

Production and Perception of English /r/ and /l/ by Korean Learners of English: An Experimental Study

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ABSTRACT

Eleven Korean learners of English took part in an experiment where the production and perception of English /r/ and /l/ in four different word positions was investigated. Overall the subjects made more errors on /l/ in both production and identification tests. The frequency of the subjects' errors was also sensitive to word positions in which the two English liquids occur. Especially the subjects made noticeably fewer errors in intervocalic medial position. It is suggested that the Korean subjects' acquisitional pattern in this particular case of foreign phone learning can be explained more by language particular 'interference' effects rather than 'universal' acoustic arguments such as those given in Dissosway et al. (1982) and Sheldon and Strange (1982). The results of the experiment also support the minority position among second language educators that in some cases of non-native phone acquisition, learners' production abilities can be developed earlier than their perceptual abilities.

Keywords: English liquids, phonological interference, word-positions

1. Introduction

Like (for instance) Thai, Japanese and Cantonese, Korean is one of the languages that do not have such phonemic distinction between /r/ and /l/ as exists in English. In Korean, there are two liquids, [l], a light apical lateral approximant, and [r], an apical flap (Ladefoged and Maddieson 1996, Jung 1962; see also Lee 1999 for variable phonetic realizations of the flap in different prosodic positions). But these two consonants do not distinguish meaning but occur in complementary distribution: [r] appears only between vowels, while [l] occurs elsewhere, i.e., syllable- and word-finally and also syllable-initially when preceded by another [l]. Unlike in English a liquid consonant can appear neither word-initially (though this is possible with recent loanwords from other languages such as English, Italian, etc. nor following another consonant.

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Because Korean lacks phonemic and also phonetic distinctions between a retroflex approximant [ɾ] and a lateral approximant [l] of English,¹⁾ it has been observed that Korean speakers have difficulty in their production and perception of English [ɾ] and [l] when they learn this language as a second tongue. Borden, Gerber, and Milsark (1983), Sakow and McNutt (1993), and Ingram and Park (1998) are three previous studies that investigated the acquisition of English /r/ and /l/ by Korean learners.

Borden et al. (1983) was a research that investigated production and perception of the two English liquids by Korean speakers. They report that in their experiment speakers with lowest production abilities (among the subjects) had a tendency to produce [ɾ]-like sound for /l/, while speakers with higher abilities showed less confusion and made errors bi-directionally: r/l and l/r. They also found that speakers, overall, produced more errors for /l/ than for /r/ except consonant cluster position (e.g., bring, plight), where /r/-errors were more numerous. Another important finding in this research is that the subjects' production abilities had a significant correlation with their abilities in 'self-perception', i.e., perception of their own speech as to whether they correctly produced the intended English liquid.

Sakow and McNutt (1993) was a study that investigated the perception of English /r/ by four Korean and four Japanese speakers. Tape recordings made by a native English speaker and eight subjects were used as stimuli for the experiment in which the subjects were asked to identify correctly produced /r/'s and incorrectly pronounced /r/'s (i.e., /l/'s). This study found that the subjects made significantly more errors in perceiving their own production of /r/'s than other speakers' productions. This result is taken by the authors as suggesting the importance of training the second language learners in monitoring their own speech.

Ingram and Park (1998) compared Japanese and Korean speakers' identification and discrimination of Australian English /r/ and /l/. They found that perception of /r/ and /l/ by the two groups of subjects was significantly affected by their (native) language background, word-internal position where the English liquids appear (word-initial, word-initial consonant cluster, and word-medial position), and acoustic discriminability of the produced liquids (by two Australian English speakers). However, the significant interaction effects among the above factors they observed in the identification test were not discovered in the results from the discrimination test. Ingram and Park (1998) take this result as indicating that second language learners face somewhat

1) It should be noted that not all speakers of American English produce the retroflex approximant, though. It is reported (Lindau 1985) that some American speakers produce the approximant informally called 'bunched r', which is produced with constrictions at the center of the palate without the raising of the tongue tip. The retroflex and 'bunched r' approximants both produce a low third formant.

different task demands in the two tests, while undergoing different perceptual processes.

On the basis of the results from the above three previous studies, the present study reinvestigates the production and perception of English /r/ and /l/ by Korean learners of English using the same data set for both aspects of acquisition. The goals of this study are as follows. First the production results of English liquids reported in Borden et al. (1983) will be reexamined. This study will first examine whether Korean speakers have more difficulty in producing /l/ than /r/ at the earlier stage (or lower level) of acquisition and confusions go both ways in later stages. It will also be examined whether the word-internal position in which the two English liquids appear (cf. Goto 1971, Sheldon and Strange 1982, Ingram and Park 1998) has any bearing on the frequency of errors that Korean speakers make.

It is widely accepted (e.g., Sheldon and Strange 1982, Dissosway-Huff, Port and Pisoni 1982, Henry and Shledon 1986) that the acquisition of foreign phonemes by speakers of other languages can be affected by both (native) language-dependent phonological interference and language-independent (possibly universal) articulatory-acoustic factors. A second interest of this paper is to examine which line of explanation, i.e., contrastive phonological analyses of Korean and English (i.e., theories of phonetic interference) or articulatory-acoustic accounts, provides more persuasive explanation of Korean speakers' actual behavior as to the acquisition of the English liquids.

Literature on second language acquisition are divided over the issue of which aspect of acquisition, i.e., production or perception, is ahead in the process of second language learning. A majority (e.g., Paulston and Bruder 1976, Neufeld 1977) insist that the latter must precede the former in the acquisition of a foreign phone, while, according to others (e.g., Catford and Pisoni 1970, Ladefoged 1967), learners' production ability can be expected to be actually better than their perceptual ability in some cases of acquisition. The third interest of this paper will be to examine the relationship between production and perception in the process of Koreans' learning of English /r/ and /l/ and seek to find possible implications.

2. Methods

subjects

Eleven female speakers in their early-20 to mid-30's took part in the experiment. A simple questionnaire was prepared to gather background information from each subject including their English and other language background. Five of the subjects were graduate students and the remaining six were undergraduates. They received

formal English education at least eight years from middle school. All of them had an experience of taking English conversation or listening courses during their college years. Five speakers were Kyongsang natives; four were born and grew up in Seoul and the remaining two were Chunla natives. Because two liquid phones of Korean are not known as showing any difference across (South) Korean dialects in their phonetic quality and phonological distribution, any significant effect of the subjects' native dialects on the acquisition of English /r/ and /l/ is not expected. Each subject was paid a small amount of money for participating in the experiment.

materials

The current study, like Goto (1971) and Sheldon and Strange (1982), aims to examine whether Korean speakers' production and perception of English liquids shows variable patterns according to different word positions where /r/ and /l/ can occur. Chosen for the production and perception tests of this study are sixteen pairs of words that contrasted /r/ and /l/ in each of the four positions in the word: word-initial position (I), word-initial 'stop + liquid' clusters (CC), intervocalic medial position (M), and word-final position (F). Table 1 shows these word pairs.

Table 1. Test words and distracters used in the production and perception tests

Test words (32 words)

<u>Initial(I)</u>	<u>Consonant Cluster(CC)</u>	<u>Intervocalic(M)</u>	<u>Final(F)</u>
read-lead	broom-bloom	mirror-miller	dear-deal
road-load	breed-bleed	berry-belly	war-wall
right-light	grass-glass	arrive-alive	tire-tile
rock-lock	grow-glow	correct-collect	tour-tool

Distracters (16 words)

<u>Initial(I)</u>	<u>Vowel (V)</u>	<u>Intervocalic(M)</u>	<u>Final(F)</u>
may-day	boat-bat	defend-descend	same-safe
noon-moon	mad-mood	swimming-swinging	mad-man

Most of the words were selected from Sheldon and Strange (1982), except two pairs constructed by the author (S and S's *room-loom* pair was substituted by *road-load* because the subjects may not be familiar with the word *loom*; their *core-coal* pair was replaced by *tour-tool* since the vowel of *coal* has diphthongal quality unlike that of *core*). One difficulty in constructing word pairs was that in word-final position it was not possible to find minimal pairs in their exact sense

(except the *war-wall* pair). For instance, *dear* [dɪr] and *deal* [di:l] are not exactly minimal pairs since the former has a syllabic [r] while the latter's [l] is non-syllabic. Since syllabic consonants are usually known to have more intensity and duration than their non-syllabic counterparts, this fact should be taken into account in the interpretation of the results from this study. Pairs *tire-tile* and *tour-tool* were also quasi-minimal pairs for the same reason.

Word pairs that contrasted the two liquids in I (initial) and CC (initial consonant cluster) positions all consist of one-syllable words, whereas those for M (intervocalic medial) position are two-syllabled. Two of the word pairs for M position had stress on the first syllable; the remaining two on the second. However, there were no differences between the words contrasted within the pair in stress placement and the number of syllables.

Eight pairs of filler items were also included as experiment material and presented to the subjects together with the above 32 test words. Six contrasted consonants in initial, intervocalic, and final positions, two for each position; two contrasted vowels. Contrasted consonants and vowels were chosen among those phonologically distinctive in Korean.

procedures

A word list that contained all the words used in the experiment and additional 20 basic words was made to check whether the subject was familiar with the word pairs used in the perception and production tests (The purpose of adding 20 more words to the list was to mask the aim of the study). The subjects were told that the words on the list are the ones used in the experiment. The subjects knew the pronunciation and meaning of nearly all the words. Each subject told the author that zero to two words are not familiar to her (6 subjects: 0, 4 subjects: 1, 1 subject: 2). The meaning and pronunciation of the word(s) were informed of her in case the subject reports that she does not know any word(s).

The subject took the perception test first. For this test, two native American English speakers (one male and one female) recorded, each, two repetitions of the 48 words in Table 1. The male and female speakers were from Michigan and Minnesota, respectively; both spoke Midwestern standard American English. The speakers were asked to read with a statement intonation. The recording was made at a sound-proof booth at the Korea University of International Studies. The recording was digitized using CSL and rerecorded at a random order with a five second inter-stimulus interval.

Answer sheets were prepared for the perception test. The answer sheet contained four repetitions of the 48 word pairs listed in Table 1 (two repetitions by a male and

two by a female). The subjects were forced to choose one word from each word pair (e.g., *read* vs *lead*) after listening to recorded words through a headphone. They were instructed to circle the right word.

After the perception experiment, the production test was administered. The subject was given a deck of cards where each test or filler word was typewritten. The subject was instructed to read the word on the card as the author removed each card from the deck. Approximately three second interval was placed between words. The production test was designed so that the subject read each word four times. The production of the subject was recorded through a microphone into a tape. The experiment took approximately 50 minutes. Both perception and production tests were conducted in a sound-proof booth at the Korea University of Foreign Studies.

3. Results

perception

The subjects' perception abilities were considerably variable. The subjects could be divided into three groups (proficient, medial, non-proficient) based on the number of errors they made in the test. Two subjects (proficient: KMJ (15), SJ (16)) made fewer than 17 errors; five (medial: PIH (27), JHC (28), PYJ (29), CEJ (30), KEA (32)) made errors between 27 to 32; and the number of errors made by the four remaining speakers (non-proficient: CHC 39, LHC 44, NHY 53., CEO 64) exceeded 38. There was no significant interspeaker variability: the subjects made similar numbers of errors in identifying the English liquids across two American English speakers, i.e., 193 errors for the male vs. 184 for the female ($\chi^2=.22$, $df=1$, $p>.60$). The results of the perception test showed the following patterns across different word positions for each proficiency-level group.

The subjects, overall, made very comparable numbers of errors in three word positions: 107, 105, and 109 in word-initial, consonant cluster, and word-final positions, respectively. No significant differences were observed among the three groups in this respect except the fact that errors in the consonant cluster position were markedly fewer for the 'proficient' group than the other groups.

What is notable is that the subjects made more errors in perceiving /l/ than /r/, which is consistently observed in each group. This result is attributable to the subjects' consistent perceptual bias in two word positions: word-intial and final. The three groups made noticeably more errors in perceiving /l/ than /r/ in these positions. Overall the subjects misidentified /r/ more than /l/ in intervocalic position. However, the three groups did not show a consistent pattern. A meaningful result was not observed in consonant cluster position either.

Table 2. Perception errors made by different proficiency groups in different word positions

	I	CC	M	F	Combined
(Proficient: 31)					
r->l	3	0	2	6	<u>11</u>
l->r	10	3	0	7	<u>20</u>
Sum	<u>13</u>	<u>3</u>	<u>2</u>	<u>13</u>	
(Medial: 146)					
r->l	7	25	6	21	<u>59</u>
l->r	29	22	9	27	<u>87</u>
Sum	<u>36</u>	<u>47</u>	<u>15</u>	<u>48</u>	
(Non-proficient: 200)					
r->l	27	31	25	11	<u>94</u>
l->r	31	24	14	37	<u>106</u>
Sum	<u>58</u>	<u>55</u>	<u>39</u>	<u>48</u>	
(All subjects: 377)					
r->l	37	55	35	41	<u>168</u>
l->r	70	50	21	68	<u>209</u>
Sum	<u>107</u>	<u>105</u>	<u>56</u>	<u>109</u>	

production

The two American English speakers whose recording was used for the perception test judged whether the subject produced [r] or [l] or an intermediate sound between the two. Since in some varieties of standard English (e.g., most dialects of British and Australian English and some Eastern dialects of American English) it is quite common not to produce word-final [r], the judges were instructed not to identify the subjects' failing to produce the [r] liquid in this position as an error (Naturally in the experiment the subjects were just told to read the word on the card). The two English native speakers' judgements showed an approximately 85% agreement (1195/1408). A third native speaker was asked to judge the problematic cases. The judgement of the third speaker was followed as correct in these cases. The production of an intermediate sound was also identified as an error.

Some notes should be made regarding the American judges' judgement on the subjects' production. First, some subjects made flapped [r]-like productions for /r/ (probably from native language interference: recall that Korean has [r] rather than retroflex [ɻ]). The judges mostly identified these productions as [r] rather than [l].

Secondly, a number of subjects produced a longer [l] (i.e., geminate [l]) for /l/ in intervocalic medial position. This type of production is conjectured to originate from two sources: one is spelling pronunciation (three of the four test words for intervocalic /l/ have two l's in spelling, i.e., *miller*, *belly*, *collect*); the other (probably the main source) is transfer from the subjects' native tongue, where only geminate [l], i.e., [ll], is allowed intervocalically. The judges showed the overwhelming tendency to identify the geminate [l] productions as [l]. Thirdly, it was observed that some subjects made light [l]-like productions in word-final position, which is also presumed to come from transfer from the subjects' native language that lacks dark (velarized) [l] in its phone inventory. The judges mostly judged these productions as [l] as well rather than [r].

The subjects' production abilities were as variable as their perceptual abilities. The eleven speakers could be divided into three groups (proficient, medial, non-proficient) on the basis of the number of production errors. Three subjects (proficient: KMJ (4); SJ (10); PIH (10)) made errors within ten; five (medial: JHC (18); KEA (18); PYJ (20); LHC (22); CEJ (24)) made errors between 18 to 24; 38 to 50 errors were made by three subjects (non-proficient: CHC (38); CEO (40); NHY (50)). Table 3 shows the pattern of production errors exhibited across different word positions by the three proficiency-level groups.

The three groups showed rather different patterns in their production of /r/ and /l/. More errors were made for /l/ than /r/ by 'proficient' and 'medial' groups but the non-proficient group's production was more erroneous for /r/ than /l/. Since the subjects often did not produce /r/ word-finally (overall about 36 % (63/176) of word-final /r/'s were pronounced) and thus a considerably less number of errors were bound to be made in that position for /r/, the number of errors made in word-final position cannot be compared to those in the other positions.²⁾ Accordingly only the errors made in the other three positions were compared. A random-looking distribution of errors was observed across these positions. The 'proficient' group made most errors in consonant cluster position followed by initial and then medial positions (error No's: 6; 2; 0); the 'medial' group was most erroneous in initial position followed by medial and then consonant cluster positions (error No's: 40; 22; 20). The non-proficient group

2) The number of errors made in /l/ production was the second most in word-final position along with medial position following word-initial context (see the final subtable of Table 3). Also if it is hypothesized that the subjects would make the same percentage of errors for unproduced word-final /r/'s as for those produced, the expected number of /r/ (production) errors in this context reaches 33 ($12 \times 176/63$), thus making the total number of liquid production errors 65, when combined with the /l/ production errors (32). However, this hypothesized result cannot be considered reliable because the basis of this calculation is only about one third of the tokens (36 %: 63 tokens out of 176).

showed most errors in consonant cluster position and made a smaller but comparable number of errors in initial and medial positions (error No's: 48; 36; 36). The subjects showed a relatively consistent directional bias in initial and final positions: the predominant number of errors were observed in the production of /l/. The production bias observed in the final position is, however, due to subjects' (often) failing to produce /r/ in this position. Overall rather idiosyncratic behavior by the subjects was observed in the production results.

Table 3. Production errors made by different proficiency groups in different word positions

	I	CC	M	F	Combined
(Proficient: 24)					
/r/	1	2	0	4(11)	<u>7 (14)</u>
/l/	1	4	0	12	<u>17</u>
Sum	<u>2</u>	<u>6</u>	<u>0</u>	<u>16</u>	
(Medial: 102)					
/r/	12	10	6	4(11)	<u>32 (39)</u>
/l/	28	10	16	16	<u>70</u>
Sum	<u>40</u>	<u>20</u>	<u>22</u>	<u>20</u>	
(Non-proficient: 128)					
/r/	16	32	20	4(11)	<u>72 (79)</u>
/l/	20	16	16	4	<u>56</u>
Sum	<u>36</u>	<u>48</u>	<u>36</u>	<u>8</u>	
(All subjects: 254(275))					
/r/	32	44	26	12(33)	<u>114(135)</u>
/l/	46	30	32	32	<u>140</u>
Sum	<u>78</u>	<u>74</u>	<u>58</u>	<u>44(65)</u>	

* The numbers within the brackets are the No's of errors the subjects should make if they would make the same frequency of errors for unproduced word-final /r/'s as for those produced.

correlation between perception and production

The number of errors made in the perception test and the number of those identified by the judges as production errors showed a high correlation ($r=.869$, $df=9$, $p<.01$) as can be seen in Table 4. Generally subjects with fewer (or more) perception errors made fewer (or more) production errors and vice versa. The subjects also

generally made fewer errors in production than in perception. No subject made more errors in her production than in perception. Given within the brackets in Table 4 is the expected number of errors for each subject calculated on the assumption that she would make the same percentage of errors for her unproduced /r/'s as her produced ones. Only one subject (NHY) would produce more errors in production and than in perception on the basis of this assumption.

Table 4. Numbers of perception and production errors of each subject

<u>subject</u>	<u>perception errors</u>	<u>production errors</u>
KMJ	15	4 (4)
SJ	16	10 (11)
PIH	27	10 (12)
JHC	28	18 (19)
PYJ	29	20 (20)
CEJ	30	24 (26)
KEA	32	18 (20)
CHC	39	38 (38)
LHC	44	22 (25)
NHY	53	50 (55)
CEO	64	40 (45)
<u>combined</u>	<u>377</u>	<u>254(275)</u>

- * The numbers within the brackets are the No's of errors the subjects would make if they make the same frequency of errors for unproduced word-final /r/'s as for their produced word-final /r/'s.

4. Discussion

Like Borden et al. (1983) this research found more errors on production of /l/ than of /r/ by the subjects. However, their experiment results were not really replicated. First, Borden et al. (1983) reported that those speakers with lowest production scores (and thus lowest production abilities) showed the tendency to produce [r] for /l/, while those with better abilities made errors both ways. In this study no such results were obtained. Those speakers with lowest production abilities in terms of number of errors did not have the tendency to produce [r] for /l/; rather they made more errors for /r/ (3rd subtable of Table 3). Those subjects who exhibited better production abilities, on the other hand, made more frequent errors in /l/ to [r] direction (1st and 2nd subtables of Table 3).

Secondly, in Borden et al. (1983), where only liquids in word-initial position and consonant cluster positions are used as (production) test material, more errors were found on /r/ in consonant clusters than when in singleton (i.e., in word-initial position), and no significant difference was found between the two positions for /l/. The current study found the same tendency for /r/ but errors on /l/ were observed noticeably more in singleton (word-initial) position than in the consonant cluster context (see the 4th subtable of Table 3) just like in Sheldon and Strange (1982), which examined Japanese learners' acquisition of English liquids.

These disparities between the two studies may be due to differences in subjects: Borden et al.'s (1983) subjects were residing in the US to prepare for college entrance taking intensive English courses, while the subjects for the current research were all living in Korea without everyday contact with native speakers of English. Or the difference could be caused by different test methods: Borden et al. (1983) used nonsense words (such as *pla* vs *pra*, *kli* vs *kri*) as well as real English words for the production test; they also elicited the production of /r/ and /l/ within the sentence as well as in citation forms. However, the results obtained in this research suggest that the production patterns by Korean learners of English reported in Borden et al. (1983) are not generally observed in the context of Korean speakers' English learning as a second language.

The results of the current study also show that Koreans' acquisition of English liquids are sensitive to word position in which the phones appear (last subtables of Tables 2 and 3). Especially, the subjects' perceptual performance was clearly better in intervocalic position. The three other positions did not reveal any major differences in the perception results. As observed earlier, there are two lines of attempts to explain these different degrees of difficulty in the acquisition of foreign phones in different word positions: accounts of (native) language-dependent phonological interference and those exploiting language-independent articulatory-acoustic factors.

Let us first turn to the first line of explanation. As mentioned earlier, Korean has two liquid phones [r], an apical flap, and [l], a light apical lateral, in its sound inventory, but the two are not phonemically distinctive and appear in two different phonological environments. The flap phone occurs only intervocalically, while light [l]'s distribution is usually limited to syllable- and word-final positions (though the lateral can also occur syllable-initially if it follows another [l]). Korean does not allow liquid phones to appear in word-initial position (except recent loanwords) and (word-initial) consonant cluster position (e.g., *#br, *#pl). Accordingly liquid sounds of English and Korean are different not only in their articulatory and acoustic characteristics but also in the phonological contexts where they could appear.

The differences in phonological distribution between the two languages mentioned

above lead us to predict that Korean learners of English will have difficulty in the identification (and production) of English liquids in word-initial and consonant cluster positions since Korean does not allow any liquid in these environments. The 'phonological interference' account can also explain the fact that Korean native speakers have difficulty in perceiving word-final liquids: the perceptual difficulty in this position can be attributed to different acoustic natures of [l]'s of the two languages in this environment, characterized as velarized (dark) [l] of English³⁾ (cf. Gartenberg 1984, Sproat and Fujimura 1993) and light [l] of Korean. Since Korean has [l] of its own, it can be predicted that Korean speakers use their light [l] as a perceptual template for identifying English [l], i.e., those phones that match the template are judged as (English) [l], while others are identified as [r] in the (forced choice) perceptual test (see Henry and Sheldon 1986: 516 ff. for a similar line of argument in their explanation of Cantonese speakers' perceptual bias). If this reasoning is correct, the subjects are expected to show an error bias toward /l/ (i.e., more frequent errors on /l/) in word-final position, which is indeed the case as shown in the 2nd rightmost column of Table 2. All the three groups showed such a tendency. (Another possible explanation for this perceptual bias in final position is that three of the four constructed word-final /r/'s are syllabic consonants that are usually produced with more intensity (Table 1) and thus could be perceptually more distinctive. However, this interpretation of the results is not very plausible because the number of /r/ perception errors in this position (41) is actually larger than numbers of those made in initial and medial positions (37, 35, respectively: see the last subtable of Table 2)).

Korean apical flap [r], which occurs intervocally, is very different acoustically and articulatorily from English retroflex approximant [ɻ], a phone which is rarely found in the world's languages (Maddieson 1984: 78-80). It could possibly be that the Korean apical flap is phonetically as distinct from English retroflex [ɻ] as from the English lateral approximant. Accordingly the status of Korean flap [r] is clearly different from the situation of Korean light [l], which is very like an (light) allophone of English /l/ observed in most phonological environments but post-nucleus positions where 'dark' [l] occurs (e.g., mill [mɪl], silk [sɪlk]). Table 2 shows that in the perception test the subjects made a significantly fewer number of errors in medial position, which replicates the results from Ingram and Park (1998). This result is conjectured to come from the presence of a native liquid phone in this position, which

3) The ('dark') velarized [l] is produced with the back of the tongue raised toward the soft palate. One important acoustic characteristic of English velarized [l] is that its first and second formants are closer together than those of light [l]: Sproat and Fujimura 1993).

could precipitate the identification and production of English liquids in this context. Since Korean [r] is similar neither to retroflex [ɾ] nor to English [l], no such interference effects found with Korean [l] are observed (cf. the last subtables of Tables 2 and 3): [r] cannot be a template in the perception and production of neither English [r] nor [l] and is not expected to hinder the acquisition of the two English liquids in intervocalic position.

One clear directional bias in error is observed in word-initial position. The subjects made more errors on /l/ both in production and perception (The same tendency in perception is reported in Ingram and Park 1998). Only the production results are explained by contrastive phonological analyses. The error bias in production seems to be closely related to the fact that Modern Korean (exceptionally) allows flap [ɾ] in word-initial position when it borrows and nativizes words from foreign languages, mostly English. Both [r] and [l] of English are substituted by Korean [ɾ]. For instance, [raillak] 'lilac', [remon] 'lemon', [radio] 'radio', and [rum] 'room' are the forms in which these words are borrowed into Korean. The just cited words are now half-nativized and among the commonly used words of Korean. It is presumed that this borrowing and nativization process has caused the /l/ to /r/ bias in production (as mentioned earlier, the American judges tended to identify flap-like productions by the subjects as [r] rather than [l]). However, no persuasive explanation can be given for the /l/ to /r/ perceptual bias observed in word-initial position.

In Mochizuki (1981), Sheldon and Strange (1982), and Dissosway et al. (1982), three studies that investigated Japanese learners' perception of English liquids, the subjects had least difficulty in perceiving word-final liquids. This result is not explained by contrastive analyses of English and Japanese since the latter has only an apical tap or flap as its liquid phone occurring in syllable-initial and intervocalic positions. Dissosway et al. (1982), based on the measurements of the duration of liquids in each word-position,⁴ suggested that the greater duration of liquids might be the cause of better perceptual performance of Japanese speakers in word-final position. Henry and Sheldon (1986) found, however, that speakers of Cantonese, which has one liquid phone, i.e., light [l] (an apical lateral approximant), with its distribution limited to syllable-initial position, had more perceptual difficulty in word-final and consonant cluster positions than word-initial and intervocalic contexts, which result they interpret as refuting the "duration hypothesis".

4) Results of Dissosway et al.'s (1982) measurements on average were as follows: word-initial: 108 ms, word-initial consonant cluster: 120 ms, intervocalic: 121 ms, word-final: 195 ms. Henry and Sheldon's (1986) mean measurements were: word-initial: 106 ms, word-initial consonant cluster: 142 ms, intervocalic: 95 ms; word-final 152 ms.

The current study does not support Dissosway et al.'s (1982) hypothesis, either. Actually in our experiment the subjects made most errors in word-final position (see the last subtable of Table 2), though the duration of liquids produced by native American speakers of English in this context is found to be longer than any other position (cf. Dissosway et al. 1982 and Henry and Sheldon 1986; see also footnote 4). In our study the number of errors were very comparable in word-initial, consonant cluster, and final positions, while errors in intervocalic position were significantly fewer. This result, like those of Henry and Sheldon (1986), does not lend support to the duration hypothesis proposed by Dissosway et al. (1982).

One of the findings by Sheldon and Strange (1982) and Mochizuki (1981) was that Japanese learners of English had most difficulty perceiving the English liquids in consonant cluster among the four contexts examined in the current study. Sheldon and Strange (1982) attribute this result to coarticulation effects caused when an English liquid is produced preceded by a stop consonant, i.e., the articulatory or acoustic targets of the liquid do not reach or maintain its articulatory or acoustic goals, blurring the characteristics of transition and steady states of F_3 of the two liquids, the most important cues in differentiating English [r] and [l] (Underbakke, Polka, Gottfried, and Strange 1987, Strange and Dittmann 1984) and thus impeding the correct identification of the English liquids in this context. In the current study the subjects did not find the perception of the English liquids in this position particularly difficult, failing to provide support to the "coarticulation effect" hypothesis. The results of the present study raises some doubt on Sheldon and Strange's (1982) proposal since Korean and Japanese are not different in native language setting in that both do not allow a liquid phone in consonant cluster position.

The subjects for this study made fewer errors in production of English liquids than in their perception. This result is identical to what was found in Goto (1971) and Sheldon and Strange (1982), two studies investigating the acquisition of English liquids by Japanese learners of English. This finding implies that production abilities can really precede perception abilities at least in some cases of foreign phone acquisition, refuting the majority position held by foreign language teachers that mastery of production requires perceptual mastery (Henning 1966, Neufeld 1977, and Postovsky 1974 provide research results supporting this position). The findings by the current research, when combined with the reported results of the just cited works, could suggest that perception and production abilities are significantly correlated (cf. Table 4) in phonological acquisition of a second language but either aspect, i.e., production or perception, of second language learning can be developed earlier than the other depending on the characteristics of phones and phonemic contrasts to be learned.

5. Conclusion

This study has examined the production and perception of English /r/ and /l/ by Korean learners of English. This research is differentiated from Borden et al. (1983) in that it aimed to investigate Korean speakers' acquisition of the English liquids using the same data set for both aspects (i.e., production and perception) of foreign phone learning, thus enabling it to examine the precedence relationship and correlation between the two aspects in the learning process. The present study is also different from Ingram and Park (1998) in that the latter deals (only) with Korean speakers' perception (identification and discrimination) of the two liquids of Australian English, which allows /r/'s only in three word-positions: initial, consonant cluster, and medial positions.

Some of the results which Borden et al. (1983) obtained from their experiments were replicated but many were not. Generally comparable results to those of Ingram and Park (1998) were observed in this study. Both studies found that /l/ is, overall, more difficult to identify than /r/ and that Korean listeners' perception is also position-sensitive: /l/ poses more difficulty in initial position than /r/ while /r/ in word-initial consonant cluster is more problematic than /l/ in the same position. The latter result is all the more noteworthy since the same finding is also reported in Sheldon and Strange (1982) and Mochizuki (1981) for Japanese learners of English. More thorough investigations of the factors causing these perceptual biases should be undertaken in future studies, which will be possible only when acoustic, perceptual characteristics of the Korean liquid phones (as well as those of the Japanese tap) are thoroughly investigated.

REFERENCES

- Baik, W. 1997. "On tensivity of Korean stops." *J. of Korean Association of Speech Sciences*, 3, pp. 149-158.
- Borden, G., A. Gerber & G. Milsark. 1983. "Production and perception of the /r/-/l/ contrast in Korean adults learning English." *Language Learning*, 33, pp. 499-526.
- Catford, J. G. & D. B. Pisoni. 1970. "Auditory vs. articulatory training in exotics sounds." *Modern Language Journal*, 44, pp. 477-481.
- Dissosway-Huff, P., R. Port & D. Pisoni. 1982. "Context effects in the perception of English /r/ and /l/ by Japanese." *Research on Speech Perception*, Progress Report Number Eight, pp. 277-288. Bloomington, Indiana: Speech Research Laboratory, Department of Linguistics.
- Goto, H. 1971. "Auditory perception by normal Japanese adults of the sounds 'l' and 'r'." *Neuropsychologia*, 9, pp. 317-323.
- Henning, W. A. 1966. "Discrimination training and self-evaluation in the teaching of

- pronunciation." *International Review of Applied Linguistics*, 4, pp. 7-17.
- Henry, E. & A. Sheldon. 1986. "Duration and context effects on the perception of English /r/ and /l/: A comparison of Cantonese and Japanese speakers." *Language Learning*, 36(4), pp. 505-521.
- Ingram, J. & S.-K. Park. 1998. "Language, context, and speaker effects in the identification and discrimination of English /r/ and /l/ by Japanese and Korean listeners." *Journal of the Acoustical Society of America*, 103, pp. 1161-1174.
- Jung, M.-W. 1962. *A Contrastive Study of English and Korean Segmental Phonemes with Some Suggestions toward Pedagogical Application*. M.S. Dissertation, Georgetown University.
- Kim, H.-S. 1998. "The place of articulation of Korean affricates observed in LPC spectra." *Korean Journal of Speech Sciences*, 3(1), pp. 93-108.
- Ko, D.-H. & O.-R. Jeong. 1998. "Treatment effect of a modified melodic intonation therapy (MMIT) in Korean aphasics." *Korean Journal of Speech Sciences*, 4(2), pp. 91-102.
- Ladefoged, P. 1967. *Three Areas of Experimental Phonetics*. London: Oxford University Press.
- Ladefoged, P. & I. Maddieson. 1996. *The Sounds of the World's Languages*. Cambridge: Blackwell.
- Lee, S.-H. 1999. "Effects of prosodic position on phonetic realization of Korean syllable-initial /l/." Paper read in the 1999 International Conference of Spoken Language Processing.
- Lindau, M. 1985. "The story of r." *Phonetic Linguistics*. Edited by V. A. Fromkin. Orlando: Academic Press, pp. 157-168.
- Maddieson, I. 1984. *Patterns of Sounds*. New York: Cambridge University Press.
- Mochizuki, M. 1981. "The identification of /r/ and /l/ in natural and synthesized speech." *Journal of Phonetics*, 9, pp. 283-303.
- Neufeld, G. 1977. "Language learning ability in adults: A study on the acquisition of prosodic and articulatory features." *Working Papers on Bilingualism*. Ontario Institute for Studies in Education, Toronto, 12, pp. 46-60.
- Paulston, C. B. & M. M. Bruder. 1976. *Teaching English as a Second Language: Techniques and Procedures*. Cambridge: Winthrop Publishers, Inc.
- Underbakke, M., L. Polka, T. Gottfried & W. Strange. 1987. "Trading relations in the perception of /r/-/l/ by Japanese learners of English." *The Journal of the Acoustical Society of America*, 84(1), pp. 90-100.
- Postovsky, V. 1974. "Effects of delay in oral practice at the beginning of second language learning." *Modern Language Journal*, 58, pp. 229-239.
- Sakow, M. & J. McNutt. 1993. "Perception of /R/ by native speakers of Japanese and Korean: Internal and external perception." *The International Review of Applied Linguistics*, 29(1), pp. 46-53.
- Sheldon, A. & W. Strange. 1982. "The acquisition of /r/ and /l/ by Japanese learners of English: Evidence that speech production can precede speech perception." *Applied Psycholinguistics*, 3, pp. 243-261.
- Strange, W. & S. Dittmann. 1984. "Effects of discrimination training on the perception of /r-l/ by Japanese adults learning English." *Perception and Psychophysics*, 36(2), pp. 131-145.

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APPENDIX. Collected personal information of each subject

<u>Subject</u>	<u>Age</u>	<u>Dialect</u>	<u>School</u>	<u>Yr's of Eng. Educ.</u>
KMJ	25	Seoul	graduate	9 yr's
SJ	28	Chunla	graduate	9 yr's
CEO	21	Kyongsang	undergraduate	9 yr's
CHC	21	Kyongsang	undergraduate	9 yr's
JHC	21	Chunla	undergraduate	9 yr's
CEJ	21	Kyongsang	undergraduate	9 yr's
NHY	21	Kyongsang	undergraduate	8 yr's
KEA	21	Kyongsang	undergraduate	8 yr's
LHC	28	Seoul	graduate	8 yr's
PIH	36	Seoul	graduate	8 yr's
PYJ	31	Seoul	graduate	8 yr's