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Phonological Acquisition

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Introduction

Over the past 50 years, research on second language (L2) phonological acquisition has expanded immensely. And while the vast majority of it has focused on L2 English, in the past 20 years there has been a steadily growing literature on L2 Korean, as well. The goals of this chapter are to introduce the reader to the segmental phonology of Korean, to review some studies of the L2 acquisition of this system, and to suggest some directions for future research. It would be impossible to provide a thorough treatment of all potential issues in just this one chapter, so we will focus specifically on issues for which the most empirical data has been reported: the acquisition of stops, affricates, fricatives, and vowels.

The Korean phonological inventory

Across studies of Korean L2 phonological acquisition, there exists some variation in terminology, choice of phonetic symbols, and both the phonetic and phonological characterization of the sounds of Korean. This variation can complicate attempts to synthesize the results of such studies. In this section, we will therefore provide an overview of the Korean segmental phonological inventory and describe some unresolved issues that should be borne in mind when interpreting the findings of studies on the L2 phonological acquisition of Korean.

Consonants

The phonological inventory of Modern Seoul Korean (hereafter, Korean) contains 19 consonants, listed in Table 3.1. As is typical in spoken languages, the consonants can be classified according to their manner and place of articulation. Manner of articulation refers to the way in which the sound is produced (e.g., by stopping the airflow and then releasing it with a burst, as in a stop), whereas the place of articulation refers to the location along the vocal tract at which the primary articulation is made (e.g., with both lips, as in bilabial place).

The Hangul letter given for each consonant represents the most typical letter used to write that sound (i.e., in syllable-initial position, except for /ŋ/, which only occurs in syllable-final position). But these same sounds can also be the result of phonetic or phonological processes.
that arise from certain sequences of sounds. For example, regressive nasal assimilation can cause the letter <ㄱ> /k/ to be pronounced as the homorganic nasal [ŋ] when it is followed by another nasal, as in the word <악마> [aŋma]. What is important to bear in mind here is simply that the Hangul spelling of a word does not always reflect its phonetic realization and that these variations are also part of the phonological knowledge that L2 learners of Korean acquire.

While more detailed information about the phonetic properties of Korean consonants will be discussed as relevant in subsequent sections, the Korean three-way contrast among fortis, lenis, and aspirated stops (and affricates) will be preemptively explained here given its centrality to many other issues. In brief, these three phonation types are phonetically cued in word-initial position by differences in both voice onset time (VOT) and the fundamental frequency (f0) of the following vowel. The VOT of a stop, typically measured in milliseconds (ms), is the temporal difference between the release of the stop closure and the onset of voicing in the following vowel, and f0 is the number of vocal fold vibrations per second, typically measured in hertz (Hz). The perceptual correlate of f0 is pitch, e.g., a sound with a higher f0 is perceived as having a higher pitch. Generally, word-initial fortis stops are produced with short lag VOT and a high f0, lenis stops with long lag VOT and a low f0, and aspirated stops with long lag VOT and a high f0. Thus, the lenis-aspirated contrast is cued primarily by f0, the fortis-aspirated contrast primarily by VOT, and the fortis-lenis contrast by both. Although these f0 differences are somewhat attenuated in word-medial position, the contrast is nonetheless maintained as lenis stops become phonetically voiced when appearing between two voiced sounds (e.g., intervocally). More detailed discussion of the phonetic and phonological properties of this contrast can be found in Shin, Kiaer, and Cha (2013, pp. 57–68) and Lee, Holliday, and Kong (2020).

The contrast between the fricatives /s/ and /s*/, known as sibilant fricatives, has some parallels with the three-way stop contrast, but there is not yet a consensus on its phonological characterization. While the fricative /s*/ is widely classified as fortis, as it shares many of the acoustic and articulatory properties of other fortis consonants and is subject to the same set of phonological processes, the fricative /s/ shares some properties with lenis obstruents and other properties with aspirated obstruents. A more thorough discussion of this issue can be found in Chang (2013). For the remainder of this chapter, we will refer to /s/ simply as “non-fortis”.

### Table 3.1 The Korean consonant inventory

<table>
<thead>
<tr>
<th>Manner</th>
<th>Phonation type</th>
<th>Place of articulation</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>Bilabial</td>
</tr>
<tr>
<td>Stop</td>
<td>Fortis (Tense)</td>
<td>/p*/ &lt;ㅂ&gt;</td>
</tr>
<tr>
<td></td>
<td>Lenis (Lax)</td>
<td>/p/ &lt;ㅂ&gt;</td>
</tr>
<tr>
<td></td>
<td>Aspirated</td>
<td>/pʰ/ &lt;ㅂ&gt;</td>
</tr>
<tr>
<td>Affricate</td>
<td>Fortis (Tense)</td>
<td>/ʨ*/ &lt;ㅉ&gt;</td>
</tr>
<tr>
<td></td>
<td>Lenis (Lax)</td>
<td>/ʨ/ &lt;ㅉ&gt;</td>
</tr>
<tr>
<td></td>
<td>Aspirated</td>
<td>/ʨʰ/ &lt;ㅉ&gt;</td>
</tr>
<tr>
<td>Fricative</td>
<td>Fortis (Tense)</td>
<td>/s*/ &lt;ㅅ&gt;</td>
</tr>
<tr>
<td></td>
<td>Non-fortis</td>
<td>/s/ &lt;ㅅ&gt;</td>
</tr>
<tr>
<td>Nasal</td>
<td>/m/ &lt;ㅁ&gt;</td>
<td>/n/ &lt;ㄴ&gt;</td>
</tr>
<tr>
<td>Liquid</td>
<td>/l/ &lt;ㄹ&gt;</td>
<td>/ɾ/ &lt;ㄹ&gt;</td>
</tr>
</tbody>
</table>
The inventory of Korean vowels is given in Table 3.2. Because descriptions of Korean vowels differ across references and textbooks, a few points of clarification are warranted. First, the inventory in Table 3.2 reflects Modern Seoul Korean as it is spoken by people born after approximately 1970. While some Korean grammars depict the vowel inventory as including the front round vowels /y/ (for <ㅟ>) and /ø/ (for <ㅚ>), the reality is that nearly all speakers of Modern Seoul Korean produce these as unrounded vowels with on-glides, [wi] and [we] (Kwak, 2003). Furthermore, while Hangul preserves an orthographic distinction between /e/ <ㅔ> and /ɛ/ <ㅐ>, most speakers have completely neutralized this phonological contrast (Kwak, 2003; Kang & Kong, 2016). Second, among the diphthongs in Table 3.2, we make a subdivision between “complex vowels” and “palatalized vowels”. The complex vowels are those written as combinations of two other vowel letters and comprise four glide-vowel sequences (i.e., [wa, wʌ, wɛ, wi]) and one true diphthong (i.e., [ii]). The palatalized vowels are also phonetically realized as glide-vowel sequences (i.e., [ja, jʌ, jo, ju, jɛ]) but are written in Hangul as individual letters, not as combinations of two vowel letters. Third, vowel length is completely ignored in the current chapter, as it has also disappeared as a contrastive feature in the speech of most speakers of Modern Seoul Korean.

### Theoretical frameworks in L2 segmental perception and production

Because studies of Korean L2 segmental acquisition often reference theoretical models such as PAM, PAM-L2, or SLM, we will provide a brief overview of these models here. First, the Perceptual Assimilation Model, commonly referred to as PAM, is laid out in detail in Best (1995). The purpose of PAM is to model how naïve listeners perceptually assimilate non-native speech sounds. Perceptual assimilation is the process of perceiving a non-native speech sound as a member of a native category. For example, when a native English listener hears the Korean sound /i/, they are likely to perceive it as a good example of their English /i/ category. On the other hand, the Korean sound /p*/ may be perceived as a good example of their English /b/ category. Thus, perceptual assimilation is essentially the mapping of non-native speech sounds onto native phonological categories.

PAM makes several predictions related to this process. First, non-native speech sounds can be assimilated in one of three ways: assimilated to a native category, not assimilated to any native category, or not perceived as speech. Second, when a speech sound is assimilated, its goodness of assimilation can vary from excellent to poor. Third, the way in which members of a non-native phonological contrast assimilate to native categories is predictive of how well

<table>
<thead>
<tr>
<th>Monophthongs</th>
<th>Diphthongs</th>
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<tbody>
<tr>
<td>/a/ &lt;ㅏ&gt;</td>
<td>/wa/ &lt;wa&gt;</td>
</tr>
<tr>
<td>/ʌ/ &lt;ㅗ&gt;</td>
<td>/wʌ/ &lt;wʌ&gt;</td>
</tr>
<tr>
<td>/o/ &lt;ㅓ&gt;</td>
<td>/we/ &lt;we&gt;</td>
</tr>
<tr>
<td>/u/ &lt;ㅜ&gt;</td>
<td>/wi/ &lt;wi&gt;</td>
</tr>
<tr>
<td>/ɨ/ &lt;ㅡ&gt;</td>
<td>/ɨi/ &lt;ɨi&gt;</td>
</tr>
<tr>
<td>/ɨ/ &lt;ㅟ&gt;</td>
<td>/jɛ/ &lt;jɛ&gt;</td>
</tr>
</tbody>
</table>

Table 3.2 The Korean vowel inventory
listeners will be able to discriminate between those sounds, which is the ability to judge two sounds as “the same” or “different”. Discrimination is often tested through an AX discrimination task, in which two sounds are played with a short interceding pause (e.g., 500 ms), and the listener has to determine whether the sounds were the same or different.

One important aspect of PAM, as discussed in both Best (1995) and Best and Tyler (2007), is that its predictions were only intended to apply to naïve non-native perception – that is, perception by listeners who have no experience with or exposure to the language. Thus, PAM was not intended to be used to make predictions about the perception of L2 learners. To address this, Best and Tyler (2007) offered the PAM-L2 model, which was designed as an extension of PAM to the L2 learning environment. While the reader is referred to Best and Tyler (2007) for a more thorough description, an important point raised therein and relevant to the current discussion of L2 Korean is the fact that (naïve) non-native perception and L2 perception are fundamentally different phenomena. In the case of non-native perception, the listener has no knowledge about the phonological system of the foreign language and can only perceive incoming speech sounds in terms of the phonetic similarity to L1 sounds and categories. But in L2 perception, the listener has knowledge of the phonological system of the L2 and may have developed perceptual mappings between the L1 and L2 that rely on more than just phonetic similarity. While this distinction may seem minute, it is important to bear in mind when reviewing the literature on L2 Korean phonological acquisition.

Whereas PAM and PAM-L2 are models of non-native and L2 speech sound perception, the Speech Learning Model (SLM; Flege, 1995) is a model of L2 speech sound acquisition. It seeks to explain the production and perception of L2 speech sounds by L2 learners. One of its main claims is that an L2 sound that is similar – but not identical – to an L1 sound will be harder to acquire than an L2 sound that is totally different from any L1 sound. Although it may seem counterintuitive at first, this claim rests on the idea of perceptual equivalence: if an L2 sound is too similar to an L1 sound, it will be perceived by the learner as simply “the same” as the L1 sound, and it will be difficult to produce any difference between them. For a more detailed explanation, the reader is referred to Flege (1987) and Flege (1995).

**Overview of this chapter**

Research on the L2 acquisition of Korean segments began in earnest only in the late 1990s, presumably motivated in part by an increase in students learning Korean as a second or foreign language. It should also be noted that the volume of research published in Korean, either in Korean scholarly journals or graduate theses, has always been far greater than that published in English or other languages, and the English-language literature should therefore be viewed as only part of the extant research record. Accordingly, one goal of this chapter is to highlight some important studies that have been published in Korean but may have remained unknown to a wider international community.

While the main focus of this chapter (and book) is on L2 learners of Korean, in this chapter we will also look at some studies that have investigated the perception of Korean sounds by naïve non-native listeners. The term “naïve” refers to listeners who have not studied Korean and have had no meaningful exposure to it. The primary reason for looking at such studies is that the naïve listener represents the “pre-learner state”. Up until the moment an L2 learner stepped into their first Korean classroom, they were themselves “naïve”, and understanding how such listeners perceive Korean sounds can help us understand more about the process by which L2 speech sounds are learned. There are also good reasons to suspect that even a little bit of L2 experience can affect how L2 sounds are perceived (Best & Tyler, 2007), but it is hard to
understand what the effect of L2 experience is without comparing results to those from listeners without such experience. Thus, in each of the main sections of this chapter, which focus on stops, affricates, fricatives, and vowels, we will first review any relevant findings on naïve listeners and then move on to studies of L2 learners.

Finally, it should be noted that the range of L1s investigated is naturally limited. Research on L2 phonological acquisition requires access to a population of L2 learners large enough to draw meaningful conclusions about, and so the L1s that get investigated end up being those with enough L2 learners that researchers have access to. As a result, by far the most commonly investigated L1 population is Mandarin, especially among studies carried out in Korea, with the next most frequently studied L1s being English, Japanese, and, in more recent years, Vietnamese. Thus, when reviewing the literature, we must always bear in mind that what is known about L2 Korean phonological acquisition is constrained by this set of L1s, and some generalizations may not hold as more research is carried out in the future.

**Stops**

Research on the stop contrast comprises a large share of the literature on L2 Korean phonological acquisition, and virtually all of it concerns the three-way laryngeal stop contrast (discussed above). There may be several reasons for this. First, the most important phonetic cues to the contrast, VOT and f0, are well understood and are relatively easy to measure. Second, almost all research on L2 Korean phonology has examined L1 speakers of languages with a two-way contrast (e.g., voiced–voiceless, as in Japanese, or unaspirated–aspirated, as in English or Mandarin), and the acquisition of Korean’s three-way voiceless contrast poses a genuine challenge for many of these L2 learners. And third, stop sounds are very frequent in Korean, raising the stakes for intelligible pronunciation.

**Stop perception**

For many novice L2 learners of Korean, their first encounter with the three-way contrast is characterized by wonder – how do listeners tell the three sounds apart? Studies examining the perception of Korean stops by naïve listeners have shown, at least for the L1s that have been tested, that perceiving at least two of the members of the contrast as “the same” is typical. The specific pattern of perception has been shown to depend on the phonetic properties of the stop contrast in the L1: for languages with a two-way stop contrast, the contrast can usually be characterized as one of voicing (contrasting voiced [b, d, g] with voiceless [p, t, k]) or one of aspiration (unaspirated [p, t, k] with aspirated [pʰ, tʰ, kʰ]). For example, among the listener L1s that have been tested, the stop contrast in Spanish and Dutch is one of voicing, in English and Mandarin one of aspiration, and in Japanese it seems to be undergoing a change from voicing to aspiration.

It has been reported that L1 English (Schmidt, 2007) and Mandarin (Holliday, 2014a) naïve listeners assimilate both lenis and aspirated stops to English and Mandarin aspirated stop categories [pʰ, tʰ, kʰ] (i.e., those written as <p, t, k> in English and pinyin), and fortis stops to unaspirated stop categories [p, t, k] (i.e., <b, d, g>). The simplest explanation for this finding is that L1 English and Mandarin naïve listeners assimilate Korean stops based on VOT: Korean long-lag lenis and aspirated stops assimilate to L1 long-lag aspirated stops, and Korean short-lag fortis stops to L1 short-lag unaspirated stops. Thus, while f0 is an important cue that L1 Korean listeners use to help identify a stop as lenis or aspirated (Lee, Politzer-Ahles, & Jongman, 2013), it does not affect which L1 stop category L1 English and Mandarin naïve
listeners perceive the Korean stops as being most similar to. Similar results have also been reported for L1 Japanese listeners (Yasuta, 2004; Holliday, 2019). Although Japanese historically contrasted voiced and voiceless stops, recent data indicates that Japanese voiced stops may be produced with short-lag VOT and voiceless stops with intermediate-lag VOT (Riney, Takagi, Ota, & Uchida, 2007; Takada, 2008), rendering the Japanese contrast somewhat similar to that of English and Mandarin.

In the case of Spanish, Martínez García and Holliday (2019) found that naïve listeners assimilated all Korean stops – fortis, lenis, and aspirated – to their Spanish voiceless category, although fortis stops were perceived as voiced some of the time as well. This result suggests that L1 listeners of a language with a stop voicing contrast may perceive all three Korean stop phonation types as more similar to each other than L1 listeners of a language with a stop aspiration contrast. Studies that have tested naïve listeners on discrimination have confirmed this. Martínez García and Holliday (2019) and Choi (2015) tested the discrimination of L1 Spanish and Dutch naïve listeners, and found that discrimination on all three contrasts ranged from roughly 40% to 65%. But in a smaller study on L1 listeners of English, a language with a stop aspiration contrast, Kang and Lee (2002) reported that only the discrimination of the lenis-aspirated contrast was very poor, and performance on the fortis-lenis and fortis-aspirated contrasts was at ceiling.

In summary, studies on the perceptual assimilation and discrimination of word-initial Korean stops by naïve listeners from a range of L1s indicate that listeners typically perceive at least two of the three Korean stop types as the same: either the lenis and aspirated stops are perceived as similar to each other with the fortis stop perceived as distinct, or all three stop types are perceived as similar to each other, with none of them perceived as particularly distinct. But what have studies of actual L2 learners revealed? One of the few investigations of Korean stop perceptual assimilation by L2 learners was Kim (2006), who tested L1 Mandarin novice learners studying in Daegu. Although they consistently assimilated fortis and aspirated stops to their Mandarin unaspirated and aspirated categories, like the naïve listeners in Holliday (2014a), lenis stops were variably perceived as both unaspirated and aspirated.

This finding raises the question of whether it was the listeners’ L2 experience that led them to perceive lenis stops differently from naïve listeners. And while it may be the case, we cannot rule out the possibility that the acoustic properties of the stimuli had an effect. The stimuli used in Kim (2006) were produced by native Korean speakers from Daegu, who (along with speakers from the larger Gyeongsang region) have been shown to produce lenis stops with shorter VOT than speakers from other regions, especially Seoul (Lee & Jongman, 2012). A smaller-scale but similar study run on L2 Korean learners in China using stimuli produced by a native speaker of Seoul Korean reported that word-initial lenis stops assimilated much more consistently to Mandarin unaspirated and aspirated categories, like the naïve listeners in Holliday (2014a), lenis stops were variably perceived as both unaspirated and aspirated.

In any case, while L2 learners’ perceptual assimilation patterns may be useful in predicting the ability to discriminate between or identify the members of L2 contrasts, other tasks are needed to directly measure such abilities. In terms of discrimination, both Oh (2013) and Ryu (2016) reported that while novice L2 learners were about 80% accurate, about half of the errors on “same trials” involved lenis stops, and 91% (Oh, 2013) and 63% (Ryu, 2016) of errors on “different trials” involved the lenis-aspirated contrast. Jung and Kwon (2010) tested very novice L2 learners from a range of L1 backgrounds using a similar task in their study as well, although overall accuracy was 61% and lenis-aspirated trials comprised 64% of errors. Oh (2013) further tested L1 Mandarin learners’ AX discrimination ability in intervocalic position (e.g., 아다-아타), and found that not only was accuracy significantly lower, at 73%, but that 100% of the errors were on lenis-fortis trials. Thus, while the lenis and aspirated stops are the
most difficult for L1 Mandarin L2 learners to perceive the difference between in word-initial position, in intervocalic word-medial position the difficulty shifts to the lenis-fortis contrast. Discrimination tasks require the listener to tell whether two sounds are different from each other, but they do not require the listener to identify what either of the sounds are. In other words, a listener may be able to tell that the two sounds 다-타 are not the same, but they may not be able to tell which is lenis and which is aspirated, and in real-life speech perception it is the ability to correctly identify a phonetic target that is ultimately needed for lexical access and comprehension. To probe this ability, researchers use identification tasks in which a listener is presented with stimuli one at a time and asked to identify the target. One interesting aspect of this method is that it allows the researcher to observe the direction of misperception. That is, lenis and aspirated stops may be perceptually confusable, but is it because lenis stops are misperceived as aspirated, aspirated stops are misperceived as lenis, or both?

Studies using this method with word-initial Korean stops have found, unsurprisingly, that the majority of L1 Mandarin learners’ perceptual errors involve lenis stops. Both T.-K. Kim (2014) and Ryu (2016) showed not only that the majority of errors were between lenis and aspirated stops but that it was much more likely for a lenis stop to be misperceived as aspirated than vice versa. Furthermore, among the errors involving lenis and fortis stops, it was rarely the case that a lenis stop was perceived as fortis; instead, it was more likely that a fortis stop was perceived as lenis. The directionality of these errors is interesting because it suggests that the difficulty L2 learners have in accurately identifying word-initial Korean stops is not just due to general confusion but, rather, an incorrect perceptual target for lenis stops. In other words, it may not be that they are guessing randomly but that they actually do have a well-defined mental representation of what a lenis stop should be. The results of T.-K. Kim (2014) and Ryu (2016) suggest that the listeners in those studies had a lenis stop perceptual target closer to an actual fortis stop, which would explain why actual lenis stops were incorrectly perceived as aspirated, and actual fortis stops were incorrectly perceived as lenis.

Not all studies report such asymmetric results, however, so we cannot take the results of T.-K. Kim (2014) and Ryu (2016) to be necessary outcomes. Yang (2017) reported that word-initial lenis and aspirated stops were often misperceived as each other, but the strength of directionality was weaker than in T.-K. Kim (2014) and Ryu (2016), and there was no directionality at all observed in misperceptions of lenis and fortis stops. There were many other methodological differences among these studies, however, and so a more controlled and targeted investigation of directionality in perception errors may be needed.

Stop production

In summary, studies on L2 perception of Korean stops have generally shown that most difficulties faced by L2 learners involve lenis stops: they are most often confused with aspirated stops in word-initial position, and with fortis stops in word-medial intervocalic position. Findings on L2 production, on the other hand, cannot be summarized so succinctly. While L2 production studies have focused mostly on word-initial position, and mostly on L1 speakers of languages with a voiceless unaspirated–aspirated stop contrast, the results reported across studies vary widely.

Chang (2010) reported longitudinal stop productions data from L1 English novice learners (n = 26) who had just arrived in Seoul for a six-week intensive Korean language program. After five weeks of study, a wide variety of production patterns were observed, despite participants having the same L1 background and being enrolled in the same intensive course. While some of the learners did produce a three-way contrast, none seemed to do it in a native-like way:
some used only VOT, others used only f0, and others used both VOT and f0 but in a novel way (e.g., producing aspirated stops with long-lag VOT but low f0, and lenis stops with low f0 but short-lag VOT). Other learners produced only a two-way contrast in production, totally merging lenis and aspirated stops or lenis and fortis stops, and other learners produced no distinction among the stops whatsoever. Holliday (2015) collected similar data on L1 Mandarin novice learners (n = 12) after six weeks of instruction, and then half of the learners were re-recorded both 6 and 12 months later. In the recordings done after six weeks, just as in Chang (2010), wide variation in production strategies was observed, with some learners making clear two-way contrasts, and others making no contrast at all. The longitudinal data showed improvement with three of the six learners who exhibited near-native-like productions after one year of instruction. Yet another learner seemed to produce native-like VOT but with no contrast at all in f0, while the remaining two learners showed no improvement whatsoever despite being enrolled in the same intensive course as everyone else.

The finding in common between these two studies seems to be that when L1 speakers of a language with a two-way stop contrast try to learn Korean’s three-way contrast, they do not all follow the same path. Holliday (2019), on the other hand, presented analogous data from L1 Japanese learners and found virtually no variation among learners whatsoever. Other studies have suggested that learners’ production errors are at least partially predicted by their L1 (e.g., Chang, Burge, & Choi, 2011; Han & Kim, 2014), but because these studies reported only group-level statistics, it is unclear how much variation existed among learners. Chang et al. (2011) suggested that L1 Mandarin learners (n = 8) were able to use f0 and H1-H2 in ways that L1 English and Spanish learners were not, whereas Han and Kim (2014) reported that even novice L1 Mandarin learners (n = 6) produced what was essentially a three-way VOT contrast, with distinct VOT ranges for each phonation type. Lastly, Oh (2018) reported that even novice L1 Mandarin learners (n = 16) with roughly two to three months of in-country L2 instruction produced all three Korean stop types with VOT and f0 values that did not significantly deviate from L1 Korean norms.

What, then, can be concluded from these studies? First, it is probably true that a range of production patterns can be observed even among L2 learners from the same L1 background. Two of the three studies that actually reported acoustic measurements for each individual learner did report wide variation. A fair amount of variation has been observed even in studies of the L2 acquisition of a single acoustic cue (VOT) in a two-way stop contrast, as in L2 Spanish (e.g., Nagle, 2017; Casillas, 2020). Second, while it is difficult to say which of the three stop types poses the greatest difficulty for L2 learners (especially given the narrow range of L1s that have been investigated), one point of agreement among studies seems to be that the aspirated stops are the least challenging. Third, learners seem to learn how to use VOT to signal the contrast before they learn how to use f0. Indeed, some of the studies that reported on L1 Mandarin learners found that even after an entire year of in-country intensive L2 instruction, some learners were unable to manipulate f0 in a native-like way.

**Affricates**

The L2 acquisition of Korean affricates has been investigated mostly in two domains: the three-way laryngeal contrast and place of articulation. In the case of the laryngeal contrast, among fortis <XP> /ʨʰ/, lenis < вс > /ʨ/, and aspirated < вс > /WritableDatabase, there may not be much reason to presume the error patterns and difficulties would significantly differ from what has been observed in research on the three-way stop laryngeal contrast, given that the laryngeal mechanism underlying both is ostensibly the same. With respect to place of articulation, on
the other hand, there exists a range of potential difficulties for L2 learners. For example, while Korean affricates are alveolopalatal and can occur with any vowel, Mandarin affricates are articulated at three different places of articulation and subject to vowel co-occurrence restrictions (Ren & Mok, 2015), which could pose a difficulty for L1 Mandarin learners of Korean (Jung, 2008). To date, however, most published research dealing with the L2 perception or production of Korean affricates has focused on the laryngeal contrast, with very little discussion of place of articulation.

### Affricate perception

We begin this section again by looking at the perceptual assimilation of Korean affricates by naïve listeners, the results of which touch on both of these domains. In Schmidt (2007), L1 English listeners assimilated Korean affricates to both affricate and stop categories, with Korean /ʨʰ/ almost always assimilating to an aspirated category (either /ʧʰ/ or /t/), Korean /ʨ/ to an aspirated category nearly 85% of the time (with the remainder to the unaspirated affricate /ʤ/), and Korean /ʨ*/ assimilating to an unaspirated category (either /ʤ/, /z/, or /d/) a little over 85% of the time. Thus, much like the results for stops, L1 English listeners usually assimilate lenis and aspirated affricates to an aspirated category and fortis affricates to an unaspirated category. With respect to place of articulation, the question raised by the results of Schmidt (2007) is whether the assimilation of Korean affricates to stop categories (/t/ or /d/) is driven by the perception of place or the perception of manner, e.g., Korean /ʧʰ/ could be perceived as English /t/ because it is perceived a stop (and not an affricate), or it could be because it is perceived as alveolar (and not postalveolar, as English affricates are). While this question remains open, it helps exemplify that the more difficult aspect of Korean affricate perception to explain is not the perception of the laryngeal contrast but of the place of articulation.

As for naïve L1 Mandarin listeners, the perception of the laryngeal contrast in affricates again seems to be quite similar to that of stops. Mandarin contrasts aspirated and unaspirated affricates at three places of articulation: denti-alveolar /ʦ, ʦʰ/, alveolopalatal /ʨ, ʨʰ/, and postalveolar or retroflex /ʧ, ʧʰ/. The listeners in Holliday (2014a) almost always assimilated Korean /ʨʰ/ to an aspirated Mandarin category (usually an affricate, but sometimes a stop), and Korean /ʨ*/ almost always to an unaspirated category. Lenis /ʨ/ again patterned with aspirated /ʨʰ/, usually assimilating to an aspirated category but also sometimes to an unaspirated category. Just as with the stops, this result can be mostly predicted by VOT alone. The potentially more interesting question, alluded to earlier, is how L1 Mandarin listeners would perceive the place of articulation. Mandarin has both aspirated and unaspirated alveolopalatal affricates, just like Korean, so why do listeners not always assimilate to those categories? One reason is that Mandarin alveolopalatal affricates can only be followed by the vowels /i/ or /y/, or a palatal on-glide. Thus, the sequence of /ʨʰ/ + /a/ would only be possible if a glide were inserted, resulting in a pronunciation like [ʨia] or [ʨja], and written as <jia> in pinyin. Therefore, the Korean syllable /ʨʰa/ \(<ja\)> with no palatal on-glide, may be difficult for an L1 Mandarin listener to assimilate to a native category: although the affricate is alveolopalatal, the lack of an on-glide may make the listener hesitant to respond that it sounds similar to a Mandarin alveolopalatal. The listeners in Holliday (2014a) indeed displayed such a tendency. When the vowel in the stimulus was /a/, the affricates were assimilated to Mandarin affricate categories at all three places of articulation – denti-alveolar, alveolopalatal, and postalveolar – at roughly equal rates. But when the vowel was /i/, the affricates were almost always assimilated to a Mandarin alveolopalatal affricate category, and when the vowel was /u/ they were assimilated mostly to Mandarin postalveolar categories.
Very few studies have investigated the perception of affricates by actual L2 learners. One example, Kim and Kim (2013), tested the identification of Korean affricates by L1 Vietnamese listeners. The acquisition of Korean affricates by L1 Vietnamese learners is potentially interesting because Vietnamese, unlike other L1s common among L2 Korean learners, has no affricates at all, which raises questions like: Do they perceive them as stops? Or fricatives? And when they produce them, do they produce true affricates, or do they substitute a stop or fricative? And at what place of articulation? Unfortunately, studies that have investigated affricate acquisition by L1 Vietnamese learners have left these questions for future work and have instead focused on the laryngeal contrast. Using an identification task, Kim and Kim (2013) found that listeners confused all three affricate phonation types with each other, with accuracy in word-initial position hovering around 40% and in word-medial position around 47%.

**Affricate production**

Affricate productions recorded from the same group of L1 Vietnamese learners in Kim and Kim (2013) also revealed no significant phonetic differences among the three affricate types, with all three most closely resembling a fortis affricate. Jang (2018) analyzed the affricate productions of another group of L1 Vietnamese learners and found a wide range of production patterns, with some learners producing a three-way contrast, others only a two-way, and many of them producing no contrast among the three affricates at all. Like some of the studies on L2 stop production discussed earlier, by reporting the production pattern of each individual participant in the study, Jang (2018) shows us that while the learners as a whole do not produce the contrast correctly, they are not all making the same errors.

Again, however, the acoustic analyses in Kim and Kim (2013) and Jang (2018), are focused on the three-way laryngeal contrast and not place or manner of articulation. Studies of L1 Mandarin learners’ affricate productions share this focus, reporting many of the same difficulties reported for stops. For example, Lei and Kim (2010) and Jo (2017) report difficulties by L1 Mandarin learners manipulating f0, and Jo (2017) found that novice learners’ lenis affricates were often perceived by native Korean listeners as fortis. These error patterns are quite similar to those found in L2 stop productions and are, perhaps, to be expected. There remain virtually no studies that have investigated place of articulation in L2 Korean affricate production.

**Fricatives**

Like the three-way laryngeal contrast in stops and affricates, the contrast between the Korean sibilant fricatives, non-fortis <ㅅ>/s/ and fortis <ㅆ>/s*/i, is typologically uncommon. It is not just the fortis quality of /s*/ that marks the contrast, however. As many studies have pointed out, non-fortis /s/ is produced with aspiration in non-high vowel contexts, resulting in syllables like <사>/sa/ and <새>/sɛ/ being phonetically realized like [sʰa] and [sʰɛ]. Aspiration is minimal or absent in high-vowel contexts like <수>/su/ or <시>/si/, and totally absent in fortis fricatives. As aspirated fricatives are cross-linguistically quite rare (Jacques, 2011), the largest L2 Korean learner population whose L1 contains aspirated fricatives is most likely Burmese. Another wrinkle in the Korean sibilant fricative contrast concerns palatalization. While the non-fortis /s/ becomes alveolopalatal [ɕ] when followed by /i/ or /j/, there is disagreement about whether the fortis fricative /s*/ also palatalizes in the same environment. Some texts claim it is always palatalized and others that it is never palatalized. The truth is probably somewhere in between, and there has yet to be any in-depth investigation of the issue.
**Fricative perception**

In terms of perceptual assimilation by naïve listeners, L1 English (Schmidt, 2007) and Japanese (Holliday, 2012) listeners have been reported to assimilate Korean fricatives in a similar way, with both /s/ and /s*/ assimilating to their L1 /s/ category when the following vowel was /a/ or /u/, and to their L1 /ʃ/ (English) or /ɕ/ (Japanese) category when the following vowel was /i/. In a cross-language discrimination task, Cheon and Anderson (2008) further showed that L1 English naïve listeners perceived both Korean /ʌ/ /sa/ and /ʌ/ /s*a/ as quite similar – but not identical – to English /sa/. Korean /ʌ/ /si/, on the other hand, was perceived as a much closer fit to English /ʃ/, and Korean /ʌ/ /s*i/ as split between English /s/ and /ʃ/.

L1 Mandarin listeners (Holliday, 2014a, 2016) have been shown to be similar to L1 English and Japanese listeners in the /u/ and /i/ contexts: both /s/ /su/ and /s*/ /s*u/ were assimilated to Mandarin /su/, and both /ʃ/ /si/ and /ɕ/ /s*i/ (when palatalized) were assimilated to Mandarin /ɕi/. In the /a/ context, however, L1 Mandarin listeners consistently assimilate Korean /ʌ/ /s*a/ to Mandarin /sa/, but Korean /ʌ/ /sa/ to Mandarin /sa/ and /tsʰa/. In other words, in the /a/ context, and only the /a/ context, the Korean non-fortis fricative /s/ is perceived by L1 Mandarin listeners as an aspirated affricate roughly half the time.

To date, research on the L2 perception of the Korean sibilant fricative contrast is limited. One consistent finding is that L1 English, Japanese, and Mandarin listeners struggle to correctly identify /s/ and /s*/ in any vowel context (Holliday, 2014b, 2016). In Cheon (2005), even L2 Korean learners with more than five years of experience only identified Korean fricatives with 67% accuracy, even when the experimental stimuli were isolated CVs from a single talker. But this finding for L1 English and Japanese is not surprising: if naïve listeners perceptually assimilate both Korean /s/ and /s*/ to a single L1 category, PAM (Best, 1995) predicts that discrimination accuracy should be poor. And if the perceptual assimilation patterns of L1 English and Japanese L2 learners remain unchanged, we should expect discrimination and identification accuracy to be poor as well.

Despite the somewhat different perceptual assimilation results from naïve listeners, L1 Mandarin L2 learners of Korean have roughly the same difficulties as their L1 English and Japanese counterparts. Because naïve L1 Mandarin listeners often perceive Korean /ʌ/ /sa/ as an affricate and /ʌ/ /s*a/ as a fricative, one might expect L1 Mandarin learners of Korean to perceive them differently as well, but results from both Ren and Mok (2015) and Holliday (2016) show that both novice and advanced L2 learners perceptually assimilate both /ʌ/ /sa/ and /ʌ/ /s*a/ to a Mandarin fricative category (usually /s/), and that their discrimination of the contrast is poor. It was shown in Holliday (2016) that even naïve listeners were more accurate at discriminating between /ʌ/ /sa/ and /ʌ/ /s*a/ than L2 learners. Because these discrimination results are predicted by how the Korean fricatives are perceptually assimilated (see Best, 1995; Best & Tyler, 2007), perhaps the next question to investigate with respect to L2 Korean fricatives is why the perceptual assimilation of L2 learners might differ from naïve listeners.

**Fricative production**

Lastly, the production of Korean /s/ and /s*/ by L2 learners seems to generally reflect how they are perceptually assimilated. In her study of L1 English learners, Cheon (2006) found that no contrast was produced between /s/ and /s*/ by novice learners, and only minimal contrast by advanced learners. In their study of L1 Mandarin novice learners, Kallay and Holliday (2012) also found virtually no distinction between /s/ and /s*/ in any vowel context: Korean /ʌ/ /sa/ and /ʌ/ /s*a/ were produced identically to Mandarin /sa/, and Korean /ʌ/ /si/ and /ʌ/ /s*i/ identically to Mandarin /ɕi/.
These findings from Cheon (2006) and Kallay and Holliday (2012) suggest the possibility that L2 learners’ production targets are tied to perception. If learners perceive /s/ and /s*/ to be more or less identical, as has been shown, then it would be surprising to observe significant differences in their production. Holliday and Hong (2020) tested this question explicitly by asking L1 Mandarin naïve listeners and L2 learners to listen to Korean fricative productions and imitate them as accurately as possible. Their repetitions were then played to another group of L1 Korean listeners, who were asked to identify the sound they heard. Across vowel contexts, the L2 learners’ productions were perceived variably, as both /s/ and /s*/, lending further support to the idea that accurate fricative production remains challenging, even for more advanced L2 learners.

Vowels

There are two issues to bear in mind when reviewing the literature on vowel acquisition. First, as alluded to above, language instructors (and researchers) may hold different views regarding what the vowels of Korean are and which ones should be taught. As explained earlier, the Korean vowel system has undergone changes in the past few decades, most notably in the neutralization of /e-ɛ/ and the diphthongization of /y/ and /o/ into /wi/ and /we/, respectively. A survey of studies over the past 20 years reveals some that do not acknowledge these changes at all and others that suggest teaching such distinctions is not worth the effort when not even the instructors themselves pronounce them (e.g., Jang, 2002).

Second, in addition to these phonological changes that have resulted in the total loss of certain monophthongs, there have also been phonetic changes that have shifted the articulatory targets of vowels in ways that native speakers themselves may not be aware of. Specifically, acoustic studies of Korean monophthongs even as recently as Yang (1996) showed that the contrast between /o/ and /u/ was primarily one of height: in the vowel space, /u/ occupied the high back corner, with /o/ almost directly below it. But more recent studies of native Korean monophthong production have shown that /o/ has raised to a position that nearly coincides with where /u/ used to be, while /u/ has moved forward a bit (Kim, J., 2014, Fig. 1; Kang & Kong, 2016, Fig. 1; Lee, Shin, & Shin, 2017, Fig. 1). The high-back quadrant of the Korean vowel space is already the most crowded, with /o/, /u/, /i/, and /ʌ/, and has long been identified as the source of most difficulties for L2 learners of Korean (e.g., Jang, 2002; Kwon, 2007).

Vowel perception

One of the few studies of Korean vowel perception by naïve listeners was Kim (2018), who tested the perceptual assimilation of Korean monophthongs by L1 Mandarin and Vietnamese naïve listeners. Among the L1 Mandarin listeners, it was found that while Korean /u/ assimilated clearly to Mandarin /u/, Korean /o/ was also often (70%) assimilated to Mandarin /u/, and less often (30%) to Mandarin /o/. Korean /ʌ/, on the other hand, did not assimilate clearly to any single Mandarin category, being perceived as /ɤ/, /o/, or something else. The L1 Vietnamese listeners exhibited similar patterns, with Korean /o/ assimilating mostly to Vietnamese /o/ but also sometimes /u/, and Korean /u/ assimilating mostly to Vietnamese /u/ but also sometimes to /o/. And in two studies of the discrimination ability of L1 Arabic naïve listeners, Hong and Jun (2013) and Hong (2018) reported the most difficulty in discriminating between Korean /o/ and /u/.

Although we have seen other cases in which the perception of naïve listeners does not straightforwardly predict that of L2 learners, the perceptual confusability of the Korean high
back vowels among L2 learners has been demonstrated in several different studies. In an identification task, Ryu (2018) reported similar confusion patterns in L1 English and L1 Mandarin L2 learners, who misperceived /ʌ/ and /u/ as /o/, and /o/ as /ʌ/. L1 English (but not Mandarin) learners also occasionally misperceived /ɨ/ as /u/. In another study of L1 Mandarin learners, Park (2010) also found that both /ʌ/ and /u/ were misperceived as /o/, and vice versa. The confusion between /o/ and /u/ may also extend to palatalized vowels, as Kim and Kwon (2019) show that L1 Mongolian novice L2 learners often misperceived /jo/ and /ju/ for each other.

Kim and Kwon (2019) further demonstrate the complexity involved in understanding the perception of Korean diphthongs. While many L2 perception tasks involve playing a stimulus and asking the listener to choose from a closed set of categories, Kim and Kwon (2019) allowed the L1 Mongolian listeners to write their responses freely any way they chose. As a result, some diphthongs were perceived as not diphthongs at all, but monophthongs (e.g., /je/ as /ɛ/), or even a sequence of two monophthongs (e.g., /we/ as /we/). Kim (2020) applied this free response method to perceptual assimilation of the entire inventory of Korean monophthongs and diphthongs: L1 Mandarin novice and advanced L2 learners listened to Korean vowels and wrote in pinyin what it sounded like in Mandarin. While the results revealed once again that both Korean /o/ is often assimilated to Mandarin <u>, the free response style also revealed that Korean /ʌ/ assimilates most often not to a single Mandarin vowel, but rather <ao>, followed by <o>, <ou>, and <e>. Thus, some studies may actually underestimate perceptual variability both within and across listeners by restricting their responses to only a few options.

**Vowel production**

Confusion between Korean /o/ and /u/ has been observed in L2 production as well. Han and Kim (2011) recorded six L1 Mandarin learners every two months over their first year of L2 Korean instruction and had L1 Korean listeners identify and rate their productions of the vowels /a, ɛ, i, o, u/. The learners’ vowels were almost always correctly identified with the exception of /u/, which was misperceived as /o/ roughly 20–35% of the time at all time points. This asymmetric misperception is likely a consequence of the raising of /o/ in Seoul in Korean discussed earlier. It is possible that learners’ /o/ or /u/ productions could also be misperceived as /ʌ/ or /ɨ/, but these options were not given to the listeners.

In another longitudinal study, J. Kim (2014) recorded the entire set of Korean monophthongs produced by 23 L1 Mandarin learners after one month and 12 months of L2 instruction, and compared the acoustic properties to those of Korean vowels produced by native speakers. The results suggested an improvement in /o/ over the course of the year, indicated by an overall raising to the high back corner of the vowel space. The learners’ productions of /u/, however, moved further back, and after 12 months were almost entirely overlapping with their /o/ productions. What could explain this apparent decrease in vowel production accuracy? L2 learners with more canonical /o/ and /u/ targets in their L1 are likely to be very aware that Korean /o/ is raised, but they may not realize that Korean /u/ is fronted if they do not have a separate high central vowel category. The difficulty in establishing an L2 category very close to an already existing L1 category (Flege, 1995) could then lead learners to simply merge the two, resulting in overlapping distributions of /o/ and /u/.

**Other issues**

**Coda consonants**

With respect to Korean coda consonants, there are two main issues that L2 learners must grapple with. First, there is the existence and inventory of coda consonants itself, as all Korean
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consonant phonemes other than /p*/ and /t*/ may appear in syllable-final position. Second, among these, the obstruents (i.e., stops, affricates, and fricatives) become neutralized to homorganic unreleased stops. In other words, all bilabial and velar stops are phonetically realized as [p̚] and [k̚], respectively, and all dental-alveolar stops, affricates, and fricatives are realized as [t̚]. The only consonants permitted in coda position in Mandarin are [n] and [ŋ], while Japanese has only a single coda nasal whose place of articulation is underspecified. Thus, for L1 speakers of these languages, the very existence of coda stops or liquids would be new, and even among coda nasals it may difficult to differentiate among them. English, on the other hand, permits many consonants in coda position, but it is also common for them to be released (i.e., the slight burst or puff of air at the end of a word like “kick”). In Korean, coda stops must be produced without any audible release.

Yoon (2013) identifies several areas of difficulty for L2 learners relating to coda consonants. For example, when the following syllable has an empty onset, a coda consonant will resyllabify instead of neutralize. Additionally, because neutralized coda consonants are unreleased, they may be harder to distinguish perceptually, especially when not in word-final position and followed by another obstruent. Thus, while L2 learners are not prone to misperceive stop place of articulation in syllable-initial position, evidence suggests that they may struggle in syllable-final position (Kim, T.-K., 2014). Learners may also struggle with lexical access, as orthographically distinct words may be phonetically indistinguishable (e.g., [it*a] could be exist <있다> /is*ta/ or forget <잊다> /iteta/).

Other phonological processes

Due to its automatic, predictable nature, coda neutralization is viewed as a phonological (or phonetic) process in Korean. But there are many others, and as they operate at the segmental level, the acquisition of these processes is not independent from the acquisition of segments themselves. One such process is post-obstruent tensification, in which a lenis obstruent or non-fortis fricative is realized as fortis when directly preceded by another obstruent, e.g., block <막다> /makta/ is realized as [makt*a]. To complicate matters further, although tensification always occurs in post-obstruent position, it can also occur in other positions for historical or morphological reasons, such as in the word flour <밀가루> /milkalu/, pronounced as [milk*aru]. The L2 learner therefore must master not only the pronunciation of fortis obstruents but also the rules that govern when underlying lenis obstruents should be pronounced as fortis. Work by Lee and Park (2018) suggests that accuracy of word-initial fortis stop pronunciation is not related to accuracy in tensified fortis stop pronunciation and that the former is not a prerequisite for the latter. Thus, while the current chapter focused on the acquisition of underlying segments, and a more thorough exploration of the acquisition of phonological processes is left for future work, it should not be assumed that mastery of phonological processes follows directly from the mastery of individual segments.

Global properties

Although some research on L2 Korean segmental acquisition is of purely theoretical interest, it is safe to say that much of it is, ultimately, pedagogically motivated. Many researchers want to understand the problems that L2 learners of Korean face in order to help them improve their pronunciation. But how is their pronunciation evaluated? Many of the studies cited in this chapter use laboratory methods to measure acoustic differences between the productions of L1 and L2 speakers, or psycholinguistic methods to measure accuracy on some perception task. But does good performance on these tasks correlate with good pronunciation evaluation
by native Korean listeners? In other words, just because an L2 speaker fails to produce an L2 sound in a completely native-like way does not mean that a listener will notice, or that it will negatively affect intelligibility.

Thus, there is a need for more research that bridges the gap between the laboratory analysis of L2 Korean segmental production and the evaluation of L2 learners’ speech in terms of intelligibility, comprehensibility, or foreign accent. For example, Jung (2020) investigated whether larger deviations from L1 Korean acoustic norms in the isolated word productions of L2 Korean learners were correlated with stronger foreign accent. Some correlations were found, but more research is needed to better understand the contributions of segmental and suprasegmental properties of L2 Korean to not only foreign accent, but also the sociolinguistic perception of other talker attributes.

**Conclusion**

In tandem with the increase in research on L2 Korean phonology in the early 2000s, it became clear that more empirically informed pronunciation teaching methods were needed. According to Jang (2002), both instructors and students would benefit from deeper knowledge about the phonetic differences between the L1 and L2 and that having students merely listen to and repeat the instructor’s pronunciation has its limits. To this end, the primary goal of the current chapter was to provide an empirical basis for understanding phenomena in the L2 acquisition of Korean segmental phonology. It is our hope that the evidence offered herein may not only motivate more research in this area but also inform the teaching practices of Korean language instructors.

In the preceding sections, we summarized some of the issues faced by L2 learners in the acquisition of Korean stops, affricates, fricatives, and vowels. Conspicuously absent from this chapter was any discussion of suprasegmental issues. While this omission is regrettable, the scope of the chapter was already so vast that it was judged better to leave for future work. In the space that remains, some suggestions for directions and methods in future research are offered.

In terms of methodology, studies of perceptual assimilation in L2 learners may help shed light on why certain Korean sounds are difficult for some learners. According to Flege (1995), one reason a learner may produce an L2 sound incorrectly is that the learner perceives it to be equivalent to an already existing L1 sound. To explore whether this is the case, it is necessary to probe the perceptual mappings between L1 and L2 categories, and perceptual assimilation is one task that can do exactly that. Relatedly, more work is also needed to offer a more unified account of the acquisition of individual phonemes. For example, in the case of stops, while there are many studies that have investigated production and perception in word-initial position, there are far fewer that have looked at word-medial position, and even fewer that have speculated how the two may be related. L2 learners of Korean probably do not start out thinking that lenis stops should be pronounced differently in different syllabic environments. How and when is that knowledge acquired?

Another promising – and needed – area of future research concerns the relationship between specific pronunciation teaching methods and learner outcomes. So-called classroom studies that implement a pronunciation teaching technique in one classroom while withholding it in a comparable control classroom are the only truly ecologically valid way to test whether a particular teaching technique is effective (Derwing & Munro, 2015, p. 83). For example, it was observed above that learners from various L1 backgrounds struggle to manipulate f0 correctly in their L2 production of Korean stops. But how many of these learners were
explicitly aware of how the f0 of the following vowel correlates with stop phonation type? Did their instructors ever point this out to them or provide any contrastive examples or training? We may speculate that such instruction would be helpful, but it could only be empirically demonstrated through a controlled classroom study, which would also give a sense of how effective (and therefore worthwhile) such instruction would be. In one study in this vein, Isbell, Park, and Lee (2019) conducted a classroom-based study on the effect of specialized pronunciation instruction on the comprehensibility, accentedness, and segmental error rates of L2 Korean learners’ speech. While the results were mixed, the study represents an important step in connecting classroom instruction to actual learner outcomes in L2 Korean pronunciation.

In terms of analysis and interpretation, not many of the studies cited in this chapter looked closely at individual differences. When accuracy is high, this may be fine since mathematically there is little room for variation. But when the mean accuracy rate on a task hovers around 50%, it raises questions about what the errors are, whether they are distributed across learners or concentrated within a few, and whether they occur across the stimulus set or are caused only by a subset of difficult stimuli. This issue can be partly addressed by using statistical methods that take both intra- and inter-subject and -item variability into account, but it can also be addressed by simply providing data visualizations or appendices that show performance across subjects and items.

Lastly, with the exception of those that investigated L1 English learners, many (if not all) of the studies cited in this chapter were actually investigating the production and perception of L3 Korean, since most of the participants in the studies studied English as an L2 to at least some degree. While the level of English proficiency or experience would play a role, we feel compelled to point out that this issue has been virtually ignored in every study cited here. And while there is growing interest in L3 phonological acquisition, to our knowledge there has been no systematic or large-scale investigation of L2 effects – especially L2 English – on L3 Korean phonological acquisition (although see Hong and Jun [2013] for an example of a study that explicitly examines the effect of L2 English experience, albeit among a population of naïve listeners). This issue is inextricably linked to questions about perceptual equivalence: if a learner of Korean already has phonological categories for both their L1 and English, it is reasonable to expect that their pronunciation or perception of Korean could be connected to both the structure of and mappings between these categories.

Notes
1 While the terms “fortis” and “lenis” are used in the current chapter, the terms “tense” and “lax” are also common.
2 A thorough discussion of Korean phonetic and phonological process can be found in chapters 8 and 9 of Shin, Kiaer, and Cha (2013, pp. 178–215) and chapter 7 of Sohn (2013, pp. 163–177).
3 Other references may transcribe this vowel with the IPA symbol /ɯ/.
4 Some listeners in Holliday (2014a) and Holliday (2016) assimilated Korean /s/ and /s*/ in the /a/ and /u/ contexts to a Mandarin postalveolar/retroflex, such as /ʃ/ or /ʧʰ/, but it was speculated that this was due to L1 dialectal variation in which the contrast between Mandarin denti-alveolars and postalveolars (e.g., /s/ and /ʃ/) has been neutralized.
5 For a review of these concepts, please see Chapter 1 of Derwing and Munro (2015).

References


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