



Journal of Arts & Humanities

Volume 08, Issue 12, 2019: 43-56

Article Received: 22-11-2019

Accepted: 10-12-2019

Available Online: 23-12-2019

ISSN: 2167-9045 (Print), 2167-9053 (Online)

DOI: <http://dx.doi.org/10.18533/journal.v8i12.1797>

Spanish vowel Perception by Korean Learners of Spanish: Korean Learners do not Perceive Spanish 'O' as 'O'

Joo Kyeong Kim¹

ABSTRACT

This paper examines Spanish vowel perception by Korean learners. According to Speech Learning Model (Flege, 1987, 1992, 1995; Bohn & Flege, 1992), L2 phones can be classified into three categories, 'new', 'similar', and 'identical'. Many studies have found that in the long run, 'similar' phones cause the most trouble for L2 learners. Generally, Spanish vowels are believed to have one-to-one correspondence with Korean, making them straight-forward to learn. In contrast, using experimental phonetics measures, it was discovered that the two vowel systems do have considerable differences. Thus, Spanish vowels should be considered as 'similar' phones, rather than 'identical'. In order to investigate whether the learners and the native speakers demonstrate some differences in Spanish vowel perception, an experiment utilizing synthesized sounds was carried out. There were three groups of subjects, with one native speaker (NS) group and two Korean speaker (KS) groups depending on the amount of L2 experience. For the experiment, four continua (/a/-/o/, /e/-/i/, /e/-/a/, and /ɛ/-/o/-/u/) were synthesized. The fourth continuum was designed in a more complex way, in order to contain the points of articulation for not only Spanish /o/ and /u/ but also Korean /ɛ/, /o/, and /u/. The subjects chose the closest Spanish vowel for each synthesized sound. The results reinforced the SLM's argument that similar phones are difficult to learn. KS surely perceived Spanish vowels in a different manner from NS. Against our initial predictions, however, the results did not support the learning effect.

Keywords: Vowel, L1 Korean-L2 Spanish, L2 perception, Speech Learning Model.

This is an open access article under Creative Commons Attribution 4.0 License.

1. Introduction

The ability to perceive and produce phonemes is indispensable for verbal communication. Strong foreign accents may result in negative impression of the speaker, or worse, may even hamper the communication. Thus, many researchers (Bohn & Flege, 1992; Flege, 1987; Flege, Bohn, & Jang, 1997; Fox, Flege, & Munro, 1995, and many others) have investigated L2 phoneme acquisition. Especially, L2 vowel perception and production with languages using Latin alphabet (i.e. English, Spanish,

¹ Department of Hispanic Language & Literature, Seoul National University, Republic of Korea. E-mail: anitag2@snu.ac.kr

Portuguese, French, or German) have been actively studied. On the other hand, research on Spanish perceived or produced by Korean learners is very limited. This may be due to the wide-spread belief that Spanish pronunciation is straight forward and easy to learn for Korean speakers. As Kim (2017) admitted, “Korean teachers and learners of Spanish do not emphasize the importance of pronunciation nor spend sufficient time to practice”.

This lack of interest in Spanish vowel acquisition is quite understandable, as Korean has a larger vowel inventory than Spanish, with 7 monophthongs compared to 5.² Furthermore, these 7 Korean vowels seem to cover the 5 Spanish ones. Spanish has a simple, symmetrical, five-vowel system –two high vowels (/i/, /u/), two mid vowels (/e/, /o/), and one low vowel (/a/) (Hualde, 2005). These vowels almost show one-to-one correspondence with those of Korean /i/, /u/ (high), /ɛ/, /o/ (mid), /a/ (low), as we can see in Tables 1 and 2.³ While, strictly speaking, Koreans do not receive appropriate instructions on Spanish vowel pronunciation, some Korean and Spanish vowels are actually different in terms of precise place of articulation.

Table 1.

Spanish Vowel Chart

	Front	Central	Back
High	i		u
Mid	e		o
Low		a	

Table 2.

Korean Vowel Chart

	Front	Central	Back
High	ㅣ /i/	— /u/	ㄸ /u/
Close-Mid	ㅓ /e/		ㅗ /o/
Open-Mid	(ㅓ /ɛ/) ⁴		ㅓ /ʌ/
Low		ㅏ /a/	

Our study intends to contribute to the field of sound acquisition in two ways. First, we bring new data to verify the degree of difficulty in ‘similar’ L2 sound acquisition. This will be the first study to implement experimental measures to analyze Spanish vowel perception by Korean speakers. Also, the present study examines the relationship between proficiency and L2 vowel perception. Based on Flege’s Speech Learning Model, we hypothesize that there will be differences between three groups: the native speaker group, the experienced learner group, and the inexperienced learner group. In order to clarify how L1 Koreans differ from Spanish native speakers concerning vowel perception, we synthesized /a/-/o/, /e/-/a/, /e/-/i/ and /ʌ/-/o/-/u/ continua. Each participant had to choose the closest Spanish vowel after hearing 100 synthesized sounds. Then, their response data was analyzed to find out if the Korean learners have trouble with similar sounds and if that trouble wears off with experience in Spanish. L1 similarity was actually found to be a reliable measure in the prediction of difficulty in L2 sound acquisition. After the result analysis, we provide the conclusion and suggestions for further research.

2. Literature review

The field of research on L1 Korean-L2 Spanish segmental acquisition has been very understudied. This is mainly due to the long-held belief that Spanish pronunciation is easy for Korean speakers, and also to the lack of Korean researchers in Spanish phonetics. One of the few investigators interested in this particular field is Kim (2001, 2011, 2013, 2014, 2017), who has identified Korean learners’ errors in Spanish pronunciation and has consistently explored Spanish segmental acquisition. However, his observations in relation to vowels were just limited to mentioning some differences between

² In this paper, we use the vowel systems proposed by Hualde (2005) for Spanish and Shin, Kiaer, & Cha (2012) for Korean.

³ Korean has two more vowels other than these five, /ɯ/ (high) and /ʌ/ (mid) (Shin, Kiaer, & Cha, 2012).

⁴ According to Gwag (2003), Shin, Kiaer, & Cha (2012), and many more, young and middle-aged adults speaking standard Korean do not differentiate between vowels ‘ㅓ /e/’ and ‘ㅓ /ɛ/’.

Spanish and Korean vowels with his instincts and sense of hearing. According to Kim (2009), Korean /a/ is pronounced further back compared to Spanish /a/, while Korean high vowels (/i/, /u/) are articulated higher than Spanish high vowels. Therefore, it is time that we utilized experimental methods for more precise and more scientific research in the field of Spanish vowel acquisition.

On the other hand, there are a few studies on L1 Spanish-L2 Korean vowel acquisition (Suh, 2007; Kim, 2009; Lee, 2015). Of the three studies, Lee (2015) is the only one who utilized the experimental phonetics approach. First, she did a questionnaire to find out which Korean vowel the Spanish learners of Korean consider the most difficult. Then, their vowel productions were analyzed. The analysis demonstrated that Spanish learners' /ʌ/ productions were significantly different from that of Korean native. Also, for female learners, both F1 and F2 values for /o/ and F2 values for /u/ and /a/ were found to be statistically different from female native speakers. It could be inferred from these results that Koreans, just like the Spanish learners of Korean, will have trouble with /o/, /u/, and /a/.

3. Research questions

This study intends to investigate Spanish vowel perception with the following three research questions.

- 1) Do Korean learners of Spanish have difficulty learning similar sounds?
- 2) Do the experienced learners perceive Spanish vowels in a more native-like way than the inexperienced group?
- 3) Can L2 learners achieve native-like perception of Spanish vowels in the long run?

Adapting Speech Learning Model (henceforth SLM) (Flege, 1987, 1992, 1995; Bohn & Flege, 1992), the current paper evaluates Spanish vowels according to level of similarity to Korean vowels, and compares vowel perception by Korean learners to that of Spanish native. As generally accepted, L2 learners perceive L2 phones in terms of L1 categories and use these categorizations to realize L2 phones (Flege, 1987). SLM classified L2 phones into three categories, according to L1 similarity: 'identical phones', 'similar phones' and 'new phones'. Due to L1 interference, 'similar phones' are the most troubling ones in the long term for L2 learners. Two sounds are 'similar' when they are counterpart to each other but differ acoustically. Unlike the case of 'new sound', where learners eventually recognize the acoustic difference between two sounds, it is very tricky to achieve native-level perception and production for 'similar phones'. A good example is English /ɪ/ and Korean /i/. While Koreans will correspond English /ɪ/ to Korean /i/, English /ɪ/ and Korean /i/ are completely different sounds. This similar but definitely different quality is what makes /ɪ/ one of the hardest vowels to learn for L1 Korean. Likewise, we expect all similar phones to cause trouble for Korean learners of Spanish.

To verify the second research question, we take L2 experience into consideration to further investigate SLM's claim.⁵ Many studies have proven the effects of proficiency on perception and production of L2 vowels. They have confirmed that experienced learners with different L1s, such as English, Spanish, German, French, Mandarin, and Korean, perceive or produce L2 vowels with greater accuracy (Bohn & Flege, 1992; Flege & Hillenbrand, 1984; Flege, Bohn, & Jang, 1997; Fox, Flege, & Munro, 1995). However, in the field of L1 Korean – L2 Spanish, this will be the first to study proficiency effects on Spanish vowels by Korean speakers. We will have two groups of learner participants, one inexperienced and the other experienced. It is expected the latter group perceive vowels in a more native-like way.

For the last research question, we hypothesize that L2 learners, irrespective of experience, fail to fully achieve native-level perception for similar phones. The experienced learners may perceive in a more native-like way than the inexperienced ones, but they, too, will still perceive the vowels differently from native speakers. Due to Equivalence Classification, the learners do not perceive the L2 phones as it is, but rather, they correspond the sound to the closest L1 phone they can find. As a result, they fail to perceive the minute difference between L1-L2 phones, even with sufficient L2 input (Flege & Hillenbrand, 1984; Flege, 1987).

⁵ In Fox, Flege, & Munro (1995) have pointed out that the amount of experience is not necessarily proportional to L2 proficiency. However, in this paper, in order to assume that the learners with more L2 experience show higher proficiency level, we controlled the two learner groups to have a big difference in the amount of experience (more than 5 years vs. less than 1 year).

4. Vowel comparison

In this paper, two aspects of vowel are taken into consideration: height and backness. These characteristics can be measured by formants, F1 (first formant) correlating inversely with vowel height (i.e. the higher the value, the lower the vowel is produced), and F2 (second formant) being relative to frontness (i.e. the higher the value, the more fronted the vowel). Close front vowel /i/, for instance, would have low F1 and high F2. As neither F3 (or higher) nor duration are discriminating factors for Spanish vowels, only F1 and F2 are included as variables.

Intuitively speaking, Spanish vowels could easily be matched with Korean vowels. However, vowel space and Euclidean Distance (ED)⁶ calculations display a different vowel contrast.⁷ In Figure 1, it is notable that in the upper right segment, Spanish /o/ appears to be closer to Korean /ʌ/ rather than to Korean /o/, the intuitive-counterpart. What is more, Korean /o/ is produced even further back than Spanish /u/.

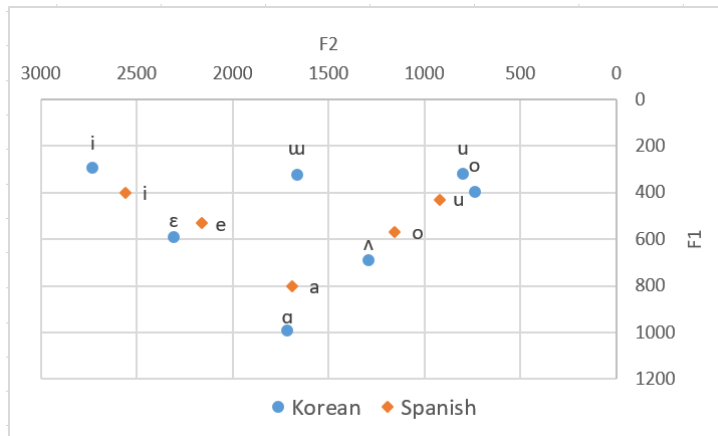


Figure 1. Female speakers' mean F1 and F2 measurements for Korean and Spanish

Table 3 gives us more concrete data, with Euclidean Distances (ED) between native and target vowels' formant values. To begin with, there seem to exist fair amounts of distance between pairs /i/-/i/, /e/-/ε/, and /a/-/a/ (ED(/i-i/) = 202.43, ED(/e-ε/) = 161.23, ED(/a-a/) = 191.56 (/Spanish-Korean/)). While Korean learners of Spanish match Korean vowel /o/ and /u/ to Spanish /o/ and /u/, actual phonetic analysis suggests something different. Counter-intuitively, Korean vowel acoustically closer to Spanish /o/ is /ʌ/ (ED(/o-ʌ/) = 183.51 < ED(/o-o/) = 448.71) and both Korean vowels /o/, /u/ are close to Spanish /u/ (ED(/u-o/) = 184.26 ≐ ED(/u-u/) = 162.94). This contrast suggests that Spanish vowels are 'similar', not 'identical' to Korean.

Table 3.

Euclidean distances between target vowel (Spanish) and L1 vowel (Korean)

		Target Vowel (Spanish)					
		i	e	a	o	u	
L1 Vowel (Korean)	i	202.43	619.96	1157.96	1599.83	1815.09	
	ε	314.40	161.23	653.35	1154.40	1397.23	
	ɑ	1030.13	638.42	191.56	702.70	972.54	
	ʌ	1299.04	879.81	413.21	183.51	452.76	
	u	896.68	534.75	479.42	567.67	753.60	
	o	1820.30	1425.51	1033.10	448.71	184.26	
	u	1761.07	1374.42	1011.40	431.84	162.94	

Many works on SLM simply classified the vowels into three categories of new, similar, and identical phones. However, until now, we do not have a fixed and unquestioned criterion for 'similarity'. For Korean and Spanish, /i/, /e/, and /a/ vowel pairs are quite alike, but it is difficult to assert that they are the same. Thus, it seems more reasonable to consider similarity as a relative concept rather than an

⁶ Euclidean Distance (ED) = $d(p, q) = \sqrt{\sum_{i=1}^n (q_i - p_i)^2}$

⁷ Data were taken from Shin, Kiaer, & Cha (2012) for Korean and Chládkova, Escudero, &Boersma (2011) for Spanish.

absolute one. In this experiment, we presumed that all Spanish vowels are ‘similar vowels’, but with different levels of similarity, from Level-1 to Level-3.

Level-3 similar phones are the phones with undoubtable L1 counterparts, and vowels /i/, /e/, and /a/ are classified into this group. /u/ was assigned as Level-2 because both Korean /o/ and /u/ are located very closely. Finally, /o/ is a Level-1 Similar Phone because it is actually closer to Korean /ʌ/ rather than the intuitively-counterpart /o/.

I) Level-3 Similar Phones: /i/, /e/, /a/

II) Level-2 Similar Phones: /u/

III) Level-1 Similar Phones: /o/

5. Methods

5.1 Subjects

In total, 3 native speakers⁸ and 28 standard Korean speakers learning Spanish participated in the perception experiment. To prevent variations concerning age or education level, only undergraduate or graduate students in their 20s or 30s were tested. Out of 28 learners of Spanish, 16 were experienced learners (five or more years of learning Spanish) and the rest were inexperienced (maximum one year of experience). In the analysis, however, only 12 learners in experienced group (KSE) and 11 students in inexperienced group (KSI) were included, due to a variety of reasons.⁹ Table 4 is a summary of the information about the participants.

Table 4.

Participant Information

Group	Subject	Gender	Place of Birth	L1	Age of Learning L2	Duration of L2 Experience (year)
Native Speaker (NS)	NS1	F	Spain	Spanish	22	Between 1 and 3
	NS2	F	Mexico	Spanish	30	Less than 1
	NS3	F	Mexico	Spanish	33	Between 1 and 3
Experienced Learner (KSE)	KSE1	F	Daejeon	Korean	16	More than 10
	KSE2	M	Seoul	Korean	16	Between 5 and 10
	KSE3	F	Gyeonggi	Korean	19	More than 10
	KSE4	F	Seoul	Korean	15	Between 5 and 10
	KSE5	F	Seoul	Korean	15	Between 5 and 10
	KSE6	M	Seoul	Korean	16	Between 5 and 10
	KSE7	F	Daejeon	Korean	16	Between 5 and 10
	KSE8	F	Daejeon	Korean	18	Between 5 and 10
	KSE9	M	Seoul	Korean	18	Between 5 and 10
	KSE10	M	Seoul	Korean	16	Between 5 and 10
	KSE11	F	Seoul	Korean	16	Between 5 and 10
	KSE12	M	Seoul	Korean	19	Between 4 and 5
In-experienced Learner (KSI)	KSI1	F	Seoul	Korean	18	Less than 1
	KSI2	M	Gyeonggi	Korean	19	Less than 1
	KSI3	M	Daejeon	Korean	19	Less than 1
	KSI4	M	Jeonju	Korean	20	Less than 1
	KSI5	F	Daejeon	Korean	20	Less than 1
	KSI6	M	Gwangju	Korean	22	Less than 1
	KSI7	M	Incheon	Korean	23	Less than 1

⁸ In this experiment, we did not take account of dialectal variations due to difficulty of recruiting native speaker participants. Furthermore, many researchers have claimed that Spanish vowels do not differ greatly according to dialects (Hualde, 2005; Solon, Long, & Gurzynsky-Weiss, 2017).

⁹ Two participants were excluded because they had lived abroad in an English-speaking country before adolescence. Two other participants not qualify for neither group. One participant's onset of Spanish acquisition was before entering high school. Nevertheless, one participant had experience of a little less than five years and was included because they had experience of studying abroad in Spain.

KSI8	M	Gwangju	Korean	19	Less than 1
KSI9	M	Seoul	Korean	19	Less than 1
KSI10	F	Gangneung	Korean	18	Less than 1
KSI1	M	Jeonju	Korean	21	Less than 1

5.2 Stimuli

This study was modeled after Bohn &Flege (1990) and Yun (2005), having synthesized sounds as stimuli for perception experiment. Praat's plugin program Vocal Toolkit (Corrette, 2019) was used to synthesize four sets of continuum. Vocal Toolkit produces vowel sounds with given formants. Using data from Chládkova, Escudero, &Boersma (2011) for Spanish and Shin, Kiaer, & Cha (2012) for Korean, test sounds were synthesized. In studies where English was the target language, considered vowel duration as an important variable (Bohn &Flege, 1990; Yun, 2005), but as the length is not a discriminatory factor for Spanish nor for Korean vowels, we only take account of vowel formants.

5.2.1 /a/-/o/, /e/-/i/, and /e/-/a/ continua

For three continua, we divided the distance in vowel space between pairs /a/-/o/, /e/-/i/, and /e/-/a/ by seven. Thus, excluding the end points (i.e. mean Spanish vowel F1 and F2 values from Chládkova, Escudero, &Boersma (2011)), each continuum had six linearly equal steps. For example, (F1, F2) for /a/ and /o/ are (801, 1671) and (568, 1155), so each step would have a difference of 33.3 ($= (801-568)/7$) for F1 and 76.5 ($= (1671-1155)/7$) for F2. As a result, we ended up with 22 different sounds in total, since we had 8 sounds for three continua each, and excluded two end points (/a/, /e/) that were repeated twice ($8 \times 3 - 2$).

Table 5.

F1 and F2 values for /a/-/o/, /e/-/a/, /e/-/i/ continua

/a/-/o/	F1	F2	/e/-/a/	F1	F2	/e/-/i/	F1	F2
/a-o/1	801	1691	/e-a/1	531	2159	/e-i/1	531	2159
/a-o/2	768	1615	/e-a/2	570	2092	/e-i/2	512	2216
/a-o/3	734	1538	/e-a/3	608	2025	/e-i/3	494	2274
/a-o/4	701	1462	/e-a/4	647	1958	/e-i/4	475	2331
/a-o/5	668	1385	/e-a/5	685	1891	/e-i/5	456	2388
/a-o/6	635	1309	/e-a/6	724	1825	/e-i/6	438	2446
/a-o/7	601	1232	/e-a/7	763	1758	/e-i/7	419	2503
/a-o/8	568	1155	/e-a/8	801	1691	/e-i/8	400	2560

5.2.2 /ʌ/-/o/-/u/ continuum

As /o/ and /u/ are Level-1 and Level-2 Similar Phones respectively, for /o/-/u/ continuum, a wider range of continuum was used in order to investigate the perception range in detail. As Figure 1 indicates, Korean /ʌ/, /o/, and /u/ have a wider coverage over formant space than Spanish /o/ and /u/. Therefore, this experiment used Korean /ʌ/ for one end point of the continuum (688.5, 1293.4), and for the other end point, the F1 value of Korean /u/ (since F1 of /u/ < F1 of /o/) and the F2 value of Korean /o/ (since F2 of /o/ < F2 of /u/) were used (321.1, 739.7). In sum, we chose the end points in a way that our continuum could embrace all the points of articulation for both Korean and Spanish.

Likewise, we calculated six linearly equal steps between two end points. That is, every two points should be spread apart by 52.5 ($= (688.5-321)/7$) for F1 and 79.1 ($= (1293.4-739.7)/7$) for F2. However, the stimuli needed to be more precise for detailed investigation, so we included additional points locating nearby the vowels. In total, 26 sounds were synthesized as given in Table 6. For instance, /ʌ/-/o/-/u/8 was synthesized with (F1, F2) = (426, 1056.1) setting. Surely, it would have been preferable to include all 64 (= 8x8) sounds in Table 6, but effectiveness was also an important issue, as we have a limited time to carry out the experiment.

Table 6.
F1 and F2 values for /ʌ/-/o/-/u/ continuum

F2 \ F1	1293.4	1214.3	1135.2	1056.1	977	897.9	818.8	739.7
321	-	-	-	-	-	-	/ʌ/-/o/- /u/20	-
373.5	-	-	-	-	/ʌ/-/o/- /u/12	/ʌ/-/o/-/u/16	/ʌ/-/o/- /u/21	/ʌ/-/o/- /u/24
426	-	-	-	/ʌ/-/o/- /u/8	/ʌ/-/o/- /u/13	/ʌ/-/o/- /u/17	/ʌ/-/o/- /u/22	/ʌ/-/o/- /u/25
478.5	-	-	/ʌ/-/o/- /u/4	/ʌ/-/o/- /u/9	/ʌ/-/o/- /u/14	/ʌ/-/o/- /u/18	/ʌ/-/o/- /u/23	/ʌ/-/o/- /u/26
531	-	-	/ʌ/-/o/- /u/5	/ʌ/-/o/- /u/10	/ʌ/-/o/- /u/15	/ʌ/-/o/- /u/19	-	-
583.5	-	/ʌ/-/o/- /u/2	/ʌ/-/o/- /u/6	/ʌ/-/o/- /u/11	-	-	-	-
636	-	/ʌ/-/o/- /u/3	/ʌ/-/o/- /u/7	-	-	-	-	-
688.5	/ʌ/-/o/-/u/1	-	-	-	-	-	-	-

5.3 Procedure

After filling out the participant information questionnaire, the perception experiment was executed in a quiet room, not to be disturbed by noise. 22 sounds from /a/-/o/, /e/-/a/, /e/-/i/ continua were played once and 26 sounds from /ʌ/-/o/-/u/ continuum were played three times. In total, each subject was given 100 sounds (= 22+26x3). Each sound was played twice in a row with a short stop, and we asked the subjects to choose the Spanish vowel closest to the given sound. If there were no plausible vowels, they could choose 'N' (Not Identifiable) instead. Before the experiment, one sound was provided as an example so that they understood the procedure. The whole experiment, including the questionnaire, took 15 minutes at most.

After collecting the responses from the subjects, the data was organized by the following rules. As the responses for /a/-/o/, /e/-/a/, /e/-/i/ continua were only recorded once, they were directly included in our final results. Meanwhile, we received three responses for each sound in /ʌ/-/o/-/u/ continuum. For every sound, it was deemed that the vowel with the majority vote is the final response. If all three responses varied, the final response was written down as 'N'. This would be the case where the subject did not recognize the given sound as a particular vowel consistently. For instance, if a participant answered 'O'-'O'-'U' for /ʌ/-/o/-/u/6, it was deemed that the final response was 'O'. If the three responses were 'N'-'O'-'U' without a majority vote, the final response was recorded as 'N'. In conclusion, we had 48 (= 22+26) responses from each subject.

6. Results

6.1 Results for /a/-/o/, /e/-/i/, and /e/-/a/ continua

The test responses for each continuum were analyzed by group. As /e/-/a/, /e/-/i/ continua only consist of Level-3 Similar Phones, it was expected that the results for NS and for two KS groups will be similar. On the other hand, KS group results for /a/-/o/ continuum will supposedly differ from NS group because /o/ is Level-1 Similar Phone.

For each continuum, we calculated the percentages of responses for each vowel.¹⁰ To start with, the three group responses for /a/-/o/ continuum are given in Figure 2, 3, and 4. The dark part on the graph demonstrates the percentage of responses for 'O'. In all three Figures, it is observed that the

¹⁰ It is worth mentioning that while NS only gave responses from the three responses-the first end point vowel, the other end point vowel, and 'N'-a few participants from KS groups chose a vowel other than the two end points.

tendency to choose ‘O’ increases from /a-/o/1 to /a-/o/8. However, that tendency is obviously stronger for NS group compared to the other two learner groups. While 67% of NS chose ‘O’ for /a-/o/8(/o/), only 17% of KSE and 18% of KSI responded ‘O’. For /a-/o/7 and /a-/o/8, no one in NS group answered ‘N’, while the learners showed preference for ‘N’. In fact, half of KSI and two thirds of KSE refused to choose a vowel for /a-/o/8. This is because Korean learners of Spanish perceive L2 in terms of L1 categories, Spanish /o/ being perceived in the way how Korean /o/ is. To elaborate, /a-/o/7, /a-/o/8 are actually rather closely located to Korean /ʌ/, and since there is no corresponding Spanish vowel for /ʌ/, many learners ended up choosing ‘N’ instead.

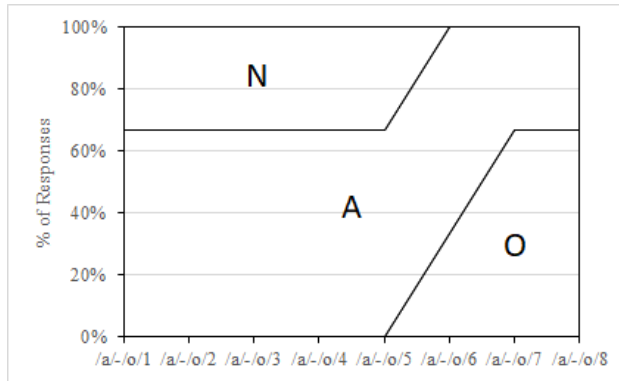


Figure 2. NS Group Responses for /a-/o/ continuum

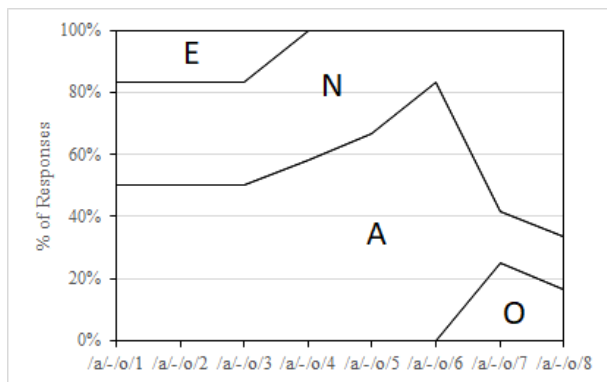


Figure 3. KSE Group Responses for /a-/o/ continuum

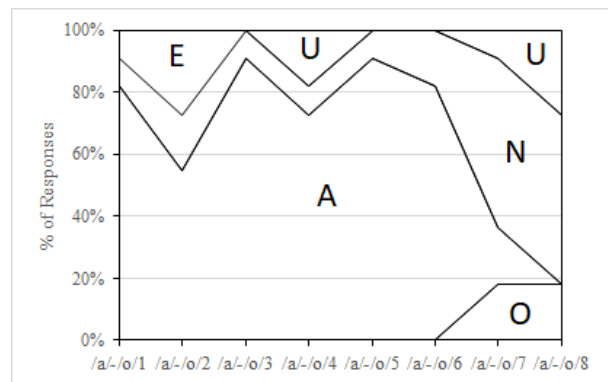


Figure 4. KSI Group Responses to /a-/o/ continuum

Figure 5, 6, and 7 illustrates the percentage of responses for /e-/i/ continuum by group. The results were not deviant from what was predicted. Three group responses look quite alike. This may be explained by the fact that both /e/ and /i/ are Level-3 Similar Phones. It is worth noting that unlike /a-/o/ continuum, almost all the learners refused to choose ‘N’. The closer the sound was to /e-/i/8, the more native speakers and learners chose ‘I’ over ‘E’. Also, interestingly for all three groups, ambiguous sounds like /e-/i/5 or /e-/i/6 were perceived as ‘E’ rather than ‘I’. It can be inferred that the perception range of mid vowel /e/ is extensive in comparison to high vowel /i/ for both NS and KS group subjects.

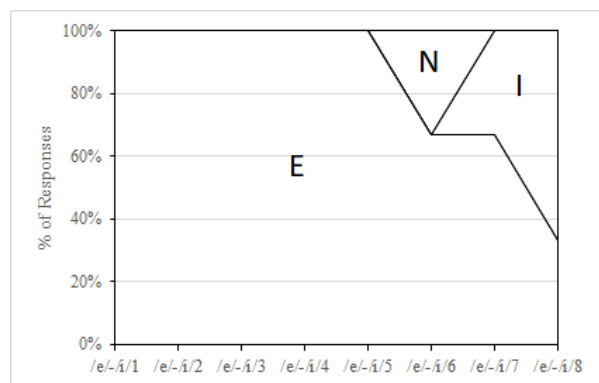


Figure 5. NS Group Responses for /e-/i/ continuum

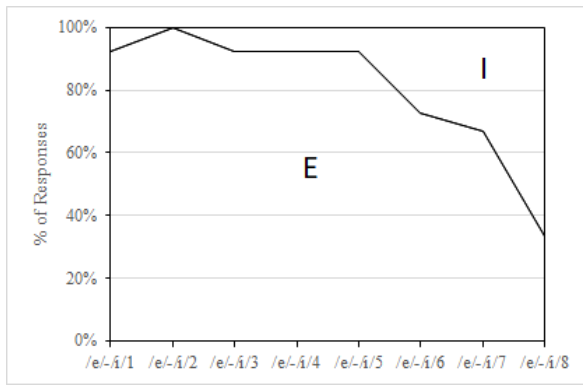


Figure 6. KSE Group Responses for /e/-/i/ continuum

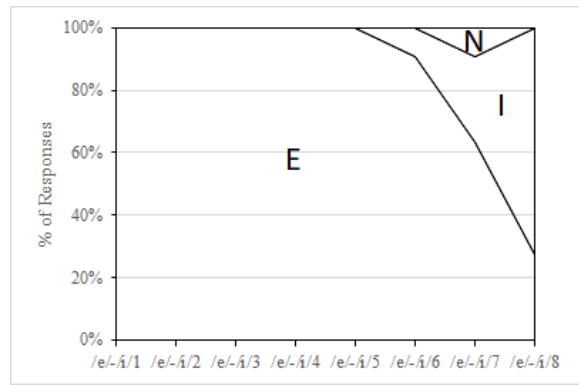


Figure 7. KSI Group Responses for /e/-/i/ continuum

Next, three group responses for /e/-/a/ continuum are provided in Figure 8, 9, and 10. Just as in the previous section, the perception range of /e/ appeared to be extensive in comparison to low vowel /a/. For ambiguous sounds—i.e. /e/-/a/5 and /e/-/a/6—the subjects chose ‘E’ over ‘A’, even though they are numerically closer to /a/.

Despite the fact that both /e/ and /a/ are classified as Level-3 Similar Phones, some differences were discovered between NS group and KS groups, especially between NS and KSI. It is true that KSE’s performance is more native-like than KSI’s, so this may be partly supporting the learning effect. While a little over 60% of NS and KSE responded ‘E’ for /e/-/a/6, almost 80% of KSI chose ‘E’ over ‘A’. However, this outcome is still not a very effective proof. As for /e/-/a/7, none of NS answered ‘E’ but 42% of KSE and 82% of KSI chose ‘E’. Also for /e/-/a/8, a few KS participants responded ‘E’. Supposedly, this is due to the lower point of articulation of Korean /a/ compared to Spanish /a/. As Korean learners correspond /a/ to Korean /a/, the sound needs to have a higher F1 to be recognized as /a/.

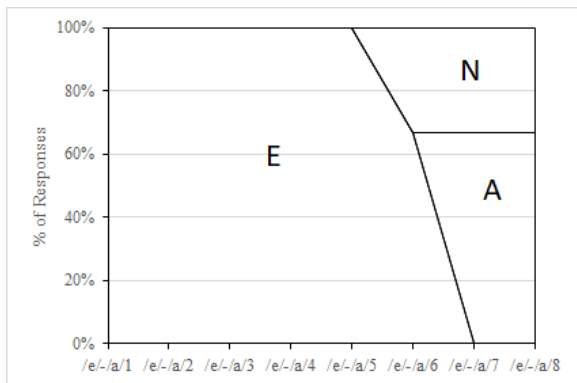


Figure 8. NS Group Responses for /e/-/a/ continuum

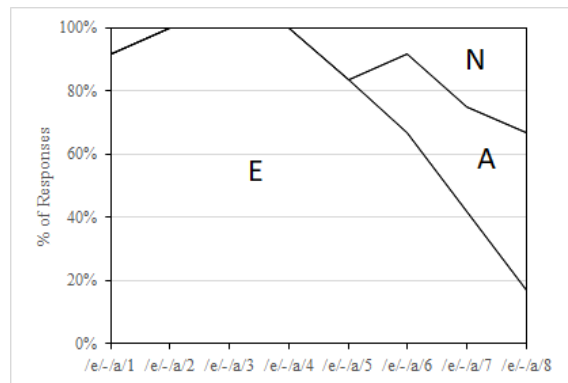


Figure 9. KSE Group Responses for /e/-/a/ continuum

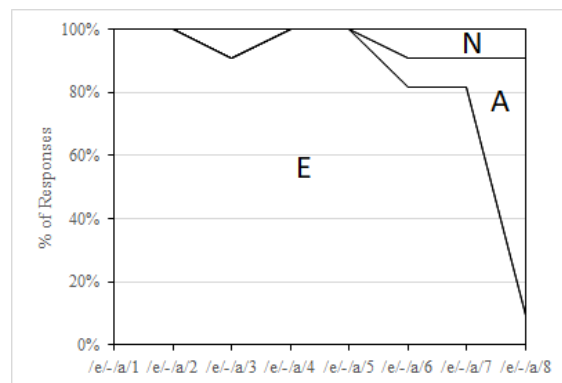


Figure 10. KSI Group Responses to /e/-/a/ continuum

6.2 Results for /ʌ/-/o/-/u/ continuum

As /o/ and /u/ are Level 1 and 2 Similar Phones, some differences between groups were expected. Also for /ʌ/-/o/-/u/ continuum, we calculated the percentage of responses of 'O', 'U', 'N' for each synthesized sound.¹¹ Figure 11, 12, and 13 demonstrate the results for each vowel. The circle size is proportional to percentage of responses, and the 0% does not show on the graph. Gray-filled circles are responses of NS, while empty circles are responses of KS. Two black ovals stand for points of articulation of Spanish /o/ (/ʌ/-/o/-/u/5, 6) and /u/ (/ʌ/-/o/-/u/13, 17).

To begin with, Figure 11 demonstrates the perception range of /o/ for all three groups. The more circles overlap with each other, the more similarly the groups perceive Spanish vowels. The most remarkable difference between NS and KS was the extent of perception range. NS group's perception range was much more extensive than the other two groups. In the right side of Figure 11, the three groups did not perform very differently, but in the left side, gray circles are much bigger than empty circles. This is interpreted as NS perceiving these sounds as /o/ unlike KS. It is interesting to note that this part in the formant space is supposed to be where Spanish /o/ is articulated (as marked by black oval). Again, this is in line with the findings for /a/-/o/ continuum, where we discovered that Koreans perceive Spanish in terms of L1. In addition, the empty circles grow bigger as F2 decreases, which is close to point of articulation of Korean /o/. This definitely implies that Korean learners' perception of Korean /o/ is reflected in Spanish /o/.

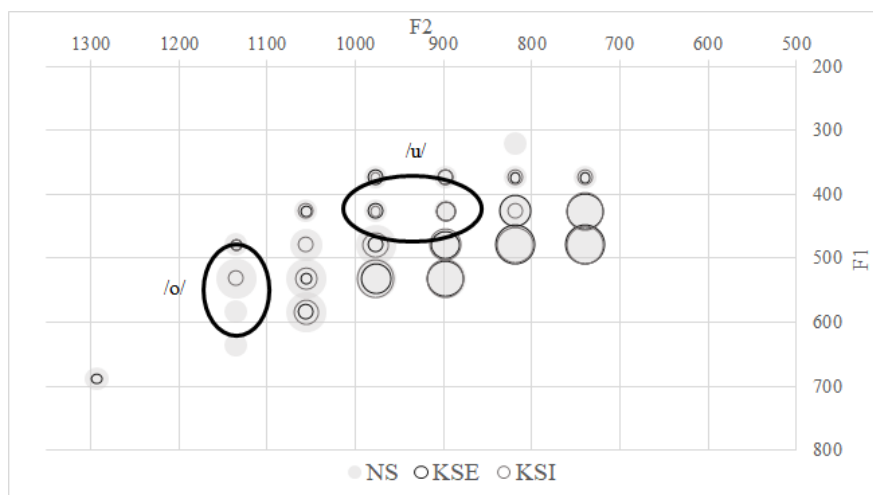


Figure 11. Percentage of Responses of "O" for /ʌ/-/o/-/u/ Continuum by Group

Now turning to analysis of the responses of "U" for the continuum, the responses of "U" did not differ very much between the groups (gray circles and empty circles overlap). Also, according to Figure 12, big circles are located around the point of articulation of Spanish /u/. That is, native speakers and Korean learners have more or less similar perception ranges for /u/. However, it is worth

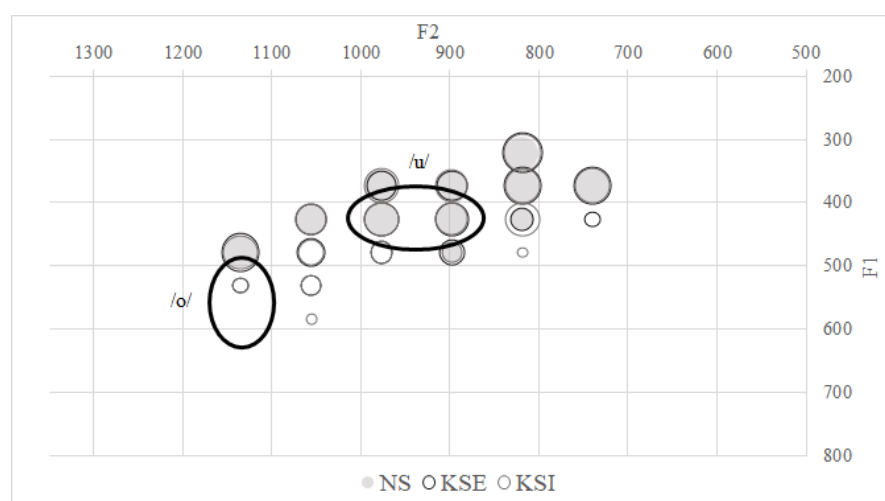


Figure 12. Percentage of Responses of "U" for /ʌ/-/o/-/u/ Continuum by Group

¹¹ There were a few participants that gave answers other than 'O', 'U', or 'N'. However, that number is insignificant and is not very crucial to the scope of our study.

mentioning that a few empty circles, but not gray circles, are dispersed over the lower part of the formant space.

Finally, percentage of responses of "N" is provided in Figure 13. Overall, we received much more 'N' from KS than from NS (empty circles are prevalent compared to gray circles). More and larger circles imply limited perception range for /o/ and /u/, so Figure 13 proves that native speakers are more generous towards variation of Spanish /o/ and /u/. In addition, large empty circles are located around /ʌ/-o/-u/5, 6, which again, are where Korean /ʌ/ is articulated. To be specific, Korean learners, irrespective of experience, are unable to correctly discriminate Spanish /o/ because of L1 influence.

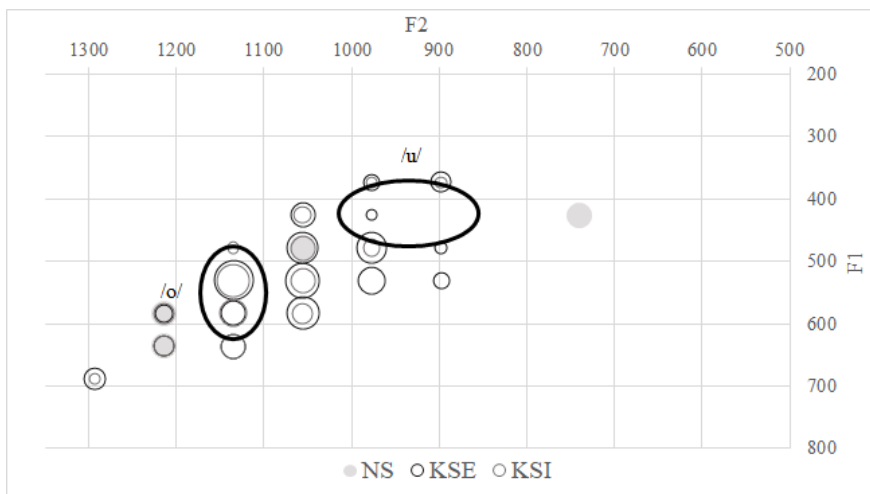


Figure 13. Percentage of Responses of "N" for /ʌ/-o/-u/ Continuum by Group

7. Discussion

This study examined Spanish vowel perception by Korean speakers, with different amount of experience in Spanish. Five Spanish vowels were evaluated in terms of L1 similarity, and were classified into three Similarity Levels. Based on the results of the perception experiment, the research questions are discussed.

1) Do Spanish learners have difficulty learning similar sounds?

The results obtained here demonstrate that Korean speakers did have difficulty in perceiving some Spanish vowels. Out of four continua, only the results for /e/-/i/ continuum indicate more or less identical perception range between NS and KS. It is interesting to point out that both /e/ and /i/ are Level-3 Similar Vowels, meaning they are almost identical to Korean /e/ and /i/. Meanwhile, the results for /a/-/o/ continuum and /ʌ/-/o/-/u/ continuum varied between NS and KS, as predicted. This difference stems from Level-1 Similar Vowel /o/.

The way how native speakers perceive /o/ was much more generous compared to Korean learners. NS group's perception range for /a/ and for /o/ overlap with each other, while KS groups' do not. This is clearly displayed in Figure 14, 15 and 16, where we have the summary of the result. In Figure 14, /o/ is perceived wide in scope, but in Figure 15 and 16, about half of that scope is allocated to none of the vowels ('N'). This outcome implies that Spanish learners generally have difficulty learning similar sounds overall, but the difficulty level is higher for less similar vowels than almost identical vowels.

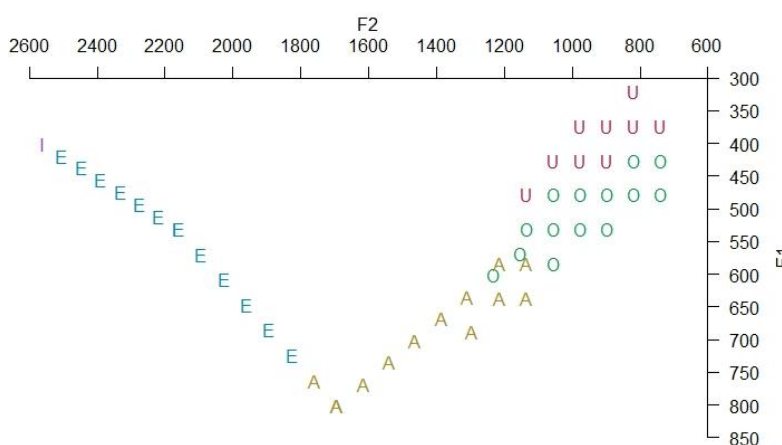


Figure 14. Summarized Responses of NS

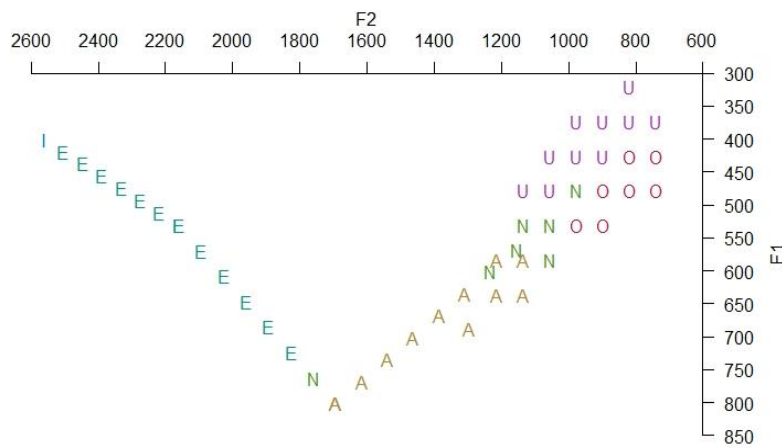


Figure 15. Summarized Responses of KSE

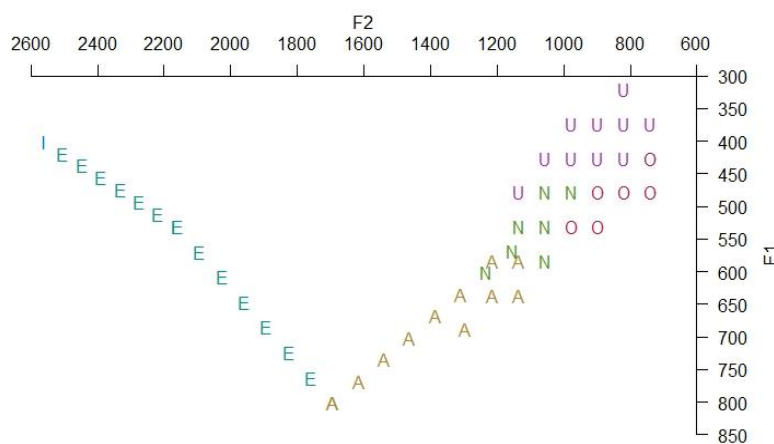


Figure 16. Summarized Responses of KSI

2) Do the experienced learners perceive Spanish vowels in a more native-like way than the inexperienced group?

Contrary to our expectations, KSE did not show better performance concerning Spanish vowel perception. KSE responses for /e/-/a/ continuum resembled that of NS a little, however, that the experiment results did not entirely disprove positive effects of L2 experience. This result is more or less in line with the implication above. As /a/ is Level-3 Similar Phone, KSE succeeded in improving their Spanish vowel perception.

3) Can L2 learners achieve native-like perception of Spanish vowels in the long run?

As the answer for the second research question was negative, the last question is answered automatically. Korean learners did not show much improvement in Spanish vowel perception, much less achievement of native-like level. Even the KSE responses for /e/-/a/ continuum were still more similar to KSI than NS.

To sum up, the results of this perception study have a number of interesting implications for the field of Spanish phoneme perception by Korean learners. As the initial prediction, learner groups perceived similar phones differently from Spanish natives irrespective of L1 similarity level. Also, it is interesting to note that experienced participants did not perform in a more native-like way than unexperienced ones. That is, vowel perception and language proficiency did not show positive relationship. Thus, the result here provides evidence that similar phones are very difficult to acquire.

However, there were some limitations. First of all, as this was the first study to investigate L1 Korean-L2 Spanish vowel perception, it was essential to deal with the whole vowel space. On the other hand, in order to encourage the participants to concentrate on the experiment, the total number of test sounds was limited. That way the test time did not exceed 15 minutes including the background questionnaire. As a result, our experiment lacks more detailed analysis for individual vowel. Moreover,

it would have been much more desirable to include perception experiment of Korean vowels. For instance, a future study could focus on /o/ and /u/, but also test for Korean /o/ and /u/ to verify L1 effects. If the Korean learners were found to have the same perception ranges for Korean vowels as for Spanish vowels, it would mean that they treat the two vowel systems in the same way. Lastly, we plan to further investigate acquisition of Spanish vowels by Korean learners with production study. The findings here would be much more interesting with a production experiment.

References

- Boersma P. & Weenink D. (2018). Praat: Doing phonetics by computer [Computer program]. Version 6.0.37. Retrieved from: <http://www.praat.org>.
- Bohn, O.-S., & Flege, J. E. (1990). Interlingual identification and the role of foreign language experience in L2 vowel perception, *Applied Psycholinguistics*, 11(3), 303-328. DOI: <https://doi.org/10.1017/S0142716400008912>
- Bohn, O.-S. & Flege, J. (1992). The production of new and similar vowels by adult German learners of English. *Studies in Second Language Acquisition*, 14, 131-158. DOI: <https://doi.org/10.1017/S0272263100010792>
- Chládková, K., Escudero, P., & Boersma, P. (2011). Context-specific acoustic differences between Peruvian and Iberian Spanish vowels. *Journal of the Acoustical Society of America*, 130(1), 416-428. DOI: <https://doi.org/10.1121/1.3592242>
- Corrette, R. (2019). Praat Vocal Toolkit. Retrieved From: <http://www.praatvocaltoolkit.com>.
- Flege, J. E. (1987). The production of “new” and “similar” phones in a foreign language: Evidence for the effect of equivalence classification. *Journal of Phonetics*, 15, 47-65. DOI: [https://doi.org/10.1016/S0095-4470\(19\)30537-6](https://doi.org/10.1016/S0095-4470(19)30537-6)
- Flege, J. E. (1992). Speech learning in a second language. In C. A. Ferguson, L. Menn, & C. Stoel-Gemmon (Eds.), *Phonological Development: Models, Research, and Application* (pp. 565-604). Timonium, MD: York Press.
- Flege, J. E. (1995). Second language speech learning theory, findings, and problems. In W. Strange (Eds.), *Speech Perception and Linguistic Experience: Issues in Cross-Language Research* (pp. 233-277). Timonium, MD: York Press. Retrieved from: <https://www.researchgate.net/publication/333815781>
- Flege, J. E. & Hillenbrand, J. (1984). Limits on pronunciation accuracy in adult foreign language speech production, *Journal of the Acoustical Society of America*, 76, 708-721.
- Flege, J. E., Bohn, O.-S., & Jang, S. (1997). Effects of experience on non-native speakers' production and perception of English vowels, *Journal of Phonetics*, 25, 437-470. DOI: <https://doi.org/10.1006/jpho.1997.0052>
- Fox, R., Flege, J., & Munro, M. (1995). The perception of English and Spanish vowels by native English and Spanish listeners: A multidimensional scaling analysis. *The Journal of the Acoustical Society of America*, 97(4), 2540-2551. DOI: <https://doi.org/10.1121/1.411974>
- Hualde, J. I. (2005). *The sounds of Spanish*. Cambridge: Cambridge University Press.
- Gwag, C. G. (2003). Vowel system of contemporary Korean and direction of change. *Journal of Korean Linguistics*, 41, 59-91.
- Kim, J. (2014). A comparative study of second language acquisition models: Focusing on vowel acquisition by Chinese learners of Korean. *Phonetics and Speech Sciences*, 6(4), 27-36. DOI: <https://doi.org/10.13064/ksss.2014.6.4.027>
- Kim, W.-P. (2001). Un método educativo de la pronunciación de las consonantes españolas, *Estudios Hispánicos*, 20, 3-24. Retrieved from: http://210.101.116.28/W_files/ftp41/17500459_pv.pdf
- Kim, W.-P. (2009). El aprendizaje efectivo de los segmentos coreanos por parte de los nativos de español: Por medio de análisis contrastivo entre el español y el coreano, *Revista Iberoamericana*, 20(1), 233-260. Retrieved from: <http://s-space.snu.ac.kr/bitstream/10371/69298/1/200920109.pdf>
- Kim, W.-P. (2011). Un estudio teórico y práctico sobre el enlace y la sinalefa en español para su enseñanza en la aula, *Revista Iberoamericana*, 22(2), 127-140. Retrieved from: <http://s-space.snu.ac.kr/bitstream/10371/77192/1/snuibero220205.pdf>

- Kim, W.-P. (2013). Un estudio sobre los errores de la pronunciación española causados por la interferencia fonética del coreano, *Estudios Hispánicos*, 67, 177-197. DOI: <https://doi.org/10.18217/kjhs.6.2.201311.29>
- Kim, W.-P. (2014). Sobre algunas confusiones ocurridas en los términos básicos y su concepto de la fonética española: basándose en los usos particulares de los estudiantes coreanos de español, *The Korean Journal of Hispanic Studies*, 7(1), 107-129. DOI: <https://doi.org/10.18217/kjhs.7.1.201405.107>
- Kim, W.-P. (2017). A study on the effective teaching methods of the Spanish phonetic variants, *Estudios Hispánicos*, 84, 35-54. DOI: <https://doi.org/10.21811/eh.84.35>
- Lee, S. (2015). A Study of Korean Monophthong Pronunciation by Central and South America Learners (Master's Thesis). Kyung Hee University.
- McCloy, D. R. (2016). phonR: tools for phoneticians and phonologists. R package version 1.0-7.
- R Core Team. (2018). R: A language and environment for statistical computing. R Foundation for Statistical Computing, Vienna, Austria. Retrieved from: <https://www.R-project.org/>
- Shin, J., Kiaer, J., & Cha, J. (2012). *The Sounds of Korean*, Cambridge: Cambridge University Press. DOI: <https://doi.org/10.1017/CBO9781139342858>
- Solon, M., Long, A., & Gurzynsky-Weiss, L. (2017). Task complexity, language-related episodes, and production of L2 Spanish vowels. *Studies in Second Language Acquisition*, 39, 347-380. DOI: <https://doi.org/10.1017/S0272263116000425>
- Suh, K. S. (2007). El método de la enseñanza de la pronunciación del coreano para los hispanohablantes, *Revista Iberoamericana*, 9(2), 197-220.
- Yun, Y. (2005). Korean listeners' perception of English /i/, /l/, and /ɛ/. *Speech Sciences*, 12(1), 75-87.