# Learning to Realize Prosodic Prominence in L2 French and Spanish

**Laura Colantoni, Olivia Marasco, Jeffrey Steele, and Simona Sunara**
**University of Toronto**

## 1. Introduction

Non-native prosodic prominence below the level of the sentence has been the subject of a considerable amount of research, in part because it contributes significantly to perceived foreign accent and lesser L2 speech intelligibility (e.g., Munro, 1995; Cutler, Dahan, & van Donselaar, 1997; Hahn, 2004; Field, 2005; Kang, 2010). Among the different prosodic phenomena one might investigate, studies have tested L2 learners' placement of prominence within the relevant phonological domain (e.g., Archibald, 1998; Pater, 1997; Altmann, 2006; Ploquin, 2009 for L2 English; Dubeda, 2002; Barquero Armesto, 2012; Schwab, 2012 for L2 French; Menke & Face, 2010 for L2 Spanish; Rasier & Hiligsmann, 2007 for L2 Dutch) and their acquisition of the phonetic properties of its realization (e.g., Lansing, 2001 for L2 Spanish; Miglio & Chun, 2008 for L2 German & Spanish; Kondo, 2009 for L2 English). Such research has shown that both phonological and phonetic aspects of prominence may prove challenging to learners of all levels, even those of advanced proficiency (e.g., Dubeda, 2002; Altmann, 2006; Barquero Armesto, 2012). However, the issue of the relative difficulty in acquiring phonological versus phonetic aspects has yet to receive substantial attention, despite the fact that such research promises important insights into relative difficulty and phonological acquisition as a whole (but see Miglio & Chun, 2008, and Altmann, 2006; Kijak, 2009, on relative difficulty and the L2 acquisition of the phonetics and phonology of prominence respectively).

The current study examines the relative difficulty and acquisition of sub-utterance prominence (lexical prominence in Spanish; post-lexical prominence in French)[1] with a particular focus on the role of L1-based cross-linguistic influence (CLI) and typological similarity between learners' L1 and the target language. Specifically, we investigate how two groups of learners with the same L1 (English) acquire phonological and phonetic properties of prominence in two different target languages, one of them being more similar to English in terms of prosodic typology (Spanish), the other being very different (French). Whereas English and Spanish are similar in terms of the phonologically-determined location of prominence, they differ in several respects of their phonetic realization, including the presence of vowel reduction in English non-prominent syllables. French contrasts relatively even more with English, differing not only in terms of the phonetics but also in the phonological placement of prominence. Based on CLI, we predict superior performance by the learners of Spanish in terms of prominence placement (Hypothesis 1). However, we hypothesize that both learners of French and Spanish will experience difficulties with the phonetic parameters, namely vowel quality in non-prominent syllables (Hypothesis 2) and the prominent-to-non-prominent vowel duration ratio (Hypothesis 3). The data, taken from the *Romance Language Survey* housed within the *University of*

[*] An earlier version of this research was presented at the Laboratory Approaches to Romance Phonology (LARP) VI conference held at the Colegio de México, Mexico City, Mexico. We wish to thank the LARP VI and SLRF 2012 audiences as well as two anonymous reviewers for their feedback.

[1] A direct comparison between these target languages is not possible, given the typological differences in the assignment of prosodic prominence. While in Spanish the word is the domain of prominence, in French prominence is assigned post-lexically at the level of the accentual phrase (Jun, 2005). See Section 2 for further details.

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*Toronto Romance Phonetics Database*, come from 17 mid-intermediate to high-advanced learners (9 for L2 French; 8 for L2 Spanish) and 7 native controls (4 for French; 3 for Spanish) who completed two reading tasks (carrier sentences and a passage). Auditory and acoustic analysis of the data reveal that the L2 Spanish learners were indeed more accurate compared to the L2 French learners in terms of the location of prominence, in support of Hypothesis 1. Moreover, both Spanish, to a smaller extent, and French learners experienced difficulties with some phonetic aspects of the realization of prominent syllables (namely, vowel quantity and, to a lesser extent, vowel quality). Based on these results, it would appear that, when the L1-L2 prominence systems are more similar (such as those of English and Spanish), learners can achieve high levels of success when placing prominence. It would also appear that accurately realizing phonetic properties of prosodic prominence may be more difficult for learners in comparison with phonological properties – whereas the former were difficult to varying extents for learners of both target languages, the latter presented difficulties only for learners of French.

The remainder of the present paper is organized as follows. We first present the characteristics of the prosodic systems of the learners' L1 and the target languages under analysis (§2) followed by a review of some of the previous L2 prosody studies most relevant to the current project. We then turn to the experimental study, outlining the cross-linguistic-influence-based hypotheses to be tested (§3) and summarizing the methodology used to study the L2 acquisition of the prominence phenomenon in question (§4). This is followed by a review of the results and the evaluation of the specific hypotheses (§5). Finally, we discuss our findings vis-à-vis previous L2 prosody research and suggest directions for future investigation (§§6,7).

## 2. Prosodic prominence in English, French, and Spanish

It has been proposed that English lexical prominence involves the formation of trochaic feet; the head of such feet tend to align themselves with phonologically heavy syllables (e.g., Selkirk, 1980; Hayes, 1995). Statistically, it is the initial syllable that tends to receive prominence most frequently in English (Clopper, 2002). Somewhat similarly to English, Spanish is said to contain a hybrid trochaic-iambic system at the word level where feet are formed iteratively from right to left; any of the last three syllables may be prominent, but it is most often the penult (e.g., Roca, 1991; Harris, 1992). In contrast to both English and Spanish, prominence in French is not usually analyzed at the word level (but see e.g., Charrette, 1991; Goad & Buckley, 2006; Tremblay & Owens, 2010 for different accounts), but rather at the level of the Accentual Phrase (Jun & Fougeron, 2002; similarly in Post, 2000; Di Cristo, 2011; corresponding approximately to the Prosodic Phrase in Nespor & Vogel, 1986). Within the Accentual Phrase, prominence is marked at the right edge on the final syllable unless this syllable contains a schwa.

Prominent syllables are signaled by one or more of the acoustic cues of pitch, duration, and amplitude whose relative importance varies by language (e.g., Liberman, 1960). In English, pitch and, to a lesser degree, duration generally appear to play the most important role as cues to primary prominence (e.g., Fry, 1958; Liberman, 1960; Morton & Jessom, 1965). In French, duration seems to be most important, followed by pitch and amplitude (e.g., Benguerel, 1973; Jun & Fougeron, 2000; Astésano, 2001; Léon, 2001). In Spanish, duration, pitch and amplitude are in a trading relationship, playing essential roles depending on the vowel under analysis (Ortega-Llebaria, 2006). Table 1 provides a summary of the acoustic prominence cues and their relative importance in the three languages under analysis.

Table 1. Relative importance of acoustic cues to lexical (English, Spanish) or phrasal (French) prominence.

| | **Cues** | | |
|---|---|---|---|
| **Language** | *Duration* | *Pitch* | *Amplitude* |
| English | Important | Most important | Of lesser importance |
| French | Most important | Important | Of lesser importance |
| Spanish | (Most) important | Important | Important |

The phonetic realization of prominence does not involve prominent syllables alone. Prominence may also be cued by the contrast between prominent and non-prominent positions with the latter being subject to some form of lenition. In English, such weakening involves vowel reduction whereby unstressed vowels are centralized (e.g., Lindblom, 1963; Flege & Bohn, 1989; Braun, Lemhöfer, & Cutler, 2008). Such reduction is generally insignificant in both French and Spanish (e.g., Navarro Tomás, 1918; Hualde, 2005). The prominent versus non-prominent contrast may also be realized via durational contrasts: prominent vowels may be as much as twice as long as their less prominent counterparts in French versus 50% longer in English or a relatively small 10% in Spanish (Delattre, 1966). Table 2 summarizes these properties.

Table 2. Comparison of vowel reduction and the prominent-to-non-prominent duration ratio in prominent and non-prominent syllables in English, French, and Spanish.

| Language | Vowel reduction | Prominent-to-non-prominent duration ratio |
|---|---|---|
| English | Yes | 1.5 |
| French | No | 2 |
| Spanish | No | 1.1 |

Having reviewed differences in the phonologically-conditioned placement of prominence and the phonetic realization of such prominence in both the learners' L1, English, and the two target languages of interest, French and Spanish, we now turn to previous research that has investigated the L2 acquisition of these aspects.

## 3. Acquisition of prosodic prominence in L2 French and L2 Spanish

Much of the previous research on the L2 acquisition of prominence has focused on the extent to which L2 learners' performance is influenced by the L1 prosodic system.[2] To date, many studies have investigated prominence placement in L2 English. For example, Archibald (1998) reports on the CLI observed with Hungarian, Polish, and Spanish-speaking learners of English. Based on the learners' production of phonological prominence in real word reading tasks that required learners to place prominence on syllables that would have been target-like in their L1s (e.g., initial syllables in Hungarian or penultimate syllables in Polish), Archibald attributes his learners' non-target-like realizations to the transfer of prosodic parameter settings. Similarly, Altmann (2006) for L2 English and Kijak (2009) for L2 Polish explored the phonological placement of prominence by analyzing nonce word reading tasks by intermediate/advanced learners of multiple L1s including Arabic, Mandarin, Korean, Japanese, French, Spanish, Turkish, and Czech. These authors argue that L1-based CLI plays a central role in the L2 realization of prominence, as native speakers having L1s with fixed prominence placement used different strategies compared to learners who had L1s similar to the target language (English or Polish) when reading. Miglio & Chun (2008) also studied how English-speaking beginner/advanced L2 learners of German and Spanish acquire the phonetic aspects of prosodic prominence. These authors used a carrier sentence reading task to elicit target stimuli measured for pitch, duration, and amplitude. The L2 learners tested were found to manipulate a subset of phonetic parameters similarly to the L1 native speaker controls. However, learners' prominent-to-non-prominent vowel ratios were greater than those of native speakers.

The importance of cross-linguistic influence in the L2 acquisition of prosodic prominence is also illustrated by studies of French and Spanish. For example, Dubeda (2002) investigated the production of French prominence by high-intermediate/advanced Czech-speaking learners using reading aloud data and concluded that CLI also played the most important role in the target learners' production,

[2] A number of studies such as Guion, Harada, & Clark (2004), Guion (2005), and Wayland, Guion, Landfair, & Li (2006) have also investigated the role of analogy in acquiring L2 prosody. These authors argue that cross-linguistic influence may play only a partial role with analogy between target language forms also shaping L2 learners' prosodic prominence systems.

which reflected to a large degree the Czech-based preference for initial prominence despite the learners' advanced proficiency. Recently, Schwab (2012) and Barquero Armesto (2012) examined advanced Spanish-speaking learners of L2 French whose performance was tested via real word reading tasks (Barquero Armesto, 2012) or nonce word reading (Schwab, 2012). Based on acoustic analyses of pitch, duration, and amplitude in addition to auditory evaluation, both authors argue that, while learners mastered the phonological placement of prosodic prominence at the right edge of the Accentual Phrase, they nevertheless lacked knowledge of other important aspects, especially the size of the prominence domain and continued to mark prominence at the word level, an L1 Spanish-based effect.

In summary, based on previous empirical research, we adopt the general hypothesis that L1 CLI plays a significant role in L2 learners' production of prosodic prominence, even with more advanced learners. As our study involves the comparison of two relatively underexplored language pairings in the L2 prominence literature (L1 English-L2 Spanish; L1 English-L2 French), we pay close attention to the typological differences between these two parings. Specifically, we predict that, in terms of phonological acquisition, English-speaking learners of Spanish will place prominence with a higher level of accuracy than their French-learning counterparts due to the greater typological similarity between English and Spanish (Hypothesis 1). Additionally, compared to native speakers, given the presence of vowel reduction in English non-prominent syllables, there should be a greater degree of vowel reduction in non-prominent syllables (Hypothesis 2) and, thus, the prominent-to-non-prominent vowel duration ratios should be greater (Hypothesis 3) with both L2 learner groups.

## 4. Methodology

### *4.1. Participants*

Data from 17 mid-intermediate to high-advanced[3] learners (9 for French; 8 for Spanish) and 7 native speaker controls (4 for French; 3 for Spanish) were analyzed in the current study. Two of the French native speakers come from Canada (Quebec), the other two from France; all Spanish native speakers were Colombian. The data come from the *University of Toronto Romance Language Survey* housed within the *University of Toronto Romance Phonetics Database*.[4] Every effort was made to obtain language samples from English-speaking L2 learners of comparable profiles. As shown in Table 3, some differences between the two learner groups exist due to the nature of the data available at the time of analysis. The most striking of these is the younger age at onset of acquisition of the French-learning group (mean of 6 versus 17 years for the Spanish learners) and the greater immersion experience (mean of 19 versus 12 months for the Spanish learners). These differences are directly related to the data being collected in Canada where L2 learners normally begin to study French during elementary school as opposed to high school or university, and the more extensive possibilities for immersion in a native-speaking environment.

Table 3. L2 learner and native speaker participant profiles.

| | **French** | | **Spanish** | |
|---|---|---|---|---|
| | Learners | Native Speakers | Learners | Native Speakers |
| n | 9 | 4 | 8 | 3 |
| Gender (M;F) | 2;7 | 1;3 | 4;4 | 2;1 |
| Mean (range) Age at Acquisition onset | 6 (5-12) | | 17 (11-26) | |
| Mean (range) Immersion (months) | 23 (19-40) | | 25 (18-29) | |
| Immersion (Months) | 19 (0-150) | | 12 (0-66) | |

[3] Learners' proficiency is based on their own self-reported evaluation confirmed by the authors during data analysis.

[4] http://rpd.chass.utoronto.ca

### *4.2. Tasks*

All participants completed a carrier sentence reading task[5] and a passage reading task (*The Northwind and the Sun*; see Appendices for French and Spanish versions) in the relevant target language. The carrier sentences involved 108 target word stimuli for French and 139 word stimuli for Spanish which differed in (i) length (1-4 syllables); (ii) the quality of the prominent vowel; and, in Spanish, (iii) the location of prominence (penultimate or ultimate syllable in the word). The reading passage stimuli (52 target stimuli for French and 55 target stimuli for Spanish) also varied in the above-mentioned criteria; however, the stimuli were obtained by segmenting prominence domains (words in Spanish, phrases in French) from the recorded samples.

### *4.3. Method of analysis*

Target stimuli (individual words from the carrier sentence reading; phrases from the passage reading) were extracted and analyzed using PRAAT (Boersma & Weenink, 2012). Placement of phonological prominence was determined auditorily and coded with reference to the target. Instances of secondary prominence and multiple primary prominences, which were restricted to French, were also coded. Target prominent vowels as well as those preceding and following the target when appearing in the same word/phrase were segmented. A PRAAT script (Kroos et al., September 20, 2012; modified Antoniou, 2010) was then used to extract measurements of duration and formant structure (F1, F2).

## 5. Results

The results are organized here with reference to the three hypotheses concerning the learners' production of phrasal (French) or lexical (Spanish) prominence in terms of phonological placement (H1) and phonetic realization – quality (H2) and quantity, specifically duration ratios (H3).

### *5.1. Results: Hypothesis 1*

Hypothesis 1 predicted that, based on the greater phonological typological similarity between English and Spanish, English-speaking learners of Spanish would be more accurate than their French-learning counterparts in terms of the location of lexical/phrasal prominence. As shown in Figure 1, the hypothesis was supported: for words with ultimate stress, the L2 learners of Spanish were more target-like compared to the French learners, particularly with the longer 3-syllable words (2 syllables: 94% versus 99%; 3 syllables: 73% versus 100%).[6] The Spanish learners accuracy rates with penultimate stress was also higher (99% in both 2 and 3 syllables) than those of the French learners in the ultimate context.

[5] French: *Je dis* [stimulus] *encore une fois*. Spanish: *Digo* [stimulus] *otra vez* 'I say [stimulus] again'.
[6] Penultimate stress occurred in Spanish alone.

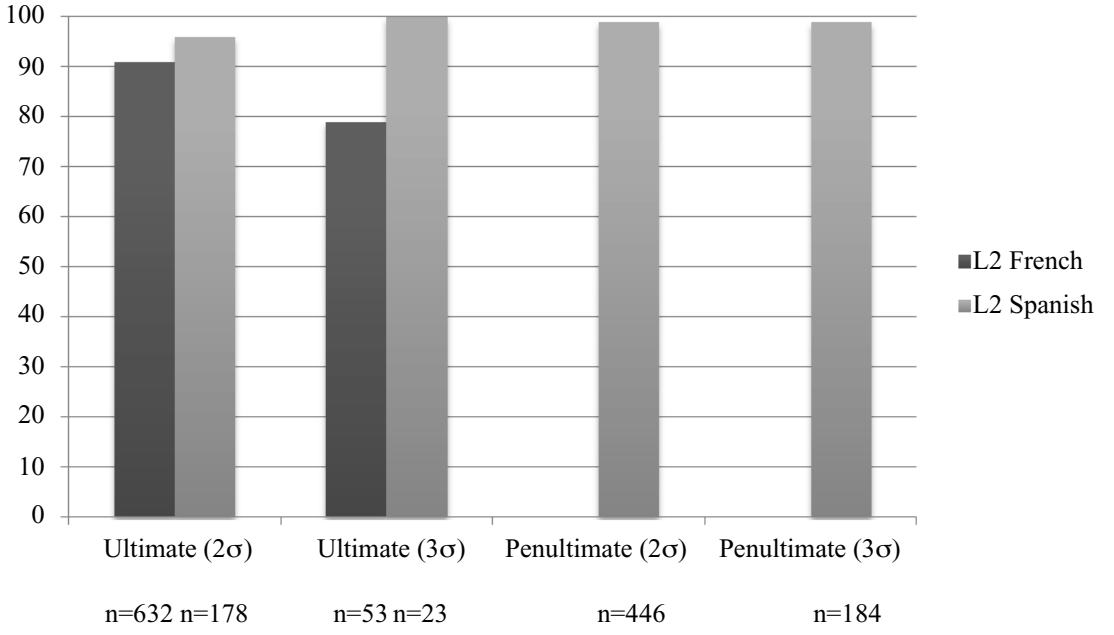


Figure 1. Percentage of accurate prominence placement by target language (French, Spanish) and word length (2 or 3 syllables): Carrier sentences.

When we examine the learners' prominence placement in the reading passage (Figure 2), the patterns mirror those observed with the carrier sentences. Whereas the Spanish learners were once again highly accurate with words with both ultimate and penultimate stress of all three syllable lengths, their French-learning counterparts made a considerable number of errors with the error rate increasing in parallel to the number of syllables in the target (2 syllables: 6%; 3 syllables: 27%; 4 syllables: 38%).

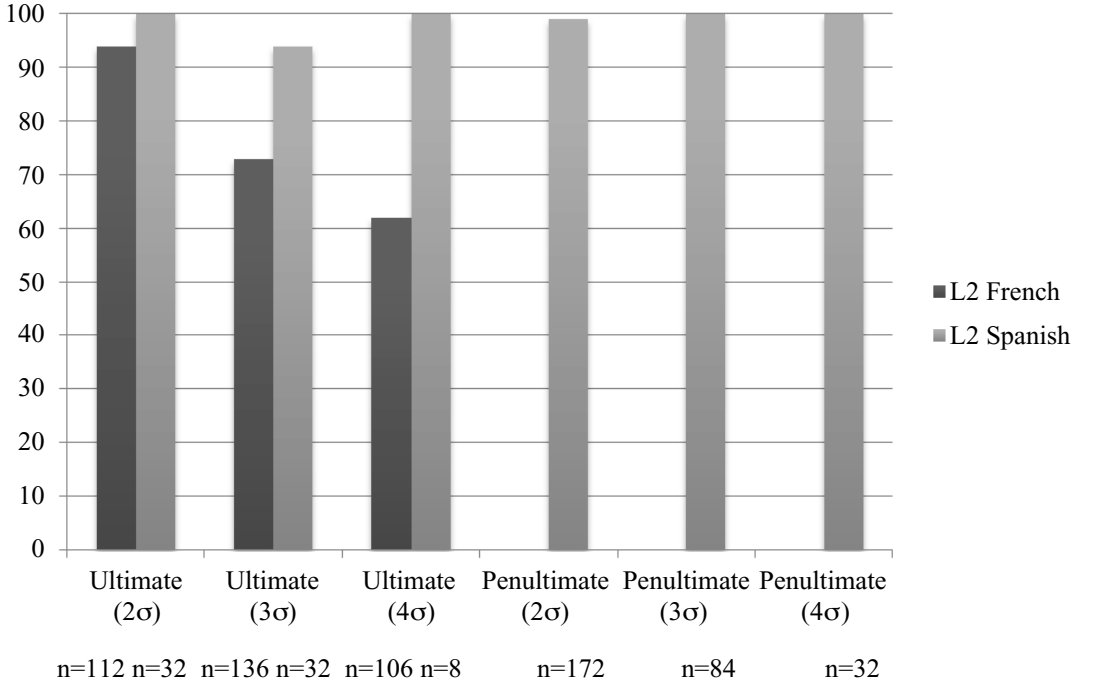


Figure 2. Percentage of accurate prominence placement by target language (French, Spanish) and word length (2, 3 or 4 syllables): Passage reading.

Having examined the learners' accuracy with prominence placement, we now turn to Table 4 that summarizes the learners' errors in the carrier sentence task by type. As the Spanish learners made virtually no errors, we comment here on the French learner data alone. In the 2-syllable context, the first error type included forms in which both syllables received equal prominence (2%), which we hypothesize may be due to reading difficulties. The majority of errors (7%) involved pre-tonic (i.e., initial) stress, which is consistent with English trochaic footing and the prototypicality of initial stress in the learners' L1. In the 3-syllable context where a higher error rate (21%) occurred, non-target production was evenly split between multiple primary prominences (11%) and ante-pre-tonic prominence (10%). These latter errors involving initial prominence parallel the pre-tonic errors in the 2-syllable context in that they are consistent with the English trochaic pattern and initial stress.

Table 4. Percentage of incorrect prominence placement by language (French, Spanish), target pattern (ultimate, penultimate), and phrase length (2 or 3 syllables): Carrier sentences.

| | **Target** | **# syllables** | **Error type** | | | |
|---|---|---|---|---|---|---|
| | | | *Multiple prominences* | *Ante-penult* | *Penult* | *Post-tonic* |
| French | Ultimate | 2 | 2 | | 7 | |
| | | 3 | 11 | 10 | | |
| Spanish | Ultimate | 2 | | | 3 | |
| | | 3 | | | | |
| | Penultimate | 2 | | | | 1 |
| | | 3 | | | | |

The same three types of errors were observed in the French reading passage task as with the carrier sentences (Table 5). First, we observed multiple instances of primary prominence per target (3 syllables: 5%; 4 syllables: 23%). While some of these errors may be due to reading problems with lack of fluency resulting in each syllable being realized with prominence, it is clear that, in many cases, the learners were realizing single target phrases as two or three separate phrases. Indeed, some realizations include pauses between such phrases. Such errors might have resulted either from problems with syntactic parsing or with phonological/phonetic production. Second, errors also included non-target-like realizations of prosodic prominence on the ante-penult (3 syllables: 6%; 4 syllables: 8%) or penult (2 syllables: 8%; 3 syllables: 16%; 4 syllables: 8%). Such errors appear consistent with the learners' L1, English, in which prominence most often does not fall on the ultimate syllable. Third and finally, along with non-target-like phonological placement, 12-40% of the French learners' tokens received secondary prominence (see Table 6), which occurred most often two syllables before the main prominence. While the secondary prominence observed in our data may be an L1 English-based effect, such prominences mirror the phrase-initial prominence known as 'accent rythmique' that occurs in certain registers in French (e.g., Astesano, 2001). In such cases, learners' productions reflect the input to which they are exposed.

Table 5. Percentage of incorrect prominence placements (French alone) by phrase length (2 or 3 syllables): Reading passage.

| | **Error type** | | |
|---|---|---|---|
| **Phrase length (# syllables)** | *Multiple prominences* | *Ante-penult* | *Penult* |
| 2 | | | 6% |
| 3 | 5% | 6% | 16% |
| 4 | 23% | 7% | 7% |

Table 6. Percentage of French learners' productions involving secondary prominences by task (Carrier sentences, Passage) and phrase length (2, 3 or 4 syllables).

| Task | Phrase length (# of syllables) | n | % of secondary prominences |
|---|---|---|---|
| Carrier sentence | 2 | 632 | 12 |
| | 3 | 53 | 40 |
| Passage reading | 2 | 112 | 11 |
| | 3 | 136 | 25 |
| | 4 | 106 | 29 |

All of the results discussed to this point support Hypothesis 1: the L2 learners of Spanish did indeed outperform their French-learning counterparts in terms of the placement of prominence with words and phrases of all lengths in both tasks. Thus, our results confirm that the phonological differences between the L1 and the target languages play a role in determining the successful acquisition of prominence placement. In the next section, we look at the results concerning some of the phonetic aspects of prominence realization.

### *5.2. Results: Hypotheses 2 and 3*

Hypothesis 2 concerned vowel quality. On the assumption that L1 English-based influence would be observed in the L2 learners' French and Spanish vowel realizations, we predicted that their non-prominent vowels would be more centralized than those of the native speakers. In order to test this hypothesis, we compared the mean midpoint formant values of stressed versus unstressed vowels. A subset of the data was used to test this hypothesis, namely /a, e, o/, to allow for a more direct comparison between the languages and because /i, u/ are extremely infrequent in the Spanish sample. In both languages, the stressed vowel is compared to the immediately preceding unstressed vowels. Results are reported by gender and by language. Figures 3 & 4 display the French data and Figures 5 & 6 present comparable Spanish data.

Female L2 French learners show clear centralization patterns. This is particularly evident with front vowels, which in the stressed context (Figure 3, left) are more fronted (higher F2) than those produced by native speakers, whereas in unstressed positions (Figure 3, right), the learners' realizations are more retracted vis-à-vis those of the native speakers. Vowel reduction in the L2 male speakers' production (Figure 4), on the other hand, affects /a/, which is more closed (lower F1) and /o/, which is more fronted.

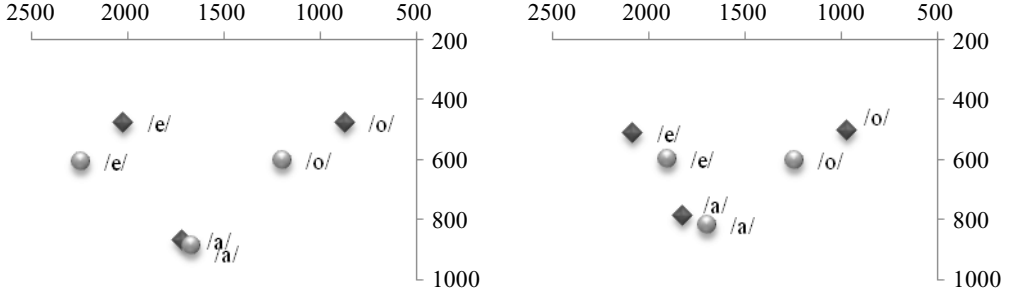


Figure 3. Female French native speaker (diamonds) and L2 learner (circles) mean formant values (Hz; F1: vertical axis x F2: horizontal axis) for stressed (left) versus unstressed (right) /a, e, o/: Carrier sentence task.

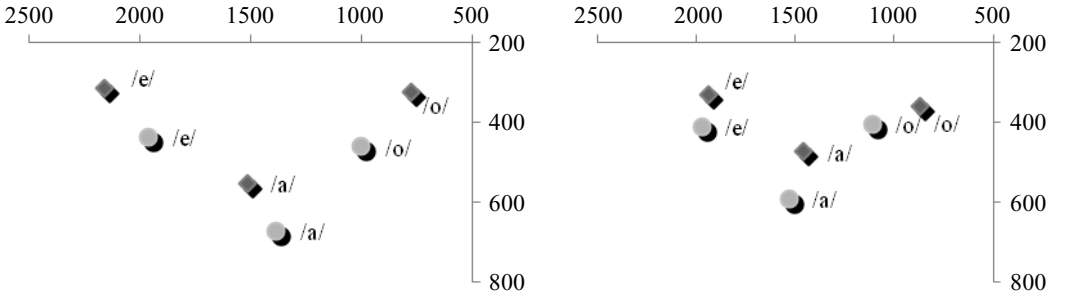


Figure 4. Male French native speaker (diamonds) and L2 learner (circles) mean formant values (Hz; F1: vertical axis x F2: horizontal axis) for stressed (left) versus unstressed (right) /a, e, o/: Carrier sentence task.

When compared to French patterns, the Spanish results (Figures 5 & 6) reveal that L2 stressed vowels, especially /a/ and /e/, are similar to those produced by native speakers. Unstressed vowels, however, mainly differ from those produced by controls in the F1 dimension (i.e., they display a higher F1 both compared to their stressed counterparts and to the unstressed vowels produced by native speakers), which suggests that unstressed vowels are produced with a more open articulation.

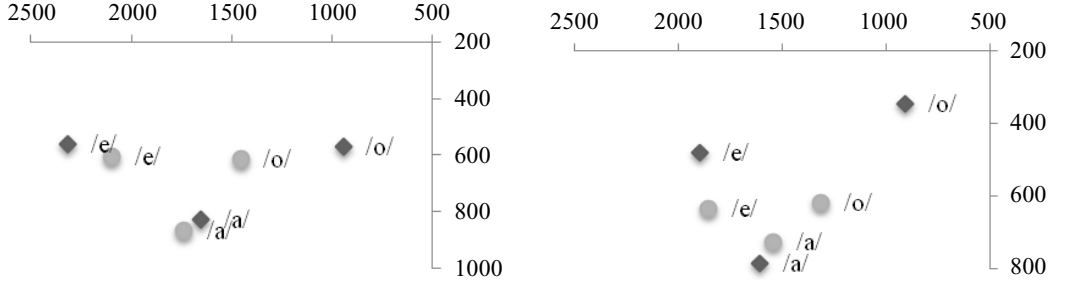


Figure 5. Female Spanish native speaker (diamonds) and L2 learner (circles) mean formant values (Hz; F1: vertical axis x F2: horizontal axis) for stressed (left) versus unstressed (right) /a, e, o/: Carrier sentence task.

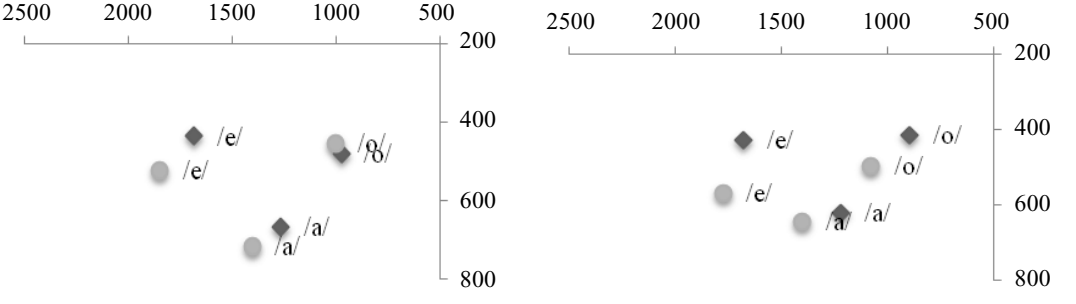


Figure 6. Male Spanish native speaker (diamonds) and L2 learner (circles) mean formant values (Hz; F1: vertical axis x F2: horizontal axis) for stressed (left) versus unstressed (right) /a, e, o/: Carrier sentence task.

Hypothesis 3 concerned the vowel duration ratio between prominent and non-prominent syllables. Given the presence of vowel reduction in the learners' L1 English, we predicted that, for both French and L2 Spanish learners, this ratio would be larger than that of native speakers of these languages on the assumption that some degree of non-target-like vowel shortening would occur in non-prominent syllables. Such shortening would increase the difference between prominent and non-prominent syllables and hence the duration ratio.

Figures 7 and 8 provide mean vowel duration ratios for the L2 French and L2 Spanish learners respectively based on data from the carrier sentence task alone, as it offered a better sample and variety of vowel targets. In both figures, mean ratios are presented for each of the vowels /a, e, i, o, u/ in French and /a, e, o/ in Spanish. These vowels are chosen to allow the most direct between-language comparison; the absence of /i, u/ in Spanish is due to the low frequency of these vowels in the stimuli, particularly in non-prominent position. For each occurrence of each vowel, the duration ratio of the prominent vowel versus the preceding non-prominent vowel was calculated. As we mentioned in discussing Hypothesis 2, the focus on the preceding non-prominent (as opposed to following non-prominent) vowel allows for direct comparison of French and Spanish – in French, where prominence is final, there is no following non-prominent syllable. The mean of these ratios was calculated for each of the five French or three Spanish vowels. For each vowel, the mean vowel ratio is graphed with the first column representing the mean of the native speaker controls; the second column representing the learner group mean; and the remaining columns representing the mean for each of the learners.

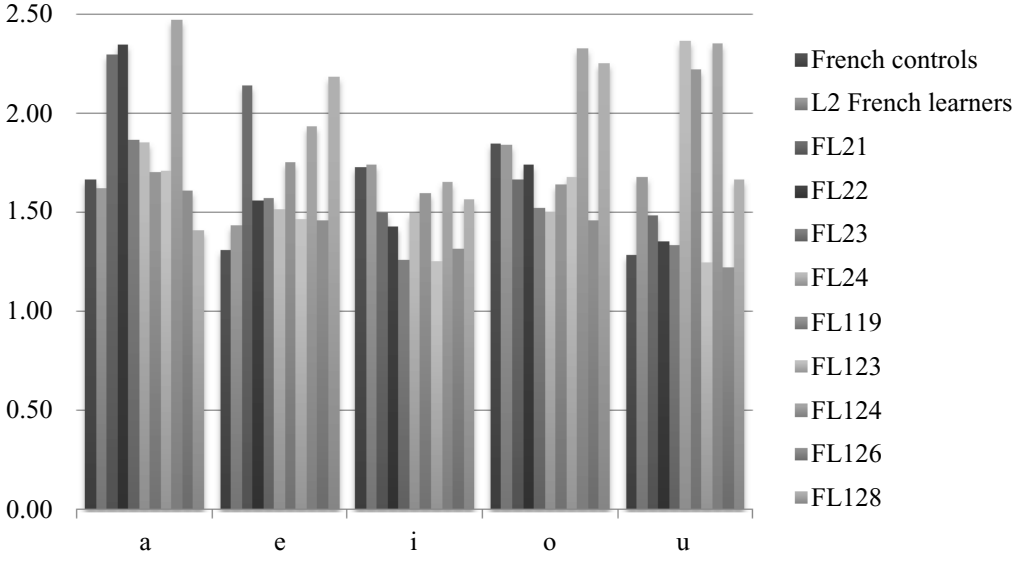


Figure 7. Prominent-to-non-prominent vowel duration ratio in French /a, e, i, o, u/: Native speaker group and L2 learner group and individual means: Carrier sentences.

Support for Hypothesis 3 is mixed regarding the French data (Figure 7). For /i/, the hypothesis is not supported, as the French control mean ratio exceeds or equals that of the L2 learner group mean as well as those of all of the learners. However, the results for the four other vowels provide partial support to the hypothesis, as several of the L2 learner means exceed that of the control group for each of these phonemes.

Hypothesis 3 also receives mixed support from the Spanish data (Figure 8). In support of the hypothesis, the L2 Spanish learners' vowel ratio is greater than that of the Spanish controls for /o/ and less so for /a/. In contrast, with /e/, the mean control vowel ratio is greater than that of each of the learners.

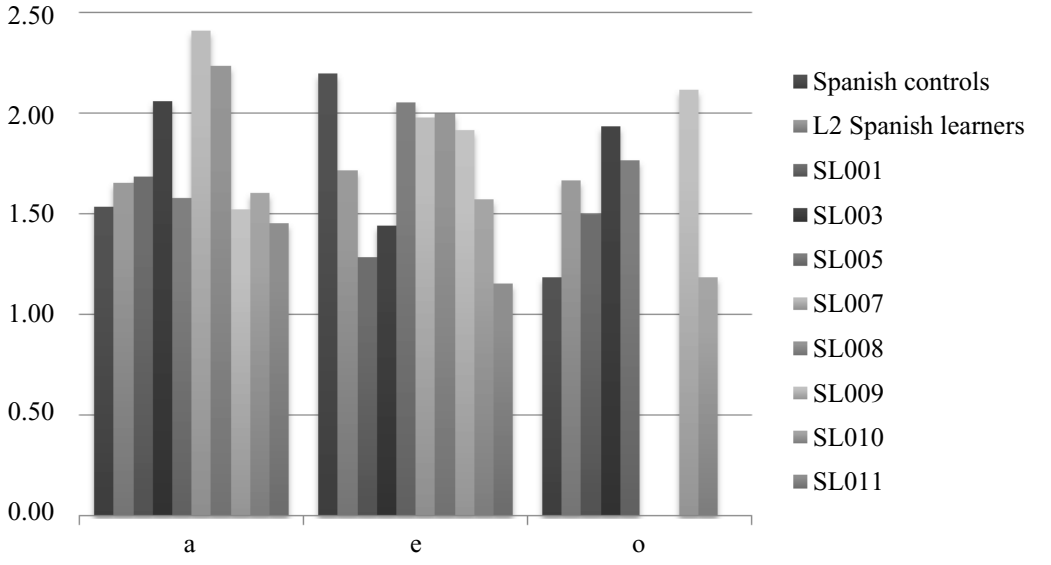


Figure 8. Prominent-to-non-prominent vowel duration ratio in Spanish /a, e, o/: Native speaker group and L2 learner group and individual means: Carrier sentences.

### *5.3. Hypothesis evaluation*

In summary, Hypothesis 1 concerning the phonological placement of prominence received clear support. As we predicted, L2 learners of French were less accurate in comparison with their Spanish-learning counterparts in both the carrier sentence and passage tasks. The learners' non-target-like productions included inaccurate placement of prominence as well as multiple prominent syllables; the learners divided target domains into smaller units or realized words/phrases with secondary prominences in addition to primary prominent syllables. In the case of French, the learners' varying degree of accuracy also appears to be somewhat connected to the length of the prominence domain: the greater the number of syllables per target, the lower the overall accuracy of prominence placement. In comparison with L2 French, L2 Spanish learners achieved high levels of accuracy when placing prominence on target syllables, which had been predicted based on the typological similarity between Spanish and English prosody.

Following Hypotheses 2 and 3, we predicted that, due to L1 English-based influence, L2 learners of both French and Spanish would show more centralization in unstressed vis-à-vis stressed vowels and thus we expected a larger prominent-to-non-prominent vowel duration ratio. It is clear that neither of these two hypotheses received strong support. Female French learners were the only group showing consistent unstressed vowel centralization. Centralization in the production of male L2 French speakers as well as Spanish L2 learners, both males and females, affected only a subset of vowels. Although the L2 learners differed from the controls in the unstressed context, these differences were restricted to the F1 dimension (with the exception of male French L2 learners' /o/), suggesting that these vowels are produced with a less constricted articulation. As concerns Hypothesis 3, the learners' vowel ratios were greater than those of native speakers only for a subset of the data (French /a, e, o, u/ and Spanish /o/ and partially /a/).

## 6. Discussion and Conclusion

The current study contributes to our understanding of the L2 acquisition of prosody by exploring the production of lexical/phrasal prominence by two groups of learners sharing an L1 but acquiring typologically different prosodic systems. The findings suggest that learning a system prosodically similar to one's L1 may facilitate the L2 acquisition of prominence placement. In contrast, based on the results, we propose that acquiring the phonetics of prominence may be relatively more difficult.

Indeed, while phonological problems with realizing prominence on the correct syllable and within the appropriate domain were restricted to learners of French, both learner groups were much less accurate realizing vowel quality and vowel quantity (L2 French and L2 Spanish).

The current results parallel some of those of previous studies that have investigated the L2 acquisition of prominence. In the case of L2 French, learners sometimes assigned prominence to multiple syllables within a single target domain, and produced a greater number of domains (multiple stresses) with some target forms than the native speaker controls. The French learners' accuracy also decreased in parallel to an increase in the size of the target prominence domain. Findings similar to those of the current paper have been made recently by Barquero Armesto (2012) and Schwab (2012), both of whom investigated the L2 acquisition of French by Spanish-speaking learners. Participants in both studies were highly target-like when placing prominence. Similarly, in our study, L2 French learners reached generally high levels of accuracy – up to 90% in 2-syllable contexts. In line with the results reported in the current study, Schwab (2012) notes that learners continue to experience difficulties with the target prominence domain: "it appears that the Spanish speakers have acquired the knowledge that the position of the stressed syllable is fixed in French (…), but they have not acquired the knowledge that the stress domain in French is the accentual phrase and not the word as in Spanish" (Schwab, 2012; p. 4). While it was primarily in the reading passage that the target phrases were sufficiently long to present learners with the possibility of misparsing the prominence domain, determining the target prominence domain may represent a similar problem both for Spanish-speaking learners of French, as in Schwab (2012) or Barquero Armesto (2012), and for English-speaking learners, as in our study. Further research may be required, as both Spanish and English ways of marking prominence appear to have much in common. As such, the similarities between the current study and the two previous ones mentioned above may not be particularly surprising: the target prominence domain in French may not pose problems to learners having an L1 typologically similar to French.

Additionally, our study indicates that vowel quantity and quality prove problematic for L2 learners of both French and Spanish. However, the target-like realization of quantity and quality is not equally problematic with all target vowels or in both target languages. This finding is perhaps not surprising given the great phonetic variation stemming from phonology-phonetics interactions that appear inherent to prosodic prominence marking (Pierrehumbert, 2003). In order to obtain a better understanding of the L2 acquisition of prominence, it is important to start to expand our empirical coverage to include pairs of languages that differ not only in their prosodic typology (e.g., French versus English) but also in the acoustic correlates used to mark prominence (e.g., English versus Spanish). In this way, we may be able to obtain a better picture of the relative difficulties involved in the acquisition of lexical or post-lexical prominence.

Finally, while the results obtained in the current study make a new contribution, some limitations merit being highlighted. First, while a number of interesting patterns emerged, obtaining more data will be crucial in order to confirm the trends observed; such work is currently underway. Second, as previously mentioned, the two learner groups were not completely comparable in terms of proficiency and learning experience, especially as concerns age at onset of acquisition. In on-going work, participant recruitment will focus on creating more similar groups. Moreover, independent proficiency measures such as accentedness evaluations (e.g., Bongaerts, Mennen, & van der Slik, 2000; Colantoni & Steele, 2008) are also needed to verify the learners' proficiency. Finally, the testing of all three hypotheses can be bolstered by the measurement of other acoustic parameters including those of pitch and amplitude.

The results presented here are an initial attempt to compare the phonetics and phonology of lexical and post-lexical prominence in two understudied target languages (French and Spanish) by speakers of North American English. We have learnt that relative success in prominence assignment can be predicted based on typological comparisons. In the future, we would like to build upon the present research by exploring the ways in which different L1-based uses of phrasal pitch can be transferred to the post-lexical level in L2 learners' production.

## Appendix: The North Wind and the Sun – French and Spanish versions

*French version*: La bise et le soleil se disputaient, chacun assurant qu'il était le plus fort. Quand ils ont vu un voyageur qui s'avançait, enveloppé dans son manteau, ils sont tombés d'accord que celui qui arriverait le premier à le lui faire ôter serait reconnu comme le plus fort. Alors, la bise s'est mise à souffler de toutes ses forces mais plus elle soufflait, plus le voyageur serrait son manteau autour de lui. Finalement, elle renonça à le lui faire ôter. Alors, le soleil commença à briller et au bout d'un moment le voyageur, réchauffé, ôta son manteau. Ainsi, la bise dut reconnaître que le soleil était le plus fort.

*Spanish version*: El viento del norte y el sol discutían acerca de cuál de los dos sería el más fuerte, cuando, de repente, pasó un viajero envuelto en una amplia capa. Al verlo, convinieron en que el primero que consiguiera quitarle la capa sería el más fuerte. El viento del norte comenzó a soplar con mucha furia, pero, cuanto más soplaba, más se aferraba el viajante a su capa, hasta que el viento norte desistió. El sol brilló entonces con todo su esplendor, e inmediatamente, el viajante arrojó su capa. Así, el viento norte tuvo que reconocer la superioridad del sol.

## References


Altmann, Heidi. (2006). *The perception and production of second language stress: A cross-linguistic experimental study*. Unpublished doctoral dissertation, University of Delaware.

Archibald, John. (1998). *Second language phonology*. Amsterdam/Philadelphia: John Benjamins.

Astésano, Corinne. (2001). *Rythme et accentuation en français. Invariance et variabilité stylistique* [French rhythm and stress: Invariance and stylistic variability]. Paris: L'Harmattan.

Barquero Armesto, Ángeles María. (2012). A comparative study on accentual structure between Spanish learners of French interlanguage and French native speakers. *Speech Prosody*, Shanghai, 22-25 May 2012, China. Retrieved from http://www.speechprosody2012.org/uploadfiles/file/sp2012_submission_222.pdf

Benguerel, Andre-Pierre. (1973). Corrélats physiologiques de l'accent en français [Physiological correlatess of French stress]. *Phonetica, 27*, 21-35.

Boersma, Paul, & Weenink, David (2012). Praat: doing phonetics by computer [Computer program]. Version 5.3.35, retrieved 8 December 2012 from http://www.praat.org/

Bongaerts, Theo, Mennen, Susan, & van der Slik, Frans. (2000). Authenticity of pronunciation in naturalistic second language acquisition: The case of very advanced late learners of Dutch as a second language. *Studia Linguistica*, *54*, 298-308.

Braun, Bettina, Lemhöfer, Kristin, & Cutler, Anne. (2008). English word stress as produced by English and Dutch speakers: The role of segmental and suprasegmental differences. *Proceedings of Interspeech 2008* (pp. 1953-1953). Brisbane, Australia.

Bullock, Barbara E., & Lord, Gillian. (2003). Analogy as a learning tool in second language acquisition: The case of Spanish stress. In Ana Teresa Pérez-Leroux & Yves Roberge (Eds.), *Romance linguistics: Theory and acquisition* (pp. 281–297). Amsterdam/Philadelphia: John Benjamins.

Charrette, Monik. (1991). *Conditions on phonological government*. Cambridge: Cambridge University Press.

Clopper, Cynthia G. (2002). Frequency of stress patterns in English: A computational analysis. Indiana University Linguistics Club Working Papers Online. Retrieved 12 October 2012 from www.indiana.edu/iulcwp.

Cutler, Anne, Dahan, Delphine, & van Donselaar, Wilma. (1997). Prosody in the comprehension of spoken language: A literature review. *Language and Speech, 40*(2), 141–201.

Delattre, Pierre. (1966). A comparison of syllable length conditioning among languages. *International Review of Applied Linguistics*, *4*, 183-198.

Di Cristo, Albert. (2011). Une approche intégrative des relations de l'accentuation au phrasé prosodique du français [An integrative approach to the relationship between stress and prosodic phrasing in French]. *French Language Studies*, *21*, 73 – 95.

Duběda, Tomáš. (2002). Structural and quantitative properties of stress units in Czech and French. In Angelika Braun & Herbert R. Masthoff (Eds.), *Festschrift for Jens-Peter Köster on the Occasion of his 60th Birthday, Phonetics and its Applications* (pp. 338-350). Stuttgart: Steiner.

Field, John (2005). Intelligibility and the listener: The role of lexical stress. *TESOL Quarterly*, *39*(3), 399-423.

Flege, James Emil, & Bohn, Ocke-Schwen (1989). An instrumental study of vowel reduction and stress placement in Spanish-accented English. *Studies in Second Language Acquisition*, *11*, 35-62.

Fry, Dennis Butler (1958). Experiments in the perception of stress. *Language and Speech*, *1*, 126-152.

Goad, Heather, & Buckley, Meaghen. (2006). Prosodic structure in child French: Evidence for the foot. *Catalan Journal of Linguistics*, *5*, 109-142.

Guion, Susan G. (2005). Knowledge of English word stress patterns in early and late Korean-English bilinguals. *Studies in Second Language Acquisition*, *27*, 503-533.

Guion, Susan G., Harada, Tetsuo, & Clark, J. J. (2004). Early and late Spanish-English bilinguals' acquisition of English word stress patterns. *Bilingualism: Language and Cognition*, *7*, 207-226.

Hahn, Laura D. (2004). Primary stress and intelligibility: Research to motivate the teaching of suprasegmentals. *TESOL Quarterly*, *38*(2), 201-223.

Halle, Morris, & Vergnaud, Jean-Roger. (1987). *An essay on stress*. Cambridge, MA: The MIT Press.

Harris, James. (1992). *Spanish stress: The extrametricality issue*. Bloomington: Indiana University Linguistics Club.

Hayes, Bruce. (1995) *Metrical stress theory: Principles and case studies*. Chicago & London: The University of Chicago Press.

Hualde, José Ignacio. (2005). *The sounds of Spanish*. Cambridge: Cambridge University Press.

Jun, Sun-Ah (Ed.) (2005). *Prosodic typology. The phonology of intonation and phrasing*. Oxford: Oxford University Press.

Jun, Sun-Ah, & Fougeron, Cécile. (2002) The realizations of the accentual phrase in French intonation. *Probus 14*, 147-172.

Kaglik, Anna, & Boula de Mareüil, Philippe. (2010). Polish-accented French prosody in perception and production: Transfer or universal acquisition process? Talk presented at the *5th International Conference on Speech Prosody*, Chicago, 1- 4.

Kang, Okim. (2010). Relative salience of suprasegmental features on judgments of L2 comprehensibility and accentedness. *System*, *38*, 301-315.

Kondo, Mariko. (2009). Is acquisition of L2 phonemes difficult? Production of English stress by Japanese speakers. In Melissa Bowles, Tania Ionin, Silvina Montrul & Annie Tremblay (Eds.), *Proceedings of the 10th Generative Approaches to Second Language Acquisition Conference (GASLA 2009)* (pp. 105-112). Somerville, MA: Cascadilla Press.

Kroos, Christian, Bundgaard-Nielsen, Rikke, & Tyler, Michael. Modified Mark Antoniou (2010). *get measurements* (PRAAT script). Retrieved from http://markantoniou.blogspot.ca/2011/09/do-you-have-praat-script-that-can.html, 20 September 2012.

Lacheret-Dujour, Anne, & Beaugendre, Frédéric. (1999). *La prosodie du français* [French prosody]. Paris: CNRS.

Lansing, Elizabeth Ellen. (2001). *An investigation of vowel production and its relation to acquisition of stress in the interlanguage phonology of English speaking adult second language learners of Spanish*. Unpublished doctoral dissertation. State University of New York at Albany.

Léon, Pierre. (2001). *Phonétisme et prononciations du français* [Phonetism and French pronunciations] (4th ed.). Paris: Nathan.

Lieberman, Philip. (1960). Some acoustic correlates of word stress in American English. *Journal of the Acoustical Society of America, 32*(4), 451-454.

Liberman, Mark, & Prince, Alan. (1977). On stress and linguistic rhythm. *Linguistic Inquiry*, *8*, 249-336.

Lindblom, Bjorn. (1963). Spectrographic study of vowel reduction. *Journal of the Acoustical Society of America*, *35*, 1773-1781.

Lord, Gillian. (2002). *The second language acquisition of Spanish stress: Derivational, analogical or lexical?* Unpublished doctoral dissertation, University of Pennsylvania.

Miglio, Viola, & Chun, Dorothy. (2008). An acoustic study of stress in L2 production of German and Spanish. *Canadian Acoustics-Acoustique canadienne*, *36*(4), 44-45.

Menke, Mandy R., & Face, Timothy L. (2010). Second language Spanish vowel production: An acoustic analysis. *Studies in Hispanic and Lusophone Linguistics, 3*(1), 181-210.

Morton, John, & Jassem, Wiktor. (1965). Acoustic correlates of stress. *Language and Speech, 8*,159-187.

Munro, Murray. (1995). Nonsegmental factors in foreign accent. *Studies in Second Language Acquisition*, *17*,17-34.

Nakata, Shunsuke, & Meynadier, Yohann. (2008). French accent and lengthening in French. In Plinio A. Barbosa, Sandra Madureira & César Reis (Eds.), *Proceedings of the Speech Prosody 2008 conference* (pp. 567-570). Campinas, Brazil.

Nava, Emily, & Zubizarreta, Maria Luisa. (2009). Order of L2 acquisition of prosodic prominence patterns: Evidence from L1 Spanish/L2 English speech. In Jean Crawford, Otaki Koichi & Masahiko Takahashi (Eds.), *Proceedings of the 3rd Conference on Generative Approaches to Language Acquisition (GALANA 2008)* (pp. 175-187). Somerville, MA: Cascadilla Proceedings Project.

Navarro Tomás, Tomás. [1918] (1970). *Manual de pronunciación española* [Manual of Spanish pronunciation]. Madrid: CSIC.

Nespor, Marina, & Vogel, Irene. (1986). *Prosodic phonology*. Dordrecht: Foris.

Okobi, Anthony O. (2006). *Acoustic correlates of word stress in American English*. Unpublished doctoral dissertation. Massachusetts Institute of Technology.

Ortega-Llebaria, Marta. (2006). Phonetic cues to stress and accent in Spanish. In Manuel Díaz-Campos (Ed.), *Selected Proceedings of the second conference on Spanish Laboratory Phonology* (pp. 104-118). Somerville, MA: Cascadilla Press.

Pater, Joe. (1997). Metrical parameter missetting in second language acquisition. In S. J. Hannahs & Martha Young-Scholten (Eds.), *Focus on phonological acquisition* (pp. 235-261.) Amsterdam/Philadelphia: John Benjamins.

Pierrehumbert, Janet B. (2003). Phonetic diversity, statistical learning, and acquisition of phonology. *Language and Speech*, *46* (2-3), 115-154.

Ploquin, Marie. (2009). *Phonological issues in the production of prosody by francophone and sinophone learners of English as a second language*. Unpublished doctoral dissertation. Université du Québec à Montréal.

Post, Brechtje. (2000). Pitch accents, liaison and the phonological phrase in French. *Probus, 12*, 127-164.

Rasier, Laurent, & Hiligsmann, Philippe. (2007). Prosodic transfer from L1 to L2. Theoretical and methodological issues. *Nouveaux cahiers de linguistique française*, *28,* 41-66.

Roca, Iggy. (1991). Stress and syllables in Spanish. In Hector Campos & Fernando Martinez-Gil (Eds.), *Current studies in Spanish linguistics* (pp. 599-635). Washington: Georgetown University Press.

Selkirk, Elizabeth. (1980). The role of prosodic categories in English word stress. Linguistic *Inquiry*, *11*, 563-605.

Schwab, Sandra. (2012). Do native Spanish speakers transfer accentual acoustic properties from Spanish to French L2? *Proceedings of Speech Prosody 2012*, retrieved from http://www.speechprosody2012.org/uploadfiles/file/sp2012_submission_220.pdf

Sluijter, Agaath M. C., Van Heuven, Vincent J., & Pacilly, Jos J. A. (1997). Spectral balance as a cue in the perception of linguistic stress. *Journal of the Acoustical Society of America*, *101*(1), 503-513.

Stevens, John J. (2011). Vowel duration in second language Spanish vowels: Study abroad versus at-home learners. *Arizona Working Papers in Second Language Acquisition & Teaching*, *18*, 77-104.

Tremblay, Annie, & Owens, Nathan. (2010). The role of acoustic cues in the development of (non)-target-like prosodic representations. *The Canadian Journal of Linguistics*, *55*(1), 85–114.

Trouvain, Jurgen, & Gut, Ulrike. (2007). *Non-native prosody*. Berlin: Mouton de Gruyter.

Vaissière, Jacqueline. (1991). Rhythm, accentuation and final lengthening in French. In Johan Sundberg, Lennart Nord & Rolf Carlson (Eds.), *Music*, *language*, *speech and brain* (pp. 108-120). Stockholm: Wenner-Gren International Symposium Series.

Wayland, Ratree, Landfair, David, Li, Bin, & Guion, Susan G. (2006). Native Thai speakers' acquisition of English word stress patterns. *Journal of Psycholinguistic Research, 35*(3), 285-304.

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