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Production of English Alphabets by Koreans

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Production and perception of second language sounds are typically influenced by second language learners' native language sounds. In this study we investigate how the Korean language influences Korean speakers' production of English alphabets. In the experiment conducted to prepare for this study 16 native speakers of Korean pronounced English alphabets. Then three native speakers of English evaluated the Korean subjects' pronunciation of them. The results show that the Korean subjects' native language (i.e., Korean) influences their production of the English alphabets. When Korean has sounds corresponding to English alphabets, the English subjects rate the Korean subjects' production of them good. For instance, Korean has voiceless stop phonemes, hence their production of English alphabets <p, t, k> was rated good by the English subjects. The Korean subjects' production of English alphabets containing the sounds that do not exist in Korean was rated poor by the English subjects. For instance, Korean does not have voiced fricative phonemes, hence their production of English alphabets <v, z> was rated poor.

[second language, production, English, alphabets, Korean, 제2언어, 산출, 영어, 알파벳, 한국어]

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I. INTRODUCTION

Current second language (L2) speech learning theories are based on Lado's (1957) Contrastive Analysis Hypothesis. This posits that production and perception of L2 sounds are influenced by native languages' (L1) phonological contrasts. Flege's (1995) Speech Learning Model also assumes that production and perception of L2 sounds are based on how close the L1 sounds are to the corresponding L2 sounds perceptually. Best's (1995) Perceptual Assimilation Model also posits that L2 sounds are produced and perceived based on perceived similarity of L2 sounds to L1 sounds.

The aim of this study is to investigate how the Korean language influences production of English aphabets by native speakers of Korean. For this purpose we asked our Korean subjects to produce English alphabets[1] and then asked native speakers of American English to rate how good their productions are based on 1-5 scales. The results show that the Korean subjects' native language (i.e., Korean) influenced their production of the English alphabets. When the Korean language has corresponding English sounds, the Koreans' production of such sounds was good. Production of English sounds that do not exist in Korean was not good. For instance, they produced English voiceless stops very well since Korean has the corresponding consonants. Korean does not have phonemic voiced fricatives. Thus, the Korean subjects poorly produced English voiced fricatives. Based on the results obtained from the experiment, we will also discuss how to teach pronunciation of English sounds to Koreans.

1. Korean Sounds and Its Syllable Structure

Based on the second language speech learning theories above, we expect that Korean phonemic contrasts may influence the Korean subjects' production of English alphabets. Thus we briefly go over characteristics of Korean phonemes.

There are seven vowels in Korean: /i, ɨ, u, e, ə, o, a/ (see Sohn 1987 and Yun 2004, among others).[2] Korean does not have falling diphthongs. One

1) English alphabets cover most, but not all, of the sounds found in English. We do not attempt to research production of all of the English sounds in this study. This study is limited only to production of English alphabets by native speakers of Korean.

exception is /ɨi/ (의). However, Korean is currently losing this; this optionally becomes [ɨj] ~ [ɨ] ~ [i] at the word-initial position (e.g., [ɨj.sa] ~ [ɨ.sa] ~ [i.sa] 'medical doctor')[3], and [i] at the morpheme-final position (e.g., [min,ʤu.ʤu.i] 'democracy'), and [e] at the word-final position (e.g., [min.ʤu.ʤu.i.-e] 'of democracy (literally, 'democracy-of')'.

Korean has three way distinction in voiceless stops and affricates; it has lenis, aspirated, and fortis series: /p, pʰ, p*/ ('ㅂ, ㅍ, ㅃ' in the Korean orthography), /t, tʰ, t*/ (ㄷ, ㅌ, ㄸ), /k, kʰ, k*/ (ㄱ, ㅋ, ㄲ), /ʧ, ʧʰ, ʧ*/ (ㅈ, ㅊ, ㅉ). Voiceless alveolar fricatives also have lenis and fortis distinction: /s, s*/ (ㅅ, ㅆ). It should be noted that the Korean /s, s*/ are palatalized before [i], hence become [sʲ, s*ʲ], respectively (see Kim-Renaud 1974, among others). For instance, /si/ → [sʲi] 'poem', and /s*i/ → [s*ʲi] 'seed'. The obstruents do not have phonemic voiced counter parts. Korean has three nasals /m, n, ŋ/ and two glides /j, w/. It is well known that Korean has only one phonemic liquid /l/. As Yun (2004) claims, this may surface as a flap [ɾ] in syllable-initial position and an [l] in syllable-final position.[4]

It is necessary to discuss the syllable structure of Korean since we expect that when the Korean subjects pronounce English alphabets, it will influence their production. Korean has [(C)(G)V(C)]$_{\sigma}$ structure. Especially coda position is limited to seven consonants: /p, t, k, m, n, ŋ, l/ due to the well-known coda neutralization (see Kim-Renaud 1974, among others). When Koreans produce loan words, they tend to epenthesize a vowel /ɨ/ if the loan words do not meet the Korean syllable structure.[5] For instance, the English word 'pink' is pronounced [pʰiŋ.kʰɨ].[6] In the next section we discuss the previous studies that are relevant to this study.

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2) One might argue that Korean has another front vowel /æ/ (or /ɛ/ depending on researchers). However, following Hong (1991), we assume that the /æ/ has been merged to /e/ in Korean.

3) This is especially common in the Chulla and Kyungsang dialects: [ɨ.sa] in the Chulla dilect and [i.sa] in the Kyungsang dialect. I would like to thank one of the three anonymous reviewers for pointing this out.

4) Actually Yun (2004) uses [r] instead of [ɾ]. Korean phonologists typically use an [r] when they meant a [ɾ].

5) This is called an underspecified vowel in Korean. See Sohn (1987) for details.

6) The dot between syllables indicates a syllable boundary.

2. Previous Research

Kim (1972) asked native speakers of Korean to label English consonants as closest Korean consonants using the Korean orthography. He found that the Koreans labeled /d, ʤ, g/ as both Korean lenis and fortis consonants with the same place and manner of articulation. That is, English /d/ was labeled as Korean /t, t*/ (ㄷ, ㄸ), /ʤ/ as /ʧ, ʧ*/ (ㅈ, ㅉ), and /g/ as /k, k*/ (ㄱ, ㄲ). They labeled the English /b, v/ as Korean /p/ (ㅂ). English /f, Θ/ were labeled as various Korean consonants such as /pʰ, p*, h, s*, t*/.

Schmidt (1996) did the same research as the one done by Kim (1972). She said that the overall results agree with the ones found in Kim's study. Native speakers of Korean labeled English aspirated stops /p, t, k/ (i.e., [pʰ, tʰ, kʰ]) as the corresponding Korean aspirated stops /pʰ, tʰ, kʰ/ (ㅍ, ㅌ, ㅋ) using the Korean orthography. English /h/, nasals and glides were also labeled as the corresponding Korean consonants. They labeled English voiced stops and affricates as the corresponding Korean lenis and fortis ones. The English /r, l/ were labeled as Korean /l/ (ㄹ). The English /s/ was labeled as both Korean /s/ (ㅅ) and /s*/ (ㅆ). The English /z/ was labeled as Korean /ʤ/ (ㅈ). The English /f/ and /v/ were labeled as Korean /pʰ, p*, h/ (ㅍ, ㅃ, ㅎ) and /p/ (ㅂ), respectively. The English /Θ/ and /ð/[7] were labeled mostly as /pʰ, t*, s*/ (ㅍ, ㄸ, ㅆ) and /p, t, t*/ (ㅂ, ㄷ, ㄸ), respectively.

Kim (1965), Kagaya (1974), Han and Weitzman (1970), and Han (1994), among others discuss acoustic analyses of Korean stops. They show that word-initial Korean stops are voiceless ones. They identify stops based on voice onset time; aspirated stops are the longest, and the lenis stops are in the middle, and the fortis stops are the shortest.[8]

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7) This symbol should be understood as a voiced interdental fricative. We cannot provide the corresponding symbol using our word processor.

8) This study does not cover how Koreans produce suprasegmentals such as stress. For those who are interested in Koreans' production of English stress, see Kim (2004) and Park (2004).

3. Expected Findings

The present study is to investigate how native speakers of Korean produce English alphabets. Following the second language learning models above, we assume that the subjects' L1 (i.e., Korean) will influence their production of the L2 (i.e., English). Based on the previous research, the Korean phonemic inventory and the Korean syllable structure, we expect the following results from the experiment.

The Korean subjects' production of English alphabets <p, t, k, m, n> will sound good since Korean has the corresponding consonants /pʰ, tʰ, kʰ, m, n/, respectively.[9] Their production of <q> will also be good due to the same reason. Their production of the <b, d, g, j, v, z> will not be good since Korean does not have phonemic voiced obstruents.

Typically word-final /l/ is a dark-l (i.e., [ɬ]) in English, thus native speakers of English pronounce the alphabet <l> with a dark-l (i.e., [ɛɬ]). In American English the r-sound is a retroflex one. Korean does not have these sounds. Therefore, the Korean subjects' production of the <l, r> will not be good. Their production of <w> will not be good either since this is supposed to be produced with an /l/ sound (i.e., /dʌblju/).

The Korean subjects will palatalize the <c>, thus will pronounce [s^{*j}i]. When they produce <f, h, s, x>, they will epenthesize a vowel at the end since Korean does not allow /f, ʧʰ, s/ in coda position. Their production of <e, u> will be good since they meet the Korean syllable structure and Korean also has the corresponding sounds. Native speakers of English produce the alphabets <a, i, y, o> with falling diphthongs. Since Korean does not allow falling diphthongs, the Korean subjects production of these will not be good.

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9) We use <> for English alphabets. Note that they do not always match the IPA symbol. For instance, English speakers' pronunciation of the alphabet <g> is supposed to be [ʤi], not [gi].

II. PRODUCTION EXPERIMENT

1. Subjects

Sixteen native speakers of Korean participated in the experiment. The subjects were students at Korea Nazarene University at the time of the experiment. None of these subjects had been to the U.S. or any other English-speaking country.

Three Native speakers of American English evaluated the Korean subjects' production of English alphabets. They were born and brought up in the U.S. They were English teachers of Korea Nazarene University at the time of the experiment.

Two male native speakers of American English also produced English alphabets. We compared their production with the Korean subjects' production. They were also English teachers of Korea Nazarene University at the time of the experiment. Table 1 shows the subjects' information.

TABLE 1
Subjects and their Information

Group	Gender	Number	Age (years)	Birth place
Korean (production)	Male	8	20-24, M=22	Seoul, Kyungi, Chulla Choongchung, Kyunggsang,
	Female	8	20-22, M=21	
American (production)	Male	2	31, M=31	California, Ohio
American (evaluation)	Male	2	30-32, M=31	California, Texas
	Female	1	51	

2. Procedure

Before the experiment began, 16 Korean and two American English subjects filled out the subject information sheet. Each subject was seated in a sound-treated booth at the Department of Rehabilitation at Korea Nazarene University. They produced English alphabets in isolation three times in front of a microphone (Model AT815b). All subjects were given practice trials until they

completely understood the procedure. Their production was recorded into a computer and edited using a sound editing program (CoodlEdit Pro 2.0). The duration of the experiment for each subject was around 5 minutes.

We saved the Korean subjects' pronunciation of English alphabets into CDs using a CD-burning program (Nero). We gave the CD to three native speakers of American English, and asked them to evaluate the Korean subjects' pronunciation. They rated the Korean subjects' production based on 1-5 scales; 5 for native-like pronunciation, 4 for good pronunciation, 3 for fine pronunciation, 2 for understandable but poor pronunciation, 1 for 'not understandable' pronunciation. Then they made some comments on the Korean subjects' production. They also filled out the subject information sheet.

III. RESULTS AND DISCUSSION

Table 2 illustrates how the native speakers of American English evaluated the Korean subjects' production of English alphabets. Native speakers of American English also made some comments when the Korean subjects' pronunciation was not good. We interpreted their comments and summarized them in Table 3.

TABLE 2
Rating Percentages and Mean Ratings of the Koreans' Production of English Alphabets

Rating	a	b	c	d	e	f	g	h	i	j	k	l	m
5	0	0	2	2	21	2	0	2	15	0	4	0	2
4	44	17	10	15	65	8	8	13	46	19	44	10	29
3	52	50	46	44	13	46	48	35	25	52	46	44	56
2	4	23	29	29	2	31	29	27	10	17	4	33	10
1	0	10	13	10	0	13	8	23	4	13	2	13	2
Mean Rating	3.4	2.7	2.6	2.7	4.0	2.6	2.6	2.4	3.6	2.8	3.4	2.5	3.2
Rating	n	o	p	q	r	s	t	u	v	w	x	y	z
5	4	21	15	6	4	4	15	15	2	2	2	8	2
4	19	29	42	17	27	35	29	77	2	27	38	69	13
3	60	48	44	50	35	42	42	8	2	38	38	19	19
2	15	2	0	23	29	10	13	0	13	23	15	2	8
1	2	0	0	4	4	8	2	0	79	10	8	2	58
Mean Rating	3.1	3.7	3.7	3.0	3.0	3.2	3.4	4.1	1.4	2.9	3.1	3.8	1.9

TABLE 3

Comments on the Koreans' Production of English Alphabets

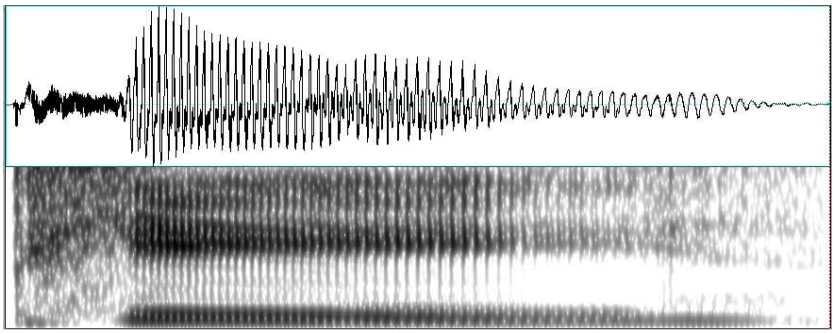
Alphabets	Comments	Alphabets	Comments
<a>	none	<n>	none
<b>	like [pʰi], between [pʰ] and [bi]	<o>	not a full round [ou], like [ɔ]
<c>	like [ʃ] or [s^{*j}]	<p>	none
<d>	like [tʰi], between [tʰ] and [di]	<q>	like [kʰu]
<e>	none	<r>	not distinct rolling, like [ɑl]
<f>	adding a vowel, like [ɛpʰi]	<s>	adding a vowel, [ɛsi]
<g>	like [ʧʰi]	<t>	none
<h>	adding a vowel, like [eiʧʰi]	<u>	none
<i>	none	<v>	very poor, like [pii]
<j>	like [ʧʰei]	<w>	none
<k>	none	<x>	like [ɛsi]
<l>	not a dark-l [ɬ]	<y>	none
<m>	none	<z>	very poor, like [ʧʰi]

As we expected before, the native speakers of American English evaluated the Korean subjects' pronunciation of <p, t, k, m, n> as relatively good pronunciation. The mean ratings for the production of these sounds are more than 3. We assume that this is because Korean has the corresponding consonants, namely /pʰ, tʰ, kʰ, m, n/. Recall that these letters are pronounced [pʰi], [tʰi], etc.

Their production of the <b, d, g, j> are less than 3. As shown in the table 3, the English speakers' heard these sounds as either voiceless obstruents (i.e., [pʰi], [tʰi], [ʧʰi], and [ʧʰei] sounds) or the sounds between voiceless and voiced obstruents (i.e., between [pʰi] and [bi], and between [tʰi] and [di]). We expected this before based on the fact that all of the Korean stop phonemes are voiceless ones. We assume that the reason why the English speakers are confused with, for instance, [pʰi] and [bi] for the Koreans' production of <b> is related to acoustic characteristics of English word-initial stops; English word-initial stops typically have short aspiration (see Ladefoged 2001, among others). That is, when they heard stops with relatively short VOT, but not as much as short as the ones produced by most English speakers, they were confused. Compare Fig.

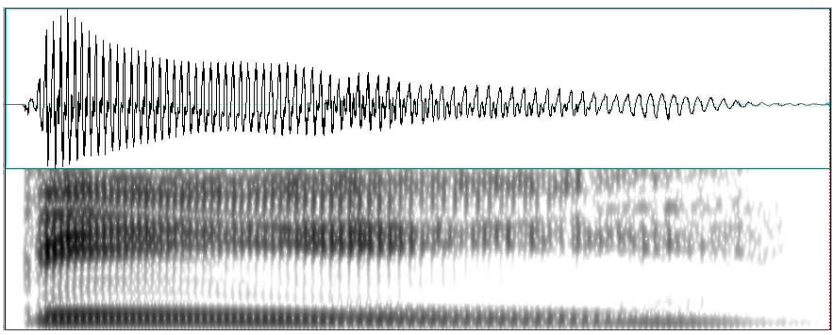
1 and 2 with Fig. 3. They show an American English subject's pronunciation of the alphabet <p> and <b>, and a Korean subject's pronunciation of the alphabet <b>, respectively.

Fig. 1
Production of English alphabet <p> by the American English subject RN. 600 ms of window was selected. The word-initial /p/'s VOT is 80 ms.



In Fig. 1 the English speaker's word-initial /p/'s VOT is 80 ms, and in Fig. 2 his word-initial /b/'s VOT is very short (i.e., 13 ms).

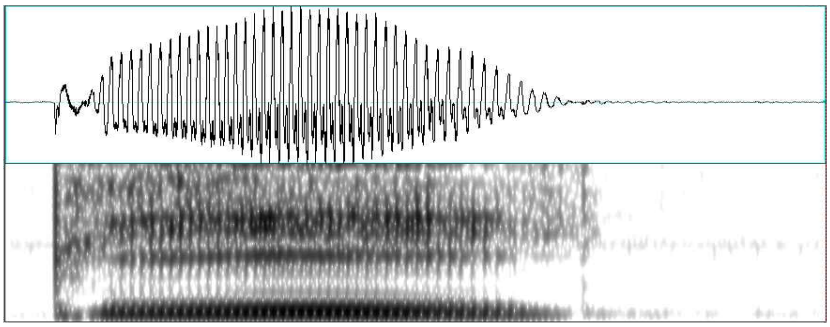
Fig. 2
Production of English alphabet <b> by the American English subject RN. 600 ms of window was selected. The word-initial /b/'s VOT is 13 ms.



However, as shown in Fig. 3, the Korean speaker's word-initial /b/'s VOT

(i.e., 31 ms) is in between the English speaker's word-initial /p/'s and /b/'s VOTs (i.e., 80 ms, and 13 ms, respectively). Thus, they might have heard the Korean subjects'<b> as the sound between [pʰi] and [bi].

Fig. 3
Production of English alphabet <b> by the Korean subject AP. 600 ms of window was selected. The word-initial /b/'s VOT is 31 ms.



As expected before, the Korean subjects' production of <l> is not good (mean rating = 2.5). Native speakers of English commented that their <l> was not a dark-l sound by this. Compare Fig. 4 and 5, which show production of <l>'s by an English and a Korean subject, respectively.

Fig. 4
Production of English alphabet <l> by the English subject RN. 600 ms of window was selected.

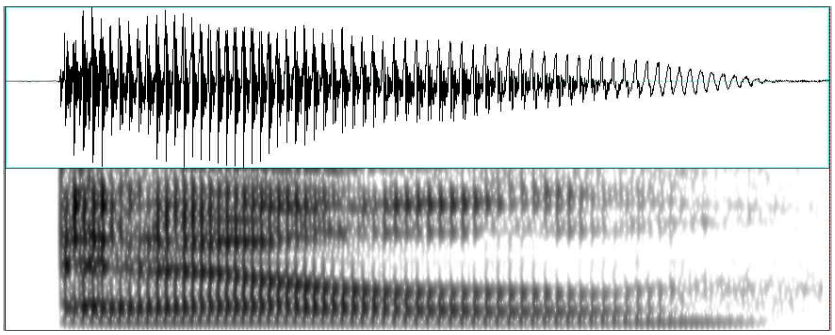
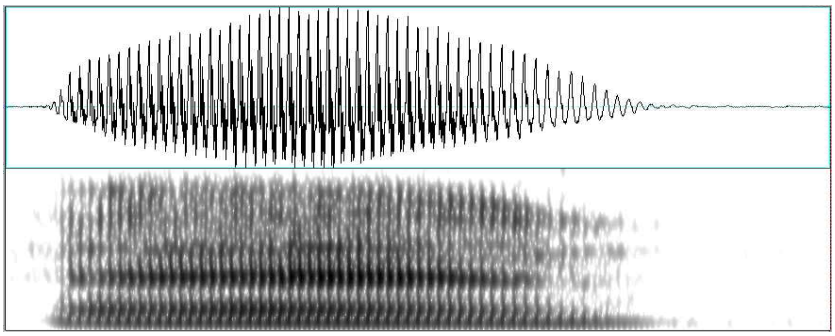


Fig. 5
Production of English alphabet <l> by the Korean subject AP. 600 ms of window was selected.



As shown in Fig. 4 the English subject produced the <l> with F2 and F3 transition. But in the Korean subject's production of <l>, all of the formants are in steady state. The Korean subjects' production <w> was relatively not good (mean rating = 2.9) since this was also produced with an /l/ sound (i.e., /dʌblju/).

The Korean subjects' production of <r> was also not good as we expected before (mean rating = 3.0). In American English this is a retroflex sound. Korean does not have this sound. Fig. 6 and 7 show production of the alphabet <r> by an English speaker and a Korean speaker, respectively. In Fig. 6, the English subject produced the alphabet <r> with F2 and F3 transition. But as shown in Fig. 7 for the Korean subject's production of <r>, formants are in relatively steady state.

Fig. 6.
Production of English alphabet <r> by the English subject RN. 600 ms of window was selected.

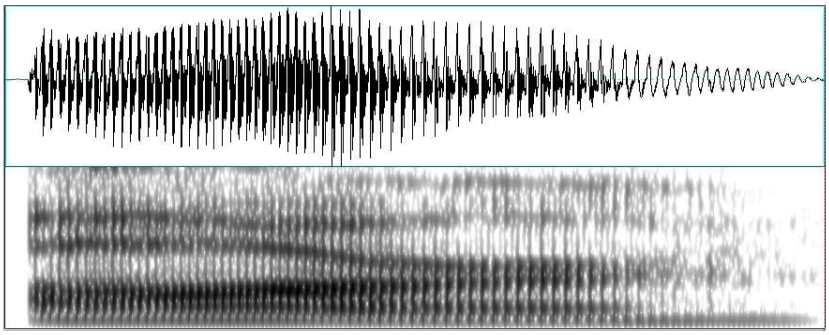
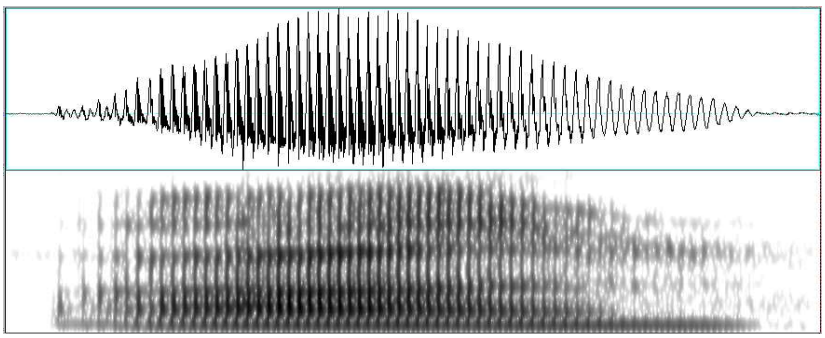


Fig. 7
Production of English alphabet <r> by the Korean subject AP. 600 ms of window was selected.



According to the English speakers' comment on the Korean subjects' pronunciation of the alphabet <c>, this sounded like [ʃ] or [s^{*j}]. We expected this before; the Korean subjects palatalized when they produced the <c>; Consider Fig. 8 and 9 for the alphabet <c> produced by an English and a Korean subject, respectively.

Fig. 8
Production of English alphabet <c> by the Korean subject AP. 700 ms of window was selected.

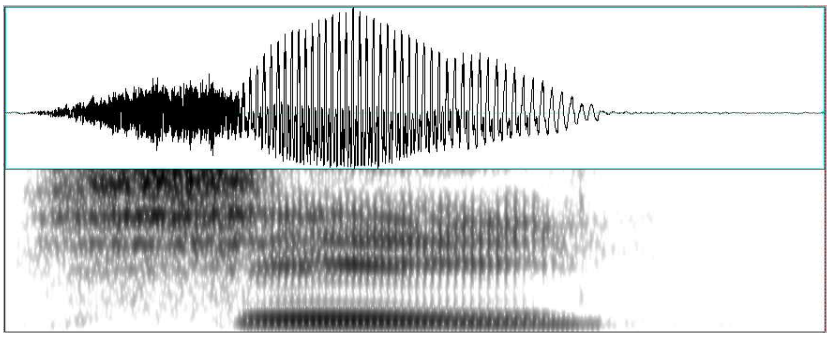
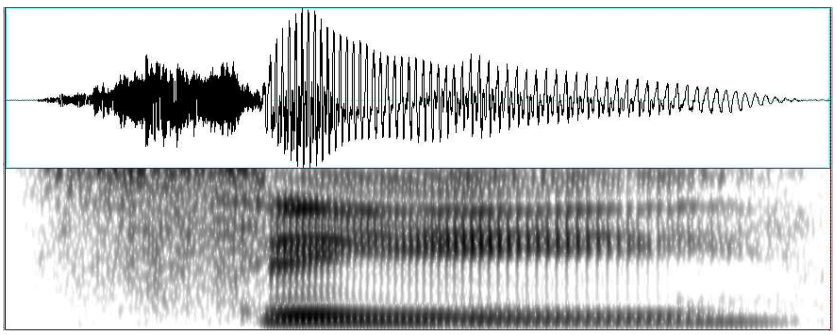


Fig. 9
Production of English alphabet <c> by the English subject RN. 700 ms of window was selected.

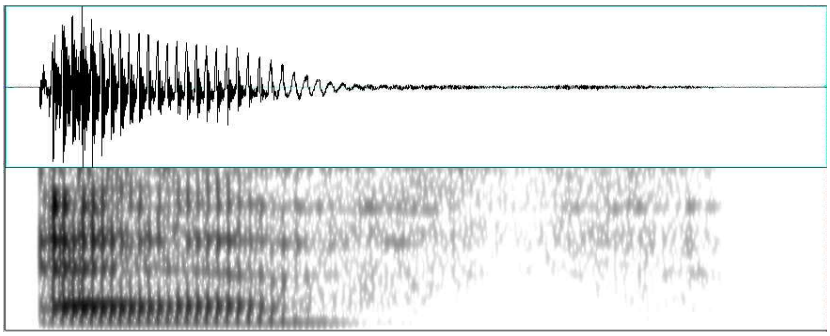


We are not sure how palatalization affects acoustic characteristics of a consonant. However, the difference between the English and Korean subjects' pronunciation of the alphabet <c> is that in the Korean subject's pronunciation of the <c> shown in Fig. 9, all of the formants except F1 were extended to the fricative noise, but this is not the case in the English speaker's pronunciation of the <c>.[10)]

10) Perhaps this is enough to explain difference between production of <c> by the English and Korean speakers. However, this is not enough to explain palatalization itself.

As we expected before, the Korean subjects epenthesized a vowel when they produced <f> and <h>. We assume that this is because Korean does not allow these consonants in coda position. Compare Fig. 10 and 11, which show production of <f> by an English and a Korean speaker, respectively.

Fig. 10
Production of English alphabet <f> by the English subject RN. 600 ms of window was selected. This is pronounced [ɛf].



As shown in Fig. 10, the English speaker's pronunciation has an [f] in coda position. However, Korean does not allow a fricative sound in coda position, hence a vowel [ɨ] was epenthesized. Since Korean does not have an /f/, this is replaced by the closest Korean consonant [pʰ]. Therefore we have [e.pʰɨ] in Fig. 11.

We expected before that when Korean subjects produce <s> and <x>, they would epenthesize a vowel at the end since Korean does not allow an /s/ sound in coda position. However, contrary to our expectation, they did not epenthesize a vowel at the end. We do not know why they epenthesized a vowel while they were producing <f> and <h>, but they did not while they were producing <s> and <x>. We guess that this may be because they have studied English

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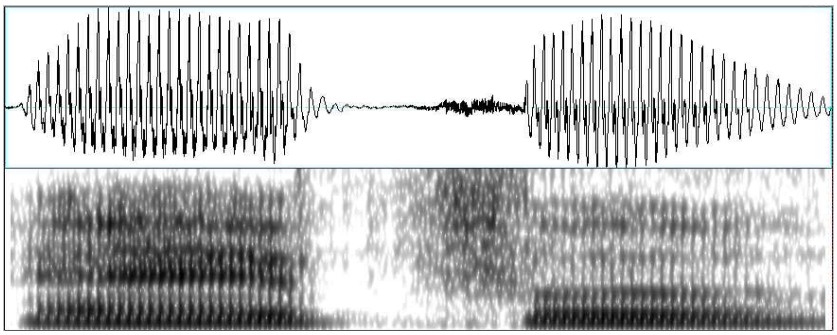
Since we are not dealing with palatalization itself in this study, we will not investigate it. Another difference is found in the vowel portion; in the English speaker's production of the <c> F2 and F3 were very close to each other; this is not the case in the Korean subject's production of <c>. However, we do not include this information in the text since we are dealing with the pronunciation of the consonant rather than the following vowel.

Fig. 11
Production of English alphabet <f> by the Korean subject AP. 600 ms of window was selected. This is pronounced [e.pʰi].



for a long time, hence already knew how to pronounce these. Native speakers of English also commented that the Korean subject's pronunciation of <x>, which was supposed to be [ɛks], sounded like [ɛs]. Perhaps this is because of a phonological process in which Koreans tend to drop an obstruent before another obstruent. We hear similar cases frequently. For instance, /katko/ [katk*o] ~ [kak*o] 'went and', /katsɨpnita/ [kats*ɨmnida] ~ [kas*ɨmnida] 'went (formal expression)' (For more examples, see Kim-Renaud 1974 and Sohn 1987, among others.). Fig. 12 and 13 show production <x> by an English subject and a Korean subject, respectively.

Fig. 12
Production of English alphabet <x> by the English subject RN. 700 ms of window was selected.

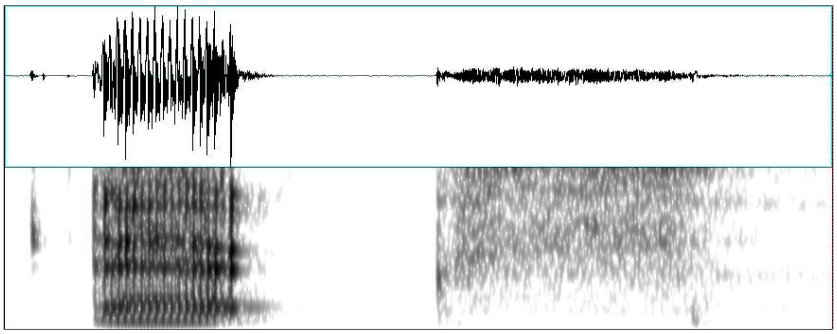
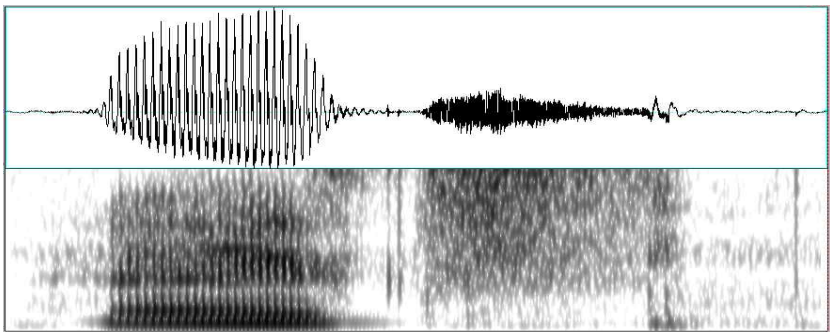


Fig. 13
Production of English alphabet <x> by the Korean subject AP. 700 ms of window was selected.



As shown in Fig. 12, there is 170 ms of [k] closure between /ɛ/ and /s/ in the production of the <x> by the English subject.[11] However, in the Korean subject's production of <x> shown in Fig. 13, the stop closure is very short or even hard to tell whether it exists. Thus native speakers of English could not perceive the word-medial stop /k/.

We expected before that Koreans' production of voiced obstruents would not be good. Among them the Korean subjects produced <v> and <z> very poorly. Their mean ratings are 1.4 and 1.9, respectively. Native speakers of English commented that their production of <v> and <z> sounded like [pi̤i] and [ʧi], respectively. Perhaps this is because Korean does not have these voiced fricatives, hence they used a voiceless lenis stop /p/ and affricate /ʧ/. They also used two syllables when they produced <v> (i.e., [pi̤.i]). Fig. 14 and 15 show production of <v> by an English subject and a Korean subject, respectively.

In Fig. 14, note that the fricative noise comes with periodic vertical striations, and there is a voice bar under the fricative noise. Thus, the word-initial /v/ is a voiced sound. However, as shown in Fig. 15, the Korean subject produced <v> with a voiceless stop [p] with 40 ms of VOT. There is also F2 transition in the vowel portion since the Korean speaker produced two vowels [i̤i].

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11) The vertical striation at the beginning of the token in Fig. 12 is a glottal stop, which typically appears in words that start with a vowel.

Fig. 14.
Production of English alphabet <v> by the English subject RN. 700 ms of window was selected. This is pronounced [vi].

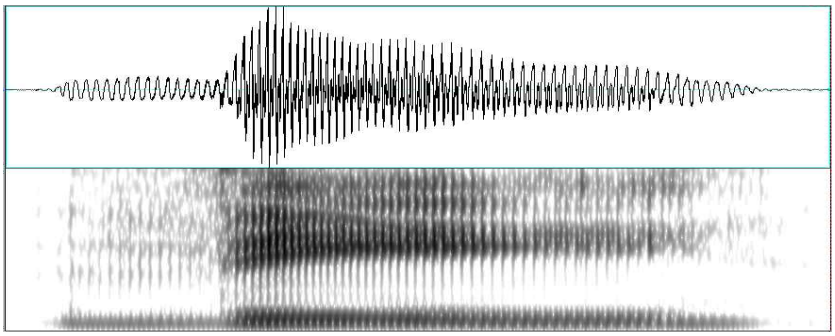
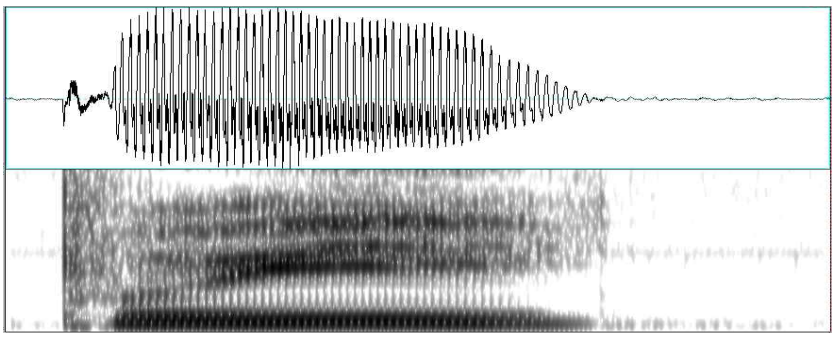


Fig. 15
Production of English alphabet <v> by the Korean subject AP. 700 ms of window was selected. This is pronounced [pii].



We expected before that the Korean subject's production of the alphabets <e, u> would be good since they meet the Korean syllable structure, and Korean also has the corresponding vowels. This turned out to be true; their mean ratings are 4.0 and 4.1, respectively.

We also expected before that the Korean subjects' production of alphabets <a, i, y, o> would not be good since Korean does not allow falling diphthongs. But their mean ratings were relatively high: 3.4, 3.6, 3.8, and 3.7, respectively. Perhaps native speakers of English did not hear much foreign accent from the

Korean subjects' production of these alphabets. However, they also commented that the Korean subjects did not pronounce a full round [ou] and sounded like [ɔ]. Fig. 16 and 17 show production <o> by an English subject and a Korean subject, respectively.

Fig. 16
Production of English alphabet <o> by the English subject RN. 600 ms of window was selected.

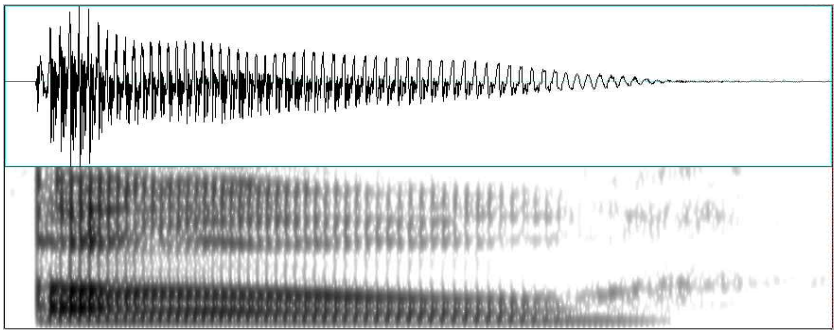
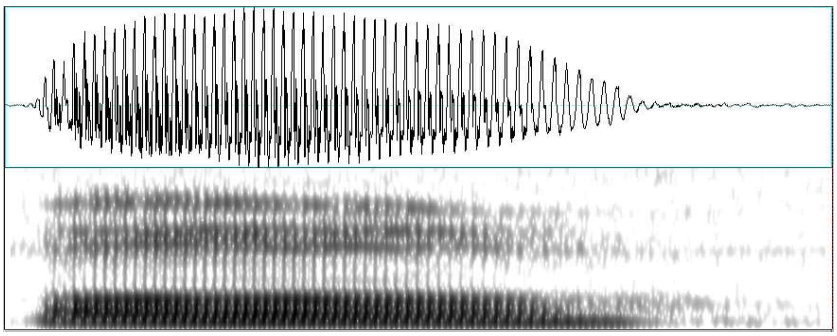


Fig. 17
Production of English alphabet <o> by the Korean subject AP. 600 ms of window was selected.



In Fig. 16, there was slight F2 transition since the English subject produced the diphthong [ou]. However, in Fig. 17, formants are in steady state since the Korean subject produced the monophthong [ɔ].

We expected before that the Korean subjects' production of <q>, which was supposed to be [kʰju], would be good since this meets the Korean syllable structure and phonemic inventory. However, contrary to our expectation, native speakers of English commented that their production sounded like [kʰu]. Fig. 18 and 19 show production of the <q> by an English subject and a Korean subject, respectively.

Fig. 18
Production of English alphabet <q> by the English subject RN. 600 ms of window was selected.

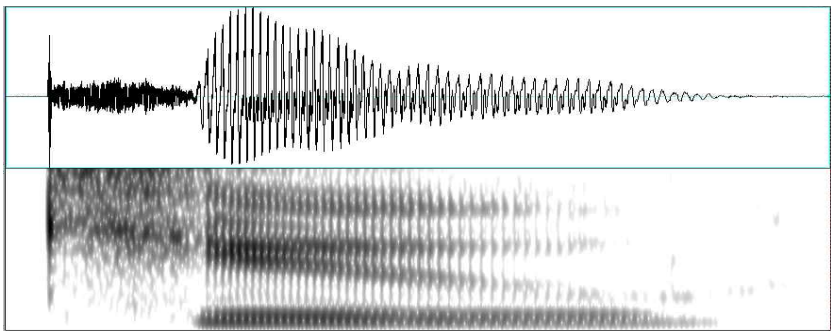
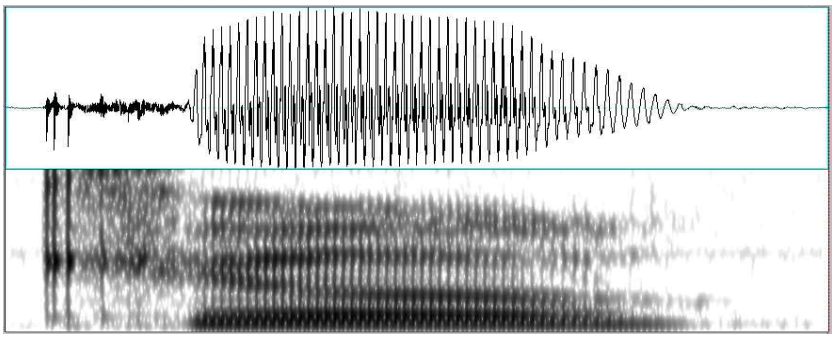


Fig. 19
Production of English alphabet <q> by the Korean subject AP. 600 ms of window was selected.



As shown in Fig. 18, there is very long F2 transition in the production of

<q> by the English subject; it is extended throughout the entire word. In Fig. 19 for the Korean subject's production <q>, there is also F2 transition. Thus the Korean subject did produce a diphthong like the English subject did. However, the F2 transition was relatively short; it ended shortly after the beginning of the vowel. We assume that this is the reason why native speakers of English identified this as [kʰu].

IV. CONCLUSION

The current study supports the second language learning theories such as Contrastive Analysis Hypothesis, Speech Learning Model, and Perceptual Assimilation Model mentioned in the beginning of this study, since the L1 (i.e., Korean) sounds influence production the L2 (i.e., English) sounds. As we assumed from the second language learning theories, the Korean subjects used Korean while they were producing the English alphabets. Our expectations about the alphabets <p, t, k, m, n, b, d, g, j, v, z, r, l, w, c, f, h, e, u> have been proved to be true. As we expected and also found in the previous research done by Kim (1972) and Schimidt (1996), The Korean subjects produced <p, t, k> and <m, n> with the corresponding Korean aspirated stops and nasals, respectively. And English speakers rated the Korean subjects' production of them relatively high. Perhaps it is not necessary to teach Koreans how to pronounce these sounds.

The Korean subjects' production of English alphabets <b, d, g, j> was not good since Korean does not have voiced obstruent phonemes. To produce these sounds they used the closest Korean sounds, namely the voiceless obstruents /p, t, ʧ/ (ㅂ, ㄷ, ㅈ). To improve Koreans' production of these English sounds, we need to teach them how to produce voiced sounds and explain that the Korean lenis obstruents /p, t, ʧ/ (ㅂ, ㄷ, ㅈ) are not the same as the English voiced obstruents.

Their production of <v, z> was worst since Korean does not have voiced fricative phonemes. Their production of <r, l> was also not good as we expected since Korean does not have a retroflex-r and a dark-l used to produce <l>. Their production of <w> was also not good since this is produced with an

/l/ sound, i.e., /dʌblju/. We assume that these English sounds are more difficult to teach than the above ones. English teachers should explain how the vocal folds, the lips, the parts of the tongue, and the roof of the mouth are used. Perhaps the dark-l is the most difficult one to teach since this involves movement of the tongue back, hence may be confused with vowels such as /u, ə/. Since the dark-l does not exit in Korean, it may be confused with another liquid sound <r>. English teachers should have some knowledge of articulatory phonetics to teach them.

The Korean subjects also palatalized the alphabet <c> like they did when they produced corresponding Korean sounds. English teachers should explain the difference between the production of alveolar and palatalized sounds and also the influence of the following /i/. Since Korean already has many instances of palatalization (e.g., /kuti/ → [kuʧi] '굳이'), it will be easy to teach how to pronounce the <c>.

The Korean subjects epenthesized a vowel while they were producing <f, h> since these did not meet the Korean syllable structure. English teachers should explain the difference of syllable structures between English and Korean, especially the difference on possible coda consonants; Korean allows only seven consonants /p, t, k, m, n, ŋ, l/ but English allows almost all of the consonants except an /h/. They should also explain that the pronunciation of the <f, h> ends with consonants, hence a vowel epenthesis is not needed.

Their production of <e, u> were good since they meet the Korean syllable structure. Perhaps English teachers do not need to teach how to produce these.

However, Some of the findings are not what we expected. Native speakers of English evaluated the Korean subjects' production of <a, i, y> as relatively good pronunciation although they contain falling diphthongs. Koreans produced these alphabets with two vowels (i.e., [ei, ai, wai]), not with falling diphthongs (i.e., [ej, aj, waj]). Perhaps native speakers of English did not hear much foreign accent from the Korean subjects' production of falling diphthongs.

They produced the <o> with a monophthong, which native speakers of English typically produce with a falling diphthong since Korean does not have a falling diphthong. We assume that most Koreans simply do not know how to pronounce this. Perhaps this is easy to teach.

Native speakers of English commented that the Korean subjects' production of

<q> sounded like [kʰu], although the Korean subjects produced a diphthong (i.e., [kʰju]) like native speakers of English did. We found that in the production by the English subjects, F2 transition was extended throughout the entire word whereas in the production by the Korean subjects, F2 transition ended shortly after the beginning of the vowel. Perhaps this difference makes native speakers of English identify the Korean subjects' production of <q> as [kʰu]. English teachers should ask Koreans to pronounce this with a little longer [j].

We expected before that the Korean subjects would add a vowel when they produced <s, x>, but they did not. We do not know why, but we guess that this is just because they have learned English for a long time, hence already knew how to pronounce these.

The subjects participated in the experiment to prepare for this study are college students. Considering the years they have spent while they have been studying English, we assume that their production of English alphabets should have been better than what we have seen in this study. We guess that this is because English teachers have focused mostly on translation of English into Korean. The trend of English education should be changed; English teachers should spend more time on teaching English pronunciation and listening comprehension.

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예시언어 (Examples in): English
적용가능 언어(Applicable Languages): English
적용가능 수준(Applicable Levels): Secondary

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