

A Study on the Production of a Stop Plus Nasal Sequence in English Words by Korean Learners*

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ABSTRACT

This paper investigates the influence of the Korean phonology on the production of English words including a stop plus nasal sequence through production experiments with a beginner and an advanced group of Korean English learners. The results of the production experiments show that both the beginner and the advanced group of Korean English learners were under the influence of the Korean phonological rule realizing a stop as a nasal before a nasal when they pronounced a stop plus nasal sequences in English words. The extent of L1 interference was greater in the beginner group than in the advanced group.

Keywords: L1 interference, stop plus nasal sequences, production experiments

1. Introduction

Native language (L1) interference on a second language (L2) learning has long been a research topic in the area of second-language acquisition. According to Beardsmore(1982), among others, a second language learner is faced with many difficulties in phonology, vocabulary and grammar of L2 due to the interference from L1.

In this paper, the influence of the Korean phonology on the production of English words including a stop plus nasal sequence is investigated. Korean native speakers learning English are expected to have difficulties in their pronunciation of English words with a

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stop plus nasal sequence since the sequence does not surface in Korean. As illustrated in the examples in (1), an underlying stop plus nasal sequence is realized as a nasal plus nasal sequence in Korean.

(1) Nasalization of a stop before a nasal in Korean (Shin & Cha 2004)

/p'op + nin/	→	[p'omnin]	'choosing'
/pap + mul/	→	[pammul]	'ricewater'
/tit + nin/	→	[tinnin]	'hearing'
/tot + namul/	→	[tonnamul]	'a kind of wild vegetable'
/mæk + nin/	→	[mæɲnin]	'eating'
/kuk + mul/	→	[kuɲmul]	'soup'

To examine how much Korean English learners are influenced by such a Korean phonological phenomenon, a production experiment was run.¹⁾ In particular, to see whether or not there is any difference in the extent of L1 interference depending on a speaker's proficiency level in English, the production experiment was run with a beginner and an advanced group of Korean English learners. In addition, for a comparison, the experiment was also run with native speakers of American English. The results of our experiment show the interference of Korean on the production of English. That is, according to our experiments, both a beginner and an advanced group of English learners tend to mispronounce a stop plus nasal sequence as a nasal plus nasal sequence, although the tendency is stronger in the former group.

This paper is organized as follows. In section 2, the methods and results of the production experiment are given. Discussion based on experiment results is in section 3.

2. Production experiment

A production experiment was designed to investigate how a stop plus nasal sequence in English words is produced by Korean and American English speakers.

1) Kang & Lee (2001) showed high school students in their first year (i.e. a beginner group of Korean English learners) tended to pronounce a stop before a nasal as a nasal in English words.

2.1 Methods

1) Procedures

For the production experiment, English words with a /pn/, /pm/, /tn/, /tm/, /kn/ and /km/ sequence given in (2) were included.

(2) Experimental tokens

Sequences	English words
/pm/	development, chipmaker, upmost
/pn/	hipness, deepness, cheapness
/tm/	atmosphere, nightman, outmost
/tn/	lightness, rightness, footnote
/km/	bookmark, stockmarket, packman
/kn/	acknowledge, blackness, nickname

For a recording, each word was put in a carrier sentence “_____ is a word”. Speakers were asked to read each sentence with a target word at a natural speech rate five times. Sentences with a target word were shuffled each time recordings were made. Thus, each speaker recorded sentences five times in different order, and sentences were presented in different orders to different speakers. Recordings were made in a sound-attenuated booth in the Spoken Language Information Laboratory at Korea University. For the recording, an SM58 SHURE microphone and a TASCAM DA-20 MKII tape recorder were used. Recordings with native speakers of American English were made in a sound-attenuated booth at the Ohio State University by using an SM10A SHURE microphone and a TEAC V-427C tape recorder.²⁾ All the recordings were digitized at 22050 Hz with 16 bit samples.

2) Subjects

20 native speakers of Seoul Korean and 4 native speakers of American English participated in the production experiment. Among 20 native speakers of Seoul Korean, 10 were a beginner group of English learners and 10 were an advanced group of English learners. A beginner group of English learners were the ones who got a first or second level of English proficiency from an interview with an English instructor of the Institute of Foreign Language Studies at Korea University. An advanced group of Korean English

2) We would like to thank Eun-Jong Kong for her assistance with the production experiment run at the Ohio State University.

learners were recruited from people who got a fifth or sixth level of English proficiency from the interview. Four American English speakers were graduate students at the Ohio State University. The American English speakers were paid for their participation in the experiment, whereas the Korean speakers were paid or participated in the experiment to earn extra credit points for their English class.

2.2 Results

The realization patterns of a stop plus nasal sequence were examined by looking at the spectrograms and listening to the tokens. Excluding 17 out of 2160 tokens (18 words × 5 repetitions × 24 speakers), 2143 tokens were used for the analysis. The tokens excluded from the analysis were the ones which were skipped or mispronounced because speakers mistook them for another words.

Since the nasal in a stop plus nasal sequence was pronounced as the nasal in all the tokens by the Korean speakers, we will present the results of the experiment focusing on the realization patterns of the stop in the sequence.

The table in (3) illustrates the realization patterns of the stop in a stop plus nasal sequence in the three different groups, i.e. the beginner and the advanced group of English learners and the American English speaker group. In the table below, numbers that are not in parentheses represent the number of the tokens with each realization form and the ones in parentheses are the percentages of the tokens with each surface form within each group.

(3) The realizations of a stop in English words with a stop plus nasal sequence

	[p], [t] or [k]	nasal	glottal stop	deletion	fricative	Vowel insertion	Total
Beginner	267 (30.0)	475 (53.4)	9 (1.0)	5 (0.4)	0 (0.0)	134 (15.1)	890 (100)
Advanced	419 (46.8)	404 (45.1)	29 (3.2)	0 (0.0)	4 (0.5)	39 (4.4)	895 (100)
American	268 (74.9)	0 (0.0)	90 (25.1)	0 (0.0)	0 (0.0)	0 (0.0)	358 (100)

As shown in the table above, native speakers of American English realized the underlying stop in a stop plus nasal sequences either as the same stop without any change (i.e. as [p], [t] or [k]) or as a glottal stop. On the other hand, in the pronunciation of the

tokens by the Korean English learners, the stop in the sequence was pronounced as more various forms. The beginner group pronounced the stop in a stop plus nasal sequence as a nasal in 53.4% of the tokens, while the stop was realized as a stop or a glottal stop in 31.0% of the tokens. This result indicates that a beginner group of English learners were influenced by the Korean phonological phenomenon, which realizes a stop as a nasal before a nasal, in their production of English words. In addition, the speakers of the beginner group produced a stop plus nasal sequence, which does not surface in Korean, by deleting a stop or by inserting a vowel between a stop and a nasal.

The advanced group of English learners pronounced the stop in a stop plus nasal sequence as a stop or a glottal stop in half of the tokens. However, like the beginner group of English learners, the advanced group of English learners produced a stop before a nasal as a nasal in 45.1% of the tokens. This result illustrates that L1 interference effect is observed even in the English pronunciation of the advanced group of English learners. However, compared with the beginner group, the advanced group of English learners inserted a vowel between a stop and a nasal in fewer tokens.

A Chi-squared test was performed on the experimental results in the table in (3), and the test shows that the realization patterns of the stop of a stop plus nasal sequence are significantly different among the three different groups ($p < 0.001$).

The table in (4) shows the realization patterns of /p/, /t/ and /k/ before a nasal in English words in the three different groups. In the table below, numbers represent the percentages of the tokens with each surface form within each group.

(4) The realizations of /p/, /t/ and /k/ before a nasal in English words

	Group	[p], [t] or [k]	nasal	glottal stop	stop deletion	fricative	vowel insertion
/p/	Beginner	24.7	66.2	0.0	1.7	0.0	7.4
	Advanced	35.5	55.3	3.1	0.0	1.4	4.8
	American	87.3	0.0	12.7	0.0	0.0	0.0
/t/	Beginner	35.7	34.7	0.3	0.0	0.0	29.3
	Advanced	50.3	40.6	4.4	0.0	0.0	4.7
	American	38.3	0.0	61.7	0.0	0.0	0.0
/k/	Beginner	29.6	59.3	2.7	0.0	0.0	8.4
	Advanced	53.5	40.5	2.3	0.0	0.0	3.7
	American	99.2	0.0	0.8	0.0	0.0	0.0

As illustrated in the table above, native speakers of American English pronounced /t/ before a nasal as a glottal stop in 61.7% of the tokens with a /t/ plus nasal sequence. On the other hand, /p/ before a nasal was realized as a glottal stop in 12.7% of the tokens with a /p/ plus nasal sequence, and /k/ was pronounced as a glottal stop in a very small number of tokens. That is, before a nasal /t/ was mostly realized as a glottal stop, while /k/ rarely surfaced as a glottal stop.

The experiment results in the table (4) shows that the beginner group of Korean English learners had more difficulties in providing an English native speaker-like pronunciation for the labial /p/ before a nasal. This is based on the result that /p/ was realized as [p] or a glottal stop in 24.7% of the tokens with a /p/ plus nasal sequence, while /k/ was pronounced as a stop (including a glottal stop) in 32.3% of the tokens with a /k/ plus nasal sequence and /t/ surfaced as a stop in 36 % of the tokens with a /t/ plus nasal sequence. This tendency is also observed in the English pronunciation of the advanced group of Korean English learners. While /t/ and /k/ were pronounced as a stop in more than half of the tokens with a /t/ or /k/ plus nasal sequence, /p/ was pronounced as a stop only in 38.6% of the tokens with a /p/ plus nasal sequence.

The beginner group of English learners had a tendency to produce /p/ or /k/ before a nasal as a nasal. The labial /p/ was pronounced as a nasal in 66.2% of the tokens with a /p/ plus nasal sequence and the velar /k/ was produced as a nasal in 59.3% of the tokens with a /k/ plus nasal sequence. In the case of /t/ before a nasal, compared with /p/ and /k/, they pronounced it as a nasal at a lower rate (i.e. 34.7%). However, unlike /p/ and /k/, the beginner group of English learners inserted a vowel between /t/ and a nasal more frequently.

Like the beginner group of English learners, the advanced group of English learners produced /p/ before a nasal as a nasal in more than half of the tokens with a /p/ plus nasal sequence. However, in the case of /k/ and /t/, the advanced group of English learners had a tendency to pronounce them as a stop.

3. Discussion

The results of our production experiment show that there is L1 interference on the production of English words with a stop plus nasal sequences. Both the beginner and the

advanced group of Korean English learners applied the Korean phonological rule realizing a stop as a nasal before a nasal when they pronounced a stop plus nasal sequences in English words. Thus, the sequence in English words was realized as a nasal plus nasal sequence. The extent of L1 interference was greater in the beginner group than in the advanced group. The beginner group of English learners pronounced a stop before a nasal as a nasal in more than half of the tokens, while the advanced group of English learners did in less than half of the tokens.

According to our production experiment with American English native speakers, before a nasal the coronal /t/ was mostly realized as a glottal stop and the labial /p/ was less likely to surface as a glottal stop than /t/. In the case of the dorsal /k/, it was rarely pronounced as a glottal stop. This result is understandable considering Jun (1995)'s universal perceptual salience ranking for unreleased stops consonants in (5):

(5) Perceptual salience

dorsal > labial > coronal

Under the assumption that a segment with more robust cues and a better cue package has greater perceptual salience, Jun claims that the coronal stop is perceptually weaker than the dorsal and labial since the coronal stop has rapid tongue gesture, resulting in short transition cues in vowel contexts. On the other hand, labials and dorsals can be said to have more robust perceptual cues since they have more sluggish gestures and thus longer transitions. Dorsals have an additional acoustic cue for place of articulation resulting from the convergence of F2 and F3 of a neighboring vowel (Stevens 1989). Thus, compared with coronals and labials, dorsals can be considered to have the higher degree of salience.

Under the assumption that acoustically less salient segments are more likely to be targets of phonological modifications than acoustically more salient ones, it is expected that the coronal stop will be more likely to be realized as a glottal stop losing its coronality and the dorsal stop will be less likely to surface as a glottal stop, as manifested from our production experiment.

Considering such a perceptual factor, the higher likelihood of inserting a vowel after the coronal stop /t/ observed in the English pronunciation by the beginner group of English learners can be understood as a way of enhancing perceptual cues for the place articulation of the coronal stop by putting it in a prevocalic context. According to Wright (1996), when

a stop occurs in prevocalic position, both release burst and vowel formant transitions are present for a stop consonant. Thus, prevocalic position is a favorable position for the perceptibility of a stop.

According to our experiment, both the beginner and the advanced group of English learners had a difficulty in pronouncing the labial stop /p/ before a nasal as a stop. They pronounced the labial stop as a nasal in more than half of the tokens with a /p/ plus nasal sequence. Although it is not clear why a labial stop is more likely to be pronounced as a nasal before a nasal than a coronal or dorsal stop by Korean English learners, our finding implies that special attention should be paid when instructing the pronunciation of English words with a labial stop plus nasal sequence to Korean English learners.

4. Conclusion

This paper investigated the influence of the Korean phonology on the production of English words including a stop plus nasal sequence. The results of the production experiments show that both the beginner and the advanced group of Korean English learners were under the influence of the Korean phonological rule realizing a stop as a nasal before a nasal when they pronounced a stop plus nasal sequences in English words. The extent of L1 interference was greater in the beginner group than in the advanced group.

In our production experiment, the beginner group of English learners showed the higher likelihood of inserting a vowel after the coronal stop than after the labial or dorsal stop. It was discussed that a vowel insertion after the coronal stop might occur to enhance perceptual cues for the place articulation of the coronal stop, which is perceptually weaker than those of the dorsal and labial (Jun 1995), by putting it in a prevocalic context.

According to our experiment, both the beginner and the advanced group of Korean English learners had more difficulties in pronouncing the labial stop /p/ before a nasal as a stop. This implies that the pronunciation of English words including a labial stop plus nasal sequence should be taught to Korean English learners with more care.

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