



The effect of L2 experience on perception of Korean nasals

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Abstract

Twenty five English native speakers with two different L2 experienced groups and nineteen native Koreans heard both Korean word-initial nasals (/m/ and /n/) in three vowel contexts (low, mid, and high) produced by a native Korean speaker. The experiment examined the hypothesis that Korean nasals are more likely to be judged or perceived correctly by the L2-experienced English learners of Korean than the unexperienced counterparts. The result showed that L2 experienced group was more sensitive to effects of vowel height in judging the Korean nasals in which the perception of nasals before the high vowels was more subject to it. In addition, place of nasal articulation causes asymmetry relations – bilabial nasal /m/ is more likely to be perceived as plosives rather than alveolar nasal /n/. The study found that the L2 experience has a somewhat limited role in perceiving the nasals correctly in the word-initial position, especially before the high vowels, in that even the L2 experienced English subjects have difficulty in identifying the Korean nasals correctly in this environment. Nevertheless, low L2 proficiency might be accounted for the difficulty in the bilabial nasal identification observed by the L2 experienced group.

Keywords: denasalization, plosives, perception, English, Korean, L2 acquisition

1. Introduction

There has been a disagreement or a cacophony among scholars regarding the issue of whether Korean nasals can be truly treated to be the same as English nasals (Jones, 1924; Gim, 1937; Martin, 1951; Umeda, 1957; Chen, 1973; Chen & Clumeck, 1975; Lee, 1993; Ohala, 1997; Kim & Ashby, 2006; Lee & Kim, 2007; Yoshida, 2008; Kim, 2011; Ahn, 2013). Through the argument, the quality of Korean nasals becomes the main issue. It has been suggested that Korean nasals behave rather differently from English nasals. A number of researchers (Jones, 1924; Martin, 1951; Chen & Clumeck, 1975; Yoshida, 2008; Kim, 2011; Ahn, 2013) have claimed that the difference lies on the idea that English nasals manifest the acoustic quality equally irrespective of their phonological environments, whereas the nasal quality in Korean changes depending on the phonological contexts, namely especially before high vowels. On the contrary, some Korean researchers

suggested that Korean nasals are not greatly different from English nasals in that they have the similar phonetic features (Gim, 1937; Kim, 2011). The idea of denasalization has not been welcomed or accepted readily by especially Korean researchers who claim “putative denasalization was illusory” (Kim, 2011:141). In addition, Yoshida (2008) repeatedly insisted that what others claim loss of nasality or denasalization is not what it appears so that it is just weakening of nasality to a small extent. In spite of the argument on whether the denasalization really occurs in Korean, it might be true that the nasal acoustic features in Korean are different from English nasals.

From the field of SLA (second language acquisition), it assumes that the perception of Korean nasals could be changed by the effect of second language experience (hereafter L2 experience). L2 development has been influenced by the effect of the age (Guion *et al.*, 2000; Tahta *et al.*, 1981), language experience (Kang *et al.*, 2012), the background of the native language (Archibald, 1995;

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Received 16 November 2016; Revised 12 December 2016; Accepted 23 December 2016

Guion *et al.*, 2000, 2004), and motivation (Conrad, 1991; Moyer, 1999). Among various effects, it is well-agreed that the effect of L2 experience has been suggested to play a key role in acquiring the target language, even for the adults (Aoyama *et al.*, 2008; Kang *et al.*, 2012). In this respect, it assumes that the perception of the nasals, so called denasalization occurred in word-initial position of Korean, could be affected by the L2 experience even for the adult English natives.

The aim of the study is to prove the hypothesis that the denasalization in Korean does occur, yet the degree is different depending not only on the variable of L2 experience, but also on the context, so called the vowel height. Therefore, the current study will answer the questions on whether the denasalization does occur and if so, how perception of Korean nasals of /m/ and /n/ before the height of the neighboring vowels is affected by L2 experience.

2. Literature Review

The term ‘de-nasalization’ refers to the phenomenon where a nasal consonant is pronounced without sufficient nasality due to the reduced nasal airflow and resonance by narrowing or blockage of the velum (Chen & Clumeck, 1975). Denasalization is said to occur where the nasals are being orally released at their end (Martin, 1951). This may take place when there is less nasal airflow in the nasal cavity due to some degree of obstruction or more closure in velopharyngeal port. However, Laver (1980) presented a rather interesting insight claiming that airflow in the nasal cavity is not a prerequisite for it to be perceived as a nasal consonant as nasal cavity can be vibrated without airflow.

Correlations or relationships between the nasality and height of vowels have been suggested by many scholars previously (House & Stevens, 1956; Chen, 1973). Nasality is produced by lowering the velum to allow some air to escape through the nose. Hence, producing any nasal sounds will involve lowering the velum. In contrast, high vowels such as /i/ and /u/ have to be produced with a raised velum. Therefore, “physiologically speaking, nasality occurs more favorably with low vowels” (Chen, 1973:184) because the velum does not have to be raised as high as it does for high vowels. Subsequently, Chen (1973) indeed found that nasalization was conditioned on vowel height in that de-nasalization will hit the high vowels first.

In more detailed, Jones (1924:523) claimed that “[t]he nasal component sometimes ends slightly before the lip closure is replaced by lip rounding, resulting in a momentary voiced stop: [mb]. By following his suggestion, this is possible as [mb] and [m] are free variants of /m/ before /u/ and /o/. In the same vein, /n/ becomes [nd] before /w/, /u/, and /o/. Martin (1951) also shared the similar ideas by agreeing that the environment for the denasalization is indeed before /w/, /u/, and /o/ but this can still happen before any vowels with varying degrees of nasalization. Umeda (1957) also claimed that Korean nasals /m/ and /n/ in word-initial position have some similarities with or qualities of voiced plosives /b/ and /d/ as the nasal murmur weakens or terminates towards the end of the segment.

This was supported by a following report of Chen & Clumeck (1975) where they claimed Korean word-initial nasals are rather perceived as plosive stops before high vowels as shown in the following.

(1) Chen & Clumeck (1975)

a. /mul/ → [m^hul] ‘water’ 물

b. /mal/ → [mal] ‘language’ 말

Ohala (1997) also attempted to explain the perceptual confusion of the nasals through the notion of emergent stops. He claimed that intrusive stops and emergent stops in this case /b/ or /d/ can emerge due to external causes such as the mis-timing of the velic closure which can be explained by anticipatory denasalization. Ohala (1997:3) put it “The latter portions of the nasal are denasalized (and devoiced) in anticipation of the following oral and voiceless oral obstruent.” Chen & Clumeck (1975)’s example of [m^hul] shows that “post-stopped nasal allophones of simple nasals in Korean appear before high vowels” (Ohala, 1997: 4)

Later Yoshida (2008) carried out a production study where nasals in initial positions produced less nasal murmur where he confirmed that there was weakening of nasal formants. He found that there are varying degrees of denasalization of Korean /m/ and /n/ in different prosodic positions or contexts – utterance, intonational phrase, accentual phrase, word, and syllable. The nasality weakens or drops as the prosodic hierarchy goes up (Cho & Keating, 2001). Yoshida (2008) insists on calling it ‘nasality weakening’ rather than ‘denasalization’ as he believes the nasality never indeed disappears. Interestingly, his study on effects of regional accents or dialects on denasalization showed that the degree of nasal weakening varies depending on dialects. Nasal weakening is comparatively greater in Kyunggi-Do than Kyungsang-Do dialects.

The reasons for the denasalization in Korean nasals have been explored and accounted for largely by Cho & Keating (2001)’s strengthening effect in Korean. Beckman (1998) regards the initial position as a “phonologically and psycholinguistically” salient and strong position (Ahn, 2013:61). Hence, Cho & Keating (2001)’s strengthening effect is effectively to raise or strengthen the ‘consonantality’ in initial positions by having low-sonority onset requirement on the initial positions. Therefore, word-initial nasals with high sonority violates the low-sonority onset requirement, which then get denasalized to obtain the more consonant-like qualities such as low sonority. The domain initial strengthening has been observed in other languages too such as English, French, Taiwanese and Korean (Ahn, 2013). A number of researchers (Fougeron & Keating, 1997; Cho & Jun, 2000) have suggested the initial strengthening effect helps the listener’s prosodic parsing or segmentation which in turn improves their speech perception. This can be supported further by the claim that even when voiced plosives were artificially moved to word-initial position, Koreans recognize them as nasals, suggesting they consider context-related factors when trying to work out the sound (Kim, 2011).

To date, little research has accumulated on the perceptual change of the denasalization occurred in Korean by the effect of L2 experience. Generally, it is well-known that the effect of L2 experience has been suggested to play a key role in acquiring the target language, changing the perceptual patterns. For example, Kang *et al.*, (2012) claimed that speakers tended to impose their acquired phonetic patterns on their L2 speaking proportional to the L2 experience. In their study, immersion-experienced Korean learners of English produced different intonational features from the Korean learners of English without such immersion experience in the English production under the circumstance of virtually equal English proficiency.

In spite of a growing number of research in L2 acquisition which has focused on acquiring L2 phonetic features, authentic understanding on Korean nasals is fairly challenging because of scant studies. This research is based on the reflection that comparatively little attention has been paid in this field. Thus, it examines L2 acquisition of Korean nasals in the word-initial position by the native English speakers.

The goal of the study is to extend our understanding of L2 experience influencing the acquisition of L2 segments which shows the extensively different phonetic features from L1. As the L2 experienced group received massive exposure to L2 speaking, we predicted that their perceptual rate on the denasalized Korean nasals would approach to that of native Koreans rather than the unexperienced Korean groups.

3. Phonetic features of nasals

The nasal consonants are produced with closure of the oral cavity and radiation of the sound through the nasal cavity while the oral obstruction is maintained (Warren *et al.*, 1993). This radiation of the energy is known to be the nasal murmurs. The murmurs are associated with distinct regions of energy, similar to the formant patterns of vowels. However, those of nasals include the greatly reduced energy. Again, the murmur similar to the vowel has a number of spectral peaks but only the low frequency nasal formant has an amplitude comparable to that of the vowel formant (Kent & Read, 2003). The reduced amplitude of the spectral peaks in the nasal murmur means that the nasal has less overall energy than the vowel. It is safe to say that the murmur portion of a nasal consonant has a dominant low-frequency and much weaker resonance than that of the vowels.

Interestingly, the formant transition appeared in the nasals is similar to that of the homorganic stops so that similar patterns are shown for the stop-nasal pairs: [b]-[m], [d]-[n], and [g]-[ŋ]. It is well-known that the nasals share some fundamental features with the stops. According to Kent & Read (2003), the acoustic properties of the stop-vowel syllable include the release burst, transition, and the vowel steady state, while the nasal-vowel sequence represents the murmur, transition, and the vowel steady state. Since the formant transition is greatly similar for both sequences, the correct identification between nasals and stops may be hard to listeners.

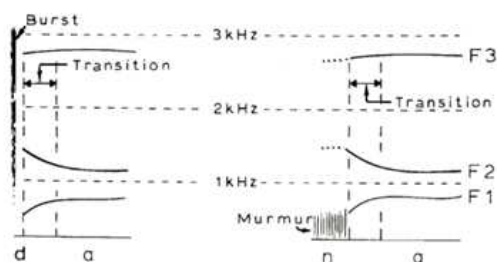


Figure 1. Stylized representation of stop + vowel and nasal + vowel syllables (Kang, 2007: 176, reprinted from Kent & Read, 2005)

For the de-nasalization in Korean, Kim (2011) found absence of nasal formants and a visible burst mark shown in Korean nasals which is a typical quality associated with plosive stops. By following these studies, it is assumed that the lack of the nasal

acoustic features cause the mis-perception to the voiced stops.

4. Method

4.1. Participants

Firstly, for providing the recordings of stimuli, researchers initially selected 3 male speakers who were grown up and educated in Seoul. Out of these speakers, one male was chosen because of his clear and intelligible speech. He was 26 years old and a graduate student who majored in Korean Education. He could definitely serve as one of the standard Korean users.

For the perception tests, 2 groups of English native speakers participated. The participants in the first group have lived in Korea over 2 years at least (K-experienced group) and the other group have not experienced any Korean learning (K-unexperienced group), and lived in their own countries. 11 native speakers of English who have stayed in Korea with varying amounts of time participated. Although they have lived in Korea, their Korean proficiency remains limited with basic communicative skills to communicate with native Koreans in their daily lives. In contrast, 14 native speakers of English without any L2 Korean experience participated online. They have never been exposed to Korean language learning situations in and out of Korea.

19 native Korean participants (as a control group) were students from a university in Seoul. They did not speak any language other than Korean on a daily basis when they took part in the experiment.

Table 1. Subject Information

Group	Subjects	Age	LOR (year)
Korean	19 (m:8, f:11)	20.6	—
K-experienced English natives	11 (m:5, f:6)	22.7	3.82
K-unexperienced English natives	14 (m:5, f:9)	19.8	—

LOR: length of residence in Korea. m: male, f: female

4.2. Materials

For recording the stimuli, a Samsung Digital Recorder Voice Pix (VP1) was used. The listening perception tests were conducted to 44 different participants. The participants performed the listening perception test with a Praat program using a PC. An earphone was also used so that the participants could focus better without any impeditive external noises.

4.3. Stimuli

18 recorded sound files that have nasals in word-initial positions were used as shown in Table 2. Those sound segments were in CVCV format. Initially it was in a format of CV yet some participants for a pilot study reported that some of the Korean non-words made by the researcher 'mu' or 'nu' sounded like the pre-existing words in English as 'moo' or 'new' and expressed the potential danger or confounding variables that could affect the results. Vowels with different height /a/, /o/, /u/ were employed to investigate if vowel height does have impact on perception of denasalization.

Table 2. Stimuli

	low-vowel /a/	mid-vowel /o/	high-vowel /u/
/p/	<i>pata</i>	<i>pota</i>	<i>puta</i>
/t/	<i>tata</i>	<i>tota</i>	<i>tuta</i>
/m/	<i>mata</i>	<i>mota</i>	<i>muta</i>
/n/	<i>data</i>	<i>nota</i>	<i>nuta</i>
/pʰ/	<i>pʰata</i>	<i>pʰota</i>	<i>pʰuta</i>
/tʰ/	<i>tʰata</i>	<i>tʰota</i>	<i>tʰuta</i>

*/p/ refers to /ㅍ/, /t/ to /ㅌ/, /m/ to /ㅁ/, /n/ to /ㄴ/, /pʰ/ to /ㅍ/, /tʰ/ to /ㅌ/.

Following are the acoustical waveform and spectrum of the target stimulus /m/ and /n/ in <Figure 2>.

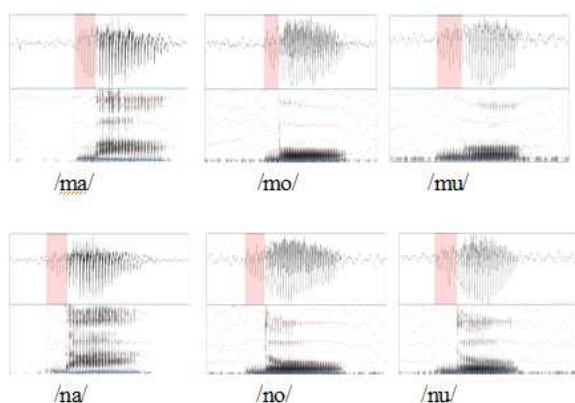


Figure 2. Screenshot of the target stimulus /m/ and /n/

The acoustical features of the target stimulus /m/ and /n/ used in the experiment are shown in <Table 3>.

Table 3. Acoustical features of Korean nasals in /m/ and /n/

	murmur duration(ms)	F1 in transition (Hz)
/ma/	70	486
/mo/	60	440
/mu/	80	367
/na/	70	650
/no/	70	400
/nu/	80	375

4.4. Procedure

Before starting a real experiment, every participant was given a clear instruction and a practice session in order to ensure everyone understood the experiment clearly. In this session, brief explanation to the Korean phonetics including phoneme structure was given to subjects, along with the phoneme letters on the screen. It ensures that they should choose one of the ‘English phonemes’ on the screen when they heard Korean word stimulus. The experiment was conducted using Multiple Forced Choice (MFC) experiment of Praat (Boersma & Weenink, 2015). They clicked the given phoneme when they heard the pre-recorded stimuli.

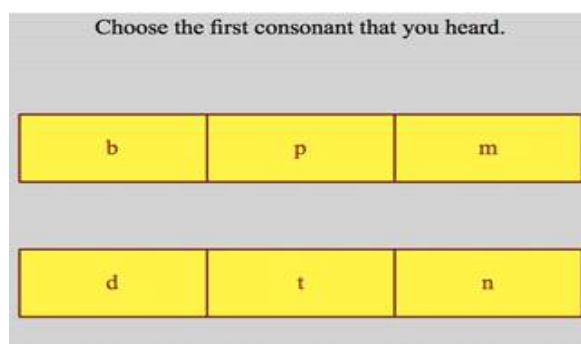


Figure 3. Screenshot of a perception test on Praat

As shown in Fig 3, the participants were asked to listen to each word stimulus (Korean non-words) and choose the English phonemes they heard based on their pure hearing perception.

4.5. Data Analysis

The results of the experiment were saved as ResultsMFC files. Then click on ‘collect to table’ and save them as a text file where the stimuli and their corresponding responses have been recorded. Even though there is no time limitation, most of the subjects conducted the task within 10 minutes. Each file for a subject consisted of 72 trials (4 repetitions). The study used in this experiment was based on the total of 3168 samples (native Koreans: 1368 trials, K-unexperienced group: 792 trials, K-experienced group: 1008 trials). Out of 3168 samples, we analyze 528 samples which represent the responses in the nasals (/m/ and /n/).

As this study seeks to investigate how the L2 experience is affected perceptually, we checked the mixed effects of both kinds of stop manners (oral and nasal stops) and vowel height (high, mid, low). The raw results were first imported to Excel to record the response rates and percentage of “nasal” and “plosive” responses. Then, it was further imported to SPSS for cross tabulation and chi-square analysis.

5. Results

5.1. Native Korean participants

The responses of Korean participants are summarized in Table 4. Numbers in the table represent the responses when given the identification test for the nasals (/m/ and /n/).

Table 4. Response rates for the native Korean group

		Response trials					
		m	b	p	n	d	t
m	/a/	75	0	1	0	0	0
	/o/	75	0	0	1	0	0
	/u/	67	9	0	0	0	0
n	/a/	0	0	0	76	0	0
	/o/	0	0	0	76	0	0
	/u/	0	0	0	76	0	0

*a bold mark: correct response

** full trials in each line: 76 (19(subjects)*4(repetition))

The general pattern shown in Table 4 is that native Korean speakers perceive the nasals comparatively well even in the word-initial position before the high vowel. In order to investigate

whether there is a significant difference of perceptual correctness rates among the three vowel height conditions for the nasals, a Chi-square test was conducted and the statistical result was not significant as Chi-square = 2.882; $df = 2$; $p > .05$. The chi-square value and its significance p value tell us that these results are achieved by chance.

Although the height of the following vowel statistically does not affect the perception of the preceding nasals, it is meaningful that /m/ is slightly harder to perceive than /n/ before the high vowel for native Korean speakers as well. Nevertheless, these results imply that the nasals even before the high vowel are likely to be perceived correctly as /m/ and /n/ for the native Koreans.

5.2. K-unexperienced English participants

The responses of participants without any L2 experience (K-unexperienced group) are summarized in Table 5.

Table 5. Response rates for the K-unexperienced group

		Response trials					
		m	b	p	n	d	t
m	/a/	12	40	0	0	0	4
	/o/	36	16	0	0	4	0
	/u/	0	48	8	0	0	0
n	/a/	0	4	0	48	4	0
	/o/	0	2	0	24	30	0
	/u/	0	0	0	18	38	0

*a bold mark: correct response

** full trials in each line: 56 (14(subjects)*4(repetitions))

The general pattern shown in Table 5 is that the correct response for the nasals is affected by the height of the vowel. That is, correctness ratio is the highest before the non-low vowels: before the mid-vowel in /m/ and before the low-vowel in /n/.

In order to investigate whether there is a significant difference of the response rate among the three vowel height conditions for the bilabial nasal /m/, a Chi-square test was conducted and the result was statistically *significant* as Chi-square = 29.400; $df = 2$; $p < 0.0001$. Also response rates of the alveolar nasal /n/ differ *significantly*; Chi-square = 19.855; $df = 2$; $p < 0.0001$. It means that for the K-unexperienced group, height of vowels affected their perception of both nasals.

Before the high vowel, nasals are more likely to perceive them as stops, but there is a difference between /m/ and /n/. When followed by the high vowel, none (0%) was perceived as nasals /m/. In more details, 86% (48 trials) were categorized as plosives /b/ and 14% (8 trials) were judged as voiceless plosives /p/. No participants in the K-unexperienced group heard the bilabial stimuli [m] as nasal /m/ before high vowels and all the participants perceived them as plosives which was the similar results for the K-experienced group (see Table 6). The ratio in perceiving them correctly increases slightly in the alveolar nasal /n/. When followed by the high vowel, 32% were correctly perceived as nasals /n/ as compared to 68% categorized as plosives /d/.

These results imply that the bilabial nasal /m/ before the high vowel is likely to be wrongly perceived by non-native speakers of Korean – most likely to be perceived as plosives. However, in a closer look, there is something unusual or unexpected about the nasals before the low vowels. Even when the bilabial nasal was followed by the low vowels, 72% of their responses (40 out of 56

trials) were perceived as a plosive. This makes it harder to draw a relationship between height of vowels and judgment of nasals as plosives, in that denasalization frequently occurs before the high vowels. Nevertheless, this fits into the general trend that we have discussed earlier in the sense that the percentages of categorizing nasal stimuli as plosives clearly are related with the vowel height.

In a short summary, for the K-unexperienced group, the plosive response rates for the bilabial nasal /m/ are indeed the highest before the high vowel than other vowels as claimed. However, for the alveolar nasal /n/, even though the plosive response rates before the high vowel are higher, the degree is somewhat low compared with /m/. Nevertheless, there was a shared tendency that nasals were more frequently judged as plosives before the high vowel.

5.3. K-Experienced group

The responses of the participants who have stayed in Korea (K-experienced group) are summarized in Table 6.

Table 6. Response rates for the K-experienced group

		Response trials					
		m	b	p	n	d	t
m	/a/	24	20	0	0	0	0
	/o/	32	12	0	0	0	0
	/u/	2	42	0	0	0	0
n	/a/	0	0	2	38	4	0
	/o/	0	0	0	34	8	2
	/u/	0	0	0	30	14	0

*a bold mark: correct response.

** full trials in each line: 44 (11(subjects)*4(repetitions))

The general pattern shown in Table 6 is that the correct response for the nasals is affected by the height of the vowel. In order to investigate whether there is a significant perceptual difference of the response rates among the three vowel height conditions, a Chi-square test was conducted. The response rate of /m/ was statistically *significant* before the high vowel; Chi-square = 25.805; $df = 2$; $p < 0.0001$. On the contrary, regardless of height conditions (low, mid, high), response rates of the alveolar nasal /n/ do not differ *significantly*; Chi-square = 2.071; $df = 2$; $p > 0.05$.

We can find the similar results as the K-unexperienced group; before the high vowel, nasals are more likely to be perceived as stops, but there is a difference between /m/ and /n/. When /m/ is followed by the high vowel, most of the participants were perceived as nasals /m/. That is, 95% were categorized it as the homorganic oral stop of /b/. The ratio in perceiving nasals correctly increases slightly in the alveolar nasal /n/. When /n/ is followed by the high vowel, 68% is perceived as nasals /n/ along with 32% categorized as plosives /d/.

This rather presents a similar trend in the sense that the percentages of categorizing nasal stimuli as plosives indeed are the highest before the high vowels although the difference in the rate of plosive responses is not as large as those observed for the K-unexperienced group. However, there is somewhat asymmetry relationship between both nasals. As we have seen before, the plosive response rates for the alveolar nasals did not vary greatly from 34 response rates with 86.4% (before the low vowel) to 30 response rates with 68.2% (before the high vowel). In other words, regardless of height conditions (low, mid, high), response rates of

alveolar plosives do not differ significantly. On the contrary, the plosive response rates for the bilabial nasals vary greatly from 32 response rates with 72.7% (before the low vowel) to 2 response rates with 5.2% (before the high vowel). In other words, /m/ is more affected by the neighboring vowel height condition than /n/.

In summary, for the K-experienced group, the plosive response rates for the bilabial nasal /m/ are the highest before the high vowel than other vowels and the difference is significant. However, for the alveolar nasal /n/, although the plosive response rates before the high vowel are the highest and the difference among the vowels is not significant.

6. Discussion

There is a discrepancy between English native speakers with or without L2 experience in perceiving Korean nasals in word initial position. For those with K-experience, denasalization in perceiving /m/ was observed significantly before the high vowel yet it was not significant for /n/. For the K-unexperienced participants shown in <Figure 4>, denasalization in perceiving /m/ occurred everywhere regardless of the contexts of the vowel height, because the correctness rate showed significantly low level before both the low vowels and high vowels. In contrast, denasalization in perceiving /n/ was observed significantly only before the high vowel.

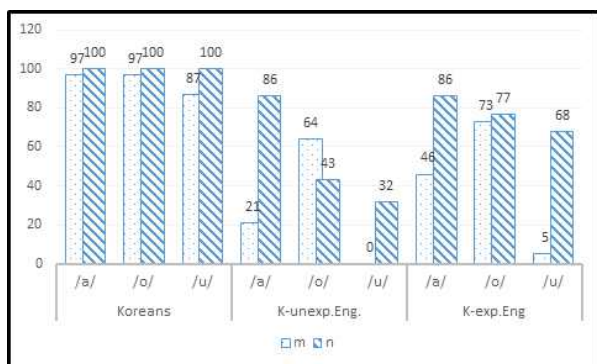


Figure 4. Histograms of correctness ratio by three groups

It appeared that L2 experience does not have effect on perception of Korean nasals. Regardless of L2 experience, all English participants showed that the height of vowels indeed has an effect on English native speakers' perception of Korean bilabial nasal stimulus [m] in word initial position. When it is placed before a high vowel, they were significantly more likely to choose a plosive as their response than before a mid or low vowel. In fact, before the high vowel, only 2% of the time (2 trials out of 100 trials) in both groups correctly perceived them as /m/ and 98% wrongly perceived them as plosives. More specifically, they dominantly chose a voiced bilabial plosive /b/ (90%) and a few times as /p/ (8%) for the [m] stimuli before the high vowel. Therefore, this finding can claim that for native speakers of English, the Korean word-initial bilabial /m/ is indeed perceived as a denasalized [m], suggesting that the rate of the denasalized perception can be accelerated by height of the following vowel.

However, the differing results of each group for the bilabial nasal stimuli respectively are interesting. For the K-unexperienced native English group, the height of the following vowel affected their

judgment of the nasal stimulus [m] as a /b/ more than their L2 experienced counterparts (correctness ratio of 28% vs. 40%). In spite of a little difference, the results of both groups show that the correctness rates before the high vowel were presumably closed to 0 as most of them perceived the denasalized nasals as plosives. It is safe to say that, for the perception of /m/ before the high vowel, there is no *absolute* difference with respect to the rates of correctness between the K-experienced and K-unexperienced groups. This implies that L2 experience up to 3.8 years is not sufficient to improve or enhance the learners' correct perception of the Korean bilabial /m/ in the case of low proficient L2 learners.

The result is against the results of Kim's (2011) study on native speakers of British English with no Korean learning experience. She claimed that denasalization in the initial position of the Korean words indeed occurs but its perception is not affected by height of vowels significantly. She points out that they are not familiar with the Korean nasal sounds as they have never learned Korean or lived in Korea, which makes them perceive the nasals as plosives regardless of whether the nasals are placed before the low or high vowels. However, this study suggests that native English subjects, regardless of L2 Korean experience, are affected by the vowel height in perceiving the nasals. It might be fair to say that even after a comparatively longer exposure to Korean language (3.8 years on average), their perception of the denasalized nasals could not effectively have been altered and adapted into that of Korean native speakers.

In the case of the /n/ perception, the variable of L2 experience has the important role to perceive the nasals correctly. The L2-experienced group shows the correctness ratio of 77%, while the unexperienced counterparts mark the comparatively low correctness of 53%. Even before the high vowel(s), the experienced group marks the correctness ratio of 68%. Its accuracy ratio is considerably higher compared with the unexperienced counterparts showing 32%. Thus, it is safe to say that L2 experience might have effect on perception of the alveolar nasal /n/.

Therefore, this finding can claim that for native speakers of English as a whole, the Korean word-initial nasals are commonly perceived as stops, suggesting that perception of Korean nasals, so called denasalization, is indeed affected by the height of the following vowels. Furthermore, the findings also suggest that English native speakers' perception of Korean nasals in word-initial position is different depending on place of articulation. It suggests that the bilabial nasal /m/ is more likely judged as a plosive than the alveolar nasal /n/ as a plosive. The result is consistent with Chen & Clumeck (1973) which claimed the bilabial nasal /m/ rather than /n/ is more likely to be judged as plosives. In addition, this study suggests that their perceptual patterns for /m/ do not easily change before the high vowels even by some degree of L2 exposure for the adult L2 learners.

7. Conclusion

In conclusion, it has been demonstrated that Korean nasals in the onset positions are indeed perceived differently by both groups of the English subjects with respect to the vowel height. In other words, English native speakers' perception of nasal onsets is correlated and dependent on the following vowel's height. Before the high vowel, the nasal /m/ and /n/ in the initial position are more likely to be perceived as plain plosives by them. In addition, it is

also confirmed by this study that place of nasal articulation is another factor that affects perception of denasalization in that bilabial nasals are more likely to be judged as plosives rather than alveolar nasals by English native speakers. In the process, the effect of L2 experience can be one of the important variables to perceive the nasals correctly. In spite of our trial, it still does not clearly explain why the outcomes of the experiment are different between both nasals of /m/ and /n/. Providing insights and rationales for this would contribute greatly to the future studies of this subject matter in this field.

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