

KYUNGSANG KOREAN SUBJECTS' PERCEPTION OF JAPANESE PITCH-ACCENT

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ABSTRACT

The purpose of the present study is to examine whether native speakers of Kyungsang Korean are sensitive to pitch variation in vowels after Japanese voiced and voiceless plosives, given the tonogenesis account that the tone difference -H and L in vowels after aspirated and fortis consonants and after lenis ones, respectively- is lexically specified word-initially in Korean [6]. In order to investigate this, we selected Kyungsang Korean which has a lexical pitch-accent like Japanese, and conducted a perception experiment where eighty native speakers of Kyungsang Korean in their early 20s (40 male and 40 female) participated.

The results showed that our subjects are not sensitive at all to pitch variation in vowels after Japanese voiced and voiceless plosives in word-initial position and also after word-medial Japanese consonants. This indicates that the lexical specification of the H/L distinctions in word-initial position in the tonogenesis account of Korean consonants is not empirically supported by the present perception experiment. It is then suggested that Kyungsang Korean subjects' perception of Japanese voiced and voiceless plosives is driven by the laryngeal features [tense, spread glottis], regardless of pitch variation, like Seoul Korean subjects' [4].

Keywords: Kyungsang Korean, Japanese pitch-accent, [tense], [spread glottis]

1. INTRODUCTION

According to Jun [2], Korean has three tonally defined prosodic units above the Word: Intonation Phrase (IP) > Intermediate Phrase (ip) > Accentual Phrase (AP). Among the three prosodic units, AP, "a unit slightly larger than a Word" is motivated, because pitch range can change in Korean depending on the segmental property at the beginning of AP. For example, APs beginning with fortis or aspirated stops (i.e., plosives and affricates) as in /s'/, /s/ or /h/ have a higher pitch range than those beginning with lenis stops. Thus,

in AP-initial position which usually corresponds to word-initial position, H is expected in vowels after fortis or aspirated stops like /s'/, /s/ or /h/ and L after lenis stops and sonorants. Recently Jun's view that pitch range in AP-initial position is closely associated with the segmental property in Korean has led some linguists to further suggest that Korean is one of the tonogenesis languages just like some of the East Asian languages [6]. It has been assumed in a standard tonogenesis model that vowels after voiceless consonants are assigned with H and those after voiced ones with L due to the difference in F₀. In line with this, Kim & Duanmu [6] have proposed that "the consonant-tone interaction in Korean is a standard case of voiceless-H and voiced-L." That is, vowels after lenis stops are lexically marked as L because Korean lenis stops are underlyingly voiced with the specification of the features [+voice, - aspirated]. Vowels after aspirated and fortis stops are proposed to be lexically marked as H because aspirated and fortis ones are voiceless with the specification of [-voice, + aspirated] and [-voice, - aspirated], respectively. When lenis stops are in word-initial or in AP-initial position, they are assumed to be devoiced with the original feature value [+voice] changed into [-voice], but the underlying lexical tone L remains unchanged in following vowels. Therefore, lenis and fortis stops are identical in their feature specification of [-voice, - aspirated] in word-initial position due to the devoicing of lenis stops, and it is the tone specification that differentiates lenis stops from fortis ones.

Given that Kyungsang Korean has been assumed to have a lexical pitch-accent like Japanese [7, 8], we raise the question of whether native speakers of Kyungsang Korean are sensitive to the H/L distinction, if F₀ plays the primary role in the three-way phonation contrast in Korean consonants. In order to answer the question, we investigate, in the present study, how native speakers of Kyungsang Korean perceive pitch variation in vowels after Japanese voiced and

voiceless plosives in word-initial and -medial position as well. If the consonant-tone interaction is lexically specified in word-initial position, as in the tonogenesis account, then native speakers of Kyungsang Korean would be sensitive to F0 difference in vowels after Japanese voiceless and voiced plosives and thus, would perceive Japanese voiceless plosives as either aspirated or fortis consonants and Japanese voiced plosives as lenis. This is because F0 of vowels after Japanese voiceless consonants is higher than that of vowels after voiced counterparts, as in other languages which have phonemic voicing contrast. In addition, if word-medial consonants do not affect tone because the tonal pattern of a word is determined solely by an initial consonant, native speakers of Kyungsang Korean would perceive a vowel after a word-medial Japanese plosive as either H or L and therefore, the Japanese plosive as either aspirated/fortis or lenis, regardless of whether the plosive is voiced or voiceless.

2. EXPERIMENT

2.1. Method

Two-, three- and four-syllable Japanese words were used as test words, as shown in (1). Words with an accent are marked with “’” over an accented vowel, as in *magó*. The other words with no accent marking are all unaccented. In both word-initial and word-medial positions, the test words have the consonants /b, d, g, t, k/. Note that no test word begins with the voiceless plosive /p/ or has the consonant in word-medial position in (1), because there are few Japanese words with /p/ in word-initial and word-medial positions except for loanwords.

(1) Japanese test words

a. two-syllable words

<i>bate</i>	LH	‘being done in’
<i>Date</i>	LH	‘(family name, place name)’
<i>gaka</i>	LH	‘painter’
<i>kabe</i>	LH	‘wall’
<i>Tada</i>	LH	‘(family name, place name)’
<i>magó</i>	LH	‘grandchild’

b. three-syllable words

<i>bakéru</i>	LHL	‘to transform oneself’
<i>dokuga</i>	LHH	‘poisonous moth’
<i>gogaku</i>	LHH	‘study of languages’
<i>kotobá</i>	LHH	‘word, language’
<i>tadami</i>	LHH	‘watching a game, etc. with no fee’

nakabá LHH ‘middle, half’

c. four-syllable words

bakamono LHHH ‘idiot’

<i>botebote</i>	LHHH	(onomatopoeia)
<i>dakareru</i>	LHHH	‘to be embraced’
<i>gatagata</i>	LHHH	(onomatopoeia)
<i>katagami</i>	LHHH	‘(paper) pattern (for a dress)’
<i>todokéru</i>	LHHL	‘to deliver, to report’

The test words were put in /korewa __desu/ ‘This is __’ and randomized. A male native speaker of Tokyo Japanese in his early 30s recorded the test words five times at a sound-proof recording room at the Laboratory of Phonetics and Phonology, CNRS/Sorbonne-Nouvelle (University of Paris 3). The best recorded test words were selected, and then pitches were manipulated in two ways, as follows: HL and LH for the two-syllable words; HLL and LHH for the three-syllable words; and HLLL and LHHH for the four-syllable words. The manipulated pitch patterns in the present study are among the pitch variation in Tokyo Japanese [9]. All of the pitch manipulations were attested by the Japanese speaker who recorded the test words in (1) and is a trained phonetician. In our pitch manipulations, the average pitch differences between H and L, H and H, and L and L vowels were 390 Hz, 73.4 Hz and 81.2 Hz, respectively, when F0 was measured in the middle of each vowel.

The total number of stimuli was 36 (18 test words x 2 pitch manipulations), and two repetitions of the stimuli were randomized at a 4 ms interval for one session. The seventy two tokens (36 stimuli x 2 repetitions) were presented three times to each participant in three sessions at a one-minute interval. One participant thus received a total of 216 trials (36 stimuli x 6 repetitions). Eighty native speakers of Kyungsang Korean (40 male and 40 female) participated in this perception experiment. All of the subjects were in their early 20s as university students and have not had any hearing impairments. They have never learned Japanese either. In a quiet room, each subject was asked to listen to the prepared stimuli, using a headphone (HD 202 SENNHEISER or Shure SRH440) and to write them down in the Korean orthography. The perception experiment was run using Praat’s ExperimentMFC facility. After the perception experiment, all the responses of the subjects were stored in excel for data analyses.

2.2. Results

Our Kyungsang Korean subjects mostly perceived the word-initial Japanese voiced plosives [b], [d] and [g] as the lenis /p/, /t/ and /k/, respectively, regardless of pitch variation, as shown in Table 1.

Paired samples two-tailed *t*-tests showed that the difference in H and L does not have a significant effect on our Kyungsang Korean subjects' perception of the word-initial Japanese voiced consonants (**HL** vs. **LH**: $t(2)=1.4$, $p<.3008$; **HLL** vs. **LHH**: $t(2)=1.6$, $p<.2539$; **HLLL** vs. **LHHH**: $t(3)=-.5$, $p<.6559$).

Table 1: Kyungsang Korean subjects' responses for the word-initial Japanese voiced plosives [b], [d] and [g] as /p/, /t/ and /k/, respectively, in pitch manipulations in (a) the two-syllable words *bate*, *Date* and *gaka*; (b) the three-syllable words *bakeru*, *dokuga* and *gogaku*; and (c) the four-syllable words *bakamono*, *botebote*, *dakareru* and *gatagata*.

a. HL	1353 (/1440 = 94%)
LH	1277 (/1440 = 89%)
b. HLL	1344 (/1440 = 93%)
LHH	1308 (/1440 = 91%)
c. HLLL	1617 (/1920 = 84%)
LHHH	1656 (/1920 = 86%)

Our Kyungsang Korean subjects' tendency to perceive the word-medial Japanese voiced consonants [b], [d] and [g] as /p/, /t/ and /k/, respectively, also shows that it has nothing to do with the difference in H and L in following vowels. Regardless of H and L differences, our Kyungsang Korean subjects are the most likely to perceive the word-medial Japanese voiced plosives [b], [d] and [g] as the lenis consonants, as shown in Table 2. Also, paired samples two-tailed *t*-tests revealed that the difference in H and L in following vowels does not have a significant effect on our Kyungsang Korean subjects' perception of the word-medial Japanese voiced consonants (**HL** vs. **LH**: $t(2)=-1.5$, $p<.2621$; **HLL** vs. **LHH**: $t(4)=4.8$, $p<.9638$; **HLLL** vs. **LHHH**: $t(3)=.3$, $p<.7729$).

Table 2: Kyungsang Korean subjects' responses for the word-medial Japanese voiced plosives [b], [d] and [g] as /p/, /t/ and /k/, respectively, in pitch manipulations in (a) the two-syllable words *kabe*, *Tada* and *mago*; (b) the three-syllable words *kotoba*, *nakaba*, *tadami*, *dokuga* and *gogaku*; and (c) the four-syllable words *botebote*, *todokeru*, *katagami* and *gatagata*.

a. HL	1309 (/1440 = 91%)
LH	1268 (/1440 = 88%)
b. HLL	2166 (/2400 = 90%)
LHH	2167 (/2400 = 90%)
c. HLLL	1825 (/1920 = 95%)
LHHH	1832 (/1920 = 95%)

In Table 3, we can note that our Kyungsang Korean subjects largely tended to perceive the word-initial Japanese voiceless consonants [k] and [t] in the test words as /k^h/ and /t^h/, respectively, regardless of pitch manipulations. Paired samples

two-tailed *t*-tests showed that there are no significant effects in all the comparisons (**HL** vs. **LH**: $t(1)=1.8$, $p<.3193$; **HLL** vs. **LHH**: $t(1)=1.7$, $p<.344$; **HLLL** vs. **LHHH**: $t(1)=5.8$, $p<.1087$).

Table 3: Kyungsang Korean subjects' responses for the word-initial Japanese voiceless plosives [k] and [t] as /k^h/ and /t^h/, respectively, in pitch manipulations in (a) the two-syllable words *kabe* and *Tada*; (b) the three-syllable words *kotoba* and *tadami*; and (c) the four-syllable words *katagami* and *todokeru*.

a. HL	878 (/960 = 92%)
LH	847 (/960 = 88%)
b. HLL	904 (/960 = 94%)
LHH	879 (/960 = 92%)
c. HLLL	901 (/960 = 94%)
LHHH	872 (/960 = 91%)

Table 4 shows that the word-medial Japanese voiceless consonants [k] and [t] were mostly perceived as /k^h/ or /k^ʔ/ and /t^h/ or /t^ʔ/, respectively, regardless of whether following vowels have H or L and that the difference in H and L in following vowels does not have a significant effect on our Kyungsang Korean subjects' perception of the word-medial Japanese voiceless consonants (**HL** vs. **LH**: $t(2)=-.4$, $p<.7269$; **HLL** vs. **LHH**: $t(4)=.7$, $p<.5156$; **HLLL** vs. **LHHH**: $t(7)=-.9$, $p<.416$).

Table 4: Kyungsang Korean subjects' responses for the word-medial Japanese voiceless consonants [k] and [t] as /k^h/ or /k^ʔ/ and /t^h/ or /t^ʔ/, respectively, in pitch manipulations in (a) the two-syllable words *gaka*, *bate* and *Date*; (b) the three-syllable words *bakeru*, *dokuga*, *gogaku*, *nakaba* and *kotoba*; and (c) the four-syllable words *bakamono*, *botebote*, *dakareru*, *gatagata*, *katagami* and *todokeru*.

a. HL	1370 (/1440 = 95%)
LH	1363 (/1440 = 95%)
b. HLL	2212 (/2400 = 92%)
LHH	2286 (/2400 = 95%)
c. HLLL	3660 (/3840 = 95%)
LHHH	3646 (/3840 = 95%)

We conducted regression analyses in order to see whether there is any significant correlation between H and L pitch manipulation in our Kyungsang subjects' perception of the Japanese voiced and voiceless plosives. As shown in Table 5, Regression analyses with L (as a regressor) against H revealed a close relationship ($ps=.0001$) between the two variables in our Kyungsang Korean subjects' perception of the Japanese plosives, regardless of whether the Japanese plosives are in word-initial or word-medial position, suggesting that a significant amount of variation in L (c.a. 90% of the variation) can be accounted for by H. The strong correlation between H and L in our Kyungsang Korean subjects' perception of

Japanese voiced and voiceless plosives indicates that our subjects are not sensitive to the difference in pitch variation in vowels after the Japanese plosives, no matter whether the Japanese plosives are voiced or voiceless and no matter whether they are in word-initial or word-medial position.

Table 5: Regression analyses with L (as a regressor) against H in Kyungsang Korean subjects' perception of (a) word-initial Japanese voiced plosives as lenis; (b) word-medial Japanese voiced plosives as lenis; (c) word-initial Japanese voiceless plosives as aspirated; and (d) word-medial Japanese voiceless plosives as either aspirated or fortis.

- a. $R^2=.9$, $F[1, 79]=679$, $p=.0001$
- b. $R^2=.9$, $F[1, 79]=534.3$, $p=.0001$
- c. $R^2=.9$, $F[1, 79]=445.5$, $p=.0001$
- d. $R^2=.9$, $F[1, 79]=679$, $p=.0001$

3. DISCUSSION

Based on the results of the present perception experiment, we suggest that F0 does not play a role in our Kyungsang Korean subjects' perception of Japanese voiced and voiceless plosives word-initially and also word-medially. In addition, the assumption that F0 plays the primary role in the three-way phonation contrast of Korean consonants in the tonogenesis account is not supported, either. As shown in Kim, et al. [5], glottal tension, that is, stiffening and slackening of the vocal folds which is acoustically reflected by F0 rises, is one of the phonetic correlates of the feature [tense] in Korean. Thus, the lexical specification of the H/L distinctions in word-initial position in Korean is not empirically supported by the present perception experiment. Instead of tones H and L, we suggest that our Kyungsang Korean subjects' perception of Japanese voiced and voiceless plosives is driven by the Korean laryngeal features [tense] and [spread glottis], like Seoul Korean subjects' [4], in support of Kim [3]. The difference in closure duration between Japanese voiceless and voiced plosives is parsed for a cue to the feature [tense], and thus word-medial Japanese voiceless plosives are perceived as either aspirated or fortis ([+tense]), and word-medial Japanese voiced ones as lenis ([-tense]). On the other hand, in word-initial position, the difference in VOT between Japanese voiceless and voiced plosives is parsed for a cue to the feature [spread glottis]: Japanese voiceless plosives are perceived as aspirated ([+spread glottis, +tense]) and voiced ones as lenis ([-spread glottis, -tense]).

4. CONCLUSION

In the present study, we have conducted the perception experiment of eighty young native speakers of Kyungsang Korean in order to investigate whether they are sensitive to the H/L distinctions in vowels after Japanese voiced and voiceless plosives in word-initial position, given the tonogenesis account [6]. We have found that our Kyungsang Korean subjects' perception of Japanese voiced and voiceless consonants has nothing to do with pitch variation in both word-initial and -medial positions. Rather, it is the Korean laryngeal features [tense] and [spread glottis] that play a role in our subjects' perception of Japanese voiced and voiceless plosives in both word-initial and word-medial positions. This supports the view that speech perception is greatly affected by the grammar of the native language (cf. [1, 10]) and in particular, L1 feature-driven perception of L2 sounds [3].

5. REFERENCES

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