

実験研究に基づいた音声教育への示唆 — 韓国人英語学習者における英語の閉鎖音と鼻音の 子音連続の産出について —

Evidence Based Pronunciation Education: A Production Study of L2 English Stop-nasal Sequences by L1 Korean Speakers

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assimilation, unreleased of stop codas

ABSTRACT

本稿では, 韓国人英語学習者の英語の /tm/・/tn/ の産出を検討した実験を報告する。韓国語では, 閉鎖音が鼻音の前に現れる場合, 単語内と単語間での逆行の鼻音化が見られる。韓国人英語学習者の英語の産出において, 母語干渉が最も強く働いているのであれば, /tm/ は [nm] に /tn/ は [nn] になる同化過程が

最も高い頻度で発生すると考えられる。さらに、連子音の有標性が鼻音化に影響するとすれば、/tn/は/tm/より鼻音化する可能性が高いと予想される。これらの予測を調査するリーディングタスクに加え、本研究では聴解タスクの結果も報告する。実験の全体結果から、母語干渉による鼻音化の頻度は、予想より低いことが分かった。また、閉鎖音が鼻音の前に現れる場合、鼻音化より、閉鎖音を無開放したまま発音する方法が優先されることが示された。これは韓国語の句レベルの規則が強く働いているからだと思われる。

This paper reports findings of a production study that examines the pronunciation of /tm/ and /tn/ sequences by Korean speakers of English. Korean L1 grammar has a post-lexical post-nasal assimilation process where the stop becomes a nasal when it is followed by a nasal. If the transfer of L1 grammar is dominant in the production of L2, post-nasal assimilation of /tm/ to [nm] or /tn/ to [nn] would be found with higher frequency. If markedness of consonant sequences affect the post-nasal assimilation, we predict that the /tn/ sequence should undergo a higher rate of nasal assimilation than the /tm/ sequence. The study also reports findings from the reading task and the listening task. The overall results show that the transfer of post-nasal assimilation is less frequent than originally predicted, but it also shows that unreleasing a stop coda, another post-lexical process, is a preferred strategy when a stop is followed by a nasal.

1. Introduction

Recent years have seen a new development in the understanding of pronunciation education (Munro, 2008; Derwing & Munro, 2015). In these bodies of work, it has been argued that pronunciation education should consider intelligibility of a learner's speech as well as comprehensibility of the speech, in addition to the traditional approaches of accuracy and fluency. When pronunciation study was still in its infancy, teachers and educators of foreign languages had to resort to their own observations to teach second language (L2) pronunciation. Classroom education inherently focused on how to produce sounds close to native speakers of the target language. While teaching an accurate pronunciation is not a trivial goal, teaching how to pronounce an L2 speech sound should be inclusive so that the pronunciation of an L2 speaker is discernible (intelligibility) and understandable (comprehensibility). Increased intelligibility and comprehensibility will allow speakers to get their message across in the communicative situation with native speakers of the target language or other

speakers of the target language.

This paper reports results of a production study in which the pronunciation of stop-nasal sequences in English (such as *treatment*) by L2 Korean speakers is examined. One of the noticeable accents in the English produced by Korean speakers is this sequence because of a phonological process that changes a stop to a nasal before another nasal sound. Thus, *treatment* is often pronounced as [tʰrimmɪnt] where the medial /...tm.../ sequence becomes a homorganic nasal sequence [...mm...]. The nasal assimilation in Korean is a post-lexical phenomenon that applies within words as well as across word boundaries. For example, aspiration in English occurs post-lexically; once the condition for aspiration is met a plosive is always aspirated. Lexical phonology differs from post-lexical phonology because lexical phenomena only apply within words and they are also prone to exceptions.

The results of the production study show that post-lexical processes may prefer one process over another in L2 production, unlike what was originally thought of. The non-application of nasal assimilation suggests that speakers would actively

in a more faithful manner close to the L2 when prompted with auditory stimuli produced by a native speaker of the L2.

Based on views about post-lexical processes in the L2 acquisition literature, the phonological markedness theory, and the effect of orthography, this paper sets out to examine whether predictions of previous studies are borne out from data obtained from a large set of speakers.

3. The current study

The current study investigates the oral production of English stop-nasal sequences by L1 Korean speakers. Particularly, we examine 12 disyllabic English words with stop-nasal sequences of the type /tm, tn/ in three different conditions: one word, compound, and two words. In all of these three conditions, it is expected that stop-nasal sequences be affected by the post-lexical nasalization rule in Korean, and produced as [mm, nn] in the output. For example, an L1 Korean speaker would pronounce the English word ‘catnap’ as [kæn.næp].

We address three major research questions in this study. First, we examine whether post-lexical nasal assimilation in Korean is easily transferrable in L2 production as described in Broselow (1987). We expect that L1 Korean speakers will produce a high number of nasalized stops when the speakers produce a stop-nasal sequence in English since post-lexical processes apply in a context-free manner. Second, the degree of assimilation of consonants depends on whether a stop-nasal sequence is heterorganic or homorganic. As such, we look into whether there is a higher tendency for homorganic sequence (/tn/) to undergo assimilation in nasality in the L2 production of stop-nasal sequences by Korean learners of English. The prediction is that an English /tn/ sequence would show a higher rate of assimilation than an English /tm/ sequence. We will also address to what extent

types of tasks affect the production of stop-nasal sequences by L1 Korean speakers. Participants will be producing English stop-nasal sequences in a reading task as well as a listening task. Since the listening task is in nature an imitation task, we hypothesize that nasal assimilation will occur more frequently in the reading task than in the listening task. The reading task on the other hand, has a higher possibility of accessing the L1 Korean grammar because participants have to reconstruct the pronunciation of English words from orthographic representation in the absence of auditory stimuli.

3.1 Participants

The participants were 61 Korean speakers living in Seoul, Republic of Korea. All participants were college-level students with 34 of them being male and 27 of them being female. The age of the participants ranged from 18 to 33 (mean = 23, standard deviation (s.d.) = 3.5). Their English ability was measured using scores taken from standardized tests. The mean score of “Test of English Proficiency developed by Seoul National University (TEPS)” by 58 participants was 694 points (s.d. = 84.9). The highest score in TEPS is 990 points. Other three participants provided their Test of English for International Communication (TOEIC) score with a mean of 805 (s.d. = 119.5). The highest possible TOEIC score is also 990 points.

Ten participants reported that they received pronunciation education (mean = 5.5 months, s.d. = 4.4.), even though none of them has had experience living in an English-speaking country. Other eight participants had experience living in an English-speaking country on average of 6.2 months (s.d. = 4.3). Seven of these 8 participants took an English class during their time in an English-speaking country.

3.2 Instruments

Stimuli for the experiment were constructed based on two phonological conditions: the coronal-coronal sequence (/tn/) and the coronal-labial sequence (/tm/). Three lexical conditions were also examined: (a) word-internal (*treatment*), (b) compound (*catnap*), and (c) phrase boundaries (*light meal*). Two tokens for each condition yielded 12 targets in total (3 lexical conditions * 2 phonological conditions * 2 tokens). Fillers with different sequences were added so that the participants do not notice the experimental condition. All the stimuli including the fillers used in this study appear in Appendix 1.

These tokens were recorded by two native speakers of English (male and female). All the target words and fillers were recorded three times each in a frame sentence: *Say ____ again*. The second repetition of each token produced by the female speaker was extracted to be used as stimuli for the listening task.

3.3 Procedures

The participants were divided into two groups. One group (n=30) conducted the reading task followed by the listening task. The other group (n=31) first listened to the stimuli and then read the stimuli. Data collection was conducted in a sound-attenuated room at a university in Korea. Participants wore a head-worn microphone (WH-30XLR) that was connected to a digital recorder (Marantz PMD 671) via an XLR cable connector. The head-worn microphone ensured that recording levels of participant's speech were constant regardless of their head movement.

The reading task included 12 target sentences mixed with 70 other sentences, some of which were distractors. Participants were asked to read the sentences aloud, presented to them using the E-prime software. This software randomized the presentation order and recorded the responses

accordingly. Participants were instructed to say target words in the frame sentence "*Say ____ again*". There were six words with the target consonant sequence /tn/ and /tm/. After the completion of the first trial, a second trial with the same stimuli was conducted.

The listening task included the same number of experimental and distractor sentences as in the reading task. The stimuli were also presented using the E-prime software that automatically played sound files as slides were advanced. Participants were instructed to listen to recordings played via a noise-cancelling headphone and to repeat the sentences. As in the reading task, two trials of the listening task were conducted.

3.4 Data analysis

A total of 1464 tokens were analyzed for this study: 3 lexical conditions * 2 phonological conditions * 2 tokens * 2 trials * 61 participants. Using scripts that can be used with Praat (Boersma, 2001), identical repetitive procedures were automatized in order to save time and also to minimize any human errors. A script created a textgrid with margins that mark pauses in a long sound file, each of them corresponding to a task conducted by a single speaker. Then, sound portions of a long sound file were manually annotated. These annotated textgrids were then cut into individual files, along with their corresponding sound files. Then, the production of stops in stop-nasal sequences were rated using audio-visual methods by using another script that opens individual sound files one-by-one.

Two native English speakers trained in linguistics rated the production data; rater 1 is the 3rd author of this paper, and rater 2 was an original collaborator of the project. As such, both raters were well aware of the purpose of this study. After rater 1 completed the rating, rater 2 rated the tokens for reliability. The rating yielded 3 major categories of production

pattern by L2 Korean speakers of English: (a) nasalization, (b) no nasalization, and (c) outliers. All tokens were marked with the subcategories that will be discussed in the results section.

4. Results

Three major categories from the rating were further divided into 11 subcategories. The first two patterns will be illustrated using catnap. In the nasalization category, (i) complete nasalization of an oral stop [kæn.næp], (ii) nasal with a voiced oral stop [kænd̪.næp], and (iii) nasal insertion [kænt̪.næp] were observed. In the no nasalization category, the oral stop is (i) debuccalized [kæʔ.næp], (ii) unreleased [kæt̪.næp], (iii) released without an aspiration [kæt.næp], (iv) aspirated [kæth.næp], (v) voiced [kæd̪.næp], or (vi) aspirated with a vowel inserted after the stop [kæthi.næp].

Some tokens were outliers and showed unexpected patterns: (i) a coronal oral stop assimilates and becomes a labial stop as in [laip mil] ‘light meal’, [lɪp.nɪs] ‘litmus’, (ii) exceptions to the outliers are as follows: [laik mil] ‘light meal’, [bað.mæn] ‘batman’ or [bag.mæn] ‘batman’.

The first research question was whether post-nasal assimilation, a post-lexical phenomenon, in Korean is readily transferrable in L2 produced as described in Broselow (1987). Figure 1 shows the overall patterns regarding the production of /tm/ and /tn/ sequences. In both types of sequences, to our surprise, nasalization was not a major strategy employed by participants. In the heterorganic /tm/ sequence, aspiration or unreleased oral stops were dominant strategies, followed by the voicing of the voiceless oral stop /t/. In the homorganic /tn/ sequence, the oral stop was unreleased, glottalized or voiced. In all the subsequent figures, outliers are omitted.

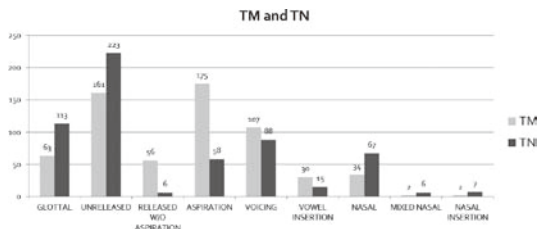


Figure 1 Overall production types of /tm/ and /tn/ sequences by Korean speakers of English

In figures 2 and 3, results separated by the reading task and the listening task are shown. In the reading task, the phonological condition, that is whether the sequence was heterorganic or homorganic, was significant ($p=1.10e-05$). The same type of result was found in the production based on the listening task ($p=0.000856$).

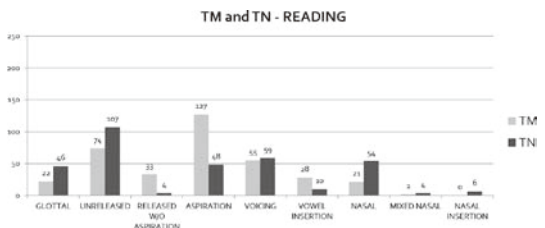


Figure 2 Overall results of the reading task

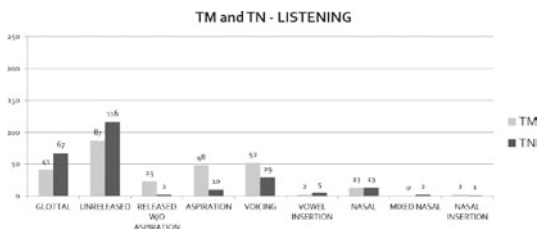


Figure 3 Overall results of the listening task

The second research question focuses on the markedness of consonants and the type of a stop-nasal sequence. What is the tendency for unmarked coronal consonants to undergo assimilation in the homorganic sequence /tn/ versus in the heterorganic sequence /tm/? In the absence of nasalization, the data points for this question are rather small. In figure 4, the post-nasal assimilation cases are divided

based on their lexical condition: simplex (one word), compound or phrasal (two words). Among these lexical conditions, simplex and compound conditions are more likely to have post-nasal assimilation compared to the phrasal condition. Note that no participant shows nasal assimilation in heterorganic phrasal condition (/tm/; two words).

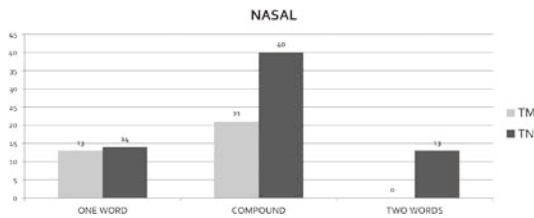


Figure 4 Patterns of post-nasal assimilation based on lexical conditions

The last research question concerns the degree of task effect in the production of stop-nasal sequence by L2 Korean speakers of English. The results are shown in figure 5. The left panel has results of the reading task, and the right panel has results from the listening task. In the reading task, compounds have a slightly higher tendency than simplex or phrasal conditions to undergo nasalization. Also, nasal assimilation of /tm/ was more frequent than that of /tm/ reading. In the listening task, the simplex heterorganic /tm/ sequence and the homorganic /tn/ sequence undergo nasal assimilation.

5. Discussion

The results show that participants did not transfer the

post-nasal assimilation in Korean when they produce the stop-nasal sequence of English. If post-lexical processes were easily transferrable in the production of L2, we would expect higher frequency of post-nasal assimilation. However, that is not what we found. A large number of participants (n = 61) rarely, if ever, produced tokens with nasal assimilation.

The underproduction of nasal assimilation did not mean that participants produced native-like pronunciation of stop-nasal sequence as shown in Figure 1. In addition to the post-nasal assimilation, Korean has a phonological process in which an oral stop in the coda position is unreleased (in English, these stops are released). The most frequent realization of stops in the stop-nasal sequence is unreleased, reflecting the L1 grammar of Korean.

The choice of unreleased stops over nasalization is not surprising. Unreleasing stops in the coda position is a transfer of Korean phonology, which is more faithful to the source in English (compared to nasalizing the stops). As such, the underproduction of nasalization is not a piece of evidence against a claim regarding post-lexical processes in general. Korean learners of English who participated in our study simply made a choice to be more faithful to the English source. They adopted another post-lexical process, namely the unreleasing of stops in the coda position. What Broselow (1987) proposed still holds in our data set.

The coronal oral stop /t/ showed varied realizations when produced as part of an oral-nasal sequence. In particular, the /t/ surfaced more faithfully with

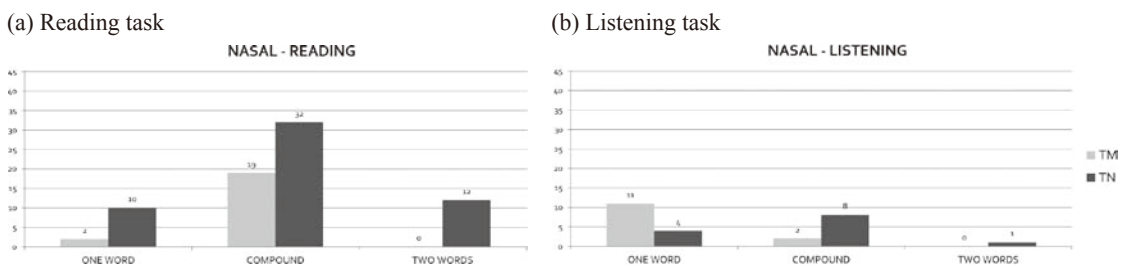


Figure 5 Nasal assimilation patterns based on (a) reading task vs. (b) listening task

release as an English [t] in the heterorganic /tm/ sequence than in the homorganic /tn/ sequence.

A slight task effect was observed concerning post-nasal assimilation. Although it was a very weak effect, nasal assimilation would occur more during the reading task than during the listening task. In the reading task, where participants had to rely on orthographic representation of stimuli, and needed to use their own knowledge of pronunciation, there was a slightly higher chance of nasal assimilation. Compound words tend to undergo nasal assimilation, and the homorganic /nt/ sequence is realized with more nasal assimilation than the heterorganic /tm/ sequence.

Of course, there are variables that the current study could not control for. Although most participants never received pronunciation education, learning English entails learning how to pronounce English words; especially how to pronounce them ‘correctly’. Such an exposure would have formed a phonological representation in the minds of the participants, which in turn would have inhibited the application of the post-nasal assimilation in the English production.

Moreover, participants could have been affected by how frequent a word is. They would not have been exposed to infrequent words, which means that the participants would have heavily relied on orthographic representation in order to spell out a word. Such a tendency would have resulted in the non-application of post-nasal assimilation.

The relatively high level of English might also be responsible for an infrequent transfer of post-nasal assimilation. Moreover, the experimental setting may have created an environment in which participants were more careful in producing the stimuli. We will leave it open for future studies as to whether the low frequency of post-nasal assimilation is due to an experimental setting or not.

Unlike our prediction, the post-nasal assimilation does not occur in the production of L1 Korean

speakers of English, and most of them were born and raised in Korea. Not nasalizing oral stops means that the oral stops are produced more faithfully to the English input. In the voicing and vowel insertion cases, however, the change would have been large enough for native speakers to misunderstand or not to understand Korean speakers of English. In other words, comprehensibility and intelligibility would have been affected in those two sub-categories.

Future studies should address the interaction of various post-lexical processes in pronunciation studies. Relying on global view of pronunciation, which is inherently multi-dimensional, will allow us to further understand how L1 transfer in L2 production ties with accuracy, intelligibility and comprehensibility in L2 pronunciation.

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Appendix 1: List of stimuli

- (1) Dorsal followed by a nasal
fake man, dogma, checkmark, locknut, oak nut, hackney
- (2) Coronal followed by a nasal
litmus, light meal, outmode, catnap, dot net, chutney
- (3) Labial followed by a nasal
topmost, chipmunk, trap mice, slipknot, hipness, hip name
- (4) Fillers
lifelike, pink heart, nice face, dollhouse, pavement, skateboard, chacma
slam door, hotbed, action, lose face, car parts, railroad, coolness

