

# The Effect of Formal Instruction on Acquisition of the English /r/ and /l/ by Korean Speakers\*

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This study assesses the role of formal instruction in the acquisition of the English /r/ and /l/ by native Korean (NK) speakers. Following the proposal by Flege (1981, 1987, 1991, 1992) that many L2 production errors have a perceptual basis, a theoretical instruction to explain the position-sensitive subtle phonetic differences between English and Korean liquids was given to NK speakers and the accuracy of their production of English liquids was evaluated by native English speakers. The results based on 18 NK speakers show that 1) a very short perceptual training, not naturalistic learning, was effective in the improvement of late learners' L2 pronunciation and its effect was maintained for a rather short-term period; but 2) the results varied according to the phonological position each segment occurred, and the perceptual training conducted in this study did not override prior L1 phonological learning. Based on the results of this study, the L2 theories and theories of perception and production were revisited.

**Key words:** formal instruction, speech production and perception, Korean and English liquids

## 1. Introduction

The Critical Age Hypothesis (CAH) has been substantiated in numerous studies of second language acquisition (SLA), even though it is somewhat questionable whether the age factor in SLA could be examined in isola-

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tion.<sup>1)</sup> Arguments for a CAH (Lenneberg, 1967; Scovel, 1981; Wode, 1994; Flege, 1987; Flege & Munro, 1994; Flege, Munro, & MacKay, 1995; Bongaerts et al., 1997; Moyer, 1999) state that there is a critical period, beyond which complete mastery of a language is unlikely. There is not a single critical period affecting all aspects of language and thus many critical periods have been proposed. For example, the ability to master a native accent in a foreign language is thought to be the first to be lost, around the onset of puberty or even earlier. This is based on the fact that pronunciation is the only aspect of language involving a physical reality. Late learners may face neurological or motor skill constraints: their articulatory habits may be established firmly or their perception of foreign accents may heavily rely on the sound contrast of their mother tongue. In particular, the perception-based account for the CAH has been put forth in a series of work by Flege (1981, 1987, 1992, 1995). Based on the two different kinds of modes of perception, namely, continuous vs. categorical, Flege argues that very young children can discriminate minute differences in speech sounds (continuous mode of perception), but after around seven-years-old or even earlier, the L1 categories are firmly established and they perceive L2 sounds in terms of the phonetic categories of L1, ignoring subtle distinctions that do not contribute to the sound contrasts of L1 (categorical mode of perception). It is noteworthy that the chances of any one individual beginning a second or foreign language after a critical period and achieving an authentic native accent are small in terms of statistically probability (Scovel, 1988).

Despite these age-related restraints, a few late learners were reported to possess the ability to override neurobiological critical period effects and were able to attain a virtually native-like pronunciation of a foreign language. These learners are different from the "normal" population of less successful learners in several respects (Walsh & Diller 1981; Novoa et al. 1988; Schneiderman & Desmarais 1988; Ioup et al. 1994); these exceptional late learners were characterized by greater neurocognitive flexibility, a very high level of motivation, continuous access to authentic language input and given the chance of acquiring *input enhancement through instruction* (Ioup, 1995). This study is focused on the final category, namely, the role of formal instruction, because in the current

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1) In this study, the second language acquisition is not distinguished from the foreign language acquisition.

EFL situation of Korea, this is the main way of learning taken by native Korean (NK) late learners.

As argued by Flege (1992, 1995), for accurate pronunciation of L2, reactivating the continuous mode of perception is necessary and thus perceptual training should be provided to L2 learners in terms of teaching the subtle phonetic contrasts between their L1 and the target language. This can help L2 learners to establish correct perceptual target for the L2, followed up by training learners in the production of L2 speech sounds in order to develop the finely tuned motor control required for accurate pronunciation. In early stages of L2 acquisition, the learner may produce a sound found in L2 words that does not have an exact phonetic equivalent in the L1 by substituting the nearest L1 sound. However, as learners gain experience in the L2, they may begin to discern differences between the L2 and L1 sounds that have been perceptually related to one another. A perceptual awareness of this sort may trigger the establishment of a new phonetic category for L2 sounds judged to differ phonetically from the nearest L1 sound. This can lead to the accurate pronunciation of L2 sounds.

The main focus of this study is to investigate the effect of formal instruction, with focus on the effect of explicit perceptual training on the production of segment-sized units of speech in L2. The stimuli presented are English liquids /r/ and /l/. Procedurally, NK speakers are provided with theoretical instruction as to the subtle phonetic differences between English and Korean liquids in each phonological position, then followed by perceptual training of English /r/ and /l/, using the native speakers' recordings. Finally, the NK speakers' production of English liquids are collected at four different times to investigate the short-term and long-term effects of formal instruction upon the production of English liquids.

## **2. Phonetic Differences: Korean and English Liquids**

In American English, a retroflex approximant /r/ and an alveolar lateral /l/ are two separate phonemes, which are contrastive in all phonological positions as in (1).

- (1) American English /r/ and /l/ in various phonological positions
- |                               |              |
|-------------------------------|--------------|
| a. word-initial position      | right-light  |
| b. consonant cluster position | pray-play    |
| c. intervocalic position      | arrive-alive |
| d. word-final position        | poor-pool    |

In the most common position for /r/, the tip and blade of the tongue are turned upward, toward the hard palate, the tip pointing to, but not touching the area immediately behind the alveolar ridges. The alveolar lateral /l/ has two allophonic variants, namely, *light l* and *dark l*. The light /l/, [l], is the sound made when /l/ precedes a front vowel, or a glide (as in *leave*). On the other hand, when the /l/ is in final position (as in *fill*) or when it precedes a back vowel (as in *lose*), or when it is syllabic (as in *beetle*) the sound is made with the back of the tongue higher in the mouth, which is called dark /l/, [ɫ].

Korean phonology differs from English in that there is a single liquid phoneme, transcribed phonemically as /l/. However, Korean /l/ has two clear allophones, an apical flap [ɾ] and an alveolar lateral [l]. These two allophones are in complementary distribution: in intervocalic position, the flap is produced (2b) and the alveolar lateral appears elsewhere, namely, in pre-consonantal or final position (2a). When this final lateral is immediately followed by another /l/ in the onset of the following syllable, a geminate alveolar lateral is invariably produced as in (2c). Finally, either the flap [ɾ] or the alveolar lateral [l] does not occur in word-initial position.<sup>2)</sup>

- (2) Korean /l/ in various phonological positions
- |         |   |
|---------|---|
| a. [l]  | tal 'moon,' pul 'fire,'<br>tal-kwa 'moon and,' pul-to 'fire, too' |
| b. [ɾ]  | uli 'we,' səlo 'each other,' nala 'country'                       |
| c. [ɫɫ] | talli 'differently,' ɕallo 'automatically'                        |

These phonological and phonetic differences in liquids between the two languages result in Korean learners experiencing a lot of difficulties in both production and perception of the English language. Interference

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2) Of course borrowed words show such liquid pronunciation as in [radio] 'radio.'

from the L1 is seen as the primary phonological cause for the presence of foreign accents. There are three situations when interference may occur: 1) an L2 sound that is identified with a sound in the L1 will be replaced by the L1 sound, even if the L1 and L2 sounds differ phonetically; 2) contrasts between sounds in the L2 that do not exist in the L1 will not be registered; and 3) contrasts in the L1 that are not found in the L2 may nevertheless be produced in the L2 (Flege, 1995).

Focusing on liquids, Borden et al. (1983), Sakow and McNutt (1993) and Ingram and Park (1998) showed that Korean learners experience interference from the Korean liquid system when producing or perceiving English liquids. More specifically, the expected L1 transfer effects on the production/perception of English liquids are tabulated in (3).

(3) L1 Transfer Effects: Korean Upon English

phonological context	English liquids	predicted pronunciation by Korean learners	examples
word-initial	/l/, /r/	-> [r]	lead [ri:di]
			read [ri:di]
consonant cluster	/l/	-> [ʌʌ] or [r]	play [pi:ʌʌeɪ] /[pi:reɪ]
	/r/	-> [r]	pray [pi:reɪ]
intervocalic	/l/	-> [ʌʌ] or [r]	teller [te:ʌʌə] /[te:rə]
	/r/	-> [r]	terror [te:rə]
word-final	/l/, /r/	-> [l]	hill [hɪl]
			here [hɪə]

In the case of word initial position, the Korean language does not have any corresponding allophone to the English /r/ or /l/, and thus the Korean learners may have a great degree of difficulty in identifying and producing English /r/ and /l/. However, considering the Korean learners' production of English loan words beginning with /r/ or /l/, which is a flap, we can predict that they produce English liquids as a flap whether they are /r/ or /l/.

In intervocalic position, the allophonic pattern of the Korean liquids as in (2b) and (2c) is expected to be directly reflected in the acquisition of

the English liquids. English /l/ may be perceived and produced as either a geminate lateral [ʎʎ] or a flap [ɾ]; and English /r/, as a flap.

As for the consonant cluster position, Korean does not have consonant + liquid clusters due to the core syllable structure of Korean which is maximally CVC. No consonant clusters are allowed in onset as well as coda positions. Thus, Korean learners may have difficulty identifying and producing English /r/ and /l/ in this position. Or they might resyllabify these consonant clusters by inserting a vowel between a consonant and a liquid, and reveal the same pattern as that for the intervocalic position.

Word-final liquids in English are all expected to be produced as an alveolar lateral, because this is the only liquid in Korean in this position. These L1 transfer effects incorporating phonotactic constraints and L1 perceptual models for foreign sounds yield the prediction that Korean learners show difficulties in producing the English liquids in the order of word-initial, consonant cluster, word-final, and intervocalic positions (Park, 1997).<sup>3)</sup> This study will test whether these predicted L1 transfer effects will appear before and after the instruction is given.

### 3. Method

#### 3.1. Speakers

The speakers were 18 second-year college students (16 females and 2 males) who volunteered to participate in the experiment. Subjects ranged in age from 19 to 26 years old, so all of them could be safely considered typical late learners, since none had received instruction in English before the age of 13, nor had they been exposed more than incidentally to English input before that age. Also, none had resided in an English-speaking country, nor had any extensive contact with native speakers of English. They were assumed to be highly motivated learners, because despite all the long and complicated procedures, they all volunteered and were willingly participated in the experiment. Finally, none had pronunciation or hearing disorders.

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3) The results for the word-final liquids were not included in Park (1997). However, based on the logical predictions put forth in the previous studies, the position of word-final liquids in the production scale can be determined.

### 3.2. Speech Materials

The target sounds for the experiment were English /r/ and /l/. Sixteen pairs of test words were selected, such that four pairs of words contrasted /r/ and /l/ in each of the four phonological positions in words: word-initial position, word-initial 'obstruent + liquid' clusters, intervocalic medial position, and word-final positions. All words used in this study could be found, in relative frequency, in high school English textbooks or other teaching material used in private teaching institutes in Korea. Table 1 shows all the /r/-/l/ contrast word pairs.

Table 1. Contrast /r/-/l/ Pairs for Each Phonological Position in Words

initial	consonant cluster	intervocalic	final
race-lace	fry-fly	Paris-palace	poor-pool
rice-lice	pray-play	terror-teller	here-heel
rink-link	crown-clown	arrive-alive	over-oval
raw-law	grew-gluе	correct-collect	fire-file

All test words for initial, consonant cluster, and final positions had the syllable structure of C(onsonant)-V(owel)-C sequences; the test words for the intervocalic position were bisyllabic, two of which (Paris-palace; terror-teller) had primary stress on the first syllable, the remaining two of which (arrive-alive; correct-collect) had a primary stress on the second syllable.

In addition to these 32 test words, sixteen pairs of filler items were included as in Table 2, not to reveal the purpose of the experiment to the speakers.

Table 2. Contrast /r/-/l/ Pairs for Each Phonological Position in Words: Fillers

initial	vowel/consonant cluster	intervocalic	final
pen-ten	seed-said	decide-divide	gain-game
let-wet	bell-ball	coffee-copy	rang-ran
sight-fight	sky-spy	prices-prizes	save-safe
yet-jet	start-smart	reviews-refuse	bag-back

Various types of consonants including liquids and vowels in initial, consonant cluster, intervocalic and final positions were prepared, which were all distinctive in Korean.

### 3.3. Procedure

Each speaker's productions were recorded at four times (recording time 1 to 4), and for each recording session all the test words, along with all filler words were produced. They also received two sessions of formal instructions, the first prior to recording time 2, and the second prior to recording time 3.<sup>4)</sup> The time line for speaker recordings and formal instructions was as follows:

#### (4) Time Line for Recordings and Formal Instructions

Recording Time 1 (pre-instruction)

Formal Instruction 1 (one week after recording 1)

Recording Time 2 (immediately after formal instruction 1)

Formal Instruction 2 (one week after recording 2)

Recording Time 3 (immediately after formal instruction 2)

Recording Time 4 (five weeks after recording 3)

The first formal instruction session involved 50 minutes of theoretical instruction about the phonetic characteristics of English and Korean liquids. Specifically, the air-stream mechanisms and articulatory organs involved in the production of liquids, along with the classification criteria for consonants. Followed by instruction about the articulatory, acoustic and perceptual characteristics of English and Korean phonemes /r/ and /l/, in each phonological position: word-initial, intervocalic, consonant cluster, and word-final. The instructions focused upon a detailed description of the subtle phonetic differences of liquids in English and Korean, as well as, their potential perceptual impact on reception and production. Speakers were provided with tape recorded sample listening of native English speakers' production of English liquids; however, no explicit instruction was provided to practice the production of English liquids.

The second formal instruction session involved approximately 20 minutes of perception practice and corrective feed-back (using tape-recordings of native English speakers' production and from instructor). In this session, speakers were explicitly instructed to practice the perception

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4) As the primary purpose of the experiment is to examine changes over time in foreign accent, the speakers were controlled not to receive any instruction to develop their listening and pronunciation skills of the English liquids while the experiment was done.

of English liquids. The material for recording was the same in four series of recordings, with a randomized order in each test.

For each recording session the speakers were individually recorded in a quiet room using a DAT recorder (Sony D10PR01) and Shure BG 2.1 microphone. For each recording session speakers read the entire list of words to familiarize themselves with the material. Then, test words were presented one at a time (in random order), which were then read in citation form three times. The time interval between each speech token was two seconds. It took about 3 minutes for each speaker to finish reading the entire word list. The recorded words for the entire study were all told 13824 (64 items x 3 repetitions x 18 speakers x 4 times).

### 3.4. Rating Procedure

Two native speakers of the American English (1 female, and 1 male) were asked to rate the speech samples for foreign accent.<sup>5)</sup> One was at the time of this study teaching English pronunciation in college. Both of them use the General American dialect of English and thus pronounce and rated the post-vocalic [r] (car). Each judge heard a different randomization of the entire data set (6912 samples) in a quiet room located on the campus at Konkuk University. The words were presented via a headphone using a DAT cassette player. If necessary, the judges replayed the tape while rating. Prior to the rating task, the judges received instructions about the phonological and also minute phonetic characteristics of English /r/ and /l/. They were told to rate each speech sample using the following 5-point scale (Bongaerts et al., 1997).

#### (5) Rating Scale

1. Correct production and also native-like [r] or [l]
2. Correct production, but not that native-like [r] or [l]
3. [r] or [l] with a slight foreign accent
4. [r] or [l] with noticeable foreign accent
5. Definitely incorrect [r] or [l]

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5) The term 'foreign accent' in here refers to that at a segmental level, not that of global accent. Thus the native speakers of English only rates the foreign accent of /r/ or /l/ in each speech sample.

## 4. Results

### 4.1. The General Results on the Effect of Formal Instruction

Table 3 shows the mean ratings of foreign accent at four times, along with the mean of all four times, as well as the mean of all speakers for each time.

Table 3. Mean Foreign Accent Rating Scores at Four Times Periods for All Speakers

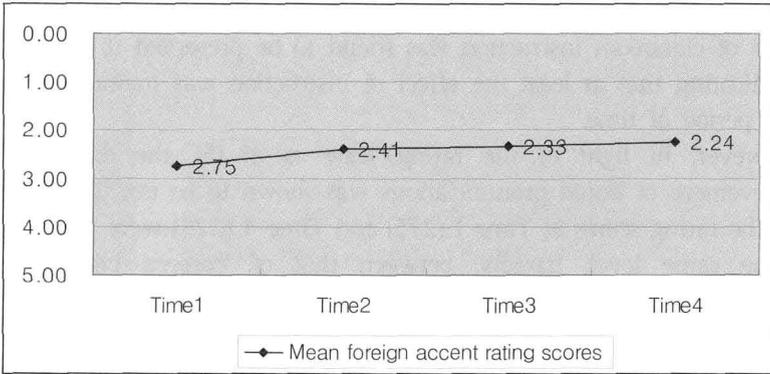
speaker	Time1	Time2	Time3	Time4	sum	mean
A	2.11	1.93	1.61	1.80	7.45	1.86
B	2.02	1.73	1.85	1.72	7.32	1.83
C	1.66	1.51	1.64	1.40	6.21	1.55
D	3.01	2.27	2.18	2.07	9.53	2.38
E	2.24	2.04	1.95	1.92	8.15	2.04
F	2.83	2.52	2.23	2.08	9.66	2.42
G	3.15	2.74	2.43	2.26	10.58	2.65
H	2.36	2.11	2.27	1.95	8.69	2.17
I	2.86	2.40	2.24	2.26	9.76	2.44
J	2.58	2.26	2.13	2.10	9.07	2.27
K	2.73	2.57	2.17	2.51	9.98	2.50
L	2.98	2.75	2.38	2.68	10.79	2.70
M	3.64	3.14	3.11	2.82	12.71	3.18
N	3.35	3.12	3.03	2.81	12.31	3.08
O	2.88	2.64	2.35	2.34	10.21	2.55
P	3.05	2.46	2.49	2.30	10.30	2.58
Q	3.13	2.87	3.03	2.95	11.98	3.00
R	2.87	2.34	2.90	2.42	10.53	2.63
sum	49.45	43.40	41.99	40.39	175.23	43.81
mean	2.75	2.41	2.33	2.24	9.74	2.43

Note: (l=correct, and also native-like [r] or [l], 5=definitely incorrect [r] or [l])

Considering Table 3, for all speakers all the rating means at Time 2 (column 3) were lower than the rating means at Time 1 (column 2).

Figure 1 displays the mean rating for all speakers at the four time periods. As seen in the figure, the rating scores were considerably lower at Time 2 than Time 1; and slightly lower at Time 3 than at Time 2; and also lightly lower at Time 4 than at Time 3.

Figure 1. Mean Foreign Accent Rating Scores for All Speakers at Four Time Periods



A series of the Paired t-Tests were carried out to determine if the NK speakers' ratings at the four time periods were statistically different from each other.

Table 4. Summary Statistics for Paired Sample t-Test on Foreign Accent Ratings

	mean		t-value (df)	<i>p</i>
Time 1 - Time 2	[Time 1] 2.75	[Time 2] 2.41	8.58 (.166)	0.000
Time 2 - Time 3	[Time 2] 2.41	[Time 3] 2.33	1.36 (.245)	0.192
Time 3 - Time 4	[Time 3] 2.33	[Time 4] 2.24	1.80 (.210)	0.090

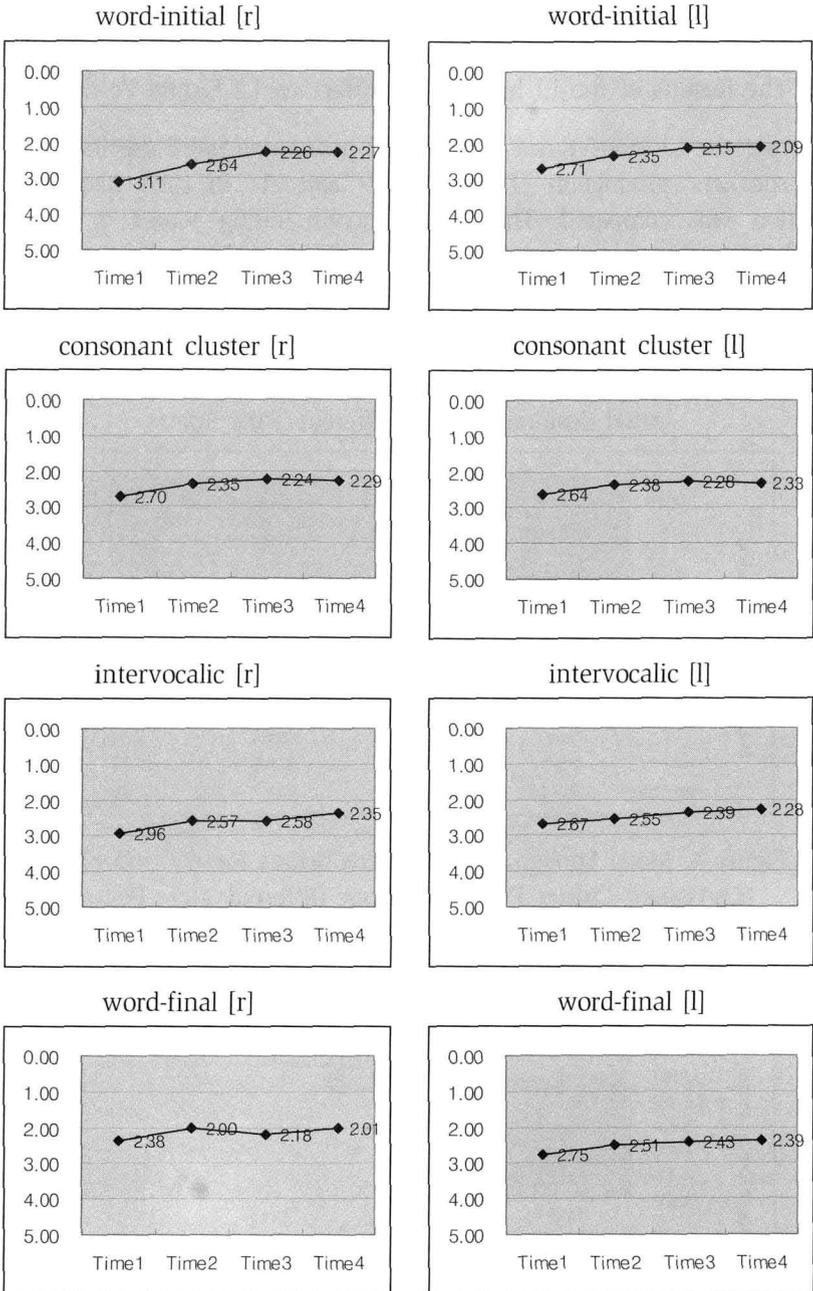
As shown in Table 4, the foreign accent rating scores of the NK speakers decreased significantly from Time 1 to Time 2, but no further significant decrease of scores was found between Time 2 and Time 3 as well as between Time 3 and Time 4. Given the fact that the first formal instruction was provided at Time 2, the results suggest overall improvement of speakers' pronunciation attributable to instruction. However, there was no further significant improvement after the second instruction session. Why was there significant improvement after the first instruction session, but none after the second? This might be explained in two ways. One is that the first instruction, which was basically a lecture, was so effective, therefore the feedback using the cassette tapes of the native speakers' pronunciation did not override the effect of the first learning. The other

possibility is that only one single training session was not sufficient to produce significant change. At this point it is hard to tell which explanation is more convincing. The improved pronunciation after two weeks of classroom instruction was found to be preserved through Time 4, indicating that at least the effect of instruction was maintained for a short period of time.

However, in light of the rating scale as in (5), the difference in improvement of liquid pronunciations was shown to be not that large, in that the rating scores at Time 1 (2.75) and Time 4 (2.24) were both within in the same level, namely, between that of 'correct, but not that native-like [r] or [l]' (level 2) and that of '[r] or [l] with a slight foreign accent' (level 3). The rating of foreign accent was shown to be much lower, yet not native-like production. This result suggests that classroom instruction conducted in this study can yield a significant but small improvement in NK speakers' English liquid production. It might be the case that the result from L1 phonological learning appears to be so dominant that two-week period of learning alone cannot override this L1 influence in NK speakers' L2 production. This issue will be treated in the following section in more detail.

The results of NK speakers' production of the English liquids in terms of the phonological position each liquid type occurs were interesting. Did the effect of formal instruction vary according to the phonological position that the English /r/ or /l/ appears? Figure 2 shows that in all phonological positions and in both liquids types, the formal instruction was found to be effective and its effect was maintained for a short period of time. The exact rating scores and the pattern of the scores were found to vary according to the phonological position and/or the liquid type /r/ or /l/. However, the general pattern of rating scores were homogeneous. Paired t-Tests was conducted to test whether the differences in rating scores between Time 1 and Time 2, and those between Time 1 and Time 4 were statistically significant ( $p < .05$  in each case) except for the intervocalic /l/'s rating scores between Time 1 and Time 2. This result might be caused by the fact that the first session of formal instruction did not provide large amount of time for intervocalic /l/, because it is assumed that this phonetic variant is produced quite similarly between Korean and English. However, it needs further systematic study to test this speculation. The results of the paired t-Tests also showed that the differences in rating scores between Time 2 and

Figure 2. Mean Foreign Accent Rating Scores Averaged Across 18 Speakers for [r] and [l] in Each Phonological Position



Time 3 were not statistically significant. In all eight cases presented in Figure 2, it was shown that the rating scores significantly increased from Time 1 to Time 3 and also from Time 1 to Time 4

#### 4.2. The Results of the L1 Interference Effect on L2 Liquid Production

To see the L1 interference effect on L2 production more specifically, the NK speakers' production of English /r/ and /l/ in each phonological position was compared. The foreign accent rating scores of the NK speakers' productions of each liquid type in word-initial, consonant cluster, intervocalic and word-final positions are presented in Figure 3, Figure 4, Figure 5, and Figure 6 respectively.

Figure 3. Mean Foreign Accent Rating Scores for /r/ and /l/ in Word-Initial Position at Four Different Time Points

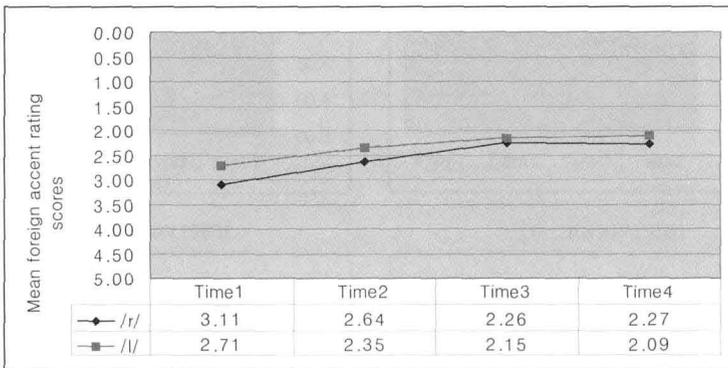


Figure 4. Mean Foreign Accent Rating Scores for /r/ and /l/ in Consonant Cluster Position at Four Different Time Points

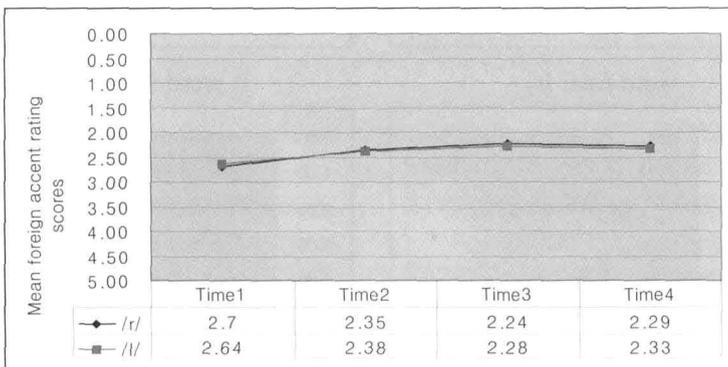


Figure 5. Mean Foreign Accent Rating Scores for /r/ and /l/ in Intervocalic Position at Four Different Time Points

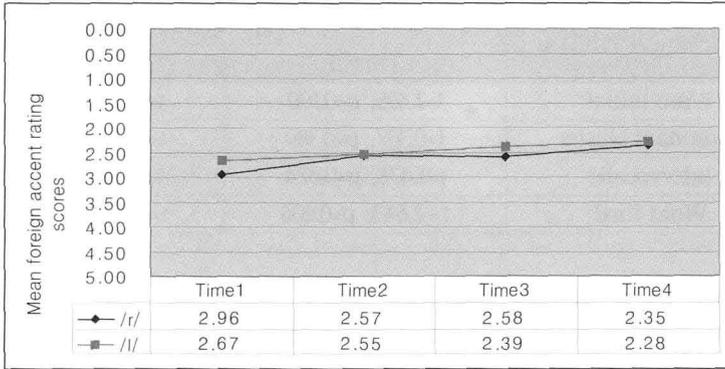
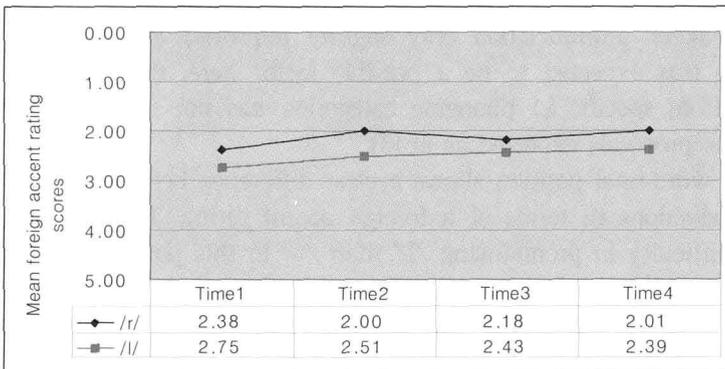


Figure 6. Mean Foreign Accent Rating Scores for /r/ and /l/ in Word-Final Position at Four Different Time Points



Even though there appeared to be a slight difference between the production of two liquid types in each phonological position, the statistical results show that there were no significant difference between NK speakers' production of /r/ and /l/ in word-initial, intervocalic, and consonant cluster positions. For reference, the results of paired t-tests for two liquid types at two time points (Time 1 and Time 4) were examined in Table 5.

Table 5 shows that only the word-final position exhibits such significant difference between two liquid segments both before and after the instruction was given. Thus these results demonstrate that NK speakers participating in this experiment pronounce both liquid type

Table 5. Summary Statistics for Paired Sample t-Test on Foreign Accent Ratings of /r/ and /l/ in Four Phonological Positions

Phonological Position	Time Points	
	Time 1	Time 4
Word-initial	t=-1.305, p=0.100	t=0.845, p=0.202
Consonant-cluster	t=0.307, p=0.380	t=-0.174, p=0.431
Intervocalic	t=1.478, p=0.074	t=0.415, p=0.340
Word-final	t=-2.643, p=0.006	t=-2.624, p=0.006

segments with similar difficulties before and even after the formal instruction, against the prediction that either /r/ or /l/ would be pronounced better in specific phonological positions due to L1 interference, as was previously discussed in (3). This may be the case that the subjects in this experiment had already been exposed to English extensively, and the effect from the L1 phonological learning is weakened. Even though NK speakers' pronunciation only slightly improved and thus L1 interference was expected to be a possible factor here, the L1 interference effect from specific L1 phoneme categories was not found in the way previous proposals expected as in (3).

Only word-final position shows a clear difference between the /r/ and /l/ productions in terms of a foreign accent rating. The speakers have more difficulty in pronouncing /l/ than /r/ in this position. This can be explained from the fact that /l/ in word-final position is not pronounced as an alveolar lateral like that in other phonological positions. It is a velarized lateral. Such allophonic characteristics were not shown to be informed to NK speakers, given the lack of overt training. Also even after they were aware of these minute phonetic differences between two kinds of /l/ allophones, the dark /l/ pronunciation was found to be less improved than that of /r/, even though their pronunciation of this allophonic /l/ was much improved on the absolute scale.

## 5. General Discussion

The primary purpose of this study was to examine the effect of formal instruction on the acquisition of L2 sounds by late learners. The results of the experiment showed that for 18 NK speakers, the pronunciation of the

English /r/ and /l/ significantly improved (i.e., had less foreign accent). Right after the instruction was given, the foreign accent ratings by the native English speakers moved towards native-like accent and this result was maintained for five weeks.

In interpreting the results of this study, two important points should be emphasized regarding the way the instruction was provided to the speakers. First, the instruction focused on the perceptual training. This was based on Flege's (1992) proposal that the primary cause of foreign accents are inaccurate perception of sounds in L2. Given the assumption that second language learning has been characterized as more analytic than L1 acquisition (Mack, 1988), and that speech production and perception are directly linked (Liberman et al., 1967; Liberman & Mattingly 1985, among others), the perceptual training of L2 sounds, rather than direct production training, was given to the L2 learners so that they could appraise the properties that differentiate the L2 sounds from one another, and from sounds in the L1. The results of this study show that such perceptual training was effective to the L2 production. The theoretical instruction to show the phonetic differences between the liquids in Korean and English and also exposure to the tape recordings of the relevant material were shown to be helpful for L2 learners to establish L2 liquid categories. Bradlow et al. (1997) also observed perceptual training effects on production. Their study involved 11 native Japanese speakers aged 19-22 and perceptual training was given for three to four weeks, involving 45 training sessions and 68 minimal pairs that contrasted /r/ and /l/ in multiple phonetic environments. After such perceptual training, an overall improvement in the identification of liquids was reported. Thus this study as well as the Bradlow et al. (1997) study suggests that awareness of the minute phonetic difference between L1 and L2 sounds and also allophonic differences between L2 sounds was sufficient for improving the production of L2.

Second, it should be noted that the perceptual training done in this study is basically explicit training, not naturalistic learning. It is still controversial whether overt learning or naturalistic learning is more effective in L2 pronunciation improvement. However, the result of /l/ in word-final position indicates that without overt instruction, late learners find it difficult to catch the allophonic difference between the word-final /l/, namely, *dark l*, and other /l/ variants. After given the instruction about the articulatory and perceptual differences between these two

kinds of allophonic /l/s were taught more explicitly, the NK speakers' /l/ production in this position was much improved. Again, the greater improvement for /l/ than /r/ in the results of Bradlow et al. (1997)'s study which was based on explicit training, not naturalistic learning, can be interpreted in a similar vein.

Overall, overt phonological instruction appears necessary for the late learners to acquire native-level phonological production and awareness for the minute phonetic difference between L1 and L2 sounds should be necessary and thus developed as well as the exposure to authentic input.

However, at this point it is difficult to determine whether the results of this study supports or challenges the Critical Age Hypothesis. First, it apparently does not result in a sharp discontinuity in L2 pronunciation ability as argued in many proposals following CAH, because two weeks of training alone showed substantial improvement in production. Thus more prolonged and intensive training might lead to much better results in the production of L2 sounds. However, a close examination of the degrees of improvement in production in each speaker shows that classroom instruction conducted in this study can yield a significant but not a large improvement in production to acquire the native-level pronunciation. Also note that no single speaker out of the 18 acquired pronunciation without any foreign accent after such training, implying that it is not easy to acquire the native-level of fluency in production. It might be the case that NK speakers participating in this study are all late learners over the critical age, and thus can never acquire native-level proficiency, supporting the CAH. Or as mentioned earlier, the training might be too short to produce native-like production. The subjects may begin to reset the categorical perceptual mode to accommodate a subtle phonetic difference in English liquids, because they are instructed to be aware of those phonetic differences in terms of explicitly focusing on their attention to the detailed physical attributes of the perception and production of the target contrast. The results of this study, however, do not provide conclusive evidence to support or refute the CAH and testing of this hypothesis requires further investigation.

A secondary purpose of this study was to examine to what extent L2 theories could account for the NK speakers' production of English liquids in terms of L1 transfer. Earlier proposals (Borden et al. 1983; Ingram & Park, 1998) yield the prediction that Korean speakers have the most difficulties in producing English liquids in word-initial position, and less

difficulties in consonant cluster and word-final positions. In intervocalic position, they were expected to produce English liquids relatively easily. This prediction was based on the phonetic properties of liquids and phonotactic constraints of each language. However, as it turned out, these predicted difficulties did not hold before and even after the instruction was given. In each phonological position, both /r/ and /l/s show much higher ratings, but not significant. Thus it could be said that Korean speakers are interfered by the Korean liquid system when they produce the English liquids in a general sense, but not in the way as proposed in earlier analyses. Only in word-final position, such significant differences were found: /l/ was rated lower than /r/, namely, before the instruction was given and after. This might result from the fact that speakers were not aware of the allophonic variant of /l/ produced in this position. Even after they received training, they showed less improvement in this /l/ production, as compared to /r/.

## References

- Bongaerts, T., Summeren, C., Planken, B., and E. Schils. (1997). Age and ultimate attainment in the pronunciation of a foreign language. *Studies in Second Language Acquisition* 19, 447-466.
- Borden, G., Gerber, A., and G. Milsark. (1983). Production and perception of the /r/-/l/ contrast in Korean adults learning English. *Language Learning* 33, 499-526.
- Bradlow, A., Pisoni, D., Akahane-Yamada, R., and Tohkura, Y. (1997). Training Japanese listeners to identify English /r/ and /l/: Some effects of perceptual learning on speech production. *Journal of the Acoustical Society of America* 101, 2299-2310.
- Flege, J. (1981). The phonological basis of foreign accent. *TESOL Quarterly* 15, 443-455.
- Flege, J. (1987). The production of "new" and "similar" phones in a foreign language: Evidence for the effect of equivalence classification. *Journal of the Phonetics* 15, 47-65.
- Flege, J. (1991). Perception and production: the relevance of phonetic input to L2 phonological learning. In Heubner, T. and C. Ferguson eds., *Crosscurrents in Second Language Acquisition and Linguistic Theory*. Philadelphia: John Benjamins.

- Flege, J. (1992). Speech Learning in a second language. In C. Ferguson, L. Menn, and C. Stoel-Gammon, eds., *Phonological Development: Models, Research, and Application* (pp. 565-604). Timonium, MD: York Press.
- Flege, J. (1995). Second language speech learning: Theory, findings and problems. W. In Strange, ed., *Speech Perception and Linguistic Experience* (pp. 233-277). Timonium, MD: York Press.
- Flege, J. and M. Munro (1994). The word unit in L2 speech production and perception. *Studies in Second Language Acquisition* 16, 381-441.
- Flege, J., Munro, M., and I. MacKay. (1995). Factors affecting strength of perceived foreign accent in a second language. *Journal of the Acoustical Society of America* 97. 3125-3134.
- Ingram, J. and 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, 1161-1174.
- Ioup, G. (1995). Evaluating the need for input enhancement in post-critical period language acquisition. In D. Singleton, and Z. Lengyel, eds., *The Age Factor in Second Language Acquisition* (pp. 95-123). Clevedon, UK: Multilingual Matters.
- Ioup, G., E. Boustagui, M. El Tigi and M. Mosell. (1994). Reexamining the critical period hypothesis: a case study in a naturalistic environment. *Studies in Second Language Acquisition* 16, 73-98.
- Kang, H-S. (1999). Production and perception of English /r/ and /l/ by Korean learners of English: an experimental study. *Korean Journal of Speech Sciences* 6, 7-23.
- Lenneberg, E. (1967). *Biological Foundations of Language*, New York: Wiley.
- Liberman, M., S. Cooper., P. Shankweiler and M. Studdert-Kennedy. (1967). Perception of the speech code. *Psychology Review* 74, 431-461.
- Liberman, M. and G. Mattingly. (1985). The motor theory of speech perception revised. *Cognition* 21, 1-36.
- Mack, M. (1988). Sentence processing by non-native speakers of English: evidence from the perception of natural and computer-generated anomalous L2 sentences. *Journal of Neurolinguistics* 3, 293-316.
- Moyer, A. (1999). Ultimate attainment in L2 phonology: the critical factors of age, motivation, and instruction. *Studies in Second Language*

*Acquisition* 21, 81-108.

- Novoa, L., D. Fein, and L. Obler. (1988). Talent in foreign languages: a case study. In Obler, L. and D. Fein eds., *The Exceptional Brain, Neuropsychology of Talent and Special Abilities* (pp. 294-302). New York: Guilford Press.
- Park, S.-G. (1997). *Australian English Pronunciation Acquisition by Korean and Japanese Learners of English*, Ph. D. dissertation, The University of Queensland.
- Schneiderman, E. and C. Desmarais. (1988). The talented language learner: some preliminary findings. *Second Language Research* 4, 91-109.
- Schumann, J. (1978). *The Pidginization Process: A Model for Second Language Acquisition*, Rowley, MA: Newbury House.
- Scovel, T. (1988). *A Time to Speak, a Psycholinguistic Inquiry into the Critical Period for Human Speech*, Cambridge, MA: Newbury House.
- Sheldon, A. and 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, 243-261.
- Walsh, T. and K. Diller. (1981). Neurolinguistic considerations on the optimum age for second language learning. In Diller, K. ed., *Individual Difference and Universals in Language Learning Aptitude* (pp. 3-21). Rowley, MA: Newbury House.
- Wode, H. (1993). The development of phonological abilities. In Hyltenstam, K. and A. Viberg eds., *Progression and Regression in Language: Sociocultural, Neuropsychological and Linguistic Perspectives* (pp. 415-438). New York: Cambridge University Press.
- Wode, H. (1994). Nature, nurture, and age in language acquisition: the case of speech perception. *Studies in Second Language Acquisition* 16, 325-345.

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