

SECOND LANGUAGE ACQUISITION OF ENGLISH QUESTION INTONATION BY KOREANS*

*Danica MacDonald
University of Calgary*

1. Introduction

Remnants of speakers' first language (L1) are often present in both the segmental and supra-segmental (prosodic) features of their second language (L2). Numerous studies focus on the L2 acquisition of segmental features (Flege 1987, 1995, among others), but few studies focus on the L2 acquisition of prosody (see Ueyama & Jun 1988). To date there has not been a large amount of research done on the L2 acquisition of intonational patterns, yet this remains an area of acquisition which poses problems for most (if not all) second-language learners. As Cruz-Ferreira (1989:24) points out, intonation is "the last stronghold of a foreign accent in speaking any L2" asserting that the observation is true "even of speakers who otherwise have perfect or near-perfect command of the phonetics of the L2".

In this paper I address how native speakers of Korean acquire English intonational patterns for two types of questions: wh-questions and yes/no-questions. The analysis presented in this paper is based on a pilot experimental study which investigates native speakers of Korean at varying stages of acquiring English. The specific research questions that I address in this paper are the following:

- i. Does the L1 intonation system affect L2 intonation patterns?
- ii. If the L1 intonation system does affect L2 intonation patterns, then to what extent?
- iii. Does a higher level of proficiency in the second language improve L2 intonation?

1.1 Overview of the Paper

Section 2 surveys the English and Korean intonational models which I adopt for this paper. Section 3 addresses the intonational structures of yes/no and wh-questions in English and Korean. In Section 4, I briefly highlight some theories of second-language acquisition and the predictions and hypothesis proposed in this current study. Section 5 will discuss the experimental design of my study and the analysis of results will be provided in Section 6. The final section, Section 7, will provide a conclusion to my paper as well as indicate directions for future research in this area.

* I wish to thank Karsten Koch and Amanda Pounder for their suggestions and comments, and my Korean and English participants for their time and insights. All errors are my own.

2. Intonational Models

2.1 Intonational Phonology in English

This section focuses on the model of intonational structure of English developed by Beckman and Pierrehumbert (1986). Under this model, intonation contours are analyzed as sequences of high (H) and low (L) tones. These tones are categorized as one of three types: pitch accents, phrasal tones, and boundary tones. The pitch accent is associated with the stressed syllable of a phrase and this stressed syllable receives pitch prominence. According to Beckman and Pierrehumbert (1986) English has six types of pitch accent. These are shown in Table 1 below.

Table 1: Six Types of English Pitch Accents

Pitch Accent	Description
H*	= peak accent
L*	= low accent
L*+H	= scooped accent
L+H*	= rising peak accent
H*+L	= fall from peak accent
H+L*	= fall onto a low accent

Source: Pierrehumbert & Hirschberg (1990)

In addition to pitch accents, English also has boundary tones which mark the end of an intonational phrase and phrasal tones which cover the space between the last pitch accent and the boundary tone. In English there are two types of phrasal tones (L-, H-) and two types of boundary tones (L%, H%). In this model (illustrated in Figure 1), the pitch accent, phrasal tone, and boundary tone are hierarchically organized into a type of prosodic hierarchy. Intonational phrases must have at least one pitch accent (but they may have more). Under this model, Phonological Phrases can have more than one Pitch Accent. When this occurs, the last pitch accent is generally the most prominent and is labeled as the nuclear pitch accent.

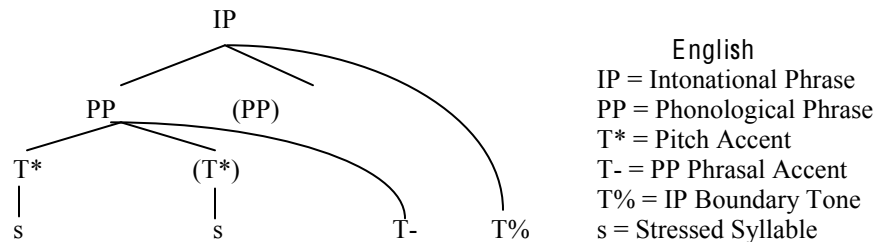


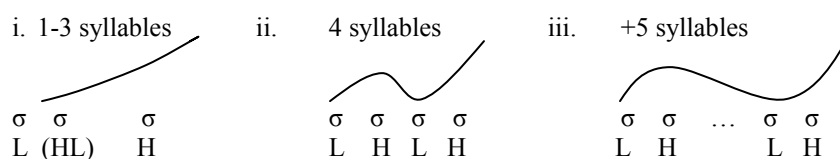
Figure 1: Intonation structure of English

2.2 Intonational Phonology in Korean

This section adopts the model of Korean prosody developed by Jun (1993, 2005) which was based on the model proposed for English by Beckman and Pierrehumbert (1986).

In this model, Jun proposes two prosodic units higher than a phonological word: an accentual phrase and an intonational phrase. According to Jun, an accentual phrase can have more than one phonological word and is marked by a phrase-final rising tone (in the Seoul dialect of Korean). An intonational phrase can have more than one accentual phrase and is marked by a boundary tone and a phrase-final lengthening. In the prosodic hierarchy, the accentual phrase is higher than a prosodic word and lower than the intonational phrase¹. The accentual phrase is found where, in many languages, we would find a phonological phrase, but these two phrases differ: accentual-phrase formation is based on the intonational pattern of an utterance rather than on the syntactic structure of a sentence.

The tonal pattern of the Accentual Phrase for the standard Seoul dialect of Korean is Low-High-Low-High (Jun 1993, 2005)². The first tone is realized on the first syllable of the phrase, followed by the second High tone on the second syllable, the Low tone on the third syllable, and the High tone on the final syllable of the phrase. The Korean Accentual Phrase tones can also change depending on the size of the word (see Figure 2).



Source: Jun & Oh 1996: 40

Figure 2: Tonal realizations of an AP in a Seoul dialect of Korean

When an Accentual Phrase is the last Accentual Phrase in an Intonational Phrase the (Accentual) Phrase final H tone is overridden by an Intonational Phrase boundary tone. The intonational structure of Korean is illustrated in Figure 3 below.

¹ Jun (1993, 1998) proposes that the Korean accentual phrase is found at the same level as the English phonological phrase under the Prosodic Hierarchy Theory developed by Selkirk (1986) and Nespors & Vogel (1986).

² This pattern can change to High-High-Low-High if the phrase-initial segment is an aspirated or tense obstruent (Jun 1993, 2005).

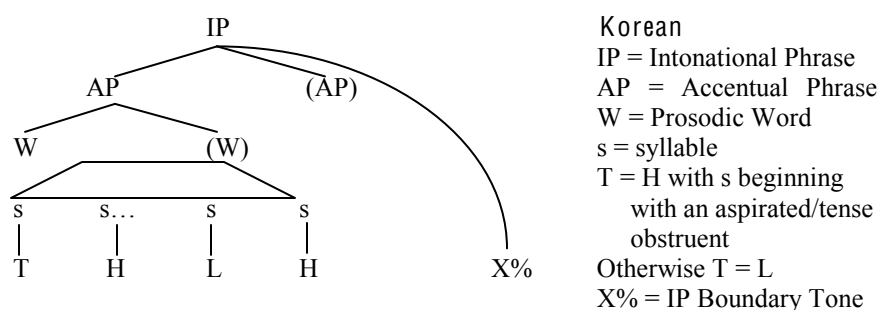


Figure 3: Intonation structure of Korean

2.3 A Comparison of Korean and English Intonation Systems

English and Korean intonational structures differ on numerous levels. English marks Pitch Accents, Phonological Phrases, and Intonational Phrases while Korean is a language which has neither lexical stress nor lexical pitch accent (Jun, 2003). In Korean, there are no Pitch Accents or Phonological Phrases, rather Accentual Phrases. Therefore, the F0 contour of the English intonational phrase (IP) is determined by pitch accents linked to stressed syllables, while in Korean it is determined by a series of Accentual Phrase (AP) tones. The Korean AP phrasal tones change depending on the size of the word, but the size of an English word does not influence the English pitch accents. The difference between the Korean and English intonational systems are summarized in Table 2 below.

Table 2: Comparison of English and Korean intonation systems

English	Korean
<ul style="list-style-type: none"> marks Pitch Accents, Phonological Phrases, and Intonational Phrases 	<ul style="list-style-type: none"> no Pitch Accents or Phonological Phrases marks Accentual Phrases, and Intonational Phrases
<ul style="list-style-type: none"> F0 contour of the Intonational Phrase is determined by Pitch Accents linked to stressed syllables 	<ul style="list-style-type: none"> F0 contour of the Intonational Phrase is determined by a series of Accentual Phrase tones
<ul style="list-style-type: none"> size of the word does not influence English Pitch Accents 	<ul style="list-style-type: none"> Accentual Phrase tones change depending on the size of the word

3. Question Formation

In addition to different intonational structures, English and Korean also differ in how they distinguish between yes/no- and wh-questions.

3.1 English Question Formation

The two types of questions that I discuss are yes/no-questions and wh-questions. Yes/no-questions are intended to elicit a response of either “yes” or “no”. They are usually formed by subject-auxiliary inversion and a sentence-final rise in pitch. If we look at Figure 4 below, we can see that in the yes/no-question *Are you hungry?* there is a final rising intonation (H-H%) with a Low Pitch Accent on *hungry*.

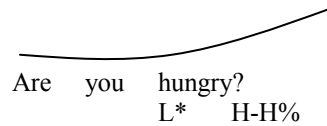


Figure 4: Intonational structure for yes/no-question *Are you hungry?*

Wh-questions (questions that contain words such as *who*, *what*, *when*, *where*, *why*, or *how*) have a different intonational pattern in English and generally do not have rising intonation, as shown in Figure 5. Instead, the main pitch accent of the utterance is generally on the wh-word itself since wh-words are generally considered to be inherently focused. In Figure 5, for the wh-question *What did you buy?* we can see that the main stress (pitch accent H*) is on the wh-word *what*, and that the rest of the sentence following the wh-word seems to be steadily flat with respect to pitch or dephrased. The sentence ends with a low boundary tone (assuming that *buy* is “given” information).

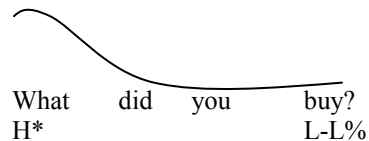


Figure 5: Intonational structure for the wh-question *What did you buy?*

3.2 Korean Question Formation

In Korean, wh-questions and yes/no-questions are syntactically ambiguous and they can be disambiguated by use of prosodic features.

Wh-words have two functions in Korean: either they serve as a wh-pronoun as in a wh-question or they function as an indefinite pronoun in a yes/no-question. For example, the Korean word *nuka* can either have the interpretation ‘who’ or ‘anyone’, and the Korean sentence *nuka wajo?* (*wa* meaning ‘come’ and *jo* being the interrogative suffix) can either mean ‘Who is coming?’ or ‘Is there anyone coming?’. This ambiguity is differentiated by prosodic features such as boundary tones, or high versus low pitch.

Jun & Oh (1996) claim that in Korean yes/no-questions have three accentual phrases and wh-questions have two. This is illustrated in (1).

- (1) atʃuməni-nin ənʃe əʃiːləwə-jo
 madam-TOP anytime/when dizzy-HON
 a. Is there any time when you feel dizzy, madam? (yes/no-question)
 b. When do you feel dizzy, madam? (wh-question)

This sentence is further illustrated in Figure 6a and 6b with a schematic representation of F0 contours of Korean yes/no-questions (a) compared to wh-questions (b). The vertical line marks the Accentual Phrase boundary. We can see in (a) that there are three Accentual Phrases: the pre-wh-phrase, the wh-indefinite, and the verb, while in (b) there are only two Accentual Phrases: the pre-wh-phrase and the wh-phrase.

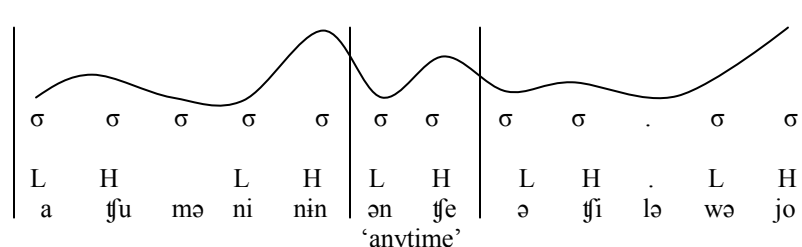


Figure 6a: Yes/no-question: 3 Accentual Phrases

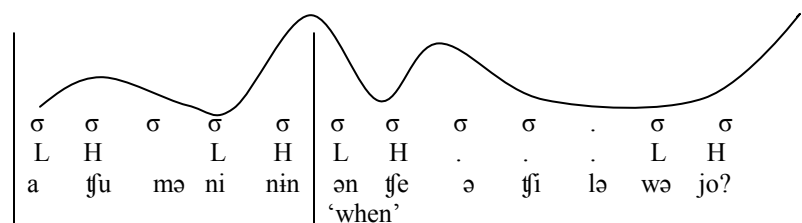


Figure 6b: Wh-question: 2 Accentual Phrases

Source: Jun & Oh (1996): 48

3.3 A Comparison of Korean and English Question Formation

Yes/no-questions and wh-questions in Korean consist of the same syntactic string on the surface, but can be distinguished by their intonational phrasing. The sentence asks a yes/no-question if the AP boundary is placed after a wh-word and a wh-question if there is no boundary after the wh-word. In English, these two items are distinguished by choice of lexical item, as well as by intonational phrasing (although as we saw in Section 3.1, there is a distinct wh-question intonational pattern compared to a yes/no-question pattern).

4. Second Language Acquisition of Intonation

To date, not a lot of attention has been paid to the interaction between L1 and L2 acquisition of language intonation, but since numerous studies have been

conducted on second-language phonology we can nonetheless make predictions as to what will be acquired by Koreans.

Many L2 studies on the segmental aspect of L2 acquisition show that the phonetic and phonological systems of the L1 interact with the L2 speech production system. Many of these studies (e.g. Flege 1995, McAllister et. al., 2002) have also shown that the degree of the interaction between the L1 and the L2 differs depending on the degree of proficiency in the second language. Ueyama & Jun (1998) have also shown that the L1 intonation system can affect L2 intonation patterns with respect to focus intonation. However, not all aspects of the L1 directly shape the L2 acquisition.

4.1 Predictions

Based on previous research, we can predict that the phonetics and phonology of the L1 intonation will interfere with the acquisition of L2 intonation, and that the degree of this interference will probably depend on the degree of proficiency of the participant in the L2.

In this study, I focus on a few specific questions. First, English wh- and yes/no-questions differ with respect to the rising and falling intonational patterns at the end of the utterance. Jun & Oh (1996) found in their study on Korean wh-questions and yes/no-questions that the Korean participants used multiple different boundary tones (H%, LH%, HL%, and HLH%) in the same sentences. Their study showed that there was no single boundary tone type which was specific to one type of question. Their Korean participants had preferences for H% or LH% boundary tones for yes/no-questions (compared to a H% preference by native English speakers). For Korean wh-questions, the most common boundary tone was LH%, while H% and HL% were also used. English native speakers generally have an L% intonation boundary for wh-questions. One question that I will be addressing in the acquisition part of the study is whether Koreans are able to use native-English-like intonational patterns for boundary tones.

Another difference between English and Korean is that English has stress on certain words in an utterance (Pitch Accent), while Korean has Accentual Phrases. For the L2 part of the study I investigate whether Koreans are able to use English-style pitch accents in their intonation, and I will also examine the Korean L2 data to see whether there are remnants of the Korean L-H-L-H tone pattern that is found in the Korean Accentual Phrase.

One final question which I address in this study is whether the level of English proficiency of participants affects their intonation.

5. Experimental Study

5.1 Subjects

One native female speaker of Canadian English participated as the control group and three Korean native speakers (two female speakers and one male speaker) participated as the experimental group of this pilot study. All Korean native speakers spoke a standard Seoul dialect of Korean. All speakers from the control

and experimental groups were in their 20's or early 30's. In order to determine whether there was a developmental path in L2 intonation acquisition, I tested different proficiency levels within the experimental group. To establish their proficiency levels in English, all participants completed a standardized English grammar test (Oxford English Grammar Placement Test). For the native Korean speakers, one participant was considered to have a beginner level of English, one participant had an intermediate level of English, and the final participant had advanced English knowledge. Table 3 provides a summary of the data.

Table 3: Description of each participant with respect to gender, time in Canada, and score on the placement test.

Participant	Sex	Time in Canada	Test Score
P1: Advanced	Male	16 months	80/100
P2: Intermediate	Female	10 months	68/100
P3: Beginner	Female	4 months	42/100

5.2 Stimuli

The stimuli for this experiment were based on the Korean stimuli from Jun & Oh (1996), with modifications by the present author. Four Korean sentences (two sentences containing the wh-word 'what' *mwə* and two words containing the wh-word 'who' *nuka*) were selected so that each sentence could be interpreted in 2 ways: as a wh-question and as a yes/no-question. Following Jun & Oh (1996), each wh-word was preceded by the adverbial phrase *onil ʃənjək-e* 'tonight'. In Korean, the yes/no question or the wh-question interpretation was triggered by the type of answer to the question. If the answer started with 'Yes' or 'No', then the question should be interpreted as a yes/no-question, otherwise the question should be interpreted as a wh-question. The same stimuli were also presented in English for the L2 part of the study. (2) and (3) below show sample 'what' and 'who' questions respectively.

- (2) a. Q: onil ʃənjək-e mwə məkəjo
 today night-in what eat
 What are we eating tonight?
- A: bap mogo
 rice eat
 We will eat rice.
- b. Q: onil ʃənjək-e mwə məkəjo
 today night-in what eat
 Are we eating anything tonight?
- A: ne mwə məjəjaʃo
 yes something eat
 Yes, we are eating something.

- (3) a. Q: onil ʃənʝək-e nuka wa
 today night-in who come
 Who is coming tonight?
- A: nuna wa
 sister come
 My sister is coming.
- b. Q: onil ʃənʝək-e nuka wa
 today night-in who come
 Is anyone coming tonight?
- A: ne nuka wa
 yes someone come
 Yes, someone is coming.

5.3 Procedure

After completing a brief questionnaire which asked participants questions about their language background and length of time in Canada and the placement test, participants moved onto the production task. Both the questions and the corresponding responses were written on cue cards and the participants were asked to read the questions and the responses aloud. Both the question and answer were recorded using an Edirol digital recorder.

5.4 Measurements

The recordings were analyzed using the acoustic speech analysis software “Praat®” (Boersma & Weenink 2010). For the phonological description of the Korean L1 data, the type of pitch accent and phrase boundaries occurring in each utterance was labeled adopting the framework described in Jun (1993, 1998). For the phonological description of English L1 and L2 intonation, the type of pitch accents and phrase boundaries occurring in each utterance was labeled adopting the framework described in Beckman & Pierrehumbert (1986). For the phonetic analysis of intonation, F0 and times from several points in each utterance were collected.

6. Results and Discussion

6.1 English L1 Results

I will illustrate the pattern of the results using two sentences with the wh-word *what* and two sentences with the wh-word *who*³. This section looks at the native English speakers’ data.

³ The data is representative of all the data collected in this study. Due to space limitations, I decided to focus on a small number of stimuli items.

In the first sentence *What are we eating tonight?* we can see a Pitch Accent on the word *eating* (on *eat*). This is demonstrated by a maximum pitch of 341Hz, a minimum pitch of 233 Hz and a mean pitch of 286Hz for this word. As we have already observed with wh-questions, there is a falling pitch contour at the end of the question. This is observed in this sentence by a final drop in pitch. The maximum pitch for *tonight* is 247Hz. It has a minimum pitch of 175Hz and a mean pitch of 193Hz. These numbers are considerably lower than what we observed for *eating*. This utterance is shown in below in Figure 7.

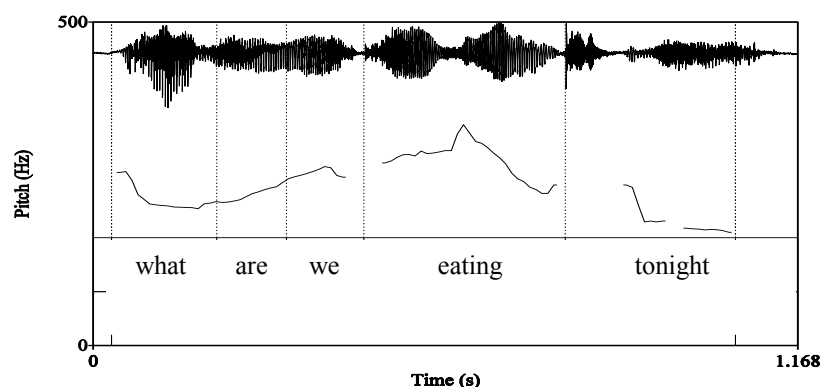


Figure 7: English L1 speaker: *What are we eating tonight?*

In the next wh-question *Who is (Who's) coming tonight?* the main stress falls on the wh-word *who* and then the pitch falls off for the rest of the utterance. While *who's* has a maximum pitch of 391Hz, a minimum pitch of 334Hz, and a mean pitch of 367Hz, the pitch readings for *coming* and *tonight* are significantly lower. *Tonight* has a maximum, minimum, and mean pitch of 267Hz, 196Hz, and 213Hz respectively (which is similar to the sentence *What are we eating tonight?*).

In the yes/no-question *Are we eating anything tonight?*, we see a steady increase in pitch between *eating*, *anything*, and *tonight*. Unlike for the falling wh-question, *tonight* in the yes/no-question has a maximum pitch of 387Hz, a minimum pitch of 317Hz, and a mean pitch of 337Hz. This question is shown in Figure 8.

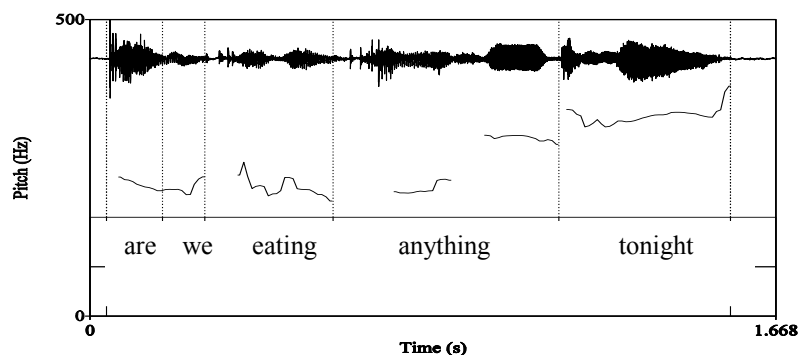


Figure 8: English L1 speaker: *Are we eating anything tonight?*

The final yes/no-question that I discuss in this paper is the question *Is anyone coming tonight?*. In this utterance, pitch is rising steadily (as we saw for the yes/no-question in Figure 8). In this question, *anyone* has a mean pitch of 234 Hz, *coming* has a mean pitch of 311 Hz, and *tonight* has a mean pitch of 348 Hz. This is very close to the mean pitch for the word *tonight* in *Are we eating anything tonight?*.

As can be seen from the data and figures presented in this section, this data supports falling intonation for wh-questions and rising intonation for yes/no-questions.

6.2 Korean L1 Results

This section discusses results from the Korean L1 data. The goal here is to see whether the Koreans I tested successfully replicate the study done by Jun & Oh (1996) and I am specifically interested in investigating what the Koreans are doing with the intonation boundary at the end of the question

Overall, my study generally replicated the findings of Jun & Oh's (1996) study. Jun & Oh (1996) found that in their study on Korean wh-questions and yes/no-questions, the Korean participants used multiple different boundary tones (H%, LH%, HL%, and HLH%) in the same sentences. Their study showed that there was no single boundary tone type which was specific to one type of question. Their Korean participants had preferences for H% or LH% boundary tones for yes/no-questions. For Korean wh-questions, the most common boundary tone was LH% while H% and HL% were also used.

I analyzed boundary tones across speakers and found that all three of my participants used either an H% or an LH% for all of the Korean sentences. Unlike the findings of Jun & Oh (1996), where some of their participants used HL% and HLH% boundary tones, my participants did not show this variability. Figure 9 shows a sample of P1's (a male speaker) rising (LH%) intonation at the end of the sentence *onil ūanjak-e nuka wa* 'Who is coming tonight?'. We also see in Figure 9, that the speaker is marking the wh-question (as in Jun & Oh, 1996) with no AP boundary before the wh-word.

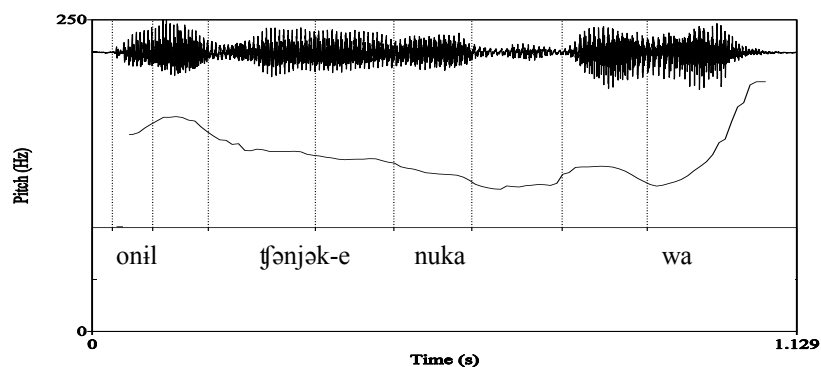


Figure 9: Korean (P1) L1 speaker: *onil ʃənjək-e nuka wa* ‘Who is coming tonight?’

For the Korean L1 data, all of the data I collected had a rising H% or LH%. In the following section, we see what the Koreans do in the L2 study with the rising intonation.

6.3 L2 Results

6.3.1 Wh-questions

For the sentence, *What are we eating tonight?* In L1 English, we saw a Pitch Accent on the word *eating* and observed a falling pitch contour at the end of the question. For the L2 learners, P1 was the most native-like in the falling intonation on tonight. His maximum pitch for that word was 123Hz, the minimum pitch was 91Hz, and the mean pitch was 107Hz. However, he was not like the native English speaker with respect to placing a Pitch Accent on *eating*. Also, unlike the native English speaker, P1 had numerous pitch resets which in English could signify a new phonological phrase. Perhaps in this case, he is treating the English Phonological Phrase similar to the Korean Accentual Phrases. Also worth mentioning is that this participant put a large pause between *what are we* and *eating tonight*, although he does not do this in his L1. It appears to be an isolated case and this was the first sentence I recorded with him so he may have just been nervous. Figure 10 shows this data. P1 also showed a native-like pattern for the wh-question *Who’s coming tonight?* He placed the main stress on the wh-word *who* and then his pitch fell off for the rest of the utterance, as we saw for the native English speaker.

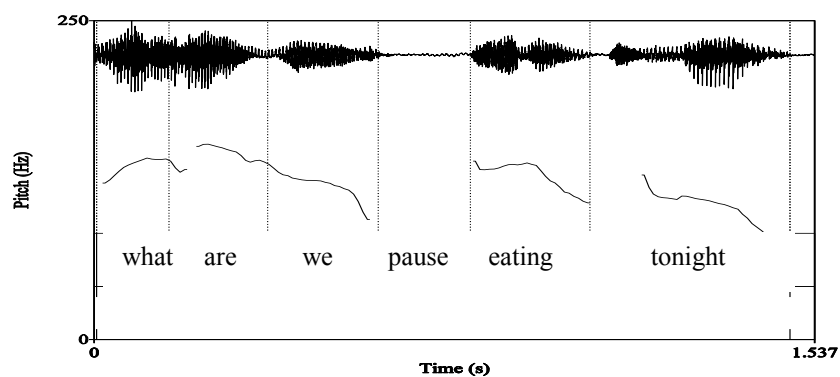


Figure 10: English L2 (P1): *What are we eating tonight?*

Participants 2 and 3 both used similar intonation for wh-questions. They both had a final rising intonational phrase boundary, and for both of these participants, the word *tonight* had very high pitch in the question. The maximum pitch for these two participants was 399Hz (P2) and 398Hz (P3), the minimum pitch was 187Hz (P2) and 182Hz (P3), and the mean pitch was 228Hz (P2) and 318Hz (P3). Clearly this pattern is one which may have transferred from their first language. Participant 3's data is shown in Figure 11.

For the wh-word intonation, these two participants generally differed in their intonation. Here, participant 3 was more native-like. Participant 2 often had a large drop in pitch when she pronounced wh-words.

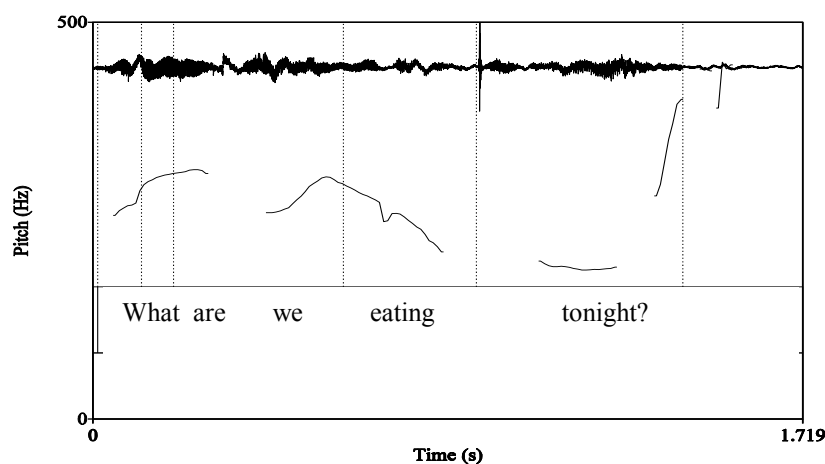


Figure 11: English L2 (P3): *What are we eating tonight?*

6.3.2 Yes/No-Questions

In English yes/no-questions, the pitch is rising steadily as the sentence progresses. In all of the Korean data, for all three participants, there is no gradual rise in pitch, but rather a sudden peak at the end of the utterance (as we saw in the Korean data). We also see dephrasing in almost all the Korean L2 data on yes/no-questions. There seems to be one pitch accent early in the question and then a steady decline in the pitch contours until the end of the utterance. This is illustrated in Figure 12.

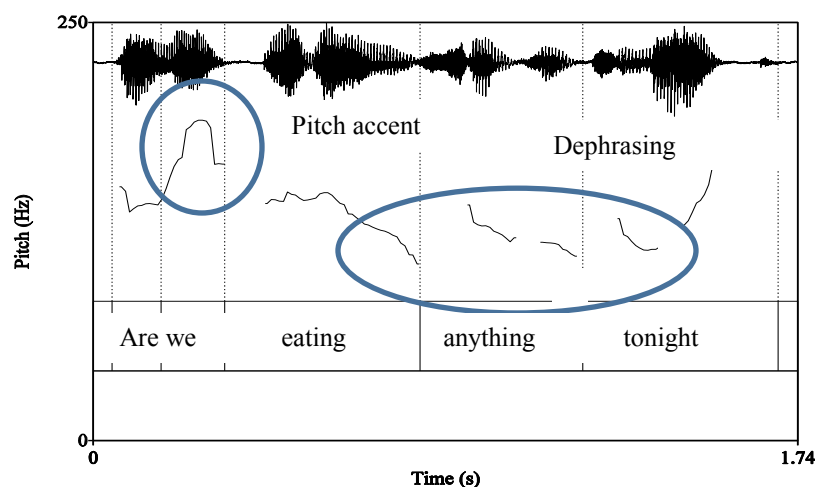


Figure 12: English L2 (P1): *Are we eating anything tonight?*

7. Conclusion

If we returning to the questions from the beginning of the paper: Does the L1 intonation system affect L2 intonation patterns? and does a higher level of proficiency in the second language improve L2 intonation? The answer to the first question is clearly “yes”. We saw in the data that two of the native Korean speakers participating in this study did not seem to be aware that English wh-questions typically have falling intonation and not rising intonation. In their L1, while wh-questions can have either H%, LH%, HL% or HLH%, all my participants used H% or LH% in their L1. P1, the most advanced learner of English, was the only participant who used falling intonation for these types of questions, so this likely had been acquired from studying English and indicates improvement with greater exposure. Clearly, the native Korean speakers are not performing at a native-like level with respect to prosody and intonation in these sentences.

7.1 Limitations and Directions for Future Research

This study was a pilot study which tested intonational patterns of three native Korean L2 learners of English on a limited set of data. I am currently extending this study to include more participants as a higher number of participants would enable us to draw more generalizations. I am also including a larger range of levels of proficiency in my study including near-native speakers who have spent a large amount of time in an English-speaking country.

To get a more accurate view of what second language learners do with intonation, I am working on extending this production task to include a processing or a perception task. This would give us a better idea of not only how L2 learners produce intonation, but also whether they have acquired enough detail about the second language they are learning to be able to perceive and process intonation like native-speakers of a language.

References

- Beckman, Mary & Janet Pierrehumbert. 1986. Intonational structure in Japanese and English. *Phonology Yearbook* 3: 255-309.
- Boersma, Paul & David Weenink. 2010. Praat: Doing phonetics by computer [Computer program]. Version 5.2.06, retrieved 2010 from <http://www.praat.org/>
- Cruz-Ferreira, Madelena. 1989. A test for non-native comprehension of intonation in English. *International Review of Applied Linguistics* 17(1): 23-39.
- Flege, James. 1987. The production of “new” and “similar” phones in a foreign language: Evidence for the effect of equivalence classification. *Journal of Phonetics* 15: 47-65.
- Flege, James. 1995. Second-language speech learning: Theory, findings, and problems. In *Speech perception and linguistic experience: Issues in cross-linguistic research*, ed. Winifred Strange, 229-273. Timonium: York Press.
- Jun, Sun-An. 1993. The phonetics and phonology of Korean. Doctoral dissertation, Ohio State University.
- Jun, Sun-An. 1998. The accentual phrase in the Korean prosodic hierarchy. *Phonology* 15(2): 189-226.
- Jun, Sun-An 2003. Prosodic phrasing and attachment preferences. *Journal of Psycholinguistic Research* 32(2): 219-249.
- Jun, Sun-An 2005. Korean intonational phonology and prosodic transcription. In *Prosodic typology: The phonology of intonation and phrasing*, ed. Sun-An Jun, 201-229. Oxford: Oxford University Press.
- Jun, Sun-An & Mira Oh. 1996. A prosodic analysis of three types of wh-phrases in Korean. *Language and Speech* 39(1): 37-61.
- McAllister, Robert, James Flege, & Thorsten Piske. 2002. The influence of the L1 on the acquisition of Swedish vowel quantity by native speakers of Spanish, English and Estonian. *Journal of Phonetics* 30: 229-258.
- Nespor, Marina & Irene Vogel. 1986. *Prosodic phonology*. Dordrecht: Foris.
- Pierrehumbert, Janet & Julia Hirschberg. 1990. The meaning of intonational contours in the interpretation of discourse. In *Intentions in communication*, eds. Philip R. Cohen, Jerry Morgan, and Martha E. Pollack, 271-311. Cambridge: MIT Press.
- Ueyama, Motoko & Sun-An Jun. 1998. Focus realization in Japanese English and Korean English intonation. *Japanese and Korean Linguistics* 7: 629-645.