listeners were more similar in their judgments to native speakers than to beginning L2 listeners. She hypothesized that the phrasing difference was due to the presence of an intermediate phrase tone and that only advanced L2 listeners had acquired the ability to attend to this prosodic cue. Although Nibert's study represents a step in the right direction in terms of the acquisition of Spanish intonation by native speakers of English, there is arguably a wide range of research topics that has yet to be explored. The field of L1 Spanish intonation has made important advances in recent years, and the groundwork has been laid to extend this line of research to the L2 context.

Lastly, we have yet to come across a study whose primary research goal was to analyze L2 intonation from a developmental perspective. It should not be seen as unexpected that the field of second language phonology has yet to pursue L2 intonation from a developmental perspective, given the tradition of the cross-sectional design in L2 segmental acquisition studies (see Flege (1987) for a well-known example). We argue that the time is right to develop a research agenda that seeks to identify specific changes incurred in learner intonation patterns over a given period of time. Rather than focus on a single acoustic property of learner intonation – as was the case in the studies cited above – we feel that the most appropriate starting point for our research program can be found in study of global intonation patterns.

2.4 The effect of context of learning on phonological acquisition

Early work on the effects of study abroad on language learning, such as that by Carroll (1967) which included over 2700 participants, demonstrated that even short stays in the target environment had a positive effect on acquisition. Since that time, we have come to understand that the effects of study abroad are more widely varied and that not all areas of a learner's grammar are affected in the same way (see Freed 1995, 1998, Lafford 2006 and Lafford & Collentine 2006 for reviews). For example, Collentine & Freed (2004) note that fluency, lexical abilities and sociolinguistic awareness tend to develop well in the study abroad environment (see also Lafford 1995, 2004). In contrast, a learner's grammatical ability does not necessarily develop more effectively during study abroad, and some studies even show a clear advantage for at home (AH) learners (Collentine 2004, DeKeyser 1986, 1990, 1991 and Torres 2003). Lafford & Collentine (2006) identify several

methodological shortcomings that may explain the differing results across studies (see also Freed (1995) for additional methodological critique). Firstly, they point out that the duration of most studies, and of most study abroad experiences, is short relative to the length of the process of second language acquisition (SLA) in general. Secondly, there is evidence that the quality and quantity of interaction that learners have with native speakers while participating in study abroad varies tremendously across learners (Brecht, Davidson & Ginsberg 1995, Díaz-Campos 2004, Segalowitz & Freed 2004 and Wilkinson 2002). Finally, they note that while most studies on study abroad include intermediate level learners, there is greater evidence of positive effects with more advanced learners (see, for example, Isabelli & Nishida 2005), and this suggests that there may be a minimum proficiency threshold that must be reached before certain aspects of the grammar, such as morphosyntactic abilities, may be positively impacted by study abroad. What is clear from this discussion is that there is a great deal more work to be done before we fully understand the effects that study abroad has on language acquisition.

As with the work on morphosyntactic abilities reviewed above, research on the effects that the study abroad experience has on second language pronunciation does not show consistent benefits across studies. For example, early work by Simões (1996) examined the pronunciation of a group of five adult learners of Spanish who participated in a 5-week study abroad program in Costa Rica. Only two students showed significant changes in their oral pronunciation by the end of the program. Simões noted less production of the American English schwa, less vowel lengthening, and more use of linking across word boundaries by the end of the study abroad experience. Díaz-Campos (2004) compared the oral production of at home vs. study abroad learners, observing learner performance at two points in time during one semester of instruction. The study abroad students had spent 10 weeks in Alicante, Spain. Developmental changes were examined for four classes of segments: voiceless stops, voiced fricatives, syllable-final laterals, and the palatal nasal. Oral data was elicited in a read-aloud task. Results showed that there was equal gain for both regular classroom and study abroad students in the production of voiceless stops and syllable-final laterals. Neither group of students yielded significant gains for the voiced fricatives. As for the palatal nasal, all participants yielded high levels of native-like production in the pre-test. In a more recent follow-up, Díaz-Campos (2006) analyzed the role of style in the study of second language phonology. He presented a further analysis of students' performance by analyzing the impact sustained by different data elicitation tasks. The goal was to complement the findings of his 2004 study by analyzing the effect of speech situation on learner production. Results showed that style had an important effect on the production of certain sounds. Specifically, learners tended to be more target-like in their pronunciation during an informal conversation than in a read-aloud task. Study abroad learners were shown to be more native-like than at-home learners in the

informal conversation for word-initial voiceless stops, syllable-final laterals, and palatal nasals. Intervocalic voiced fricatives were an exception to this pattern.

There are at least two important conclusions that can be drawn from this body of literature. The first is that the effects of study abroad are likely to vary according to the feature of the sound system under study as well as the characteristics of the tasks of measurement, the learners themselves and the context of study. The second is that the degree of inconsistency across studies may well be a result of the relative paucity of research on the topic, especially in the area of L2 phonology. One implication is that future research must expand the focus of study to include a wider array of phenomena, especially at the suprasegmental level where almost no research exists to date. To this end, the field would be well served by detailed, longitudinal research that examined the development of a second language in the study abroad environment. The current study seeks to respond to each of these issues by providing the first analysis of the development of intonational patterns in the study abroad environment using a longitudinal research design.

3. The Current Study

3.1 Research questions

As stated previously, the goal of the current paper is to examine the development in L2 Spanish speakers' intonational patterns during the course of a study abroad experience. Our work was guided by the following overarching research questions. These questions are couched within the autosegmental-metrical (AM) framework, but are specific in phonetic detail so that they can be compared across models.

1. How do the intonational patterns of English-speaking learners of Spanish change over the course of a 7-week study abroad experience for declaratives, absolute interrogatives, and pronominal interrogatives?
 - a. For each utterance type, what are the most frequent intonation strategies (i.e. boundary tones and pitch accents) employed at the beginning of the program?
 - b. For each utterance type, what are the most frequent intonation strategies (i.e. boundary tones and pitch accents) employed at the end of the program (i.e. approximately 6 weeks later)?
 - c. For each utterance type, how can the changes between the beginning and the end of the program best be characterized, both in terms of intonation strategies and frequency of contour types?

2. Are there key features in the intonation patterns of these learners that help to characterize changes over time?

3.2 Participants

The data from the current study were collected from five English-speaking learners of Spanish enrolled in the same study abroad program. Because the data from one of these speakers were not analyzable (see below for details), the remaining description of the participants will be based on the four learners whose data were submitted to acoustic analysis. We include mention of this fifth participant both here and in the results section because our research is, to our knowledge, the first of its type and we believe that information regarding how these data differed qualitatively from those that we were able to analyze will prove useful to others who seek to further our knowledge in this area. All participants were female, Caucasian and were born in the United States. No participant had prior experience living or traveling in a Spanish-speaking country. All participants learned English as a first language and attended secondary school in the same Midwestern state. The participants ranged in age from 16 to 18 (mean = 17) and had completed between 3 and 7 years of study of Spanish (mean = 4.5). Participants had begun learning Spanish as a second language between the ages of 11 and 14 (mean = 12.75) and had their first contact with native speakers of Spanish between 13 and 17 years of age (mean = 16).

Our participants were selected based on the number of characteristics they have in common, rather than the degree to which they demonstrate individual differences. As the above description indicates, all learners had extensive experience with Spanish but limited real world experience with native speakers of the language. We know that their input prior to the study abroad experience came from the classroom environment and met the minimum standards for foreign language instruction as set by their home state. Although there is some variation in the number of years that each learner had studied Spanish, the exclusiveness of the study abroad program in which they participated further underscores that these are high-achieving students of Spanish.⁹ In order to be admitted to the program, each participant completed a sit-down test, an oral interview in Spanish, and an application packet, requiring letters of recommendation from their language teachers. Despite the number of characteristics our participants share, we do note that there are several factors for which we were unable to control, and these relate largely to the type of input our learners may have received prior to study abroad. For example, we do not have measures of the quality of the high school, the instructors or the language programs from which each participant came, and we cannot measure whether or not some learners were actually exposed to greater quantities of native-like input than others. Nevertheless, we do know that each of these learners was able to use the input they received to achieve a level of proficiency that was deemed sufficient for this highly

competitive study abroad program based on the independent measures of the admissions process.

The summer program in which these participants were enrolled took place over the course of 7 weeks in León, Spain, and was somewhat unique. The program was designed for outstanding high school students between their junior and senior years. All students on this program lived with Spanish-speaking families, attended classes on language, history, culture, and literature and signed an agreement not to speak English during the course of the time in Spain. Thus, they received input in the form of social interactions with their host families and other program participants and more formal input in the form of classroom activities and lessons, taught exclusively in Spanish. All of their host families were residents of León and spoke a similar variety of Spanish. We note that the amount of conversation and the types of interactions that learners initiated with their host families and other native speakers is likely to differ from one participant to the other. Nevertheless, the rules of the program ensure a minimum level of Spanish input that might not be found in other study abroad programs with less stringent policies. Thus, although our results may not generalize to the population enrolled in basic language courses at the university level with disparate motivation levels and differential access to native speakers, the learning context that we examined provides an excellent opportunity to study the effects of a period of increased and constant native input on the developing second language system of motivated learners.

3.3 Data elicitation instruments

There were four elicitation instruments employed in the current study: a background questionnaire, a grammar test, a vocabulary test and a computerized intonation elicitation task. Each of these will be described in greater detail in the sections that follow.

3.3.1 Background questionnaire

The background questionnaire employed in the current study consisted of items eliciting information about the participants' demographic characteristics, such as age and gender, as well as their language learning and language use patterns. Participants were asked about the first language in which they learned to speak, read and write, and any additional languages they knew and/or used at home. Participants also provided information about their experience with Spanish as a second language, including how long they had studied the language and what types of contact they had with speakers of the language. This information was used to construct the preceding description of the participants and may prove useful in explaining differences between learners should the need arise upon examination of the results of the current research.

3.3.2 Grammar test

In order to gauge the formal grammatical knowledge of each participant, and to confirm that our participants had similar levels of knowledge prior to participation in the study abroad program, we administered an eleven-item grammar test. Each item had a multiple-choice format and was contextualized within a single narrative. Items focused on the grammatical properties of Spanish that are generally taught in intermediate grammar courses. Examples include the use of the subjunctive mood, the copula contrast, pronoun agreement, and aspect in the past tense. This particular instrument has been used in a variety of studies and has been demonstrated to distinguish effectively between a variety of learner levels (see Woolsey (2006) for a review and statistical support of this fact; see Appendix A for sample items).

3.3.3 Vocabulary test

In addition to a grammar test, a vocabulary test was administered. This instrument was not designed to elicit general knowledge of Spanish vocabulary but rather specific knowledge of words included in the computerized elicitation task described below. In order to meet the requirements of the task design from a phonetic perspective (e.g. avoiding intervocalic voiceless stops that would interrupt the representation of the intonation curve in the F0 track), a small number of the lexical items included in the task were not as commonly found in first and second year textbooks as might have been desirable. Thus, in order to ensure that our participants were actually producing language that they could comprehend, we employed this measure of vocabulary as a way of identifying any words that might have been problematic. The format of this instrument included the Spanish word in question and then provided 3 possible synonyms, also in Spanish, from which the participant could choose. The use of Spanish options was in keeping with the agreement on the part of the learners to use only Spanish while in Spain. There were a total of 11 items in the vocabulary test (see Appendix B for sample items).

3.3.4 Computerized elicitation task

The computerized task employed to elicit the recorded data that was the basis of the acoustic analysis consisted of 162 PowerPoint slides. This task was divided into two parts. The first part contained a story involving a fictitious cartoon family and their pets. This story served to contextualize the lexical items and the sentences used in the task. Although this is not a common feature of studies on intonation, it was especially important to include this task for second language learners in order to encourage learners to produce utterances that were meaningful. In other words, presenting the utterances in the context of a story helps to provide a better

understanding of what learner speech would look like in less constrained contexts. The story consisted of a total of four PowerPoint slides, with approximately 75 words of text per slide. Each slide also contained a series of pictures, animations, and dialogue balloons. Participants were not given a time limit for this portion of the task.

The second portion of the computerized elicitation task was a contextualized sentence reading task in which participants read a series of target sentences that were preceded by a discourse context designed to elicit the particular target sentence production: declarative, absolute interrogative or pronominal interrogative. There were a total of 136 contextualized sentences, 96 of which were test items. The remaining 40 items were distracter sentences, but retained the same format as that of the test sentences. As illustrated in (1), a given set of lexical items was used to form each of the three target pragmatic intents. This allowed for direct comparability in the acoustic analysis. In total, 8 lexical combinations were used to create the target utterances. The set of unique lexical combinations that were used to create target sentences is provided in Appendix C.

- (1) Sample lexical combination: *Mimaba a la nena. 'He was spoiling the girl.'*
 - a. Declarative

Contexto: Mamini te pregunta, “¿qué hacía Papini ayer por la tarde?”
 Respondes: “Mimaba a la nena.”
Context: Mamini asks you: “What was Papini doing yesterday afternoon?”
You respond: “He was spoiling the girl.”
 - b. Absolute interrogative

Contexto: Mamini quiere saber qué hacía Papini porque no lo vio ayer.
 Te pregunta: “¿Mimaba a la nena?”
Context: Mamini wants to know what Papini was doing because she didn't see him yesterday.
She asks you: “Was he spoiling the girl?”
 - c. Pronominal interrogative

Contexto: Alguien compró demasiados bombones ayer y Mamini quiere saber quién lo hizo.
 Te pregunta: “¿Quién mimaba a la nena?”
Context: Someone bought too many candies yesterday and Mamini wants to know who did it.
She asks you: “Who was spoiling the girl?”

With regard to data elicitation format, a contextualized prompt was provided in the upper portion of each slide. Learners were instructed to read the contextualized prompt in silence and then to say aloud the target sentence, which was provided in

the lower portion of the same slide. The first click per slide allowed participants to read the discourse context, and the second click allowed participants to see the target sentence. The target sentences in items that were not distracters contained lexical items with open syllables and penultimate stress. All consonants in these items were sonorants and approximants.

The total corpus of target sentences was evenly divided among declaratives, absolute interrogatives and pronominal interrogatives. The target utterances were created from a previously determined set of 8 lexical combinations. Each combination was produced 4 times per target sentence type (i.e. declarative, absolute interrogative, pronominal interrogative). Thus, each of the target utterances provided in (1a-c), for example, was uttered four times, for a total of 12 utterances per lexical combination ($12 \times 8 = 96$ total target utterances). The first six slides of the task served as a practice session so that participants could become familiar with the pragmatic contexts and the nature of the task. Participants took a break after each set of 25-30 slides, as indicated by the computerized instructions. Participants were not given a time limit to complete this portion of the task.

3.4 Procedure

As was stated previously, the primary goal of the current study was to examine how second language intonation develops over time in a study abroad context. Consequently, it was necessary to elicit data from the learners at two different points in time. During the first elicitation session, each participant completed the computerized elicitation task and then the vocabulary test, the grammar test and the background questionnaire. This recording took place during the first week of the program, upon arrival to León, Spain. Toward the end of the program, during the sixth week, each participant was recorded for a second time. The recording sessions and experiments were identical except for the elimination of the background questionnaire and the contextualized story at Time 2. The recording sessions will be referred to as Time 1 and Time 2 in the remaining portion of this paper.

3.5 Recording and analysis

The speech data were recorded using a Sony HI-MD MZ-RH1 minidisc recorder and a Shure WH20 head-mounted microphone sampled at 44.1K. The microphone was placed at 1½ to 2 centimeters from each informant's lips. The recordings were transferred digitally to a laptop computer in .wav format. The acoustic analyses of the sound files were performed with the software Praat (Boersma & Weenink 2008). Each utterance was labeled according to eight potential targets depending on the type of utterance. The potential targets and tonal abbreviations, which were devised by the researchers to facilitate reference to the targets, are included in Table 1. An

example of our tagging schema is provided in Figure 2. The targets kL and kH apply to pronominal interrogative utterances only.

Tonal target	Abbreviation
Initial tonal level	IT
Low tone of the first pitch accent of wh-word	kL
High tone of the first pitch accent of wh-word	kH
Low tone of the prenuclear pitch accent	pL
High tone of the prenuclear pitch accent	pH
Low tone of the nuclear pitch accent	nL
High tone of the nuclear pitch accent	nH
Final tonal value - final boundary tone	FT

Table 1. Tonal targets and abbreviations

A broad transcription of phonological labels within the AM model was assigned based on the observed tonal movements. A sample is provided in the bottom tier of Figure 2. These labels reflect rising pitch accents, falling pitch accents and boundary tones, but do not address a particular type of pitch accent based on tonal alignment criteria.

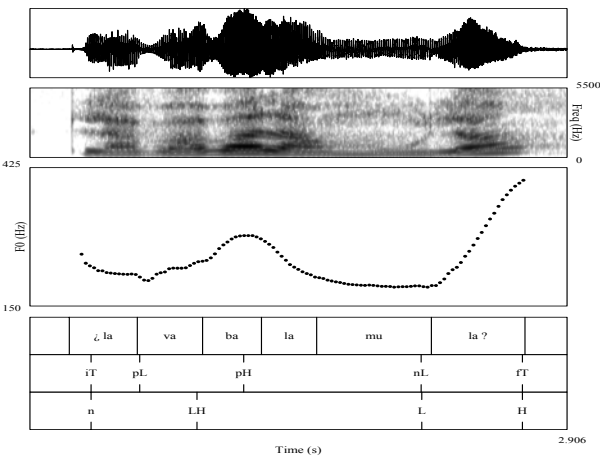


Figure 2. Sample absolute interrogative with syllable labels, F0 measurement targets, and tonal labels taken from a native speaker informant from Willis & Henriksen (2008)

Once F0 targets were measured and tonal targets were labeled, the most frequently occurring contour type was identified for each learner per sentence type

at each recording time. Identical contour types were classified as consisting of the same boundary and pitch accent movements. Box plot diagrams were then created for the most frequent pattern based on the F0 targets that had been measured. Although we originally recorded five learners for this investigation, the productions for one speaker were later discarded because there was not a sufficient quantity of data that could be submitted to reliable acoustic analysis. Her language included productions in which each word was an individual phrase, the speech was choppy, and/or pitch movements were exaggerated. Thus, data from four of the five non-native informants are presented and discussed in the following sections.

4. Results

Our analysis was guided by research questions that sought to characterize the intonation strategies employed by our learners both at the beginning and at the end of their 7-week stay in León, Spain, and to assess the types of changes that were evident between these two points in time. We begin this section with a description of the learners' performance on the grammar and vocabulary tests.

4.1 Grammar test

Each of the participants in the current study completed an 11-point grammar test upon arrival to Spain and again at the end of their stay. The raw scores for each participant, as well as the group mean at each time, are presented in Table 2.

Learner	Time 1	Time 2
1	7	11
2	11	10
3	9	11
4	11	11
Group mean	9.5	10.75

Table 2. Raw scores on grammar test for each participant by time

The scores in Table 2 demonstrate two important points. Firstly, our learners had already achieved a reasonably high understanding of the formal properties of Spanish at the inception of the program. Secondly, despite high start scores, there was an increase in the mean score on the grammar test over time. Only one learner decreased in score, and this is because an item that she originally had correct was marked as incorrect at the second time but involved a change in her use of a pronoun that is socially-governed variable in the study abroad region (i.e. *le* vs. *lo* for direct object human referents). Learner 4 did not show improvement because she

had a perfect score at both test times. Thus, these results suggest that on a global measure of grammatical knowledge, the study abroad experience contributed to an increase in accuracy with the formal properties of the language. This has bearing on our analysis of changes in intonation strategies in that it shows that learners had access to input and improved in general. Thus, changes in intonation strategies could also be attributable to development, and failure to modify strategies would set intonation apart from other properties of the grammar.

4.2 Vocabulary test

Each participant also completed an 11-item vocabulary test upon arrival to Spain and again upon completion of the program. We recall that the vocabulary test was designed to track learner knowledge of the words that appeared in the sentence reading task. The raw scores for each participant and the group mean at each time are presented in Table 3.

Learner	Time 1	Time 2
1	9	9
2	10	11
3	7	7
4	11	11
Group mean	9.25	9.5

Table 3. Raw scores on vocabulary test for each participant by time

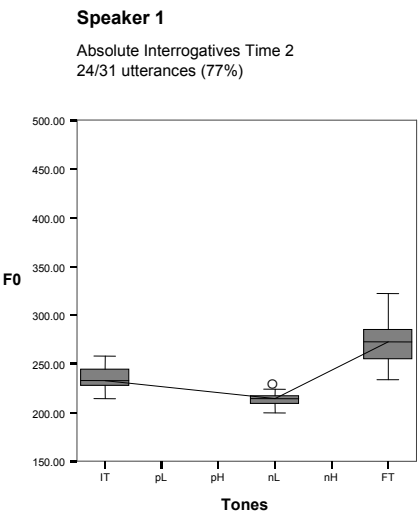
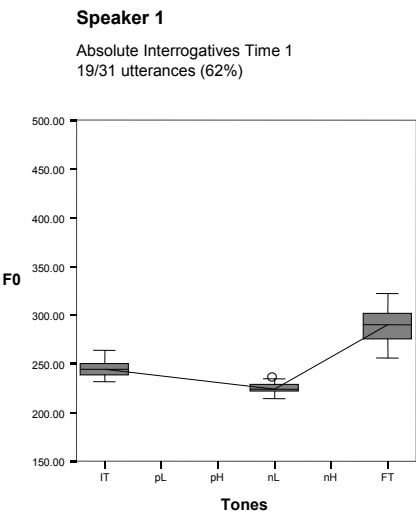
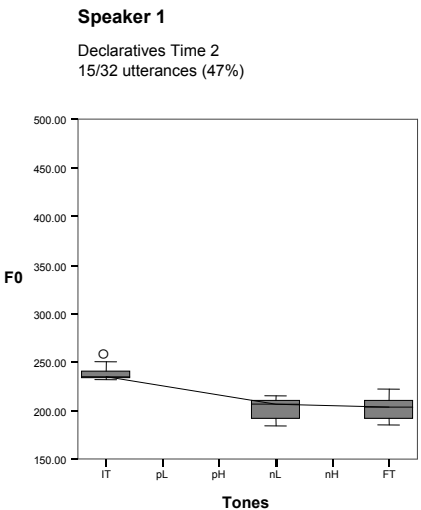
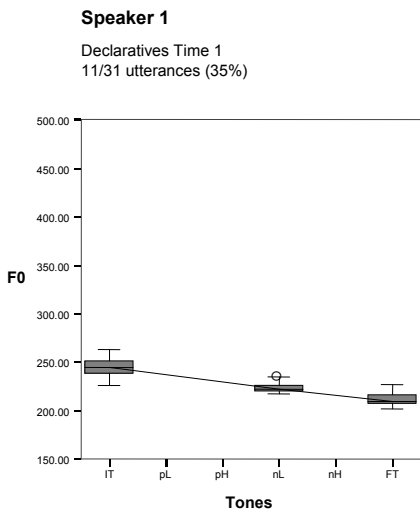
As with the grammar test, the data presented in Table 3 show improvement in the group mean between the first test time and the second. One notes that this improvement is not as large as it was with the grammar test. This result, however, is expected because the vocabulary test was administered to ensure that learners understood the meaning of somewhat lower frequency words in the computerized elicitation task.¹⁰ Consequently, one would not expect learners to have frequent exposure to the words in the input and significant improvement would not be likely to occur. In fact, most learners performed fairly closely to their original score on this test during the second test time. Only one learner improved on this measure. The important result from this measure is that learners performed fairly well on this task, indicating that they had understood the words that they produced in the sentence reading task. Given the objective of the researchers to develop a meaning-based task, failure to understand this vocabulary could undermine this goal; our results suggest that no such barrier to comprehension existed.

4.3 Learner contour production profiles

Each learner produced a total of 96 target sentences at each recording time (i.e. 32 declaratives, 32 absolute interrogatives, and 32 pronominal interrogatives). It will be recalled that one of the principal research goals of the current investigation was to document the most frequent intonational strategy employed by each learner per sentence type at each point in time. These most frequent strategies, or full tonal contours, are provided in the box plots that follow. For the purposes of the present study, tonal contours were classified as identical if they were comprised of the same boundary movements and pitch accent movements (or lack thereof). The visual representation of each contour is provided in box plot format, and the F0 values for a given boundary tone or pitch accent movement are plotted where appropriate.¹¹ For ease of interpretation, a straight line connects the tonal values for each pitch target, although it is important to bear in mind that these lines do not reflect the actual F0 pitch tracks. A last point that deserves attention is that not all speakers produced 32 analyzable utterances per sentence type at each recording time. In some cases, utterances had to be discarded due to excessive use of creaky voice, false starts, or hesitations. The total number of analyzed utterances is provided above each box plot. Because a secondary goal of the current study was to determine whether or not changes across time generalized across learners, we begin with a presentation of individual data prior to addressing that issue.

4.3.1 Speaker 1

The data in the following box plots in Figure 3 represent the most frequent declarative, absolute interrogative, and pronominal interrogative contour types produced at each recording time by Speaker 1. Regarding changes in the use of pitch accents or boundary tones, we see that she maintained the same general prosodic structure for each sentence type at both points in time. That is, for the most frequent contour of each utterance, Speaker 1 did not alter pitch accent use or modify boundary movements. In fact, the most frequent pattern for each utterance type employed at Time 1 became more frequent by Time 2 (35% to 47% for declaratives; 62% to 77% for absolute interrogatives; 31% to 62% for pronominal interrogatives). Finally, in terms of pitch accent movements, we see that this learner failed to use the prenuclear rising pitch accent, typical of Spanish intonation, in both declaratives and absolute interrogatives at both recording times.



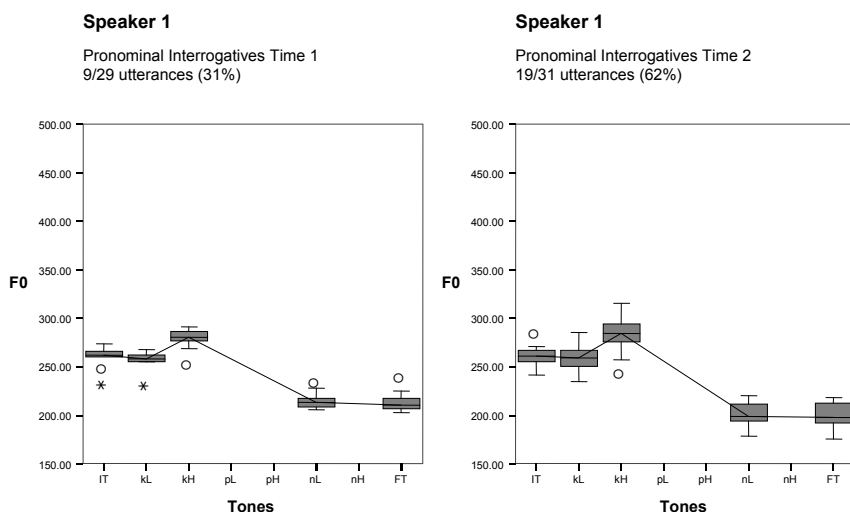


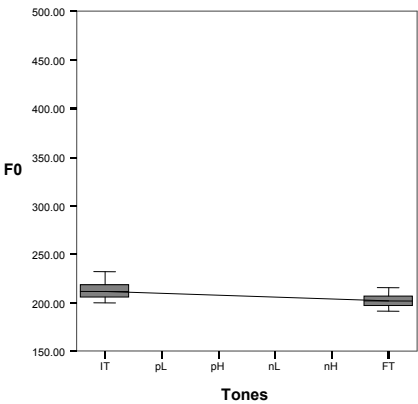
Figure 3. Speaker 1's most frequent contours at Time 1 and Time 2

4.3.2 Speaker 2

The next series of box plots, in Figure 4, represents the most frequent contour productions for Speaker 2 at each recording time. Three specific developmental changes deserve attention. First, in terms of Speaker 2's declarative production, we see that at Time 1, the most frequent pattern lacked a prenuclear rise. By Time 2, however, her most frequent pattern included a prenuclear rise. The second point concerns Speaker 2's absolute interrogative production, for which we observe a similar development as with the declaratives. Although her most frequent absolute interrogative contour lacked a prenuclear rise at Time 1, it contained this tonal movement by Time 2. A comparison of these data with those that were just observed for Speaker 1 reveals two strikingly different developmental patterns, in spite of the fact that both speakers presented similar profiles for declarative and absolute interrogative production at Time 1. That is, whereas Speaker 1 disfavored use of the prenuclear rise even at Time 2, Speaker 2 had inserted this rise in her most frequent contour productions by Time 2. Finally, in terms of pronominal interrogative production, we see that Speaker 2 no longer produced a rising nuclear pitch accent by Time 2.

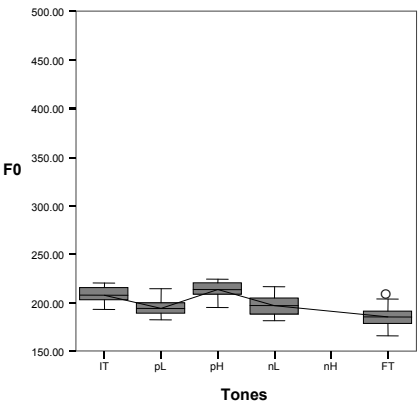
Speaker 2

Declaratives Time 1
16/26 utterances (62%)



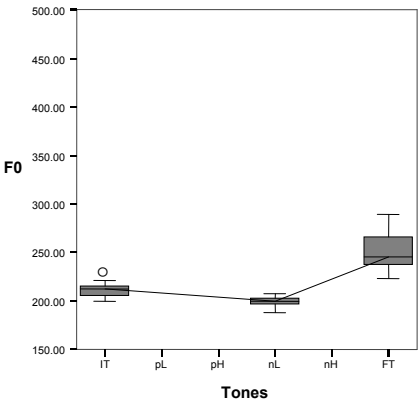
Speaker 2

Declaratives Time 2
13/31 utterances (42%)



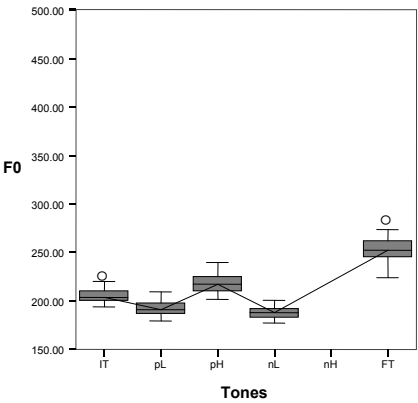
Speaker 2

Absolute Interrogatives Time 1
18/32 utterances (56%)



Speaker 2

Absolute Interrogatives Time 2
30/31 utterances (97%)



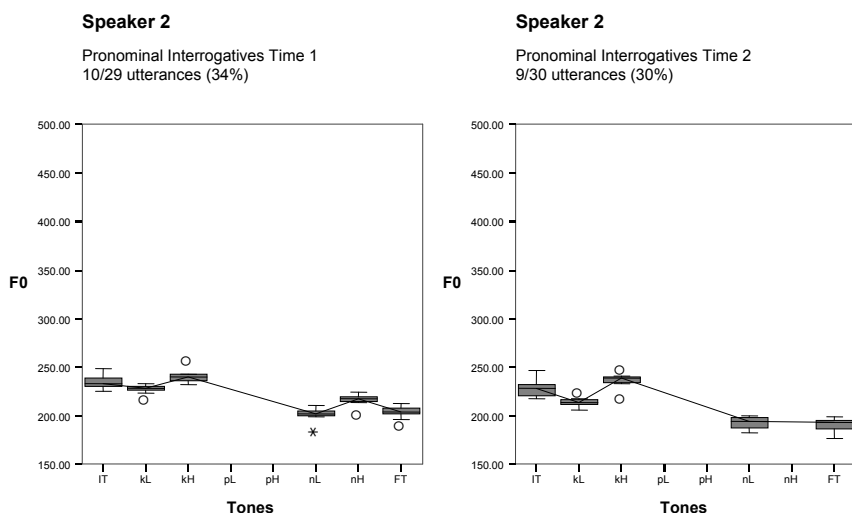


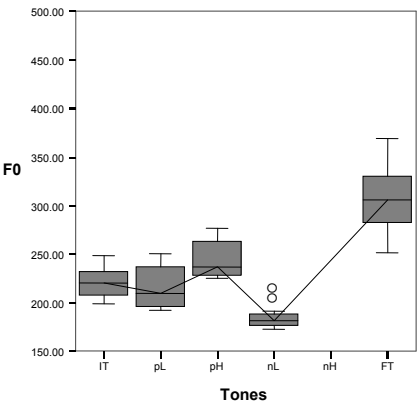
Figure 4. Speaker 2's most frequent contours at Time 1 and Time 2

4.3.3 Speaker 3

The next set of box plots, in Figure 5, corresponds to Speaker 3's most frequent contour type for each of the three sentence types under analysis. Regarding changes that occurred in her declarative productions, we see that the shape of the final boundary movement shifted from a predominance of final rises at Time 1 to a predominance of a final falls at Time 2. The most frequent contour pattern for Speaker 3's absolute interrogatives was the same at both times, and the frequency of use of this contour increased by 22% (66% at Time 1; 88% at Time 2). Finally, pronominal interrogative movements were similar at both times, although the final boundary fall became more robust by Time 2, meaning that the overall tonal magnitude increased. An interesting observation is that while the overall shape of Speaker 3's most frequent pronominal interrogative contour remained unaltered, its frequency of use did not increase (28% at both times).

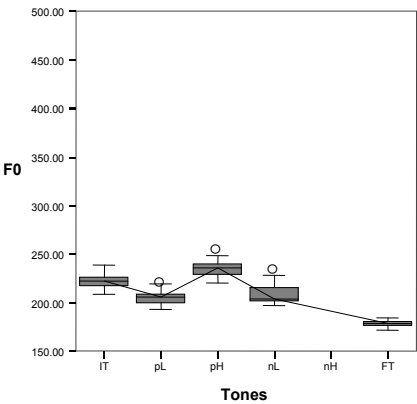
Speaker 3

Declaratives Time 1
11/32 utterances (34%)



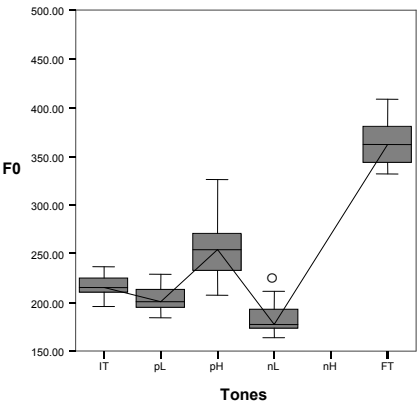
Speaker 3

Declaratives Time 2
15/32 utterances (48%)



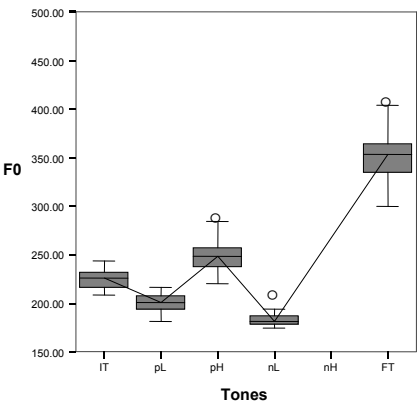
Speaker 3

Absolute Interrogatives Time 1
21/32 utterances (66%)



Speaker 3

Absolute Interrogatives Time 2
28/32 utterances (88%)



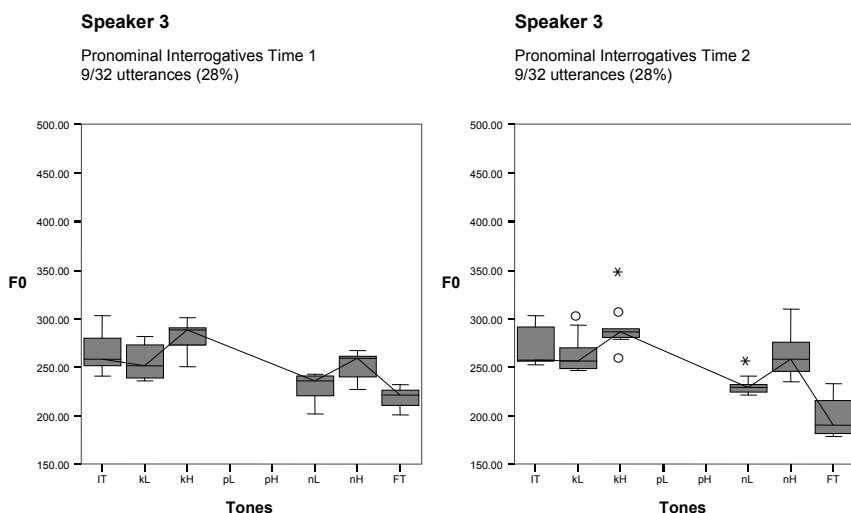


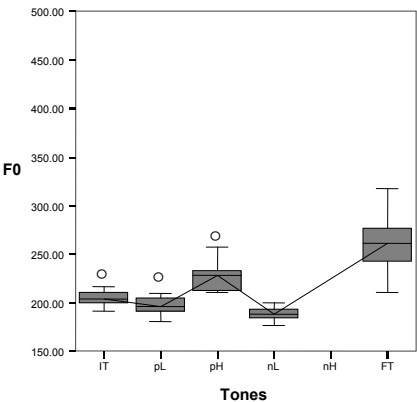
Figure 5. Speaker 3's most frequent contours at Time 1 and Time 2

4.3.4 Speaker 4

The final set of box plots, in Figure 6, corresponds to the data extracted for Speaker 4. They are displayed below. In terms of declarative production, we see a similar development for what was observed for Speaker 3, such that use of a final rising contour was substituted for use of a final falling contour by the second recording time. With regard to absolute interrogative production, the overall shape, characterized by a prenuclear rise and a final boundary rise, was identical at both times. Finally, a number of changes were evidenced in Speaker 4's pronominal interrogatives. First, the initial tonal level was considerably higher at Time 2. The rise on the *wh*-word (i.e. the magnitude of the tonal movement from kL to kH) was also more robust, with a sharper rise by Time 2. Finally, whereas this speaker's most frequent pronominal interrogative contour contained a final rise at Time 1, it contained a final fall at Time 2. This final fall was preceded by a rise on the nuclear stressed syllable.

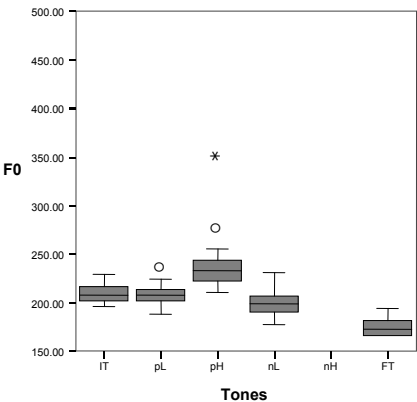
Speaker 4

Declaratives Time 1
13/32 utterances (41%)



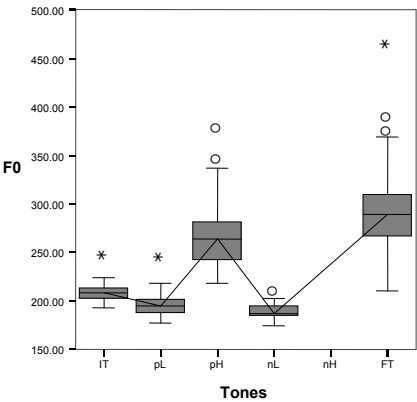
Speaker 4

Declaratives Time 2
16/32 utterances (50%)



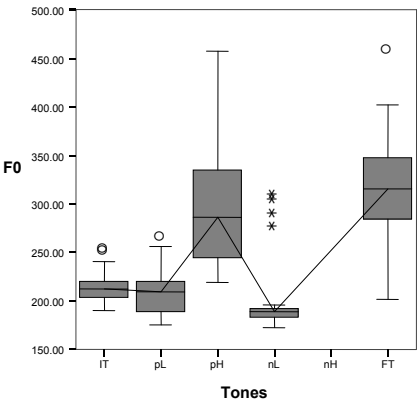
Speaker 4

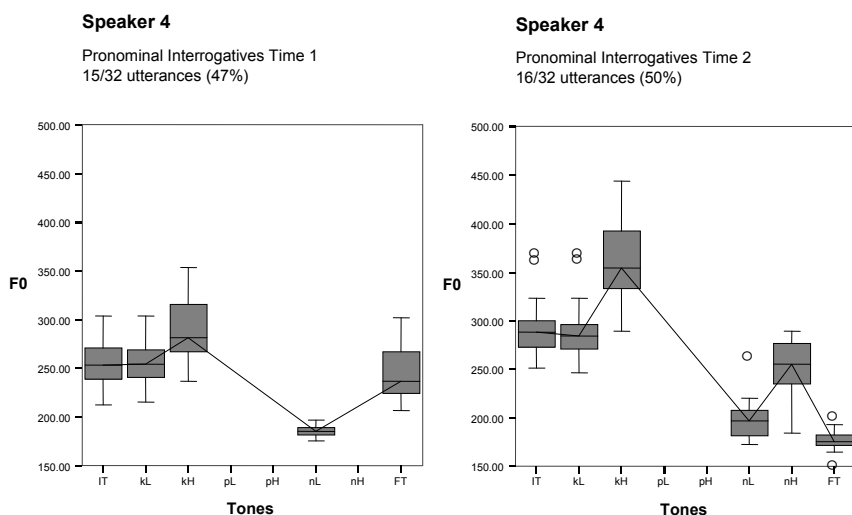
Absolute Interrogatives Time 1
30/32 utterances (94%)



Speaker 4

Absolute Interrogatives Time 2
27/32 utterances (84%)





4.4 Frequency of contour type

The percent of total tokens represented by the most frequent contour type is given in Table 4. Results for each time are presented side-by-side, so that the change in frequency of use of the most frequent strategy can be seen for each sentence type for each speaker. The table also includes calculations of this difference in frequency and reports whether there was an increase, decrease, or no change at all.

Spkr.	Declaratives			Absolute Interrogatives			Pronominal Interrogatives		
	T1	T2	+/-	T1	T2	+/-	T1	T2	+/-
1	35%	47%	+12%	62%	77%	+15%	31%	61%	+30%
2	62%	42%	-20%	56%	97%	+41%	34%	30%	-4%
3	34%	48%	+14%	66%	88%	+22%	28%	28%	0%
4	41%	50%	+9%	94%	84%	-10%	47%	50%	+3%

Table 4. Percent of total tokens represented by most frequent contour type

In terms of change over time, the declarative utterances for three of the four speakers showed an increased consistency of overall pattern use by Time 2. In the case of Speaker 2, whose most frequent declarative type decreased in use by 20% by Time 2, the reduction reflected an increased use of a native-like pattern, marked

by the presence of a prenuclear rise. Absolute interrogatives demonstrated increased consistency for all participants except for Speaker 4, whose most frequent strategy at Time 1 was native-like. The pronominal interrogatives showed the least change across time in terms of consistency and, in particular, for Speakers 2, 3, and 4. We see that no substantial gain in frequency of use was exhibited for any of these three speakers. Only the data extracted for Speaker 1 rendered a considerable gain over time in terms of pronominal interrogative production, and this may be due to the fact that she did not modify any tonal patterns over time.

4.5 Boundary tones and utterance types

We now turn to a presentation of final boundary tone development for each sentence type. In our initial examination of the data we noted that this was a key element of learner production and that it provides important information about how learners change their intonational strategies over time. The learner patterns attested in the full corpus of data could be classified by one of two final boundary movement types: a final rise, as exemplified by the pronominal interrogative production in Figure 7, or a final fall, as exemplified by the pronominal interrogative production in Figure 8.¹²

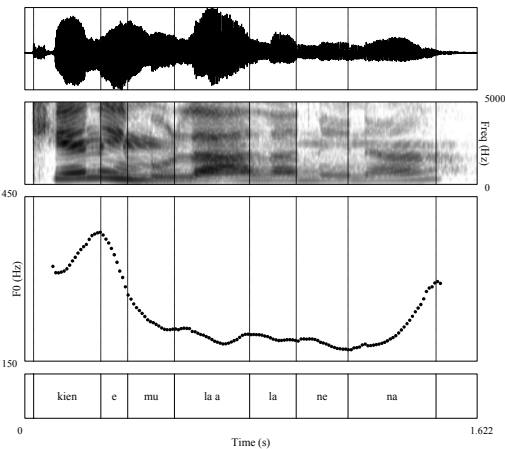


Figure 7. Sample pronominal interrogative final rise movement, produced by Speaker 3 at Time 2

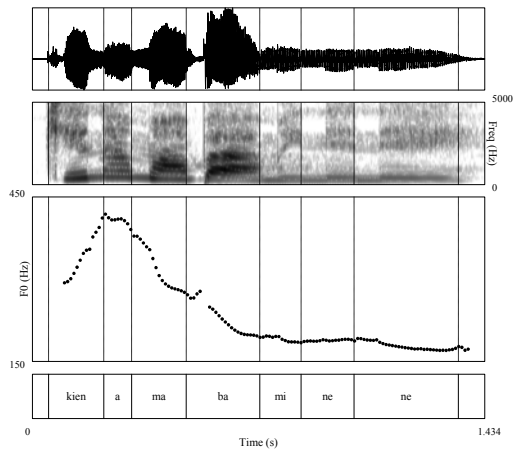


Figure 8. Sample pronominal interrogative final fall movement, produced by Speaker 4 at Time 2

The complete speaker-by-speaker classification of final boundary movements according to sentence type is provided in Table 5. The data presented there are based on all measurable productions for each speaker, in other words, they do not reflect the subset of productions corresponding to the most frequent patterns as in Section 4.3. Instead, they reflect all analyzable utterances provided by each speaker. Table 5 indicates the percentage of all utterances that contained either a final rise or a final fall for each sentence type at each recording time.

Spkr.	Declaratives				Absolute interrogatives				Pronominal interrogatives			
	Rise		Fall		Rise		Fall		Rise		Fall	
	T1	T2	T1	T2	T1	T2	T1	T2	T1	T2	T1	T2
	%	%	%	%	%	%	%	%	%	%	%	%
1	13	13	87	87	100	97	0	3	21	13	79	87
2	8	0	92	100	100	100	0	0	3	6	97	94
3	47	26	53	74	78	94	22	6	6	44	94	56
4	41	22	59	78	94	94	6	6	59	6	41	94
Avg.	27	15	73	85	93	96	7	4	23	18	77	82

Table 5. Final boundary tone inventory

Regarding final boundary movements, we see that of the three sentence types that were elicited in the current investigation, the absolute interrogative showed a very consistent pattern in terms of its final boundary movement – and in particular of the final boundary rise – at both times. In fact, the absolute interrogative final rise was the only final boundary movement whose production was categorical for at least two speakers at a given time. The final rise was the most consistently produced pattern at Time 1 (93%), with a slight increase by Time 2 (96%). Only Speaker 3 did not produce the final rise in at least 90% of her productions at Time 1. By Time 2, however, her use of the final rise was on par with the other learners.

In terms of final boundary movements in declarative utterances, these were less consistent than those of absolute interrogatives at both points in time. There was less variability in declarative production at Time 2, when speakers showed a preference for the final fall in 85% of the total utterances. A somewhat unexpected pattern was attested in the declarative corpus at Time 1, for which there was a large percentage of final boundary rises (27% combined for all speakers). Although final boundary rises are not attested in Peninsular Spanish declaratives, they have been documented for some varieties of English (Ladd 1996 and Warren 2005), though not specifically attributed to Midwest youth.¹³ By Time 2, the use of the declarative final rise had decreased to 15% for all speakers. Speakers 3 and 4, in particular, accounted for the majority of the declarative final rises at Time 1, when they produced this pattern in 47% and 41% of their productions, respectively. Although both showed a notable reduction by Time 2 (26% and 22% respectively), neither of the two used the falling pattern consistently at Time 2.

Pronominal interrogatives in Peninsular Spanish are traditionally reported to have a variable realization (Henriksen 2009, Navarro Tomás 1944 and Quilis 1987), due in large part to the multiple pragmatic readings that one can give to this sentence type. For example, a final Low tone preceded by an initial rise is the most common pattern, whereas a final rise or rise-fall suggest a degree of courtesy and surprise respectively (Navarro Tomás 1980, p.229). With respect to the current corpus of L2 data, it is clear that there was a greater use of the final fall at both times (77% at Time 1 and 82% at Time 2), and, in particular, for Speakers 1 and 2. A close look at the data extracted from Speakers 3 and 4, however, shows that the pronominal interrogative final fall was not the most frequent pattern across their data samples. While Speaker 3 increased her use of the final rise from Time 1 to Time 2 (6% to 44%), the opposite occurred for Speaker 4, who favored the final rise at Time 1 (59%), but the final fall at Time 2 (94%). Thus, although it could be said that all speakers concurred in their use of the final fall by Time 2, a closer examination of the longitudinal data reveals that developmental patterns were not uniform or uni-directional over time.

5. Discussion

In the preceding sections we detailed the most frequent intonational strategies employed at Time 1 and at Time 2 for each learner and also provided a summary of the frequency with which each strategy was used and how this changed over time. Additionally, we documented development of final boundary tones in learner production of each sentence type. In so doing, we have provided learner profiles that enable us to generalize the findings across learners in order to describe the process of acquiring L2 intonation. These generalizations will be addressed in the sections that follow. Before continuing, however, we would like to emphasize that one of the most notable characteristics of learner intonation is the variability found from one learner to the next. Such variation may indicate differing developmental strategies on the part of the learner, but it may also be a result of the variation found in intonation patterns among native speakers. Thus, as we discuss our general findings below, we remind the reader that variation is also a key finding of this study and that future research would do well to pursue the question of whether such variation is developmental, sociolinguistic, or a combination of the two. With that caveat, we begin with responses to the research questions that guided the present study and continue with a discussion of the implications of these findings.

5.1 Exploration of research findings

It will be recalled that our first research question sought to determine the nature of change of intonational patterns of English-speaking learners of Spanish over the course of a 7-week study abroad experience by comparing intonational patterns at the beginning and end of the study abroad experience. Specifically, the goal was to compare the most frequent contour type produced in declaratives, absolute interrogatives, and pronominal interrogatives at each recording time so that changes in pitch accent and boundary tone movements over the course of the study abroad experience could be documented. Additionally, our second research question sought to identify a characteristic or set of characteristics that describes changes over time in more general terms. Our analysis led us to provide a detailed account of final boundary movements, as a number of developments occurred in this prosodic position for each sentence type. We now turn to a more detailed discussion of the developmental patterns.

In terms of declarative intonation, two main types of change were observed. The first is that at Time 1, learner tonal patterns lacked certain native-like properties such as a rising prenuclear pitch accent. This was exhibited in the data extracted for Speakers 1 and 2. Change over time was not consistent for these two speakers, however. In the case of Speaker 1, her most frequent declarative strategy at both times consisted of the same contour. Its overall frequency increased from 35% to 47%. A different pattern occurred for Speaker 2, however, in that her most frequent

Time 2 declarative production did include a prenuclear rise. This pitch accent modification had a secondary effect, however, as Speaker 2's most frequent production at Time 2 was less frequent than at Time 1. What this indicates is that for learners who begin without prenuclear rises, two developmental options are available to them. The insertion of a rise is one possibility, but it comes at a cost of increased variability at Time 2. Retention of the flat pattern is the second option, which no doubt leads to consistency over time.

The second principal development that we noted in declarative intonation concerns the nature of the final boundary movement. Specifically, Speakers 3 and 4 produced a final rise pattern with highest frequency at Time 1 (47% and 41%, respectively). Use of this final rise contour decreased at Time 2 for both speakers. Nevertheless, declarative final rises had not been completely eliminated by Time 2, since for Speakers 3 and 4, 26% and 22% of their declarative final boundary movements contained rises (see Table 5). Given the differences that are posited to exist between final boundary movements in English and Spanish, one can hypothesize that the use of the declarative rises was attributable to the influence of the learners' first language and that during the course of the experience abroad learners received the input necessary to reduce this effect and move toward more target-like patterns. Another possibility is that learners were unsure or hesitant to produce a forceful declarative and instead opted for a less direct or polite intonation (cf. Quilis 1987). Regardless of the original trigger for the final rise in declaratives, it is clear that this nonnative intonational feature was reduced over time.

The most consistently produced utterance type in our corpus of data was the absolute interrogative. The most frequent contour exhibited in the learner data consisted of a prenuclear rising pitch accent followed by a nuclear valley and a final boundary rise. Similar to Bolinger (1998) and Liu's (2009) findings for L1 English, the final boundary rise appears to be the most salient cue to signal an absolute interrogative in L2 Spanish, as there was only one learner (Speaker 3) who produced absolute interrogatives with a final rise in less than 90% of her productions at Time 1. By Time 2, the use of the final boundary rise had increased to 94% for this speaker. Since a final rise is permissible in L1 Spanish interrogatives, it is not clear if the L2 speakers' use of a final rise reflects a transfer or is an acknowledgement of the L1-L2 similarities (Bolinger 1998).

In terms of development over time for absolute interrogatives, we see a pattern similar to what was observed in the production of the declarative prenuclear rise for Speakers 1 and 2. That is, while Speakers 1 and 2 did not exhibit a rise throughout the first stressed syllable of their absolute interrogatives at Time 1, Speaker 2 only modified this aspect of her intonation by Time 2. Specifically, her most frequent absolute interrogative production included a prenuclear rise at the second recording time. Speaker 1, on the other hand, did not insert a prenuclear rise by Time 2, but maintained the same general pattern as that of Time 1. As we turn to a comparison of consistency in production between declaratives and absolute interrogatives for

Speaker 2, we see somewhat conflicting developmental patterns. In spite of the fact that this learner favored the prenuclear rise in both sentence types by Time 2, it was only in her absolute interrogatives where a substantial increase in frequency of occurrence had occurred. In fact, while the declarative pattern exhibited at Time 2 was produced in 47% of her total utterances, the absolute interrogative pattern exhibited at Time 2 was near categorical, at 97%. The question that arises, given these data, is why a declarative with a prenuclear rise would be produced with inconsistency, whereas an absolute interrogative with the same prenuclear rise would be produced almost categorically. In order to better understand Speaker 2's declarative productions, we turn to the data extracted for final boundary movements (see Table 5), which reveal that of the four learners, Speaker 2 was the least likely to use the boundary rise. In particular, final rises were produced in 8% of her declarative utterances at Time 1 and in none of her declarative utterances at Time 2. One potential explanation of these facts is that for Speaker 2, declarative intonation was characterized by a lack of pitch accents and/or boundary movements, and for this reason, she not only rejected the use of the final rise, but also produced a prenuclear rise in only 47% of her declarative productions at the second recording time. Absolute interrogative intonation, on the other hand, could certainly not be interpreted as 'monotone' or 'devoid of tonal gestures' for this speaker. This is evidenced by the fact that of the four learners, she was the only one to produce absolute interrogatives with a final rise categorically at both recording times (see Table 5). It can be concluded, then, that the prenuclear rise was part of Speaker 2's intonational competence and did not pose a great challenge for her absolute interrogative intonation, due to the fact that it was inserted in a sentence type already known for its use of tonal movements.

Pronominal interrogatives showed the least consistent results, both in terms of contour type and of frequency of use. Regarding contour type, learners exhibited three patterns at Time 1. Speakers 2 and 3 employed the same contour type, characterized by a rise on the pronominal word, a rise on the final stressed syllable, and a final fall. Although Speaker 3 retained this pattern at Time 2, Speaker 2 made a modification, whereby the nuclear rise was no longer produced. Interestingly, this latter pattern – that is, a rise on the *wh*-word followed by a gradual descent throughout the remainder of the utterance – was the most frequent contour produced by Speaker 1 at both recording times. Finally, Speaker 4 was the only speaker for whom a final rise pattern was exhibited at Time 1. This pattern was replaced by a nuclear rise and final fall (i.e. what was attested for Speakers 2 and 3 at Time 1) at the second recording time. In terms of frequency of use, results showed that for Speakers 2, 3, and 4, very little changed over time (see Table 4). As for Speaker 1, however, a developmental norm similar to what was observed for her declarative and absolute interrogative production was attested. Specifically, while no changes occurred in terms of pitch accent movements or boundary movements, the

frequency of use of the pronominal interrogative pattern showed a substantial increase by Time 2.

A look at the data for pronominal interrogative final boundary movements shows that overall, there was a great preference for the final fall (77% at Time 1 and 82 % at Time 2), a tendency that was also observed in the data analyzed above. We note, however, that a somewhat unexpected development occurred for Speaker 3. Although her most frequent pronominal interrogative contour type contained a final fall at both recording times, she actually exhibited an increased use of the final rise at Time 2, as can be seen by the data in Table 5. While only 6% of her pronominal interrogative productions contained a final rise at Time 1, 44% contained a final rise by Time 2. That is, although this speaker's most frequent contour type was marked by a final fall at both times, there was an increased use of a final rise by Time 2.

A number of key issues may have contributed to the lack of pattern consistency in our pronominal interrogative corpus. First, it is not entirely clear what the full range of intonational strategies is for the production of a pronominal interrogative in Peninsular Spanish. Of the three sentence types analyzed in the current study, the pronominal interrogative has received the least amount of attention in the body of literature that exists on Spanish intonation. It may be that multiple strategies are available within the native speaker repertoire and that the lack of consistency in our L2 corpus can be attributed to this variable input. In fact, recent semi-spontaneous data collected by Henriksen (2009) suggests that native speaker pronominal interrogative intonation is more variable than what is generally assumed for Peninsular Spanish. Henriksen showed that although the final rise pattern was largely favored in a standard sentence reading task, other contour patterns prevailed in a corpus of native speaker data extracted from information gap task-oriented dialogues. Another factor which may have contributed to learner variability in pronominal interrogative production is frequency of use. While we know of no study to test this empirically, our intuition is that pronominal interrogatives are produced with less frequency than declaratives and absolute interrogatives in native speaker speech. What this would imply is that decreased consistency in our pronominal interrogative data is in part a reflection of the variability found in native speaker intonation patterns and in part a reflection of the infrequency with which pronominal interrogatives appear in the input that learners receive. Because these are both features of native speech, it is not possible to determine the degree to which each of these factors is relevant without the use of experimental research methods (e.g. providing an input flood). Nevertheless, the natural occurrence of this utterance type in native speech could well be documented in future studies.

5.2 Implications of research findings

As we stated at the outset of this paper, the current study is the first of its type in that it takes a systematic approach to measuring change in intonation patterns in

second language Spanish over time. In so doing, we make two equally important contributions to the field. The first is a description of what developmental trends exist in second language intonation based on a description of how pitch accents and boundary movements change over time, and this will be the primary focus of the discussion that follows. The second is the designation of which intonational features deserve rigorous examination. Certainly, this merits attention before continuing, because it provides the groundwork for future research. Since no previous research on the topic exists, and since work on native speakers of Spanish has uncovered variability, one of the most significant contributions that we have made was to identify the most frequent contour type and the final boundary movements as features that could be measured and compared; these portions of our analysis revealed change over time as well as individual variability. In other words, we have shown *what* to look at when examining second language intonation. We hope that future research will continue to study these features so that broader generalizations about development can be made, and that such projects will also seek to identify other features that provide additional characterizations of development.

Moving towards a broader characterization of L2 intonation, we see that two developmental trends can be highlighted in our data sample. First, there was one learner (Speaker 1) whose most frequent contour type did not undergo any pitch accent or boundary tone modification over time. For example, her most frequent declarative and absolute interrogative contour types lacked a prenuclear rise at both times, despite the fact that the prenuclear rise is a feature of the native speaker norm. The only case of a rising pitch accent was evidenced on the pronominal word of her pronominal interrogative productions. A secondary effect of this learner's lack of tonal pattern modifications was an increase in consistency for all three sentence types, something that was not observed for the other three learners. Her increased consistency was best exemplified in her pronominal interrogative data, where she was the only learner whose most frequent pronominal interrogative contour increased substantially over time. Thus, the developmental trend exemplified by this learner is that while tonal patterns were not modified over time, consistency was increased by Time 2, thereby leading to less variability overall by the second recording time. In other words, the change was not with the tonal inventory but rather with the degree to which learner production was more consistent over time.

A different developmental trend was observed for Speakers 2, 3, and 4. As noted in the previous section, each of these speakers presented contour types that had undergone modification of pitch accent and/or boundary tone movements by the second recording time. In the case of declarative and absolute interrogative prenuclear rising accents, the tendency was to insert the native-like pitch accent by the second recording time. As for pronominal interrogative nuclear pitch accents, modifications were attested in our corpus of data, but it was not clear which was the preferred pattern across the learner sample by Time 2. For example, the nuclear rise

was employed by Speaker 2 at Time 1 only, by Speaker 4 at Time 2 only, and by Speaker 2 at both recording times. As for boundary tone modifications, the data from these three speakers revealed changes in declarative and pronominal interrogative productions. One unexpected occurrence included a final rise in Time 1 declaratives, which was changed to a final fall by Time 2. Pronominal interrogatives also underwent boundary modifications, and in the case of Speaker 3, whose most frequent contour type showed identical patterns at both times, a more detailed analysis of her final boundary movements revealed an increasing preference for the final rise by Time 2. Lastly, a lack of increased consistency over time was observed for all three speakers in terms of pronominal interrogative production. Summarizing the second trend, then, we see that these three learners modified pitch accent and boundary movements over time, and in some instances, their productions had become more variable, meaning that consistency had decreased by the second recording time. Thus, these learners demonstrated development not in their consistency but in their introduction of new intonational strategies over time.

The two developmental patterns described above are clearly in opposition to one another. This finding, however, is very much in line with what we know about learner development in second language acquisition. It is very often the case that when new elements are added to the second language grammar there is an increase in variability until the more target-like element replaces the element that was previously in use (see Ellis (1999) and Preston (1993) for discussions of variation and acquisition). Given the extensive documentation of this tension between consistency and addition of new elements to the second language grammar in the existing SLA literature, we expect that a larger data set would also produce both types of learners. In other words, we do not believe that the trend that applied only to Speaker 1 in the current study is a case of individual idiosyncrasies. Although we purposefully chose to look at a small group of learners who had a great deal in common in order to increase the degree of comparability from one learner to the next, we also expected that learners would differ in terms of their individual learning styles and personalities and that this would in turn affect the types of input they receive. Nevertheless, with a larger group of participants we would expect to find repetition of these patterns amongst learners with similar traits. What makes the study of intonation even more complex, however, is the variability known to occur in native speaker intonation. This means that not only are we likely to see variability due to developmental changes, but acquisition will also entail learning to vary intonation according to linguistic, social and individual characteristics as is the case in native speech. Although we know that variable structures are often acquired late in the acquisition process (Geeslin 2003, Geeslin & Gudmestad forthcoming, Geeslin & Guijarro-Fuentes 2006 and Gudmestad 2006), we know little about whether such development at the level of the sound system takes a similar path. In this sense, our study provides a basis for connection to existing research on the

acquisition of variable structures and for comparison to future research on intonation with learners at other levels of development and in other learning contexts.

6. Limitations and future directions

The current study has served to document how the most frequent strategies employed for three utterance types develop over time and, additionally, how the final boundary tone inventory changes during a study abroad experience. We have documented both individual variability and some of the general changes that characterize development for the learners in our participant group. A careful comparison of learner data revealed two developmental patterns: increased use of a given set of intonation strategies over time, or increased use of intonation strategies (i.e. pitch accents and boundary tones) over time. In addition to our findings, the research itself provides a model for the careful elicitation of data that meets the expectations of several related disciplines and for the careful measurement of intonation features using current technology. In addition to these contributions, the current study has served to identify future research questions and to encourage additional interest in the topic. Future research should explore the issue of variation across tasks and compare the current findings with those from data elicited through more freely recorded speech, such as conversations or role play activities. We also believe that our learner population is exceptional because of their preparation and their commitment to speaking only Spanish during the abroad experience. Keeping this in mind, we encourage future researchers to examine the degree to which our findings generalize to other learner populations. As was mentioned at several points in our discussion, there are additional research findings that would enable us to make firmer conclusions about the current data set. For example, it would be beneficial to know more about the intonation patterns associated with first language Midwestern English in order to more clearly assess the degree to which influence from English is relevant to our findings. Finally, as with any study of production, it would be useful to know what the perception of these patterns by this same group of learners is like. This last issue might be helpful in connecting our findings to the theoretical discussions of the relationship between perception and production. In sum, we acknowledge that as we begin to research this area more fully, there are many questions that remain to be answered and each will help to solidify our understanding of the SLA of Spanish intonation.

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Notes

- 1 The nature of F0 modifications is widely recognized but not documented. In other languages the role of emotion has been documented acoustically (Pell 2001, Pell, Monetta, Paulmann & Kotz 2009).
- 2 We recognize that there is considerable dialectal variation of tonal alignment. For example, the alignment of the prenuclear High tone within the tonic syllable has been documented in Argentine Spanish (Colantoni & Gurlekian 2004) and bilingual Cuzco Peruvian Spanish (O'Rourke 2005) without conveying contrastive focus intent (cf. Face 2002). Nevertheless, these variations lie outside of the scope of this paper in part because our L2 speakers were exposed to a specific Peninsular Spanish variety, namely that of León, Spain.
- 3 We realize that this is a very general characterization and there are many factors that contribute to the perception of a specific phone and that these factors vary by position and language.
- 4 English intonation has been widely documented to have rising statements and falling questions with a particular pragmatic intention or semantic meaning (Bartels 1999, Bolinger 1998 and Pierrehumbert & Hirschberg 1990).
- 5 In the current study we use the term *absolute interrogative* following the tradition of Hispanic studies (Navarro Tomás 1944). However, this type of utterance can also be referred to as a *declarative question*, which is the terminology of Liu & Xu (2007), or a *yes/no question*.
- 6 This graphic is taken from Willis & Henriksen (2008).
- 7 The nuclear pitch accent, or F0 movement on the final stressed syllable, and the utterance-final tonal movement correspond to the definition of Navarro Tomás' *tonema* (1944). In the AM model, the *tonema* is deconstructed into a nuclear pitch accent and a boundary tone.
- 8 The role of intonation in second language speech has also been examined in terms of native and nonnative speaker identification. The studies designed to address these issues are not summarized here, since the current study is based on production only. For a recent review of research in this area, see Boula de Mareüil & Vieru-Dimulescu (2006).
- 9 We note that the number of years of study did not correlate with the start value of the score on the grammar test (described below). In fact, the learner with the greatest number of years of study (7) scored a 9/11 (exactly in the middle of the group) and learners with the fewest years of study scored both the highest (11/11) and the lowest (7/11) on that same exam.

- 10 These were “low frequency words” in the sense of Bybee’s (2002) views of language change, but should not be understood to be difficult to learn or produce as they all followed the phonological contexts described above.
- 11 The data points represented by each box correspond to the middle 50% of a given data set; the upper whisker indicates the 75th percentile of the data, and the lower whisker contains the 25th percentile. Outliers are indicated by either a circle or an asterisk.
- 12 Although sample pronominal interrogative productions are provided here, it should be noted that the two final boundary movement types were attested for each of the three utterance types at both recording times.
- 13 Sosa (1999) and Willis (2003) both note a final tonal rise in Dominican Spanish declaratives, though they disagree on the pragmatic intent of this pattern.

Appendix A

Sample Items from Grammar Test

Ponga un círculo alrededor de la opción que mejor complete cada frase del cuento siguiente.

Como me gusta ayudar a otras personas y tengo bastante tiempo libre, **(1) estoy / tengo / soy** voluntaria en un hospital muy grande de la ciudad de Milwaukee. A veces es muy agradable **(2) trabajo / trabajar / trabajando** allí, pero también, de vez en cuando, tenemos problemas con **(3) algún / alguna / alguno** paciente difícil y con ciertos doctores arrogantes que se creen muy importantes. Con frecuencia para **(4) pasando / pasar / pasado** el tiempo, nos reunimos los voluntarios y nos contamos chistes. Un día, un paciente me **(5) contó / contaría / conté** éste que me pareció muy gracioso.

Appendix B

Sample Items from Vocabulary Test

A continuación verá una serie de palabras.						
<div> ➤ Escoja la opción que mejor se corresponde con la palabra indicada. </div> <div> ➤ Después, indique cuán seguro/a está de su respuesta; 1 = muy seguro; 2 = seguro; 3 = inseguro. </div>						
<div> Opciones (Elcoja UNA opción) </div>				<div> 1 = Muy seguro; 2 = Seguro; 3 = Inseguro (Elcoja UNA opción) </div>		
1. Lenini	nombre	mesa	papel	1	2	3
2. Adorar	mencionar	tirar	amar	1	2	3
3. Mula	pájaro volante	animal de cuatro patas	tipo de camiseta	1	2	3
4. Alabar	pegar	glorificar	caminar	1	2	3

Appendix C

Target utterances

Declaratives

Emula a la nena. ‘S/he emulates the girl.’

Mimaba a la nena. ‘S/he was spoiling the girl.’

Miraba a mi nene. ‘S/h was watching my boy.’

Amaba a mi nene. ‘S/he was loving my boy.’

Lavaba la mula. ‘S/he was washing the mule.’

Alaba la mula. ‘S/he praises the mule.’

Adora la mona. ‘S/he adores the monkey.’

Mimaba la mona. ‘S/he was spoiling the monkey.’

Absolute interrogatives

- ¿*Emula a la nena*? 'Does s/he emulate the girl?'
 ¿*Mimaba a la nena*? 'Was s/he spoiling the girl?'
 ¿*Miraba a mi nene*? 'Was s/he watching my boy?'
 ¿*Amaba a mi nene*? 'Was s/he loving my boy?'
 ¿*Lavaba la mula*? 'Was s/he washing the mule?'
 ¿*Alaba la mula*? 'Does s/he praise the mule?'
 ¿*Adora la mona*? 'Does s/he adore the monkey?'
 ¿*Mimaba la mona*? 'Does s/he spoil the monkey?'

Pronominal interrogatives

- ¿*Quién emula a la nena*? 'Who emulates the girl?'
 ¿*Quién mimaba a la nena*? 'Who was spoiling the girl?'
 ¿*Quién miraba a mi nene*? 'Who was watching my boy?'
 ¿*Quién amaba a mi nene*? 'Who was loving my boy?'
 ¿*Quién lavaba la mula*? 'Who was washing the mule?'
 ¿*Quién alaba la mula*? 'Who praises the mule?'
 ¿*Quién adora la mona*? 'Who adores the monkey?'
 ¿*Quién mimaba la mona*? 'Who was spoiling the monkey?'

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