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*A Prosodic Analysis of Three Types of Wh-Phrases in Korean**

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KEY WORDS

accentual phrasing

incredulous question

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hyperarticulation*

speaker strategy

wh-question

yes/no-question

ABSTRACT

Wh-phrases in Korean are ambiguous due to the lexical ambiguity of "wh" words: wh-pronouns as in a wh-question, or indefinite pronouns as in a yes/no-question. Furthermore, since a wh-word in Korean is in situ (i.e. not moved to the front of a sentence as in English), wh-questions are not distinguished from echo questions in their surface forms. In this paper, we investigated prosodic characteristics disambiguating these three types of wh-phrases: 1) wh-question, 2) yes/no-question, and 3) incredulity question, a kind of echo question giving an incredulity meaning. Production and perception data were examined to discover what prosodic features are used to distinguish these three types of wh-phrases and which feature is more salient and reliable in perceiving such differences. The production results show that yes/no-questions and other types of questions are distinguished by different accentual phrasing, while incredulity and wh-questions are distinguished by different peak amplitudes, pitch ranges, and boundary tones. Interestingly, not all speakers used the same strategy to distinguish incredulity from wh-questions. The results of the perception test suggest that accentual phrasing is significantly related to the perception of three types while amplitude and boundary tones are significantly related to the perception of wh- and incredulity questions, respectively.

INTRODUCTION

As shown in previous studies of intonational meaning (Ladd, 1980; Bolinger, 1989; Hirschberg & Ward, 1992), particular prosodic features contribute to utterance interpretation. Wh-phrases

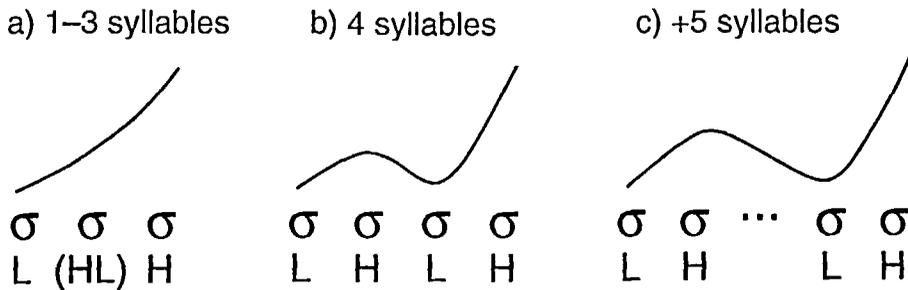
*The experimental part of this work was completed while both authors were at the Department of Linguistics, the Ohio State University. We thank the Department of Linguistics for the use of laboratory facilities. We also thank Mary Beckman and two anonymous reviewers for their helpful comments and encouragement, and S. Takayanagi for her assistance in statistics. In addition, the second author thanks Mary Beckman for giving her the opportunity to conduct research as a visiting scholar at the Ohio State University. An earlier version of this paper was presented at the International Conference on Spoken Language Processing in 1994.

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is surprised to hear it. In this paper, we will confine our investigation on the latter type of echo question and call it the “incredulity question” (Oh & Lee, 1993). Thus, the incredulity question /nuka wajo/? means “WHO did you say is coming? (= I can’t believe that X is coming. (and the speaker knows who X is.))” We added this type of question because it differs from other types of question in that it implies surprise while the others do not. It has been found in other languages that incredulity is expressed by employing higher amplitude and a bigger pitch range. For example, in English, it has been claimed that an *incredulity* reading in English is associated with shorter duration, greater amplitude, and a larger pitch range in production compared to an *uncertainty* reading, but only a large pitch range has been found to be perceptually salient in the perception of *incredulity* (Hirschberg & Ward, 1992).

In this paper, we will examine phonetic characteristics of prosodic features and phrasing to investigate how these three types of questions, the wh-question, yes/no-question, and incredulity question, are distinguished from each other. Then we will examine which prosodic feature is perceptually more salient in distinguishing three types of questions, based on utterances produced by speakers in the production experiment. For the phonetic description of phrasing and prosodic features of Korean, we will adopt the model of Korean prosody developed by Jun (1993). In this model, she proposed two prosodic units higher than a phonological word based on the intonation pattern of an utterance: an Accentual Phrase and an Intonational Phrase. An Accentual Phrase can have more than one phonological word and is marked by a phrase-final rising tone in Seoul Korean (the tonal details differ in other dialects). An Intonational Phrase can have more than one Accentual Phrase and is marked by a boundary tone and a phrase-final lengthening followed by an optional pause. Being at a higher prosodic level than a phonological word, the Accentual Phrase is at the same level as the phonological phrase of Korean proposed by Cho (1990), Kang (1992), or Silva (1989), adopting the Prosodic Hierarchy Theory developed by Selkirk (1986) and Nespor and Vogel (1986). But the Accentual Phrase differs from the phonological phrase since its formation is based on the intonational pattern of an utterance rather than on the syntactic structure of a sentence. To emphasize the tonal basis of the phrase, Jun called the phrasal unit an Accentual Phrase. Since this prosodic model is based on the tonal-temporal properties of an utterance, we can compare the pitch range and the timing of peaks and valleys as well as the tonal pattern and phrasing of the three types of wh-phrases.

A brief description of the tonal pattern of an Accentual Phrase and the tone-syllable association is in order. The tonal pattern of the Accentual Phrase in the Standard (Seoul) dialect has two alternate forms: one is Low-High-Low-High and the other is High-High-Low-High. This pattern is determined by the laryngeal feature of the phrase initial segment. If the segment is either an aspirated or tense obstruent, the phrase has a HHLH pattern, otherwise the phrase has a LHLH pattern (Jun, 1996). The first tone (Low or High) is realized on the first syllable of the phrase, the following High tone on the second syllable of the phrase, the following Low tone on the penultimate syllable of the phrase, and the final High on the final syllable of the phrase. (But, since all examples used in this experiment have a LHLH pattern, no HHLH pattern is shown in this paper.) When an Accentual Phrase is the last Accentual Phrase in an Intonational Phrase, this phrase final H tone is overridden by an Intonational Phrase boundary tone. That is, if an Intonational Phrase boundary tone is Low, the final syllable of the last Accentual Phrase would not be realized as its underlying High tone, but is pre-empted by the Low boundary tone of the Intonational Phrase. A schematic representation of the realizations of the basic tonal pattern of an Accentual Phrase in Seoul

**FIGURE 1**

A schematic representation of tonal realizations of the basic tone pattern of an Accentual Phrase in Seoul dialect of Korean. The surface tonal pattern of (a) less than four syllables, (b) four syllables, and (c) more than four syllables of an Accentual Phrase.

dialect is shown in Figure 1. The middle High tone is realized on the second syllable of a phrase if the phrase has more than four syllables. Thus, the realization of the middle High tone depends on the number of syllables in the phrase. When the phrase is shorter than four syllables, it is not realized due to undershoot. The peak of the middle High tone is in general lower than that of the final High tone. See Jun (1993) for a more detailed description of the Accentual Phrase.

Thus, the tonal pattern of a wh-phrase would be different depending on the accentual phrasing of its constituent words. If a wh-word forms one Accentual Phrase by itself, we will find a High tone at the end of the wh-word and a Low tone at the beginning of the following word, but if a wh-word forms one Accentual Phrase together with the following word, the second syllable of the wh-word will have a High tone (because the phrase will be of more than four syllables) and the following Low tone will be realized on the penultimate syllable of the phrase. We can then determine whether there is an Accentual Phrase boundary by examining the timing of peaks and valleys relative to the syllables in a wh-phrase. In addition, we can measure F0 values and amplitude at several points in a wh-phrase to compare three types of questions. The production data will be discussed in Experiment 1 and the perception data will be discussed in Experiment 2.

EXPERIMENT 1: PRODUCTION

Method

Subjects. Four Seoul speakers in their early thirties participated in the experiment: two female (speaker Y and speaker O) and two male (speaker L and speaker C). Speakers Y, L, and C were graduate students at the Ohio State University, Columbus, Ohio. Speakers Y and C have been in the United States about four years, and speaker L for three years. Speakers Y, L, and C reported that they speak Korean at home and to other Koreans in the department, amounting to 50% of daily life. Speaker O (the second author) has visited the United States periodically in the last six years. Her durations of stay ranged from 2 to 24 months.

TABLE 1

Wh-words

/mwə/	“what” or “anything”
/nuka/	“who” or “anyone”
/əntʃe/	“when” or “any time”
/əti/	“where” or “any place”
/nukulaŋ/	“with whom” or “with anyone”
/nukuhako/	“with whom” or “with anyone”

Material. Twenty sentence types were designed so that each could be interpreted in three ways: wh-question, incredulity question, and yes/no-question. Each sentence had a wh-word followed by a verb (henceforth, wh-phrase) and the wh-word was preceded either by an adverbial phrase, /onil tʃənjək-e/ “today night-in (= tonight),” or by a noun phrase, /atʃuməni-ka/nin/li/ “madam-case marker (= madam-NOM/TOP/ACC),” depending on the meaning of the wh-phrase. This adverbial or noun phrase (henceforth, pre-wh-phrase) was added before the wh-phrase to see if there is a pitch range difference outside the wh-phrase depending on the question type. Every sentence ended in a question particle /-jo/ (except for one sentence which ended with /-ə/) so that any difference in the boundary tone would not be due to the inherent meaning of the particles, but to the question type. Six wh-words were used in this experiment and they are shown in Table 1. To investigate possible changes in the tonal patterns of the wh-word and the following verb due to their accentual phrasing, we varied the number of syllables in the wh-words (from one to four syllables) as well as the number of syllables in the following verbs (from one to five syllables). However, due to difficulty of measurement, only two to five syllable verbs were analyzed. The list of all sentences appears in the Appendix.

Each type of question was triggered by a corresponding dialogue either as an answer or as a statement. Wh-questions and yes/no-questions were triggered by the type of answer: if the answer started with “Yes” or “No,” the wh-phrase should be interpreted as a yes/no-question, but if the answer started with a name of a person, place, thing, or a time, the phrase should be interpreted as a wh-question. For incredulity questions, we tried to provide a statement describing an unexpected fact before the wh-phrase to evoke the incredulity reading more naturally. In addition to this contextual cue, an explicit phrase describing incredulity, /nollatʃi, mitil su əptanintʃi/ (“Being surprised, and as if one cannot believe this”), was written in parenthesis next to the target wh-phrase. (2) and (3) below show two representative sentences with corresponding dialogues. In each dialogue, the subject’s part, A part in (a) and (b) and B part in (c), was highlighted with a fluorescent pen and the wh-word with the incredulity meaning was marked by a dot underneath each syllable of the word in order to draw the subject’s attention. Here, “/../” represents a phonemic representation.

(2) /onil tʃənjəke mwə məkəjo/ ?

(a) for wh-question meaning:

A: /onil tʃənjəke mwə məkəjo/? (“What are we eating tonight?”)

B: /tʃʼatʃənpap məkəjo/. (“We are eating tʃʼatʃənpap-rice.”)

(b) for yes/no-question meaning:

A: /onil tʃɛnjɛkɛ mwə məkəjɔ/? (“Are we eating anything tonight?”)

B: /kɪlɛmjɔ, kɔpjəwunkɛlato məkəjɔtʃjɔ/. (“Yes, we should eat something light.”)

(c) for incredulity question meaning:

A: /oniltʃɛnjɛkɛ wənsuŋi kɔljɔli məkɪlkəjɛjɔ/.

(“We will eat monkey’s brain tonight.”)

B: /onil tʃɛnjɛkɛ mwə məkəjɔ/? (/nollatɪsi, mitil su ɛptanɪntɪsi/)

(“WHAT are we eating tonight?” – Being surprised, and as if one cannot believe this.)

(3) /atfʊmənɪnɪn ɛntʃɛ ɛtʃɪlɔwəjɔ/ ?

(a) for wh-question:

A: /atfʊmənɪnɪn ɛntʃɛ ɛtʃɪlɔwəjɔ/? (“Madam, when do you feel dizzy?”)

B: /sɪksɔtʃɛnɛ ɛtʃɪlɔwəjɔ/. (“I feel dizzy before meals.”)

(b) for yes/no-question:

A: /atfʊmənɪnɪn ɛntʃɛ ɛtʃɪlɔwəjɔ/?

(“Madam, is there any time that you feel dizzy?”)

B: /jɛ, kɔnhɔk ɔntʃɔstɔ ilɔnɔmjɛn ɛtʃɪlɔwəjɔ/.

(“Yes, some of the times when I stand up from sitting.”)

(c) for incredulity question:

A: /nɔn hɔnsʊm p^hʊk tʃɔkɔnɔmjɛn ɛtʃɪlɔwəjɔ/.

(“I feel dizzy when I sleep well.”)

B: /atfʊmənɪnɪn ɛntʃɛ ɛtʃɪlɔwəjɔ/? (/nollɔntɪsi, mitil su

ɛptanɪntɪsi/) (“Madam, WHEN do you feel dizzy?” – Being surprised, and as if one cannot believe this.)

Procedure. A short dialogue (a question and answer pair) for each type of wh-question was written on a card (5.5 inch × 8.5 inch). A total of sixty (3 types × 20 sentences) dialogues were pseudo-randomized so that the same type of question did not appear three times in a row. For each dialogue, the second author read the answer or the statement corresponding to the question. The sixty dialogues were repeated three times by each speaker. The recording was made in a soundproof booth. The subjects' utterances were digitized and analyzed using Entropic Research Laboratory's XWAVES speech analysis software. The peak RMS amplitude was measured at two points in the utterance: the wh-word and the question particle at the end of an utterance. In addition, F0 values and time (referenced to the beginning of the utterance) were measured on the pitch track for seven points: two points from the pre-wh-phrase, and five points from the wh-phrase including the utterance final point. A sample pitch track with seven measurement points aligned

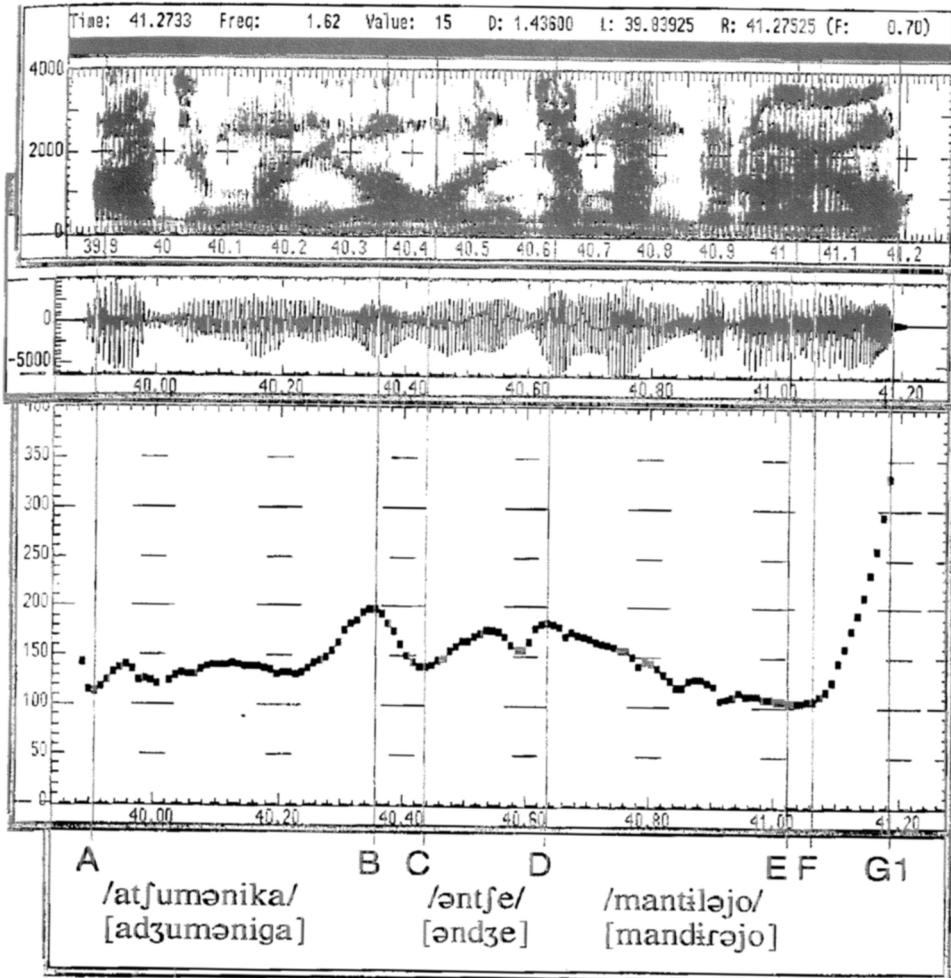


FIGURE 2

A sample screen of XWAVES program showing a spectrogram, a waveform, a F0 contour, and a label window marked by seven measurement points: the lowest F0 of the pre-wh-phrase (A), the highest F0 of the pre-wh-phrase (B), the lowest F0 after B (C), the peak F0 of the wh-phrase (D), the lowest F0 after D (E), the beginning of the question particle (F), and the utterance final F0 (G) with information of a boundary tone: 1 refers to a High boundary tone. Sentence: /atʃumənika əntʃe mantələjo/ [adʒuməniga əndʒe mandərəjo] “madam-NOM. when to make-int.” → “When does madam make (it)?” (Speaker L).

with a spectrogram and a waveform is shown in Figure 2. The two points measured in the pre-wh-phrase were: the lowest F0 (A) and the highest F0 (B). A was always the beginning of the pre-wh-phrase, that is utterance initial, and B was the end of the pre-wh-phrase. The five points in the wh-phrase were: the lowest F0 after B (C), the highest F0 of the wh-phrase (D), the beginning of low after D (E), the beginning of the question particle (F), and the utterance final F0 (G). The point F was located at the highest second formant

of [j] (or the beginning of [ə] for one sentence type) in the spectrogram. After G, information on the type of a boundary tone was added. 1 after G in Fig. 2 indicates a High boundary tone (H%).

Seoul Korean has been analyzed as having at least six boundary tones: L%, H%, LH%, HL%, LHL%, and HLH% (Jun, 1993). Each boundary type was determined depending on the F0 shape of the utterance final syllable. Thus, if the syllable /jo/ or /ə/ began with a low tone and rose to a higher F0 in the middle of the syllable, we labeled it LH%. The syllable was labeled H% if its onset showed no sign of a low plateau but rather a rising F0.¹ The same criterion was used for the distinction between LHL% and HL%. Sample contours of four boundary tone types uttered in this experiment, H%, LH%, HL%, and HLH%, are shown in Figure 3.

Results and Discussion

The three question types, wh-question, yes/no-question, and incredulity question, were distinguished by the combination of boundary tones, accentual phrasing, and pitch ranges and peak amplitude.

Boundary tones. The inventory of boundary tones and the percentage of each boundary tone used in each question type is shown in Figure 4 on page 46. There was no single boundary tone type specific to one type of wh-question. Yes/no-questions and incredulity questions were most often realized with High boundary tones (H%), although they sometimes appeared with LH boundary tones (LH%) for all four speakers. The most common boundary tone for wh-questions was LH%, although H% and HL% were also observed, and one speaker (Speaker C) used all four boundary tones with roughly comparable frequencies.

In addition to these different types of boundary tone, there was also a difference in the phonetic realization of the high boundary tone. Within a given category of boundary tone, a high tone was in general significantly higher in incredulity questions than the high tone in yes/no-questions, which was itself higher than the high tone in wh-questions. Table 2 shows the mean F0 values and the results of ANOVA and Tukey post-hoc tests for each question type (at .01 level). HL% and HLH% were not compared because these types occurred only in wh-questions. All speakers showed significantly different F0 values for the LH% tone between question types: Incredulity > Yes/no-questions > Wh-questions. The same relation

¹ It was found that the same wh-question type employs H% as well as LH%, providing a similar meaning. But, in other type of sentences, we found that the pragmatic meaning of a sentence or phrase changed depending on which type of boundary tone was used. Thus, it was not always true that every phrase ending with H% can be replaced with LH% without changing the pragmatic meaning. For example, in the following sentence, LH% is used meaning "confirmation," "seeking listener's agreement" or "speaker's insistence and confidence," but if we use H%, the sentence has only the literal meaning, "if."

ex. 1. /X-lil t^honhesə jejakilhetfusimjən, (LH%) tʃeka p'alli tʃəlihalsuis'əjo (L%)/
 "X-ACC. through make a reservation, (LH%) I-NOM. quickly handle-can-ending"
 → "(I am sure) I can handle it quickly if you make a reservation through X."

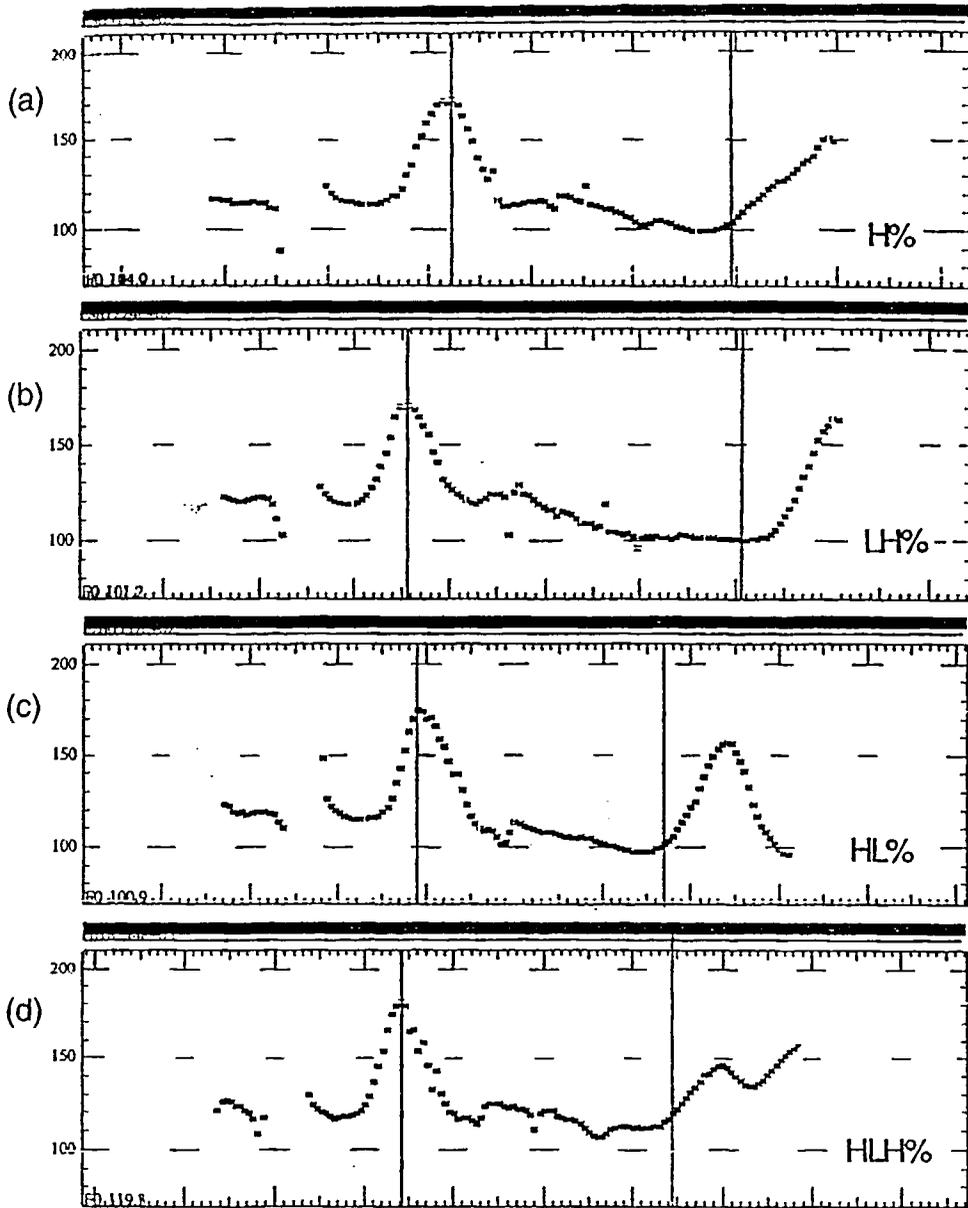


FIGURE 3

Example F0 tracks of wh-question sentences showing four different boundary tones: (a) H% (/onil tʃənjəke mwə məkəjo/ “What do (you) eat tonight?”), (b) LH% (/onil tʃənjəke nukulaŋ mannajo/ “Who do (you) meet tonight?”), (c) HL% (/onil tʃənjəke nuka wajo/ “Who is coming tonight?”), and (d) HLH% (/onil tʃənjəke nuka məkəjo/ “Who is eating tonight?”). All uttered by Speaker C. The first vertical line marks the boundary between a pre-wh-phrase and a wh-phrase, and the second vertical line marks the beginning of the question particle, /jo/.

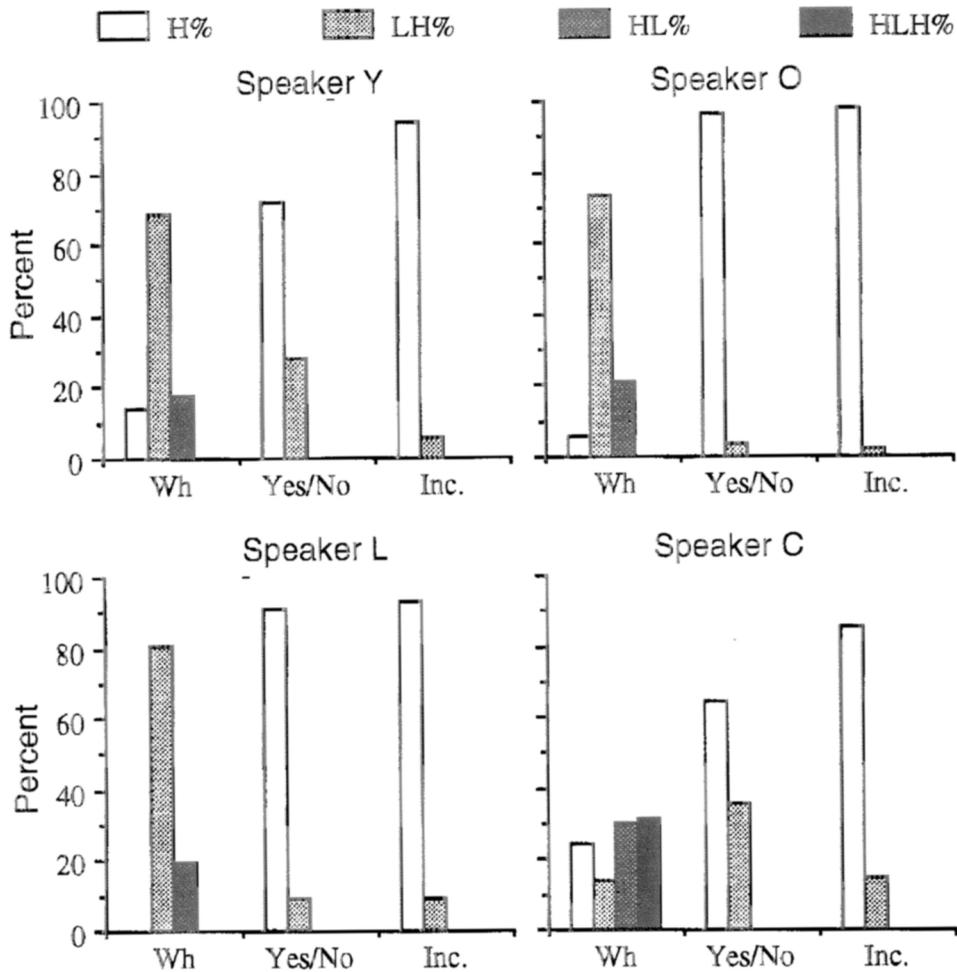


FIGURE 4

Types of boundary tones and their percentage of occurrence for each type of wh-question.

was found with the mean F0 value of the H% tone except for speakers Y and O. For these two speakers, the H% tone was not significantly different between incredulity and yes/no-questions though the tendency was the same as in LH% tone: incredulity > yes/no-question.

Thus, even within the same type of boundary tone, speakers in general distinguished three question types quantitatively. The difference in boundary tones is therefore more prominent between wh-questions and incredulity questions than between incredulity questions and yes/no-questions or between wh-questions and yes/no-questions.

Accental phrasing. Accental phrasing was categorically different between the yes/no-questions and the other two types of questions. All speakers produced the wh-phrase as two

TABLE 2

Mean F0 values (Hz) of the boundary tones and differences between Question-types (all effects at $p < .01$)

%	Spk	Q-types			Effects		
		Inc.	Y/N	Wh	d.f.	F	Tukey
H	Y	475	439	355	(2, 97)	20.41	Inc. \equiv Y/N > Wh
	O	516	465	414	(2, 110)	10.62	Inc. \equiv Y/N > Wh
	L	321	261	no data	(1, 94)	69.43	Inc. > Y/N
	C	257	196	167	(2, 79)	94.65	Inc. > Y/N > Wh
LH	Y	508	432	363	(2, 52)	50.20	Inc. > Y/N > Wh
	O	590	474	351	(2, 42)	42.33	Inc. > Y/N > Wh
	L	301	262	182	(2, 50)	170.28	Inc. > Y/N > Wh
	C	266	195	166	(2, 24)	81.83	Inc. > Y/N > Wh

separate Accentual Phrases (i.e. wh-word and the following verb each forms one Accentual Phrase) in yes/no-questions, but as one Accentual Phrase in wh- and incredulity questions. This difference in accentual phrasing of a wh-phrase means that there is a different syllable-tone association. Since an Accentual Phrase in the Seoul dialect starts with a low tone and ends with a high tone, if the wh-word itself forms one Accentual Phrase, the word would end with a high F0 and the following lowest F0 point would be the beginning of the following Accentual Phrase (i.e. the beginning of the following verb in this experiment, regardless of the number of syllables in each word). On the other hand, if the wh-word and the following verb together form one Accentual Phrase as in wh- and incredulity-questions, the whole wh-phrase will be realized with the LHLH tone patterns with the middle H tone around the second syllable of the phrase (i.e. the second syllable of a wh-word) and the following L tone around the penultimate syllable of the phrase (For the one syllable wh-word, /mwə/, the middle H tone was realized on that syllable by lengthening the syllable). This would mean that the tone of a wh-word-final syllable and the following verb-initial syllable would vary depending on the number of syllables in the whole wh-phrase because their surface tone is determined by means of an interpolation between the middle H tone and the penultimate L tone of the wh-phrase.

A schematic representation of the F0 contours of two question types, yes/no-questions versus wh- and incredulity questions, are shown in Figure 5. The example sentence given in Figure 5 is /atʃuməninin əntʃe ətʃiləwəjo/? (atʃuməni-nin “madam-top,” əntʃe “any time/when,” ətʃiləwə-jo “dizzy-honorific ending”), meaning (a) “Is there any time that you feel dizzy, madam?” versus. (b) “When (or WHEN) do you feel dizzy, madam?” In Fig. 5, each Accentual Phrase is marked by a vertical line. A yes/no-question, shown in (a), has three Accentual Phrases (the pre-wh-phrase, the wh-word functioning as an indefinite pronoun, and the verb) and a wh-question or incredulity question, shown in (b), has two Accentual Phrases (the pre-wh-phrase and the wh-phrase). Thus, the distance between the peak of wh-

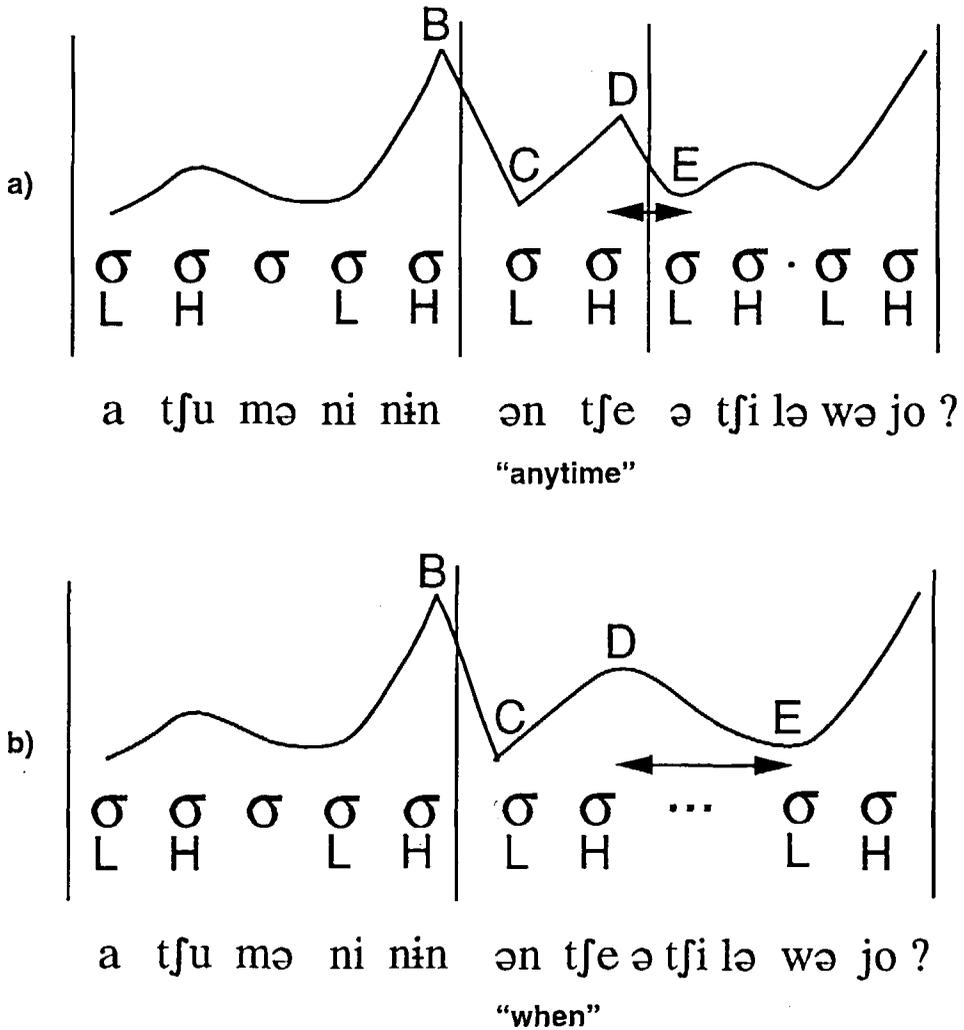


FIGURE 5

A schematic representation of F0 contours of wh-phrases of (a) yes/no-question versus (b) wh-question and incredulity question in Seoul Korean. A vertical line marks the boundary of an Accentual Phrase. (a) shows three Accentual Phrases: the pre-wh-phrase, the wh-word and the verb, and (b) shows two Accentual Phrases: the pre-wh-phrase and the wh-phrase. A horizontal arrow represents the distance between D and E.

phrase (D) and the beginning of the lowest F0 after the peak (E) would be longer when both D and E belong to the same Accentual Phrase as in (b) than when both points belong to different Accentual Phrases as in (a). Table 3 shows the mean time difference in ms between D and E in three types of questions for four speakers. One factor ANOVA test shows that there is a main effect of question types for all speakers, $F(2, 641) = 500.347, p < .0001$. A

TABLE 3

The mean time difference (ms) between D (peak F0 of the wh-phrase) and E (the lowest F0 after the peak) of three wh-question(Q) types for four speakers. (One standard error in the parenthesis.) In each cell $50 \leq n \leq 60$

Speaker	Q-type		
	wh-Q	incredulity Q	yes/no Q
Y	425.08 (16.0)	364.59 (15.4)	121.43 (4.4)
O	419.92 (18.2)	413.28 (18.2)	118.01 (5.6)
L	390.04 (15.4)	341.93 (18.0)	93.43 (2.7)
C	365.53 (16.4)	406.23 (20.0)	106.48 (2.9)

Tukey post-hoc analysis shows that the time difference (D – E) in yes/no-questions is significantly shorter (at the .01 level) than those in the other two types for all speakers.

In addition, we expect that, for yes/no-questions, the mean time difference between D and E will be stable regardless of the number of syllables in the verb, while, for wh- and incredulity questions, the mean time difference of DE will increase as the number of syllables in the verb increases. Since the number of syllables in the verb differed from two to five syllables in our data, we ran a two factor ANOVA (question types and the number of syllables in a verb (V-syll)) on DE duration. The result showed that there is a main effect of V-syll on the time difference between DE, $F(3, 632) = 158.8, p < .0001$. It also showed that the interaction of the two factors was significant, $F(6, 632) = 40.16, p < .0001$, in such a way that the DE significantly increased as the number of syllables for “V-syll” increased only for wh- and incredulity questions, but not for yes/no-questions. For yes/no-questions, the mean DE duration was similar for all verbs ranging from 111 ms for two-syllable verbs to 119 ms for five-syllable verbs. This quantitative data based on tone-syllable association confirms that the wh-phrase in yes/no-questions is produced in one Accentual Phrase while the wh-phrase of the other two types of question is produced in two Accentual Phrases.

Another aspect of tone-syllable association also confirms the different accentual phrasing between yes/no-questions and the other two types of questions. If a wh-word forms one Accentual Phrase in the yes/no-question, we expect that the H tone of a wh-word (i.e. D) will always go to the final syllable of the wh-word. On the other hand, if the whole wh-phrase forms one Accentual Phrase as in wh- and incredulity questions, the place of D will be the same (around the second syllable of the phrase) regardless of the number of syllables in a wh-word. Since the number of syllables in the wh-word differed from one to four syllables in our data, we ran a two factor ANOVA (question types and the number of syllables in a wh-word (Wh-syll)) on BD duration (the timing of the H tone from the beginning of the wh-phrase). The result showed that the time between BD significantly increased for yes/no-questions, $F(3, 213) = 43.762, p < .0001$, as the number of syllables in a wh-word increases from one to four, but not for wh- and incredulity questions. This suggests that the H tone (D) is realized at the end of a wh-word in yes/no-question, thus marking an Accentual Phrase boundary, but the tone is realized on the second syllable of the whole wh-phrase in wh- and incredulity questions, that is, as the middle H tone of an Accentual Phrase.

Therefore, the impression of a “high” tone for a wh-pronoun and a “low” tone for an indefinite pronoun (ex. Cho, 1990) does not hold when a wh-word has one or two syllables. Since most wh-word stems in Korean are no longer than two syllables, the impression would hold true only when a wh-word stem is followed by a monosyllabic case marker or a post-position such as /nuku-lan/ “with whom” or /eti-sə/ “at where.” Instead, our data show that a general difference between wh- and indefinite pronouns seems to lie in the presence or absence of a sharp falling tonal transition between the wh-word final syllable and the following word initial syllable. That is, when a wh-word is two-syllables in length, the tone of each syllable will be the same for yes/no-questions and wh-questions; the initial syllable is realized as a L tone and the second (final) syllable is realized as a H tone. What is different between these two wh-phrases is whether the initial syllable of the post-wh-word is a L tone or not.

Pitch ranges and peak amplitude. For all speakers, the incredulity question generally showed a larger pitch range than that of the other two types of question. But this prosodic feature contributes more to the distinction between the incredulity question and the wh-question than to the distinction between yes/no-questions and the other two types of questions since accentual phrasing is the same for both incredulity- and wh-questions but not for yes/no-questions. On the other hand, the way of producing a large pitch range for the incredulity question is not always the same across speakers. Figure 6 shows F0 values and times at three points for four subjects, B (final H of pre-wh-phrase) – C (initial L of wh-phrase) – D (peak of wh-phrase). The time of C and D is plotted relative to B. An asterisk (*) indicates that the F0 difference between incredulity and wh-questions is significant at the .01 level and “+” at the .05 level.

For Speaker Y, the mean F0 values of B-C-D of incredulity questions were always significantly lower than those of wh-questions, thus showing no difference in the pitch range (difference between the maximum and the minimum) between the two wh-types (B: $t = 3.89$, $p < .001$; C: $t = -6.78$, $p < .001$; D: $t = 3.41$, $p < .001$). However, as shown in Table 2, this speaker produced an inverse pattern of F0 values at a sentence final position: the sentence final peak was significantly higher (H%: $t = -5.19$, $p < .001$; LH%: $t = -5.19$, $p < .001$) for incredulity-questions (mean F0 of H%: 475Hz, LH%: 508Hz) than for wh-questions (mean F0 of H%: 355Hz, LH%: 363Hz). Thus, an incredulity question as a whole was produced with a larger pitch range than was a wh-question. The other speakers employed a larger pitch range for the incredulity questions even without including the sentence final syllable, but they used different strategies in expanding their pitch range. For example, speakers L and C achieved a wider pitch range for the incredulity question by significantly raising the peak but keeping the same valley as in wh-questions (Speaker L’s B: $t = -7.77$, $p < .001$; C: $t = -1.88$, $p = .06$, D: $t = -9.20$, $p < .001$; Speaker C’s B: $t = -2.27$, $p = .02$; C: $t = 1.48$, $p = .14$; D: $t = -3.11$, $p < .001$). In contrast, speaker O achieved a larger pitch range for incredulity questions by significantly lowering the valley but keeping the same peak as in wh-questions (B: $t = 8.52$, $p < .001$; C: $t = -4.89$, $p < .001$, D: $t = 4.61$, $p = .64$). However, as shown in the graph, this speaker’s peaks at B (the pre-wh-phrase final syllable) differed between two question types. Except for this pre-wh-phrase final H tone, the same pitch range relationship (similar H but lower L for incredulity questions compared to wh-questions) was found in the pre-wh-phrase.

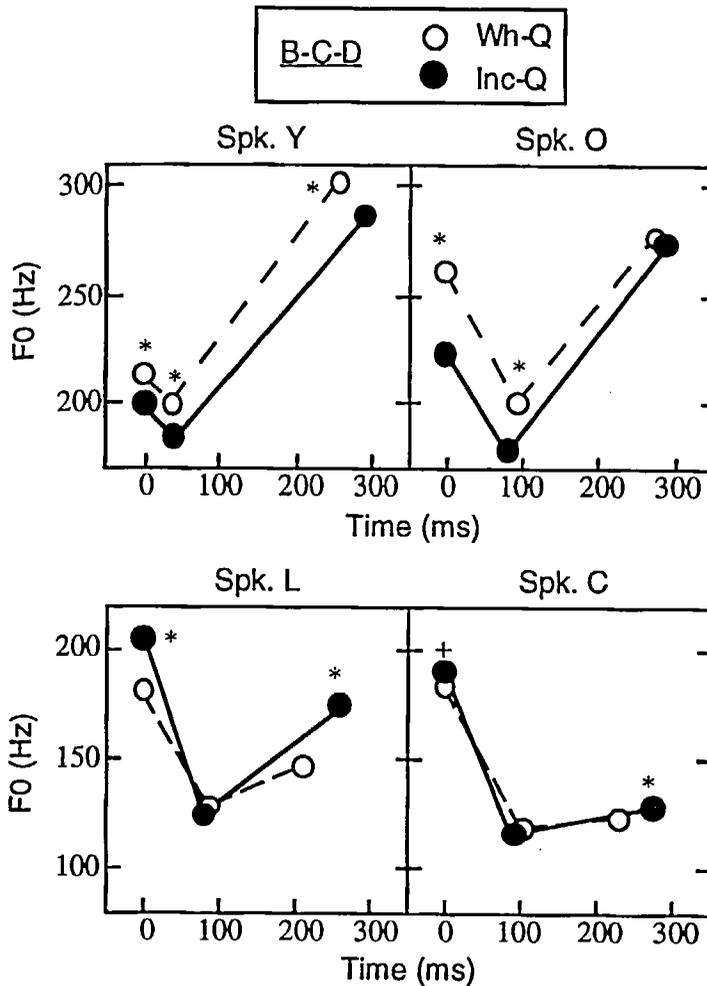


FIGURE 6

Mean F0 and time of points B-C-D in two question types, wh-question and incredulity question: B (the end of pre-wh-phrase), C (lowest F0 after B but before a peak) and D (peak F0 of wh-phrase). Time of C and D is plotted relative to B. X-axis refers to time in ms and y-axis refers to a fundamental frequency in Hz. "*" indicates the difference between two F0 values is statistically significant at the .01 level and "+" at the .05 level.

Figure 6 also shows that there is in general a durational difference between the two types: all speakers except speaker O produced the peak F0 of the wh-phrase significantly later for incredulity questions than they did for wh-question (for BD durations, speaker Y: $t = -4.45, p < .01$; speaker O: $t = -4.38, p = .066$; speaker L: $t = -6.73, p < .001$; speaker C: $t = -6.58, p < .001$). This is due to the lengthening of the first syllable of the wh-word in incredulity questions relative to the same syllable in wh-questions. But incredulity questions are not longer overall than wh-questions. Speakers Y and L reduced the rest of the

wh-phrase of incredulity questions compared to the corresponding part of wh-questions ($p < .05$), thus producing similar durations for the two types. Speaker O and C, on the other hand, did not change the length of the rest of the wh-phrase between the two question types. In contrast, English incredulity sentences are significantly shorter than their non-surprised versions (Ward & Hirschberg, 1988; Hirschberg & Ward, 1992).

In addition to differences in pitch range and duration, the three types of questions have different peak amplitudes at two points in the wh-phrase. Peak amplitudes (RMS, arbitrary scale) of wh-words and question particles are given in Figure 7 for each speaker and each type of question. For all speakers but C, the peak amplitudes of both the wh-word and the question particle were greatest in incredulity questions (one-way ANOVAs on wh-word amplitudes for each speaker: speaker Y: $F(2, 159) = 30.59, p = .0001$; speaker O: $F(2, 165) = 83.42, p = .0001$; speaker L: $F(2, 165) = 6.14, p = .002$; speaker C: $F(2, 168) = 1.27, p = .283$; on particle amplitudes: speaker Y: $F(2, 159) = 24.02, p = .0001$; speaker O: $F(2, 165) = 5.81, p = .003$; speaker L: $F(2, 165) = 3.62, p = .029$; speaker C: $F(2, 168) = 3.00, p = .0524$). The amplitude relationship between wh- and yes/no-questions depends on location, however. For all speakers but C, the peak amplitude of the wh-word was greater in wh-questions than in yes/no questions, but the difference at the question particles was variable across speakers.² In general, speaker C does not seem to distinguish the question types by amplitude. Since, however, speaker C's productions were identified as well as the other speakers' in the perception test which we will describe later, we can assume that other prosodic features such as boundary tones or duration would be more useful perceptual cues here. For the other speakers at least, the impression of greater phonological prominence for a wh-pronoun over an indefinite pronoun (Chang, 1973; Choe, 1985) seems to arise from a difference in the amplitude of the wh-words.

Finally, in addition to these prosodic features, we found that voice quality also distinguished incredulity questions from the other types. All speakers in this experiment employed breathy voice, albeit to varying degrees, when they produced incredulity questions. Speaker L, in general, used the least breathy voice, while speaker O used the most. In general, breathy phonation was used for the whole utterance including the pre-wh-phrase, but not for the sentence final particle which carries a very high boundary tone, H% or LH%. Though we have no measurement for voice quality in this experiment, we believe that it is an important cue to incredulity. As will be shown later, speaker L's incredulity questions were least often perceived correctly and this might be due to his relative failure to alter voice quality for these questions. Further work will be needed to give a full account of the characteristics of voice quality in incredulous utterances and to determine how these act on perception, either alone or with other prosodic features.

Summary: Speakers distinguished three types of questions by different combinations of boundary tones, accentual phrasing, pitch range, and peak amplitude variation. But all of

² We can see that the magnitude of amplitude is not parallel to the magnitude of F0; the wh-word in the wh-question has a higher amplitude than that in the yes/no-question, though it does not necessarily have a higher F0. At the same time, the particle in yes/no questions has a higher boundary tone than that in wh-questions. For all speakers, however, the amplitude of the particle in yes/no-questions is not significantly higher than that of wh-questions.

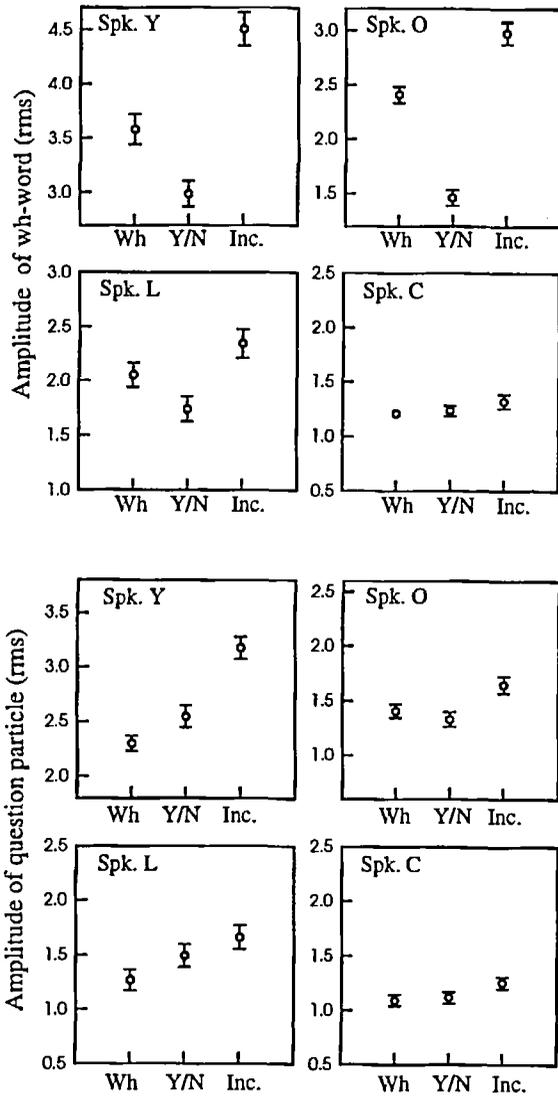


FIGURE 7

RMS amplitude (in arbitrary scale) of (a) wh-word and (b) question particle in three question types for each speaker. An error bar represents one Standard Error.

these features except for accentual phrasing were employed to a different degree in order to distinguish three question types. On the other hand, accentual phrasing was employed to qualitatively distinguish question types into two groups; two Accentual Phrases for yes/no-questions but one Accentual Phrase for wh-questions and incredulity questions. Table 4 summarizes the way each speaker distinguished the three wh-question types prosodically. Only prosodic features which are significantly different or categorically different are included.

TABLE 4

Prosodic differences between three Question Types (AP: Accentual Phrase)

<i>Q-types</i>	<i>Differences between the 1st Q-type against the 2nd Q-type</i>	<i>Speakers</i>
Inc. : Y/N	by using 1 vs 2 AP, higher % tone values, higher amplitude	Y, L
	by using 1 vs 2 AP, higher LH% tone values, higher amplitude	O
	by using 1 vs 2 AP, higher % tone values, higher amplitude (jo)	C
Y/N : wh	by using 2 vs 1 AP, different % tone types, higher % tone values	Y, O, L, C
Inc. : wh	by lowering B-C-D tone, different % tone types, higher % tone values, higher amplitude, longer BD rising time	Y
	by lowering B-C tone, different % tone types, higher % tone values, higher amplitude	O
	by raising B-D tone, different % tone types, higher % tone values, higher amplitude, longer B-D rising time	L, C

EXPERIMENT 2: PERCEPTION*Method*

Subjects. Thirty college students (24 male and 6 female) in their late teens or early twenties participated. All subjects were native Seoul speakers and students of Yeojoo College, Kyunggi-do, Korea.

Material. Forty-five sentences (3 question types \times 15 sentence types) for each speaker from the production experiment were taken from the first reading of the production data. Five sentences (1, 5, 12, 14, 19 in the appendix) were not included due to inconsistent reading materials between subjects. Sentences were randomized separately for four speakers and recorded on to a tape. The perception tape contained instructions in Korean with six example sentences and the main test of 180 sentences (45 sentences \times 4 speakers), blocked by speaker. Within the data from each speaker, a beep was placed every five sentences; each sentence was followed by four seconds of silence. Data from different speakers were separated by two beeps. The whole test took 30 minutes.

Procedure. The test was run twice in a classroom of Yeojoo College, Kyunggi-do, Korea, once with 21 listeners wearing headphones, and a second time with nine listeners who heard the materials presented over loudspeakers. Since the listener groups showed no difference in their responses, the results presented in this paper are based on the combined data of the two groups. Listeners were forced to choose one of three possible answers (wh-question, yes/no-question, incredulity question) for each stimulus by placing a mark on the answer sheet. Instructions were presented in both oral and written Korean.

TABLE 5

Percent responses to each type of question for each speaker

<i>Stimulus</i>	<i>Speaker</i>	<i>Type of Response</i>		
		<i>Wh-Q</i>	<i>Yes/No-Q</i>	<i>Inc.-Q</i>
Wh-Q	Y	87.1	8.9	4.0
	O	90.7	4.9	4.4
	L	90.7	6.7	2.6
	C	89.8	7.8	2.4
Y/N-Q	Y	19.1	67.3	13.6
	O	10.7	82.9	6.4
	L	12.7	67.8	19.5
	C	14.0	81.1	4.9
Inc.-Q	Y	24.2	11.1	64.7
	O	18.0	11.3	70.7
	L	40.0	7.8	52.2
	C	31.8	10.4	57.8

Results and discussion

The results of the perception test show that listeners were, in general, good at distinguishing among the three types of questions. But these three questions were not equally well perceived. For all speakers, wh-questions were perceived correctly most often, yes/no-questions less often, and incredulity questions least often. The percent responses to each type of questions are shown in Table 5 for each speaker. The percentage is based on 450 tokens (15 sentences \times 30 listeners) per each type of question. On average across speakers, 28.5% of incredulity questions were perceived as wh-questions and 10.2% of them were perceived as yes/no-questions. Yes/no-questions were perceived correctly about 70% to 80% of the time but incorrectly perceived more often as wh-questions than as incredulity questions, except for speaker L. Except for speaker L's yes/no-question responses, all the response patterns were very similar for all four speakers. This indicates that listeners were good at interpreting the different strategies employed by different speakers.

Since listeners' responses were very accurate for wh-questions and their incorrect responses to other question types were often wh-questions, we can infer that listeners' judgments are biased towards wh-questions. To investigate whether judgments are based on this bias alone or whether they are related in any orderly way to the measured prosodic variables, several multiple regression analyses were performed. For a multiple regression analysis, nine measurement categories (1. BD duration; 2. DE duration; 3. sentence types; 4. amplitude of wh-word; 5. amplitude of particle-jo; 6. boundary tone (%) type; 7. boundary

tone F0 values; 8. pitch range from CD; and 9. speakers) were included as independent variables and percent (%) of correct judgments as dependent variable. Since the accentual phrasing factor has a value of either one or two, it could not be used as an independent variable. Thus, we included DE duration since it best reflects the accentual phrasing (see Table 3). BD duration also reflects accentual phrasing when the number of syllables of a wh-word increases, but it also reflects the lengthening of a wh-word when the number of the syllables is the same, thus distinguishing wh-questions from incredulity questions. Since the BD duration is correlated with the number of syllables in a wh-word while the DE duration is correlated with that of a verb following a wh-word, the "sentence types" factor was defined in two different ways: Sentence Group-I was defined based on the number of syllables in a wh-word and Sentence Group-II was based on the number of syllables in a verb following a wh-word. Thus, for each dependent variable of a correct response, two sets of multiple regression analyses were performed. Each of these analyses contained eight independent variables: six independent variables (4–9 above), plus either Sentence Group-I and BD duration (henceforth Regression I); or Sentence Group-II and DE duration (henceforth Regression II).

When the dependent variable was the percent of correct wh-question responses, the eight independent variables in Regression I accounted for 22 % of the variance. Though this model was not significant, $R^2 = .22$, $F(8, 51) = 1.801$, $p = .09$, two of the independent variables showed a significant effect on the correct wh-Q response: the amplitude of particle-jo ($\beta = -.545$, $p = .01$), and the amplitude of wh-word ($\beta = .553$, $p = .02$). The independent variables in Regression II, however, accounted for a significant amount of the variance in this dependent variable, $R^2 = .302$, $F(8, 51) = 2.764$, $p = .01$. Among eight independent variables, three showed a significant effect: DE duration ($\beta = .585$, $p = .01$), the amplitude of particle-jo ($\beta = -.499$, $p = .01$), and the amplitude of wh-word ($\beta = .562$, $p = .02$). That is, listeners' correct judgments of wh-questions increased as DE duration and the amplitude of the wh-word increased and as the amplitude of particle-jo decreased. When the dependent variable was the percent of correct yes/no responses, the independent variables did not account for significant variance, either in Regression I, $R^2 = .113$, $F(8, 51) = .81447$, $p = .59$ or in Regression II, $R^2 = .191$, $F(8, 51) = 1.5114$, $p = .17$. However, when we examined individual independent variables, only DE duration turned out to be significant ($\beta = .317$, $p = .02$). In other words, listeners judged yes/no questions correctly more often as their DE duration increased. Finally, when the dependent variable was the percent of correct incredulity question responses, independent variables in both regression analyses accounted for significant variance (Regression I: $R^2 = .301$, $F(8, 51) = 2.745$, $p = .01$; Regression II: $R^2 = .351$, $F(8, 51) = 3.447$, $p = .003$). The boundary tone F0 value was a significant factor in both regression analyses (in Regression I: $\beta = .717$, $p = .0007$, in Regression II: $\beta = .581$, $p = .005$). DE duration was significant in Regression II ($\beta = -.423$, $p = .01$) but the sentence type factor was significant only in Regression I, ($\beta = -.286$, $p = .03$). That is, the sentence type factor was significant only when sentences were grouped in terms of number of syllables in a wh-word. This means that listeners correctly judged incredulity questions more often when the boundary tone was higher, the DE duration was shorter, and the number of syllables of the wh-word was fewer. In addition, BD duration was marginally significant for the incredulity-Q response ($\beta = .320$, $p = .06$): the longer the BD duration, the more correct incredulity responses.

In sum, all three types of responses were significantly influenced by DE duration, suggesting that accentual phrasing is highly related to all three types of wh-judgments. Amplitude was significantly related only to the perception of wh-questions, and boundary tone F0 value and the number of syllables in a wh-word were significantly related only to the perception of incredulity questions. This suggests that listeners' judgments were based on prosodic properties of the sentences.

The next question is then why listeners were better at distinguishing wh-questions than at distinguishing the other two types of questions. In particular, the asymmetry in the response pattern between wh-questions and incredulity questions seems to suggest that listeners might have a negative bias towards incredulity questions: they were reluctant to categorize a token as an incredulity question. We think that this might be due to insufficient information related to pitch range or amplitude of the context and/or due to the mismatch between listeners' and speakers' target for incredulity. The pre-wh-phrase did not greatly help the normalization of pitch range for the wh-phrase, because the pre-wh-phrase was not only short but also similar to that of the wh-phrase. Within a short utterance, the female speakers Y and O were in general more expressive in producing incredulity questions by expanding pitch range and amplitude, and the rate of correct incredulity responses was higher for these speakers. Listeners may expect prosodically exaggerated or more expressive speech to correspond to incredulity, although speakers do not necessarily produce such speech when they wish to sound incredulous. When we examined tokens of incredulity questions whose error response was high, we found that those tokens were all produced in a mildly surprised way by not expanding one or more prosodic features (i.e. with smaller pitch range expansion, weaker amplitude, shorter BD duration, or medium high boundary tones, etc., than we could find from tokens whose error response was low).

Mismatch between the listener's production target and the speaker's perceptual target was also found in a study of vowel perception by Johnson, Flemming, and Wright (1993). In their experiment, listeners adjusted parameters of a speech synthesizer until the vowels produced by the synthesizer sounded like the vowels found in a set of example words. Listeners chose vowels that were systematically different from those measured in productions of the set of example words but were consistent with those produced in hyperarticulated speech: high vowels were higher, low vowels were lower, and front vowels were further front, and so forth. This led them to conclude that phonetic targets of vowels are "hyperarticulated." Since, in our study, listeners responded less often towards incredulity questions unless they heard a prosodically expressive production of incredulity, we surmise that listeners' phonetic target of incredulity is prosodically hyperarticulated.

The hyperarticulation hypothesis may also explain the pattern of incorrect responses to yes/no questions: more wh-questions than incredulity responses. This also shows that listeners were less likely to categorize a yes/no-question as incredulity unless they heard a prosodically strong phrase. In addition, the error pattern may also be related to the quantitative differences among the prosodic features of the three question types. Since neither express surprise, yes/no questions resemble wh-questions in BD duration, pitch range, boundary tone, and amplitude. Consequently, we would expect that yes/no questions would be more likely to be mistaken for wh-questions than for incredulity questions. Speaker L, however, shows the opposite pattern: his yes/no-questions were more often perceived as incredulity than as wh-questions. His yes/no questions could indicate incredulity because

they were in general produced with a loud and tense voice with a very high boundary tone. As a consequence listeners would either confuse them with incredulity questions or class them correctly while feeling that they conveyed some incredulity. So, we can assume that listeners are sensitive to the quantitative difference in prosodic features and are more likely to confuse question types which have similar prosodic values than those which do not.

Finally, the listeners' perception of incredulity seemed to be influenced by the speaker's voice quality. As shown in the production data results, speaker C's incredulity had neither as strong an amplitude nor as expansive a pitch range as other speakers'. But his incredulity tokens were more often correctly perceived than speaker L's. Speaker C very often produced his incredulity tokens with a breathy voice, while speaker L did not exhibit as much. Speaker L often used a similar voice quality in both incredulous and non-incredulous questions (i.e. tense or modal voice). This suggests that voice quality is one of the important cues for the perception of incredulity.

In sum, the multiple regression analyses revealed which prosodic features are perceptually more salient in discriminating three question types. DE duration, an indirect measure of accentual phrasing, was significant for all three question types. Amplitude was a salient feature for wh-questions, and the boundary tone F0 value was a salient feature for incredulity questions. However, the response pattern did not straightforwardly reflect the quantitative values of prosodic features. In view of the poor identification of incredulity questions, we suggested that the listeners' target for incredulity is more prosodically hyperarticulated than the speakers' actual production. Since the perception results in this experiment are based on real speech, we could not determine how much hyperarticulation of each prosodic feature leads listeners to perceive incredulity or where the boundary between interpretations lies for values of each prosodic feature. For this critical range of prosodic values, an additional perception test may be needed using synthesized data. In addition, we also need to investigate non-prosodic features such as voice quality, as well as the relationship between voice quality and prosodic features.

CONCLUSION

Prosodic features of three question types with the same segmental string (wh-question, yes/no-question, and incredulity question) were examined both in production and perception. Speakers distinguished these questions by the combination of boundary tones, accentual phrasing, pitch ranges, and peak amplitude. Among these, accentual phrasing was the most consistent prosodic feature distinguishing yes/no-questions from the other questions. Other prosodic features also played a role in distinguishing question types but to a different degree. Incredulity questions were distinguished from wh-questions by a larger pitch range and higher amplitude as well as by boundary tones. However, not all speakers used the same strategy in distinguishing incredulity from wh-questions.

The results of the perception test show that the different production strategies are equally useful for listeners. It also shows that accentual phrasing is significantly related to the perception of three question types while amplitude and boundary tones are significantly related to the perception of wh-questions and incredulity questions, respectively. The fact that the listeners' recognition of incredulity questions was the lowest suggests that their perceptual target for the incredulity question is prosodically hyperarticulated. To determine

the range or boundary of prosodic feature values which distinguish the three question types, further research based on synthesized speech may be needed.

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APPENDIX*Materials*

Only wh-sentences relevant to the analysis are presented, that is, corresponding dialogues are not shown. All interpretations of wh-words shown here are only relevant to wh-pronouns. Every wh-word can be interpreted as its corresponding indefinite pronoun. The word or phrase in parenthesis after the main sentence shown in 5, 12, 13, and 16 is the replaced one uttered by more than one speaker. In the translation of grammatical categories, "hon." refers to an honorific marker, "int." to an interrogative marker, "nom." to a nominative marker, "acc." to an accusative marker, and "top." to a topic marker.

1. /onil tʃənjəke nuka wa/ ?
tonight who-nom. to come-int. (Who is coming tonight?)
2. /onil tʃənjəke nuka wajo/ ?
tonight who-nom. to come-honorific int. (Who is coming tonight?)
3. /onil tʃənjəke nuka məkəjo/ ?
tonight who-nom. to eat-hon. int. (Who is eating tonight?)
4. /onil tʃənjəke nuka mantiləjo/ ?
tonight who-nom. to make-hon. int. (Who is making tonight?)
5. /onil tʃənjəke nuka mantiləs'əjo/ ? (/ponetiljəjo/)
tonight who-nom. to make-past-hon. int. (to make a person go)
(Who made (it) tonight? or Who is making (a person) go tonight?)
6. /atʃumənika əntʃe wajo/ ?
madam-nom. when to come-hon. int. (When is madam coming?)
7. /atʃumənika əntʃe məkəjo/ ?
madam-nom. when to eat-hon. int. (When is madam eating?)
8. /atʃumənika əntʃe mantiləjo/ ?
madam-nom. when to make-hon. int. (When is madam making?)
9. /atʃuməninin əntʃe ətʃiləwəjo/ ?
madam-top. when to feel dizzy-hon. int. (When does madam feel dizzy?)
10. /atʃumənika əti kəjo/ ?
madam-nom. where to go-hon. int. (Where is madam going?)
11. /atʃumənika əti kantejo/ ?
madam-nom. where to go-hon. int. (Where is madam going, do you know?)

12. /atfʊmənika əti kasintejo/ ? (/atfʊmənɪlɪl əti ponentejo/)
 madam-nom. where to go-extreme hon. int. (madam-acc. where to make-go-hon.int.)
 (Where is madam going, do you know? or Where (are you) sending madam tonight?)
13. /atfʊmənika əti kasilk'əlejo/ ? (/atfʊmənɪlɪl əti ponetiljəjo/)
 madam-nom. where to go-extreme hon.-volition-int. (madam-acc. where to make-go-hon.int.)
 (Where will madam go, do you know? or Where (are you) sending madam tonight?)
14. /onɪl tʃənjəke mwə məkə/ ?
 tonight what to eat-int. (What are (you) eating tonight?)
15. /onɪl tʃənjəke mwə məkəjo/ ?
 tonight what to eat-hon. int. (What are (you) eating tonight?)
16. /onɪl tʃənjəke mwə mantɪləjo/ ? (/ponetiljəjo/)
 tonight what to make-hon. int. (to send-hon. int.)
 (What are (you) making tonight? or What are (you) going to send tonight?)
17. /onɪl tʃənjəke mwə mantilk'əejo/ ?
 tonight what to make hon.-volition-int. (What are you going to make tonight?)
18. /onɪl tʃənjəke nukulaŋ mannaʝo/ ?
 tonight with whom to meet-hon. int. (With whom do you meet tonight?)
19. /onɪl tʃənjəke nukuhako mannaʝo/ ?
 tonight with whom to meet-hon. int. (With whom do you meet tonight?)
20. /onɪl tʃənjəke nukuhako mantɪləjo/ ?
 tonight with whom to make-hon. int. (With whom do you make tonight?)
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