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How Different are Learner Speech and Loanword Phonology?

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ABSTRACT

Do loanword properties emerge in the acquisition of a foreign language and if so, how? Classic studies in adult language learning assumed loanword properties that range from near-ceiling to near-chance level of appearance depending on speech proficiency. The present research argues that such variations reflect different phonological types, rather than speech proficiency. To investigate the difference between learner speech and loanword phonology, the current research analyzes the speech data from five different proficiency levels of 92 Korean speakers who read 19 pairs of English words and sentences that contained loanwords. The experimental method is primarily an acoustical one, by which the phonological cause in the loanwords (e.g., the insertion of [ɯ] at the end of the word *stamp*) would be attested to appear in learner speech, in comparison with native speech from 11 English speakers and 11 Korean speakers. The data investigated for the research are of segment deletion, insertion, substitution, and alternation in both learner speech and the native speech. The results indicate that learner speech does not present the loanword properties in many cases, but depends on the types of phonological causes. The relatively easy acquisition of target pronunciation is evidenced in the cases of segment deletion, insertion, substitution, and alternation, except when the loanword property involves the successful command of the target phonology such as the de-aspiration of [p] in *apple*. Such a case of difficult learning draws a sharp distinction from the cases of easy learning in the development of learner speech, particularly beyond the intermediate level of proficiency. Overall, learner speech departs from loanword phonology and develops toward the native speech value, depending on phonological contrasts in the native and foreign languages.

Keywords: English pronunciation by Korean learners, learner speech, loanword phonology, non-native speech, second language phonology, second language acquisition

1. Introduction[2)]

Learner speech shares with loanword phonology the fact that speakers are forced to resolve the phonological mismatches of phonemic inventory, syllable structure, and phonological alternation. In this sense, the phonological environment for loanword adaptation is identical to the environment for learner speech. Loanword phonology of insertion, deletion, and sound change, is described in the *Official Loanword Transcription Regulations* (1995, current edition),[3)] and the examples illustrated in it often show learner speech phenomena in literature (e.g., Kwon, 2005; Park & Kim, 2008; Bang, Kweon & Kim, 2009;

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3) A set of loanword transcription rules of English have been announced as the *Official Loanword Transcription Regulations* by the Korean government in March 1995. The official loanword transcription system for English was first recognized in 1986 and has since been revised several times before arriving at its present form.

Heo, Kim, & Kim, 2009; and Kim, 2009). It is not known yet, however, to what extent learner speech is similar to loanword phonology.

On the other hand, learner speech is different from loanwords in its phonological pursuit. Loanwords essentially obey the phonology of the speakers' native language (L1, henceforth) as Chung (2004) demonstrates, whereas learner speech attempts to obey the phonology of the speakers' second language (L2, henceforth). In fact, loanwords do not always obey the L1 native speech, as in the English loanword example to Korean *bus* [bʌsɯ] with an inserted vowel [ɯ], while the L1 Korean word /bʌs/ 'friend' is pronounced as [bʌt] with no the epenthesis but coda stopping.

However, yet unknown in literature is the extent learner speech is different from loanword phonology. Tak (2005) argued for the difference in the speech production of a coda stop in English by Korean learners in that a vowel is inserted more in loanword adaptation than in learner speech. Other previous studies also limited the research scope to a single kind of phonological environment, and most of them are sub-projects of this study to draw the current conclusion (Park & Kim, 2008; Bang et al., 2009; Heo et al., 2009; Kim, 2009). For the purpose of this study, the discussion limits the speakers' second language to adults', as the childhood L2 may contain the native level of phonological intuition (Lenneberg, 1967; Scovel, 1988).

To study the difference between learner speech and loanword phonology, the Korean language as L1 and the English language as L2 are good candidates for the following reasons. First, Korean and English are linguistically far different, as they belong to different language families (Indo-European *vs*. Altaic). Secondly, the two languages are phonologically far different in syllable structure and phoneme inventory that loanwords must incorporate. The difference in phonological structure is extensively discussed in the following section. Thirdly, English words are frequently imported into Korean language context in daily use, including the names of apartments and stores. Fourthly, the Korean language readily accepts both the phonetic and grammatical faces of an English lexical item in loanword adaptation, and its native speakers have robust intuitions on the proper way to adapt a word (Kenstowicz, 2005). This paper purports to ask, to what extent learner speech and loanword phonology are different in L1 Korean and L2 English.

To answer this question, we analyze various learner speech phenomena that involve either loanword phonology or target phonology in terms of insertion, deletion, and phonemic and allophonic substitution. If learner speech is different from loanword phonology, we expect learner speech observes less the loanword phonology and more the target phonology.

In relation to this, different studies in literature are broadly classified into three positions: 1) Learner speech obeys loanword phonology, but not target phonology, as in Fan (2004) and Kwon (2005); 2) learner speech is an intermediate form of loanword phonology and target speech, as in Han (2006) and Kim and Lee (2005); and, 3) learner speech obeys target phonology, but not loanword phonology, as in Kim (2005).[4] The positions differ by the task difficulty for the learners (e.g., Kim, 2005 *vs.* Kim & Lee, 2005), or by the speech elicitation methods (Kim & Lee, 2005 *vs.* Kwon, 2005). Figure 1 illustrates these three types of loanword phonology occurrences in learner speech.

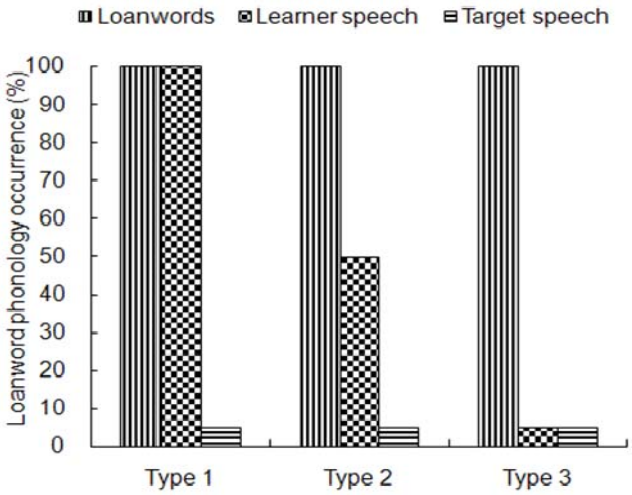


Figure 1. Types of learner speech in comparison with loanwords and target speech.

The three types in Figure 1 differ in learner speech value, while the loanword value is fixed at 100% and the target speech value

4) The study does not discuss loanwords, but compares the native and learner speech on stress assignment of noun compounds vs. noun phrases. Excluding this study, previous studies in learner speech assumed of loanword properties that range near-ceiling to near-chance level of appearance.

near zero. Learner speech may have some or all three types depending on the task complexity, or learner speech development. For instance, Type 1 may be illustrated by the acquisition of unaspirated stops after /s/, which is known to be difficult to learn (Kim & Flynn, 2004). Type 2 exemplifies the acquisition of the vowel reduction rule, which improves according to the increase of learner proficiency (Kim & Lee, 2005). Type 3 may be illustrated by the English stress placement rules that are readily learned by Korean speakers in a short-training period (Kim, 2005).

Studies in literature are mostly under the working assumption of Type 2 in that learner speech is an intermediate form of loanword phonology and target speech. Type 2 is susceptible to the developmental transition that learner speech is similar to loanword phonology in the earlier stage of learning, and develops toward target phonology at a later stage. Figure 2 broadly classifies the different types of relationship between learner speech and loanword phonology, while learner speech proficiency increases.

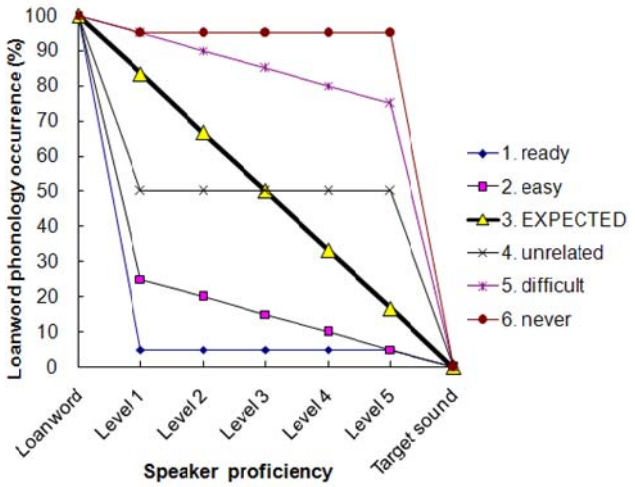


Figure 2. Types of phonological phenomenon in the learner speech of different proficiency levels that are compared to those in loanwords and target speech.

Each line in Figure 2 represents a different form of learner speech development with respect to the emergence of loanword properties, which explores the detailed realizations of Figure 1. Line 1, with diamond markers (◆), denotes that learner speech is ready for target speech sounds, being disjointed from loanword phonology. This line translates Type 3 in Figure 1, in which learner speech is different from loanword phonology and identical to target speech. Thus, this position negates that learner speech develops from loanword phonology to target phonology.

Line 2, with square markers (■), denotes that learner speech easily acquires the target phonology, and develops from the weakly-interfered to barely-interfered forms by loanword phonology as the learner proficiency increases.

Line 3, with triangle markers (△), denotes that learner speech develops as being closely related to loanword phonology, in which learner speech shows a moderate amount of loanword properties that decreases directly proportional to the learner proficiency. Thus, this position supports that learner speech develops from loanword phonology to target phonology. This line represents what is generally assumed in literature, and expected as the prototypical pattern in learner speech development.

Line 4, with X markers, denotes that learner speech develops distinctly from loanword phonology, in which learner speech shows a moderate amount of loanword properties with no developmental transitions. Thus, this position negates that learner speech develops from loanword phonology to target phonology.

Line 5, with asterisk markers (✳), denotes that learner speech shows difficulty of acquiring the target sound, and develops from the strongly-interfered to considerably-interfered forms by loanword phonology as the learner proficiency increases.

Line 6, with circle markers (●), denotes that the learner never acquires target phonology, and manifests loanword phonology at all times. This line translates Type 1 in Figure 1, in which learner speech is identical to loanword phonology and different from the target speech. This position would be taken if one assumes a strong version of critical period hypothesis in that learner speech sounds do not develop for adult learners (Lenneberg, 1967; Scovel, 1988). This position negates that learner speech develops from loanword phonology to target phonology.

To contrast loanword phonology with learner speech in accordance to the increase of speech proficiency, we investigate learner speech in a large-scale cross-sectional study. A cross-sectional study eliminates variables of time and space: all learners of varied speech proficiency are tested at the same time block of a day, at the same location. This method is free from the subjective variables that a longitudinal method risks, such as different amount of study time, different level of teacher-learner interaction, different intelligence levels, and different study methods.

A sufficient amount of data is needed in any L2 studies, since learner speech shows a greater range of variation than native

speech due to disfluency. Unlike native speech, learner speech constantly deals with the phonological mismatches between the native and the target languages; and the difficulties resulting from these mismatches are real to cause pronunciation variation and lack of intelligibility (Jenkins, 2000; Yavaş, 2006). Our study involves a large scale consisting of 114 speakers that include 22 native speakers of the two languages (English, Korean), and 92 learners classified into five proficiency levels. We investigate in our data whether learner speech gradually departs from loanword phonology, and assimilates to target phonology.

To our knowledge, the acoustic quantification of learner speech development in relation to various types of loanword phonology is first attempted in this study, in a large-scale data, by a cross-sectional method. Variations are limited in this cross-sectional study with respect to time and space. All learners were tested at the same time in the same location, so as not to be allowed different kinds of study intervention among the learner participants. In order to cover comprehensive phenomena of both learner speech and loanword phonology, four background experiments have been conducted by the author on the differences between learner speech and loanword phonology in L1 Korean and L2 English; 1) for L1 and L2 vowel phenomena in Park and Kim (2008), 2) for new L2 phonemes by Bang et al. (2009), 3) for insertion and deletion in L2 by Kim (2009), and 4) for L1 and L2 rule interaction by Heo et al. (2009). The following sections combine all these background experiments toward a comprehensive conclusion by means of an acoustic phonetic study.

The remainder of this paper is organized as follows. Section 2 outlines structural factors in learner speech and loanword phonology. Section 3 describes methods of phonetic quantification. Section 4 reports the results. Then, Section 5 discusses how different learner speech and loanword phonology are in the light of the large-scale phonetic experiment.

2. Structural factors of learner speech and loanword phonology

Both learner speech and loanword phonology must deal with mismatches between the target and native language. We outline the three common types of the mismatches that are represented from 1) the lack of the target sound in the native language, 2) the different phonological alternations in native and target language, and 3) the different syllable structure with respect to the number and quality of segments.

2.1 Missing target sounds

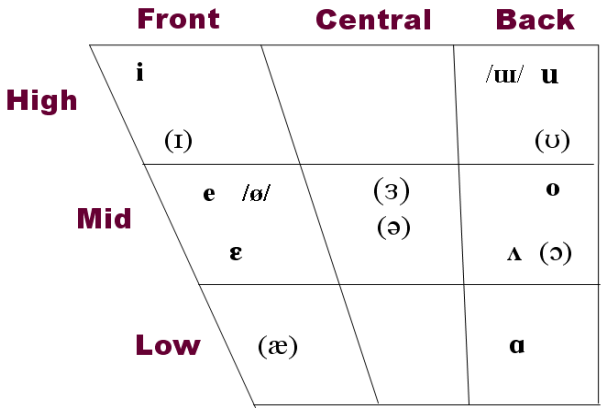
To discuss the first type of mismatch, i.e, missing target phonemes, we overlay the L1 phonemic inventory over the target English inventory. The following charts summarizes the comparison of the consonant systems in Table 1 and vowel systems in Table 2. The inventories of the two languages referred to Kim (1986: 99-108) for Korean, and Ladefoged (2006: 43-44) for English.

Table 1. Comparison of the consonant systems between L1 Korean and L2 English.

Place / Manner	Bi-labial	Labio-dental	Dental	Alveo-lar	Alveo-palatal	Palatal	Velar	Glottal
Stop	/p^h/ p' p [b]			/t^h/, t' t [d]			/k^h/, k' k [g]	
Affricate					/ʧ^h/, ʧ' ʧ [ʤ]			
Fricative		(f) (v)	(θ) (ð)	s' s (z)	[ʃ] (ʒ)			h
Nasal	m			n				
Approxi-mant				l [r]		j	w	

Note: Symbolizations used are: ( ) for missing target phoneme in L1, [ ] for sound existing only as an allophone of another phoneme in L1, / / for sound existing only as an allophone of another phoneme in L2. The tense obstruents, p', t', k', ʧ', s', are the L1 phonemes that do not exist in L2.

Table 2. Comparison of the vowel systems between L1 Korean and L2 English.



Note: Vowels in parenthesis ( ) are missing target phonemes in L1. The vowels, /ø/ and /ɯ/, are the L1 phonemes that do not exist in L2.

Tables 1 and 2 are the inventory of the L1 (Korean) that depicts the missing L2 English phonemes or allophones. Accordingly, these L2 sounds will be problematic for Korean speakers who either loan the embedding English words into Korean speech, i.e., loanwords, or learn them in English speech context, i.e., learner speech. The missing L2 phonemes are parenthesized in Tables 1 and 2, as in (f) (v) (θ) (ð) (z) (ʒ) (I) (æ) (ɜ) (ə) (ɔ) (ʊ), and are replaced both in loanwords and learner speech by the closest sounds that are available in the native inventory: [p], [b], [s], [d], [ʧ], [ʤ], [i], [ɛ], [ʌ], [ʌ], [o], [u], respectively. Of these, this paper discusses the sample cases of [f], [æ], [ə] in L2 to compare their adaptation in L1 loanwords and acquisition in L2 learner speech. The phonemic contrasts in English for /f - p/, / æ – ɛ/ and / ə - ʌ / are chosen, since these pairs may cause different degrees of difficulty for Korean speakers. The pairs include both consonants and vowels, as well as the feature distinction of [±tense] for the vowel pair / ə - ʌ / that is not present in Korean phonology.

2.2 Different phonological alternations

The second type of mismatch involves different phonological alternations from L1 or L2 allophones that show complementary distribution in their phonetic environment. Table 1 presents L1 allophones in brackets that have phonemic status in L2 (English). These L1 allophones are [b] [d] [g] [ʧ] [ʃ], and [ɾ]. L1 allophonic rules play a role both in loanwords and learner speech to cause insertion, deletion, or replacement to meet the distributional requirement of the allophone. For instance, the English word *bed* is adapted into Korean loanword [pedɯ] with the sound replacement by [p] and insertion of [ɯ]. This sound form [pedɯ] is also the typical form of non-native accented pronounciation in learner speech (Park & Kim, 2008).

In contrast, L2 allophones with L1 phonemic status are enclosed in slashes in Table 1, as in /p^h/, /t^h/, /k^h/, and /$ʧ^h$/. The application of L2 allophonic rules does not occur in loanword. For instance, the English words, *ski* [ski] and *apple* [æpl̩] with unaspirated stops are adapted into Korean loanwords [sɯk^hi] and [ɛp^hɯl] with aspirated stops. According to the English allophonic distribution of stops, these stops are unaspirated after the onset [s] as in [sk=i], but not [sk^{h}i], or in an onset of an unstressed syllable as in [ɛp=l̩], but not [æp^hl̩].

In addition to the allophonic alternations, there are phonemic alternations that may constrain the distributional properties of both L1 phonemes and L2 phonemes. For instance, the English words, *only* [onli] and *Batman* [bætmən], are adapted into the Korean loanwords [onni] or [olli] for *only* and [pɛtɯmɛn] or [pɛnmɛn] for *Batman*. These sound forms [onni, olli, pɛtɯmɛn, pɛnmɛn] are also the typical forms of non-native accented pronounciation in learner speech. According to L1 phonological rule, a nasal consonant adjacent to a liquid is assimilated to liquid, as in the Korean word /ʧʌnli/ ‘thousand li-s’ that is pronounced as [ʧʌlli]. In addition, an oral stop followed by a nasal stop is nasalized as in the Korean word /patmɛki/ ‘weeding a dry field’ that is pronounced as [panmɛgi].

To illustrate the second types of the mismatches, i.e, different phonological alternations, this paper discusses 1) the L1 allophonic rule of [r]/[l] alternation with L2 phonemic status, 2) the L2 allophonic rule of aspiration with L1 phonemic status, and 3) the L1 phonemic rules of sonorant assimilation that also bring L2 phonemic changes, as in [ll] for *only* and [nm] for *Batman*. We illustrate the English words *light*, *screen*, and *only*, that are pronounced by Korean speakers with the variants, [ɾaɪt^{h}ɯ], [sɯk^{h}ɯɾin], and [olli] when adapted in loanwords and learner speech. These words are chosen, because they cover all the different types of phonological alternations that are outlined above.

2.3 Different syllable structures

The third type of mismatch concerns the different syllabic structures of L1 and L2. A Korean syllable allows only one onset and one coda consonant, while an English syllable allows triple onsets as in *spring* [sprɪŋ] and quadruple codas as in *texts* [tɛksts]. These English words are adapted into the Korean loanword [sɯpɯɾɪŋ] and [tɛksɯtsɯ] with the inserted vowel [ɯ]. These sound forms [sɯpɯɾɪŋ,tɛksɯtsɯ] are also the typical form of non-native accented pronounciation in learner speech.

While the different number of consonants within a syllable is certainly problematic in loanwords and learner speech, what makes the matter worse is the phonotactic disparities assoiciated with the syllable structures. A Korean syllable limits the nature of a possible coda to only seven phonemes: [p, t, k, m, n, ŋ, l]. To make a sharp contrast, an English syllable liberates the nature of a possible coda to allow all consonants, other than [h]. For instance, the English

words, *bus* [bʌs] and *car* [kɑr], are adapted into Korean loanword [pʌsɯ] with an inserted vowel [ɯ], and [k^hɑ] with a deleted consonant [r]. These sound forms [pʌsɯ, k^hɑ] are also the typical form of non-native accented pronounciation in learner speech.

To illustrate the third types of the mismatches by different syllabic structures, this paper discusses, 1) the complex onsets [dr, pl, tl, st, skr, spl] and the complex codas [mp, nt, kt, st], and 2) the unpermissable onset [l] and coda [r]. The syllables with these segments are chosen to cover both simple and complex onsets and codas in L2 syllable structures that are not permissible in L1 syllable structures.

The following section describes the methods of phonetic quantification for these phonological mismatches that both loanwords and learner speech must resolve.

3. Method

In order to accomplish our objective, we administered a phonetic experiment that comprises three sub-experiments on native and learner speech in cross-sectional studies. The three sub-experiments encompass: 1) Korean native speech of English loanwords in the Korean context, 2) English native speech of English loanwords in the English context, 3) Korean learner speech of English loanwords in the English context by a cross-sectional study. Each sub-experiment used different sets of speech materials, participants, and data acquisition steps.

3.1 Speech materials

Three types of speech materials and the recording lists were used: 1) recorded L1 Korean speech materials of English loanwords to Korean in Korean context, 2) recorded L1 and L2 English speech materials of English loanwords to Korean in English context, and 3) listening test materials in English for Korean learners to serve as co-variance reference to the development in speech production.[5)]

The TOEIC listening tests were used as a standardized test to tell apart the proficiency levels for English listening comprehensibility. We then putatively used the scaling of score intervals in the *TOEIC Can-Do Guide* (ETS, 2000) as a co-variance unit for our analysis.[6)] According to the *TOEIC Can-Do Guide*, different ranks are assigned as a valid indication of English language proficiency of speaking to the listening comprehension score on a scale ranging from 5 to 495 points: 1) 5-100, 2) 105-225, 3) 230-350, 4) 355-425, and 5) 430-495. We take the TOEIC listening score as the co-variance unit, following the developmental effect that the more proficient the learner is, the more target-like the perception of the target sound is for the listener. The validity of the co-variance has been claimed by Powers, Kim & Weng (2008) for the redesigned TOEIC test, and will later be confirmed for the previous version used in this study by the correlation between the error rates in learner speech and the ranks in the listening score intervals.

For recorded speech materials, native and learner participants read words in isolation, and those embedded in English or Korean contexts. Table 3 is the recording list, in which the segments in question are underlined and filled with the International Phonetic Alphabet (IPA) symbols in Tables 1 and 2 (See also: Lee, 1999). The phonetic transcription represents the pronunciation of English loanwords by Korean speakers. The loanword form follows the government publication of the *Official Loanword Transcription Regulations* (1995, current edition) and the *Collection of Loanword Notations* (2007, current edition). The Korean contexts that embed the loanwords are romanized for readability, according to the *Official Romanization System* (2000, current edition) of Korean; while they are not transcribed by the IPA, as their phonetic contents are irrelevant for our discussion.

Words in Table 3 are subject to the various loanword phonology of insertion, deletion, and substitution of phonemes and allophones. The words are not symmetrically paired or distributed, due to the difficulty of finding real words that meet

5) Bradlow, Pisoni, Akahane-Yamada and Tohkura (1997) report that there is a close correlation between perception and production of speech sounds.

6) This edition of the *Can-do Guide* fits our learner speech data, as we used a previous version of the TOEIC listening test using the General American English. The next edition was published on 2009 to reflect the recent modification in the TOEIC questions to contain different English accents around the world.

the varied phonetic specification. When eliciting the speech of learners using the list in Table 3, we randomized the words among themselves, and the sentences among those with the similar syllable numbers. English words were presented in the English alphabet, while Korean words in the Korean alphabet.

Table 3. Recording list to elicit learner speech, loanwords, and L1 English. Learners and native speakers of English read the English words and sentences in Columns I and III in English alphabet, while Korean native speakers read the loanwords and Korean sentences in Columns II and IV in Korean alphabet. The lists were randomized and presented in plain texts with no underlines and pronunciation symbols.

Loanword phonology	I. English word	II. Loanwords in Korean	III. English word embedded in English sentence context	IV. Loanwords embedded in Korean sentence context
(a) Deletion of coda /r/	1. stai**r**	1. stai[ ]	1. The**r**e was no confirmation about the policy.	1. taieo[ ]e gumeongnasseo. (The ***tire*** is flat.)
(b) Insertion for coda cluster	1. stam**p** 2. violen**t** 3. ac**t**	1. stam**p**[ɯ] 2. violen**t**[ɯ] 3. ac**t**[ɯ]	1. How did you pain**t**[ɯ] this wall? 2. I played tennis las**t**[ɯ] week.	1. pein**t**[ɯ] chil da haenni? (Did you finish ***painting***?) 2. ibeoni laseu**t**[ɯ] geimiya. (This is the ***last*** game.)
(c) Insertion for onset cluster	1. **d**ry 2. a**pp**ly 3. a**pp**lication	1. **d**[ɯ]ry 2. a**pp**[ɯ]ly 3. a**pp**[ɯ]lication	1. I'll **d**[ɯ]rink this wine. 2. He a**pp**[ɯ]lied for the position. 3. Fill in the a**pp**[ɯ]lication form.	1. igeoseun **d**[ɯ]rinkeuimnida. (This is a soft ***drink***.) 2. naneun geu hoesae eo**p**[ɯ]lai haetta. (I ***applied*** for the company.) 3. miguk daehage eo**p**[ɯ]likeisyeoneul bonaeryeogo hamnida. (I want to send the ***application*** for a university in the US.)
(d) Insertion by spelling	1. bus**i**ness	1. bus**[i]**ness	1. Tell me about your bus**[i]**ness.	1. geuui bi**s[i]**niseu suwaneun jota. (His ability for ***business*** is good.)
(e) L1 vowel phoneme	1. **a**dd 2. **a**dditional	1. [ɛ]dd 2. [ʌ]dditional	1. I **a**dded one more figure to my paper. [ɛ] 2. I need an **a**dditional remark. [ʌ]	1. eoje **ae**peul keompyuteoreul sasseo. (I bought an ***apple*** computer yesterday.) 2. naneun geu hoesae **eo**peulai haetta. (I ***applied*** for the company.)
(f) L1 consonant phoneme	1. de**f**ine	1. de[p^h]ine	1. I can't **f**ind the place. [p^h] 2. We are going to de**f**ine the principles of physics. [p^h]	1. **p**eoseuteu keulaessue anjatseo. (I sat in the ***first*** class.) 2. na oneul geunmuneun o**p**uya. (I am ***off*** today.)
(g) L1 phoneme by spelling	1. atmos**ph**ere	1. atmos[p^h]ere	1. We are going to define the principles of **ph**ysics. [p^h]	1. **p**onbaengking hasinayo? (Do you use ***phone***-banking?)
(h) Interference by L1 rule of phonemic alternation	1. o**nl**y	1. o[nn]y, o[ll]y	1. We like i**nl**ine skates. [nn / ll]	1. geuneun i**nl**aine seukeiteu seonsuya. (He is an ***in-line skate*** player.)
(i) Interference by L1 rule of allophonic alternation	1. **l**ight	1. [r]ight	1. Where do you **l**ive in Korea? [r]	1. Eoje "**r**oseuteu" bwanni? (Did you see the movie "***lost***" yesterday?)
(j) Lack of L2 rule of allophonic alternation	1. a**pp**le 2. a**pp**lication 3. s**c**reen 4. s**p**lendid 5. s**t**yle	1. a[p^h]le 2. a[p^h]lication 3. s[k^h]reen 4. s[p^h]lendid 5. s[t^h]yle	1. I have four a**pp**les. [p^h] 2. Fill in the a**pp**lication form. [p^h] 3. I s**c**reamed at him. [k^h] 4. How s**p**lendid the idea was. [p^h] 5. I s**t**ared at her. [t^h]	1. eoje ae**p**[^{h}]eul keompyuteoreul sasseo. (I bought an ***apple*** computer yesterday.) 2. miguk daehage eo**p**[^{h}]likeisyeoneul bonaeryeogo hamnida. (I want to send the ***application*** for a university in US.) 3. yeonghwa "seu**k**[^{h}]eurim" gaebonghaettae. (The movie "***scream***" was released.) 4. jeo seu**p**[^{h}]ikeoneun soriga neomu keo. (The ***speaker*** is too loud.) 5. cheot seu**t**[^{h}]ateuga kkwae jokhuna. (You have a good ***start***.)

3.2 Speakers

Research participants consisted of 11 Korean native speakers who read English loanwords in Korean context, 11 native speakers of American English, and 92 Korean learners of English who read the English loanwords to Korean in English context. All native speakers of English spoke the General American English, while all the Korean speakers including learners spoke Standard South Korean as their native language. All speakers were college educated, in the age range of 18-27.

The learner's English proficiency levels varied with respect to the scale of five ranks in accordance to the listening score in TOEIC. The learner participants in this cross-sectional project belong to all five ranks, ranging from 65-465 points: 5 speakers in rank 1, 27 in rank 2, 23 in rank 3, 15 in rank 4, and 22 in rank 5. The number of test takers in each of the five score intervals varied, as there were very few test takers in the lowest score range and the results in percentage are not stable with any fewer test takers. We thus included all the students in the designated class, unless the individual grew up in an English speaking country for more than a year.

3.3 Data elicitation

The data elicitation procedure varied for all three sub-experiments. For the first sub-experiment, where we acquired Korean native speech of loanwords from English, we used the following three stages of eliciting the read speech. At the first stage, the Korean native speaker participants were given the English word list in English alphabet, and asked to transcribe the words into Korean alphabet. The transcription was done for the words in isolation. At the next stage, the speakers were given the Korean sentence list, where the loanwords from English are embedded, hidden in the empty blanks. The speakers are then asked to fill in the blanks by copying down their own previously transcribed loanwords from English in the Korean alphabet. At the last stage, the speakers were asked to read the completed Korean scripts for the words in isolation from the first stage and for the embedding sentences from the second stage. The typical transcription forms are given in the columns II and IV of Table 3.

For the second sub-experiment, where we acquired English native speech for the original English form of the loanwords in English context, the native speakers of American English underwent only one stage of the recording the production stimuli. They were asked to read twice the recording list in columns I and III of Table 3, without any training session. All of the native English speakers have acknowledged that they understood the meanings of all words and sentences in the recording list. Among the two recordings that each speaker read, the second-time recording was mostly taken for the data, while the first time recording was occasionally taken to replace a weak, noisy, or unnatural speech signal in the second-time recording. The second time recording is primarily taken for data, because it is usually read more fluently than the first one, due to the increased familiarity of the material to the speaker.

For the third sub-experiment, where we acquired learner speech of the loanwords from English in the English context of the cross-sectional study, learners took listening and speaking tests after a brief listen-and-repeat practice of the recording stimuli. For the listening comprehension test, the learners took the TOEIC listening test. For the production test, the learners listened to and repeated after the model native English for one time. Then, they were asked to go to one of the recording rooms to read and record the production list in columns I and III in Table 3. All recordings were completed within a day. The acquired speech data for this sub-experiment were labeled as the learner data.

3.4 Analysis

We measured the acoustic features that are relevant to the contrasting phonetic features for the segments as outlined in Table 3. We illustrate an erroneous production of learner speech in Figure 3.

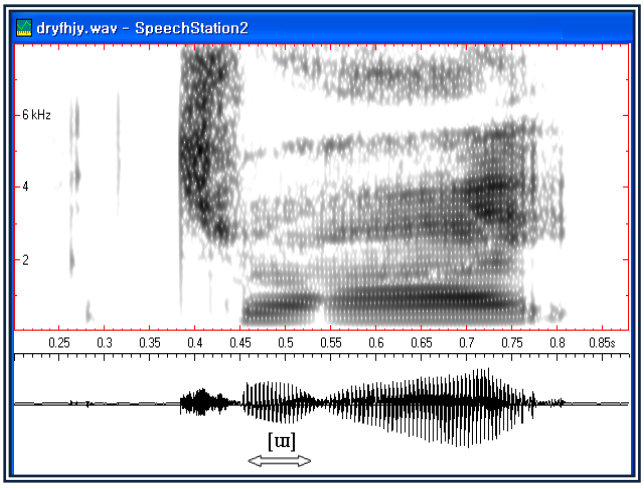


Figure 3. Insertion of a vowel [ɯ] between the consonant [d] and [ɾ] in the word *dry* spoken by a female learner.

Figure 3 illustrates a spectrogram of an erroneous production of English by a Korean learner before instruction. The English word *dry* in this learner speech is realized with an epenthetic vowel

between the stop consonant [d] and a flap [ɾ]. We determine vowel epenthesis by the characteristic spectral pattern of vowel formants and intensity level with periodic cycles, in particular, the presence of F1 and F2 on the spectrogram.

In comparison, Figure 4 illustrates a spectrogram of a correct production of the same English word by another Korean learner.

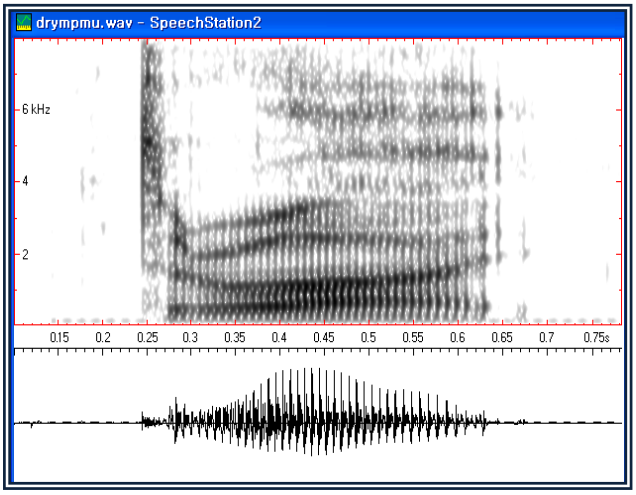


Figure 4. No insertion of a vowel between the consonant [d] and [ɹ] in the word *dry* spoken by a male learner.

In Figure 4, the English word *dry* is realized without an epenthetic vowel. The segment [d] with the burst is immediately followed by the characteristic pattern of retroflex approximant [ɹ], which is then followed by the diphthong [aɪ].

For analysis, we compared learner speech with native speech. To maintain consistency in measurements, we followed the details of the measurement manual that specified the boundary location on the waveform. When encountered with less clear cases of acoustic features, we used the additional means of the perceptual judgment by research assistants and native speakers of English, while all speech samples were cross-checked with the acoustical judgments by pairs of research assistants for quality control purposes. A total of 127 speech data with less clear acoustic features have been cross-checked with the perceptual judgment by a native speaker of American English, who is phonetically trained at a graduate school. The author was always present when eliciting the English native speaker judgment, in order to ensure that the judgment is precisely made upon the discrimination of the given sound quality. We counted only the expected errors that show the relevant loanword properties and L2 speech sounds in question.

4. Results

A total of 4,332 word data were acquired from the recorded corpus of native and learner speech in the word-level and sentence level production by 92 Korean learners of English and 11 Korean and 11 English native speakers (4,332 data = 19 words × 2 levels for word and sentence × (92 Korean learners of English + 11 English native speakers for English speech + 11 Korean native speakers for Korean speech)). We discarded 20 samples due to bad recordings. We present first the full view on item-by-item results of the analysis, and then the comparative results to compare learner speech and loanword phonology.

4.1 Item by item results: learner speech *vs.* loanwords

Tables 4 and 5 show the analyses of variance and correlations between each loanword phonology phenomenon and the speech proficiency levels as defined by (a) loanwords in Korean native speech, (b) Korean learner speech in five proficiency levels, and (c) English native speech. To allow a better indication of the speech proficiency level of speakers to each loanword phonology phenomena, we have presented item-by-item results, ordered by the degree of difficulty of each type of loanword phonology, in Table 4 for word-level production, and Table 5 for sentence-level production. The percentages shown are the proportions of speakers at each level of speech proficiency whose speech data showed the expected loanword phonology phenomenon in various English words that are adapted to the Korean language. As noted earlier, the learners' level of proficiency is in accordance with the listening score range in the *TOEIC Can-do Guide* (2000). Table entries are shaded in various colors according to magnitude, in order to enable the reader to see at a glance the overall pattern of results. The mean shown for each word item is the average numbers in percentages that learner speech data show the expected loanword phonology phenomenon.

Table 4. Percentages of speakers, by speech proficiency level, whose *word-level speech* show loanword phonology in various English words that are adapted to Korean.

Loanword phonology type	Loanword list	L1 Loan word	L2 Level 1: TOEIC 5-100	L2 Level 2: TOEIC 105-225	L2 Level 3: TOEIC 230-250	L2 Level 4: TOEIC 355-425	L2 Level 5: TOEIC 430-495	L1 English	L2 Mean	L2 Corr. with TOEIC range	*t*-test (Loan, L2 level 3)
Ins&Del	stam**p**[ɯ]	100	20	7	4	7	0	0	5.6	.76	.001***
Ins&Del	violen**t**[ɯ]	100	20	4	4	7	0	9	4.5	.76	.001***
Ins&Del	ac**t**[ɯ]	100	40	11	4	0	0	0	6.5	.86	.001***
Deletion	stai[**r**]	60	40	23	5	0	0	9	10.0	.93	.013*
Insertion	**d**[ɯ]ry	91	60	22	9	7	5	9	14.1	.86	.001***
Insertion	a**pp**[ɯ]ly	64	20	22	26	20	9	9	19.6	.60	.277
Insertion	a**pp**[ɯ]lication	82	100	30	35	33	27	0	34.8	.73	.016*
Spell_Insertion	bus[ɪ]ness	100	100	85	74	80	76	0	80.2	.81	.341
L1_consonant	de**f**ine [p]	100	20	19	9	7	5	0	11.1	.95	.001***
L1_vowel	**a**dd [ɛ]	100	40	38	23	20	10	0	24.7	.97	.001***
L1_vowel	**a**dditional [ʌ]	100	100	81	83	87	71	0	81.1	.78	.588
Spell_L1cons	atmos**ph**ere [p]	91	80	65	60	60	43	0	61.6	.94	.598
L1_allophone	**l**ight [r]	91	60	27	30	27	19	0	27.2	.82	.277
L1_rule	o**nl**y [nn / ll]	82	80	64	43	33	29	9	47.8	.97	.192
L2_allophone	s**p**lendid [p^h]	64	60	60	52	47	24	0	45.7	.91	.588
L2_allophone	s**t**yle [t^h]	73	60	50	43	40	19	0	39.1	.96	.676
L2_allophone	s**c**reen [k^h]	82	80	77	87	67	57	0	71.7	.75	.341
L2_allophone	a**pp**le [p^h]	73	100	88	78	79	62	9	76.1	.96	1.000
L2_allophone	a**pp**lication [p^h]	82	100	81	78	67	62	0	72.8	.97	.341
	N of speakers	11	5	27	23	15	22	11			

Table 5. Percentages of speakers, by speech proficiency level, whose *sentence-level speech* show loanword phonology in various English words that are adapted to Korean.

Loanword phonology type	Loanword list	L1 Loan word	L2 Level 1: TOEIC 5-100	L2 Level 2: TOEIC 105-225	L2 Level 3: TOEIC 230-250	L2 Level 4: TOEIC 355-425	L2 Level 5: TOEIC 430-495	L1 English	L2 Mean	L2 Corr. with TOEIC range	*t*-test (loan, L2 level 3)
Ins&Del	las**t**[ɯ]	91	40	7	0	0	0	9	4.3	.79	.001***
Ins&Del	pain**t**[ɯ]	100	45	12	4	7	10	0	10.0	.71	.001***
Deletion	the[**r**]e	100	20	11	13	7	0	9	8.7	.94	.001***
Insertion	**d**[ɯ]rink	100	40	33	26	20	14	0	25.0	1.00	.001***
Insertion	a**pp**[ɯ]lied	82	40	30	30	27	27	0	28.3	86	.025*
Insertion	a**pp**[ɯ]lication	82	60	48	61	67	50	9	55.4	.02	1.000
Spell_Insertion	bus[ɪ]ness	91	80	63	52	60	55	0	58.7	.77	.104
L1_consonant	**f**ind [p]	91	20	8	4	7	5	0	6.7	.76	.001***
L1_consonant	de**f**ine [p]	100	20	12	13	13	10	0	12.2	.79	.001***
L1_vowel	**a**dd [ɛ]	100	60	27	17	13	5	0	18.9	.92	.006**
L1_vowel	**a**dditional [ʌ]	100	100	88	83	80	71	0	82.2	.98	.001***
Spell_L1cons	**ph**ysics [p]	100	40	38	39	40	38	0	38.9	.32	.391
L1_allophone	**l**ive [r]	100	20	12	13	13	10	0	12.2	.78	.001***
vL1_rule	i**nl**ine [nn / ll]	82	100	63	33	20	19	9	33.3	.94	.167
L2_allophone	s**p**lendid [p^h]	100	40	56	39	40	33	0	42.9	.55	.038*
L2_allophone	s**t**are [t^h]	100	40	52	61	60	43	0	52.7	(.23)	.588
L2_allophone	s**c**ream [k^h]	91	100	81	83	79	71	0	80.0	.89	.341
L2_allophone	a**pp**le [p^h]	100	80	63	86	54	38	0	62.5	.76	.167
L2_allophone	a**pp**lication [p^h]	100	80	70	36	38	35	0	49.4	.90	.104
	N of speakers	11	5	27	23	15	22	11			

Note: Table entries for learner speech have been shaded to indicate their magnitude as shown in the key below. Ns are 4,312. ***p<.001, **p<.01, *p<.05

100-80	79-60	59-40	39-20	19-0

As can be seen in Tables 4 and 5, the correlations between each loanword phonology phenomena to the TOEIC score range are high. The correlations range from .60 to .97 with a mean of .87 for word-level production. The correlations for sentence level production are lower, but the value depends on the types of phonological phenomena. High values are shown in acquiring a new phoneme that is not present in the native language, as exemplified in the tables: **f**ind [p]**,** de**f**ine [p]**, a**dd [ɛ]**, a**ddition [ʌ]**,** and **ph**ysics [p]. The results suggest the discriminate validity of the TOEIC scores. Let us then refer to the TOEIC score range levels by the relative degree terms of speech proficiency: *low* for level 1, *lower-intermediate* for level 2, *mid-intermediate* for level 3, *upper-intermediate* for level 4, and *high* for level 5. The results in turn support that learner speech develops from loanword phonology to the target phonology.

In addition, the *t*-test results in Tables 4 and 5 (right-most column) show that learner speech of intermediate level significantly differs from the loanwords depending on the types of phonological phenomena, as marked by asterisks (∗). The segmental insertion and deletion are the cases. The *t*-test results of all word pairs for loanwords and learner speech at the intermediate level showed significant difference at the 95% confidence level for both the sentence level production (p<.001), and the word level production (p<.001). The results, therefore, do not support that learner speech is similar to loanword phonology.

4.2 Comparative results: learner speech *vs.* loanword phonology

In Figure 5, the mean values of the different types of speech are shown in terms of each loanword phonology type, ordered by the percentage of loanword properties that emerge in learner speech. For all cases, the values significantly decrease in the order of loanwords (vertical marks), learner speech (check marks), and native speech (horizontal marks).

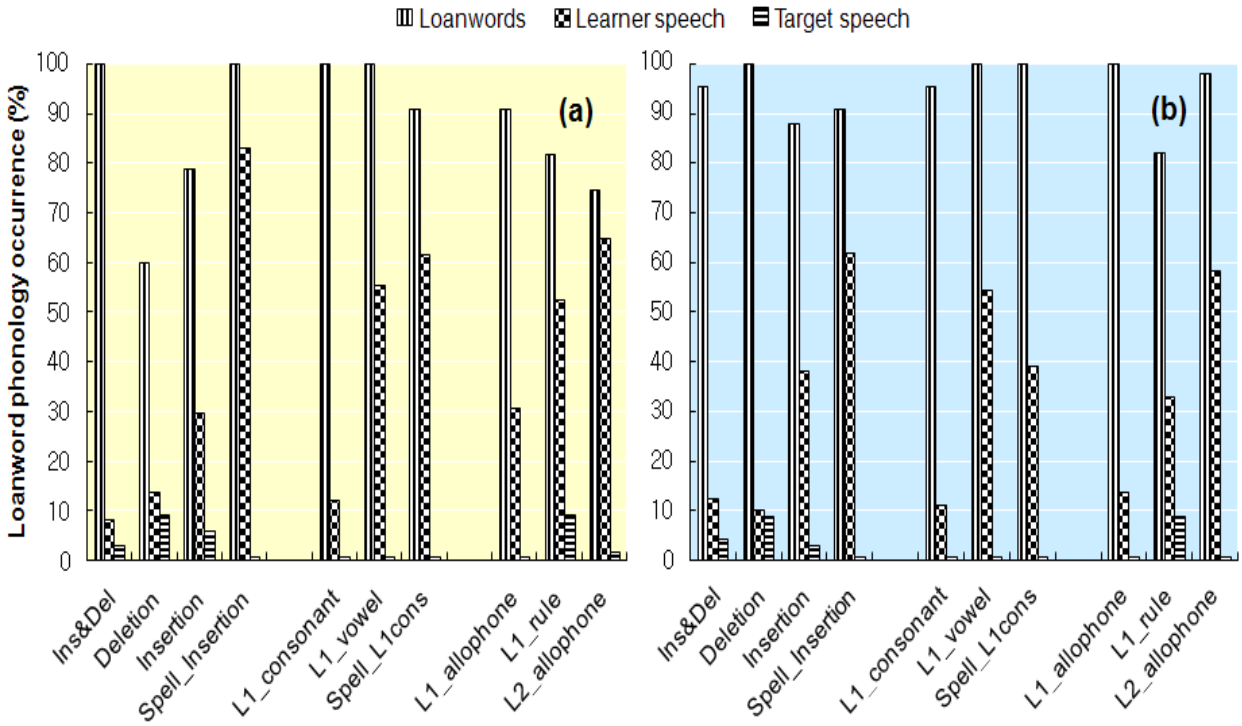


Figure 5. Types of phonological phenomena in L2 English by Korean speakers that are compared to those in loanwords and target speech for (a) word level and (b) sentence level (right) production. The values significantly decrease in the order of loanwords, learner speech, and native speech (Loanword phonology occurrence(%) = 86>35>3 in word-level production, 95>36>2 in sentence level production; n=4,312, p<.001 from ANOVA for both levels).

The pattern in Figure 5 indicate that the correct form of the relationship between learner speech and loanword phonology is Type 2 in Figure 1 that represents learner speech being intermediate between loanwords and the target speech. Our result in turn demonstrates that learner speech departs from loanword phonology depending on the phonological types. The phonological types compared in Figure 5 are deletion, insertion, phonemic substitution of consonants and vowels, allophonic and

phonemic rules of L1 and L2. Spelling influence deserves attention as it marks distinctive pattern to the comparable phonology.

The first set in Figure 5 demonstrates how different the segmental deletion and insertion are in learner speech and loanwords. Learner speech rarely deletes and largely inserts segments, while loanwords sharply delete and insert segments upon the mismatch of the syllable structures. For example, deletion of coda [r] does not occur as often as insertion of vowels in coda clusters in learner speech, unlike in loanwords, where both occur extensively especially in Korean sentence context. However, spelling mismatches of segmental presence do interfere strongly the assimilation rate of learner speech to the target speech, in the same way they affect the loanwords (Oh, 2005; An, 2008). The word 'bus[i]ness' was pronounced with the inserted [i] in both learner speech and loanwords.

The second set in Figure 5 demonstrates how different the phonemic substitution of consonants and vowels are in learner speech and loanwords. Learner speech substitutes less of the consonantal phonemes than the vowel phonemes, although loanwords do not distinguish them. For example, substitution of the consonant [f] with [p] does not occur as often as the substitution of the vowel [æ] with [ɛ] in learner speech, unlike in loanwords, where both occur indistinctively. However, spelling mismatches of phonemes do interfere strongly the assimilation rate of learner speech to the target speech, in the same way they affect the loanwords. The substitution of [f] with [p] occurs much more frequently in the word 'atmos[ph]ere' than in the words '[f]ind' or 'de[f]ine'.

The third set in Figure 5 demonstrates how different the allophonic and phonemic rules of L1 and L2 are in learner speech and loanwords. As for the phonological alternations of L1 and L2, learner speech departs from L1 phonology faster than it applies L2 phonology. In contrast, loanwords manifest L1 allophonic rules, and ignore L2 allophonic rules, as expected. For example, learner speech, but not loanwords, resists faster the L1 allophonic rule of replacing [r] to [l] in a syllable onset position, but applies slower the L2 allophonic rule of placing unaspirated [p=] after /s/ in a syllable onset position or in an unstressed syllable onset position. The result is drawn from these particular types of L1 and L2 rules, as the figure shows that the phonemic assimilation rule of sonorants in L1 Korean manifests higher percentage of loanword property. For another type of L2 rule of English spoken by Korean learners, Park & Kim (2008) reports more successful command of the vowel lengthening before voiced coda in English.

It is important to note in Figure 5, the order of different phonological types in accordance to the percentage of loanword properties: the higher the percentage is, the more difficult the phonological type is for learners to learn. Specifically, Figure 5 shows that 1) insertion is preferred to deletion in L2 speech, 2) a new vowel phoneme is more difficult to acquire than a new consonant phoneme, and 3) acquisition of an L2 allophone is more difficult than resistance to an L1 allophone. Spelling mismatch to pronunciation renders significantly (p<.001 for word-level production; p<.001 for sentence-level production) more difficult learning of the embedded words than the words without such mismatches. These results on occurrence rate difference can be used for language learning: 1) testing speech proficiency, and 2) designing the syllabus or course content.

One more interesting pattern is observed in Figure 5 about the rate differences between word-level production and sentence-level production. Word-level production observes greater variation of learner speech in the occurrence rate, when compared to sentence-level production. Sentence-level production is irregular in learner speech, being interfered by prosody, meaning, and lengthy utterance; while it is more reliable in loanwords, being embedded in the Korean context that assures the loanwords' reading, but not foreign words' reading. Word-level reading gives more reliable data for the investigation of learner speech, while sentence-level reading does so for loanwords'.

The difference between learner speech and loanword phonology as in Figure 5 depends on the type of the loanword phenomena, but it may also depend on the level of the speech proficiency of learners. The following section discusses the cross-sectional results of the comparison between learner speech proficiency and loanword phonology type.

4.3 Cross-sectional results: learner speech proficiency *vs.* loanword phonology

The developmental results of the cross-sectional study are shown in Figure 6, where loanword phonology occurrence is shown in relation to different levels of learner proficiency for word-level production (left) and sentence-level production (right).

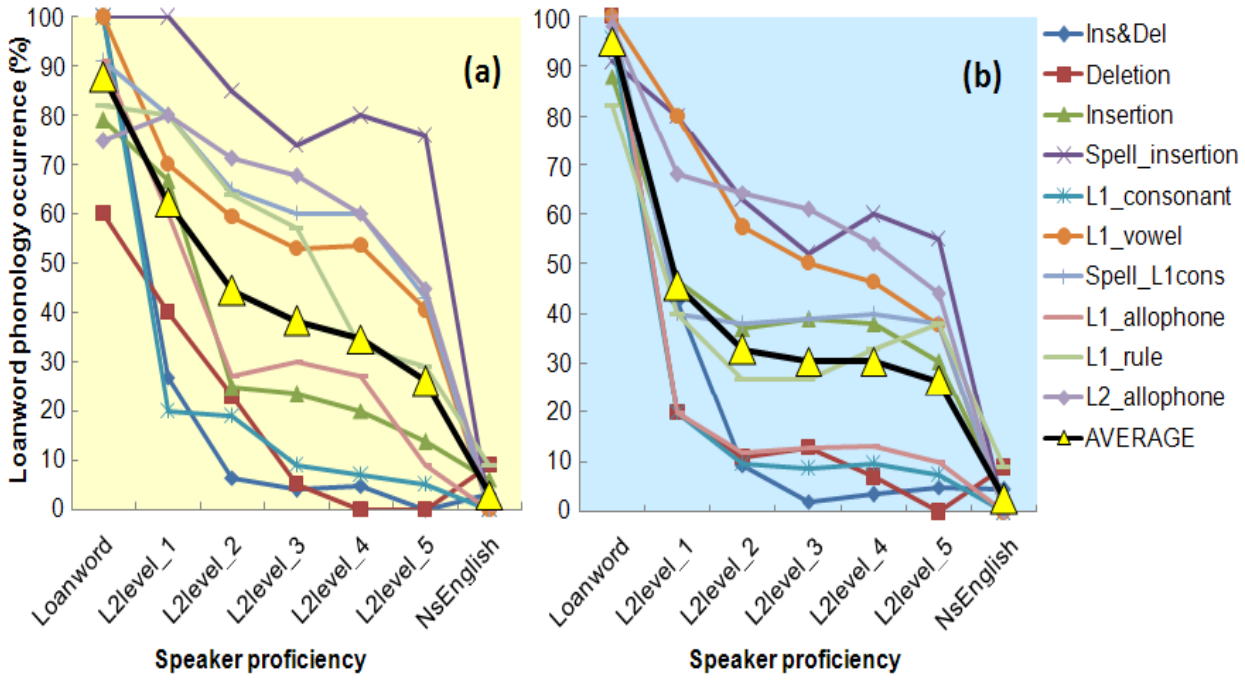


Figure 6. Types of phonological phenomena in L2 English by Korean speakers of different proficiency levels that are compared to those in loanwords and target speech for (a) word level and (b) sentence level production. The value decreases in accordance to the level of speaker proficiency (Loanword phonology occurrence (%) = 62>45>38>35>26, r=.87, n=2,160 in word-level production; 46>33>31>31>27, r=.71, n=2,152 in sentence level production).

The overall pattern in Figure 6 as observed by the average value of the developmental transition shows the following two facts. First, loanword properties appear significantly less in learner speech than in loanwords for overall proficiency levels of learner speech in (a) word-level and (b) sentence-level production. Secondly, loanword properties decrease as the learner proficiency increases for word-level production, as we have previously shown by the high correlation rates in Table 4 between the percentages of loanword properties and the learner proficiency. The sentence-level production was less clear for the developmental transition, where learner speech is known to be severely hampered (Kim & Flynn, 2004).

For the first point on the difference between loanwords and learner speech, it is important to note that learner speech, as represented by a mid-intermediate level of proficiency (Level 3 in Figure 6), is far different from loanwords, but similar to target speech. Some improvement does take place, although it may not be in a definite progressive correlation to the course from loanwords to target phonology for most cases. The majority of non-native phenomena resemble the developmental pattern of Line 2 in Figure 2, which shows significantly stronger forces of remaining faithful to L2 foreign phonology than modifying the L2 foreign words to conform to L1 native phonology at the mid-intermediate level of learner speech. The case of difficult learning draws a sharp distinction from the cases of easy learning in the development of learner speech, particularly beyond the intermediate level of proficiency. The clearer distinction in the advanced level relates to the fact that learner speech departs from loanword phonology and develops toward the native speech value, as the speech proficiency increased.

For the second point on the developmental transition, the results indicate that each loanword phenomenon in Figure 6(a) shows the decreasing patterns as outlined in Figure 2. All three decreasing types are observed among the six possible types outlined in Figure 2: many Type 2s (easy), one Type 3 (proportional), and some Type 5s (difficult). Other types are not observed: Type 1 (ready), Type 4 (unrelated), and Type 6 (never). Since the observed three patterns (Types 2, 3, and 5 in Figure 2) show the decrease of loanword phonology as the learner proficiency increases, we consider that learner speech progressively departs from loanword phonology and develops toward target speech for word-level production. The discussion on the developmental transition is less conclusive, as the sentence-level production is not so obvious.

5. Conclusion

The results indicate that learner speech departs from loanword phonology depending on the phonological types. The comparable phonological types are deletion, insertion, phonemic substitution, allophonic substitution, L1 rule application, and L2 rule application. 1) As for segmental deletion and insertion, learner speech rarely deletes and largely inserts segments, while loanwords sharply deletes and inserts segments upon the mismatch of the syllable structures. We recall the deletion of coda [r] and insertion of vowels in coda clusters. 2) As for phonemic substitution, learner speech substitutes less of consonantal phonemes than vowel phonemes, although loanwords do not distinguish them. We recall substitution of consonant [f] with [p] and vowel [æ] to [ɛ]. 3) As for the phonological alternations of L1 and L2, learner speech, but not loanwords, departs from L1 phonology faster than it applies L2 phonology. We recall the L1 allophonic rule of replacing [r] to [l] in a syllable onset position, and the L2 allophonic rule of placing unaspirated [p=] after /s/ in a syllable onset position or in an unstressed syllable onset position.

On the otherhand, there are similar aspects that learner speech shared with loanwords. Spelling mismatches of segmental presence do interfere strongly with the assimilation rate of learner speech to the target speech, in the same way they affect the loanwords. We recall the word ‘bus[i]ness’ and ‘atmos[ph]ere’ as opposed to ‘[f]ind’ or ‘de[f]ine’.

The relatively easy acquisition of target pronunciation was evidenced in the cases of segment deletion, insertion, substitution and alternation, except when the loanword property involves the successful command of the target phonology such as the de-aspiration of [p=] in apple. Such a case of difficult learning draws a sharp distinction from the cases of easy learning in the development of learner speech, particularly beyond the intermediate level of proficiency. Overall, learner speech rapidly departs from loanword phonology and develops toward the native speech value, as the speech proficiency increased.

The results confirm some old findings, while they present new findings in this study. Confirmation to old findings comprises the following. 1) As Flege (1995) predicts, a phonetic difference that distinguishes contrasting foreign sounds, but does not also distinguish contrasting native sounds are poorly detected and reproduced in learner speech, as in our loanword data [ə] of learner speech. 2) Among the data with phonetic similarity [f/p, æ/ɛ], the traditional features did distinguish the developmental order of learner speech as shown in Strange et al. (1998) and in Best, McRoberts & Goodell (2001), by which order learner speech departs from loanword phonology. 3) Spelling mismatches does affect loanword phonology, as Oh (2005) discusses, while it also affects learner speech in this study.

New findings in this study are the following. First, learner speech, as in loanwords, manifests significantly more insertion errors than deletion errors in both word-level and sentence-level production. Second, a new L2 vowel phoneme that is phonetically dissimilar in terms of tongue height, e.g., [æ] and [ɛ], is learned earlier than the one in terms of reduced energy with schwa quality, e.g., [ə] and [ʌ]. Third, the learner speech manifests significantly more difficult L2 rule acquisition (of aspiration alternation) than L1 rule avoidance (of liquid alternation and sonorant assimilation), in both word-level and sentence-level production. Fourth, the cross-sectional study shows the significant developmental transition of learner speech in word-level production. Fifth, learner speech in general is more distant from loanwords and closer to target phonology.

The transitional difference of loanwords and learner speech comes from the nature of what loanwords and learner speech are. While learner speech develops towards target phonology, loanword phonology is lexically present in a psychologically real form of the speakers’ native phonology. Loanwords conform to native phonology, whereas learner speech does not. The result is much more clearly demonstrated in word-level production than sentence-level production, along with the report by Kim and Flynn (2004).

Some limitations in this study include the limited number of words in each category of phonological phenomena to compare learner speech with loanwords. Although the previous work by the author has dealt with a larger amount of the data as subprojects to support the comprehensive conclusion in this study (Park & Kim, 2008; Bang et al., 2009; Heo et al., 2009; Kim, 2009), a wholistic view of the even more various phenomena awaits to draw a theoretical implication that interweaves 1) the phonemic changes of sound quality (e.g., l/r), 2) the allophonic changes of sound quality (e.g., ph/p=), 3) changes in syllabic structure (e.g., vowel insertion), and 4) changes in segmental duration (e.g., vowel lengthening).

Once known are the comprehensive hardfacts of the learner speech data and loanwords, the theoretical implication may be withdrawn as to how the seemingly disparate speech phenomena are related to each other by means of phonological rules or constraints. This is an interesting observable fact because we have seen that the same speaker of L1 Korean and L2 English may show different repair stategies for loanwords and learner speech speech. In relation to this, Tak (2005) argues that Korean speakers facilitate two different types of constraint hierarchies when they pronounce target words: one controlled by interlanguage grammar and the other by loanword grammar. She argues that tenseness of the preceding vowel is lower ranked in learner speech, while it is equally ranked in loanword adaptation. According to her, re-ordering of phonetic constraints derive optimal outputs in learner speech and loanwords. One may hypothesize and test that L1 constraints are higher ranked in loanwords, and learner speech works through the process of re-ranking of L2 constraints higher over L1 constraints.[7]

Finally, the results of this study may be used in applications for language learning. The developmental order in Figures 5 and 6 may be incorporated into classroom instruction and language learning software. For instance, the consonantal discrimination of [f] and [p] is expected to be acquired in early stages of learning than vowel discrimination of [ə] and [ʌ]. The learner speech data collected for this study are free to use for researchers in the field.

In conclusion, the answer to the question, "How different are learner speech and loanword phonology?" is that learner speech shows the L1 phonology in much more varied degrees depending on different phonological types, than loanword phonology does.

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