

# CROSSING THE PARALLEL: EFFECTS OF GENDER AND LENGTH OF RESIDENCE IN NORTH KOREAN REFUGEES' BACK VOWELS

Jiyeon Song & Amanda Dalola

University of South Carolina  
jiyeons@email.sc.edu, dalola@mailbox.sc.edu

## ABSTRACT

Mergers have often been considered irreversible. Much sociophonetic work has focused on describing their genesis; in contrast, there has been very little research describing their reversal. This study observes speakers having accomplished a merger reversal, or demerger, resulting in the restoration of a phonemic distinction. North Korean features a well-known merger of /u-/ /u/ that is non-merging in South Korean and stigmatized because it is associated with North Korean defector status. This research investigates to what extent North Korean refugees in South Korea continue to exhibit this merger once they are living in South Korea, or if they begin to show signs of demerger. The role of structural categories (vowel dispersion) and social categories (gender and length of residence in South Korea) are considered. Results show main effects for length of residence and gender, whereby female speakers and a longer length of residence in South Korea show preference for the demerger.

**Keywords:** vowel demergers, vowel dispersion, gender differences, North Korean, sociophonetics

## 1. INTRODUCTION

Countless studies of language variation have demonstrated that vowel quality can be a significant indicator for various sociodemographic categories, such as gender, age, and geographical region [1, 8, 12, 15]. Most research on changes in vowel quality has focused on mergers in accordance with Garde's Principle, which states that mergers cannot be reversible by linguistic means [3, 11]. The current research project, however, based on North Korean refugee speech in South Korea, suggests that this unidirectionality may not always be absolute.

Back vowel mergers frequently occur in most North Korean dialects but not South Korean ones [5]. That is, the contrast between the high back unrounded vowel /u/ and the high back rounded vowel /u/ is neutralized in the North toward /u/.

North and South Korea have been divided for almost 70 years since the Korean Peninsula came under the hegemony of two competing powers during the Cold War: the Soviet Union and the

United States [13]. Since 1945, Korean culture and language have diverged in the two countries due to the division. Recently, the growing population of North Korean refugees in South Korea has been exposed to North-South linguistic differences, causing them to become hyperaware of their language [10]. For this reason, North Korean refugees living in South Korea who must negotiate their identity via the (de)merging of these two vowels are noteworthy to variationists.

Phonetic convergence including "an increase in segmental and suprasegmental similarity of the speech of one talker to another" arises with frequent exposure to a phonetic form [16]. That is, frequent exposure through direct social contact can cause "automatic convergence," resulting in language change [16]. Thus, North Korean refugees' length of residence in South Korea is expected to be a driving force of vowel quality change.

Gender differences may exist depending on various factors in language change and thus gender does not have the same effect on language use universally [2]. However, it is well-documented that males and females show "the opposite in their use of linguistic variables" [2]. This motivates the investigation of gender effects in North Korean refugees.

The present study aims to investigate whether and to what extent North Korean refugees in South Korea exhibit changes in vowel quality indicative of a back vowel demerger, conditioned by their length of residence in South Korea and gender.

## 2. METHODS

### 2.1. The data source

Audio data, in the form of natural discourse, are taken from YouTube videos entitled "Senior and junior (or early and late) North Korean refugees [thalpwwuk senhwupay]," which aired on Payna TV from March 7, 2017 until November, 28, 2017. In the show, all participants wear a name tag showing their name, origin province (Pyongan or Hamkyung), and length of residence in South Korea. All participants came from Pyongan Province (northwest) or Hamkyung Province (northeast). According to [6] and [9], both Pyongan and

Hamkyung dialects have a documented back vowel merger in which /u/ moves into /u/. Considering this finding, we have excluded the possibility of dialectal variations among participants in terms of this feature.

## 2.2. Participants

This study measures the vowel formants, F1 and F2, of /u/ and /u/ spoken by six North Korean refugees, four females and two males, appearing on the show. Although age is not under examination in the present study, all participants are estimated to be in their late 30s to early 60s, based on their conversation and appearance. To test the effects of length of residence in South Korea, two groups are compared: early (one-year) and late (approximately ten-year). The late group is gender-balanced with two males and two females, and the early group consists of two females.

## 2.3. Procedures

The first episode of the TV show features four middle-aged refugee panelists with various lengths of residency (two one-year females, one nine-year male, and one ten-year male) and one male South Korean host, aged 35 years. After the fifth episode, the South Korean host was replaced by the nine-year male refugee. Throughout the show's progression, there were three regular panelists, two one-year females and one nine-year male. They also invited a guest in each episode.

Video data were downloaded from YouTube and then converted to .wav files for formant analysis. Five episodes were used to measure vowel formants of /u/ and /u/. Episodes were approximately 50 minutes long and cut into ten five-minute files for vowel measurement. Words including the monophthongs /u/ or /u/ were collected from the five episodes. This research reports ten tokens per vowel per speaker, for a total of 120 tokens (six speakers  $\times$  20 tokens).

## 3. ANALYSIS

Words containing one or the other of the two target vowels, /u/ and /u/, were extracted from the audio data to measure the first and second formants of vowels for a two-dimensional representation.

To label segments, spectrograms and waveforms were used with auditory inspection. Vowel onset and offset points were measured at the midpoint to minimize the effects of surrounding segments.

Vowel measurements were normalized using Labov's ANAE (speaker-extrinsic) method to eliminate speaker variation caused by differences in vocal tract length [7, 17].

Vowel distance between the two back vowels, /u/ and /u/, was calculated by using the Euclidean distance (ED) with average F1 and F2 values of each speaker. The formula for calculating the ED between /u/ and /u/ is given in (1).

$$(1) \quad d = \sqrt{(F1_u - F1_u)^2 + (F2_u - F2_u)^2}$$

As the ED increases, distance between two vowels increases, indicating demergers.

Mergers are related to the range of variation in production as well as the distance between two phonemes [14]. According to [18], the two vowels do show significant differences in backness (i.e. F2 frequencies) for both males and females. However, they do not show significant differences for vowel height (i.e. F1 frequencies). Thus, this research examines the standard deviations of F2 values of /u/, in order to observe any potential demerging of the two vowels. Kang argues that /u/ is moving backward to merge with the high back rounded vowel /u/ in the Pyongyang dialect, the standard North Korean dialect [5]. Consequently, we can predict that demergers may occur in altering the second formants (F2) of /u/.

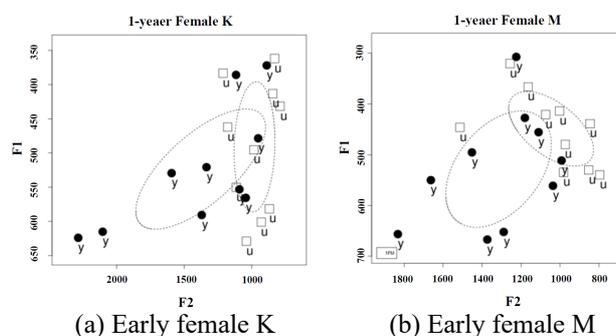
In sum, the current research measures F2 standard deviations (F2 SD) of /u/ to inspect the range of demerger occurring in the distribution of /u/. It is expected that early refugees show greater deviations than late refugees.

## 4. RESULTS

### 4.1. Vowel distance by Euclidean distance

Formant measures are used to generate two-dimensional vowel plots in NORM [17], as in Figure 1. The ellipses visualize one standard deviation in variation from each mean represented by each dot.

**Figure 1:** Vowel ellipses with standard deviation by speakers (y=/u/, u=/u/)



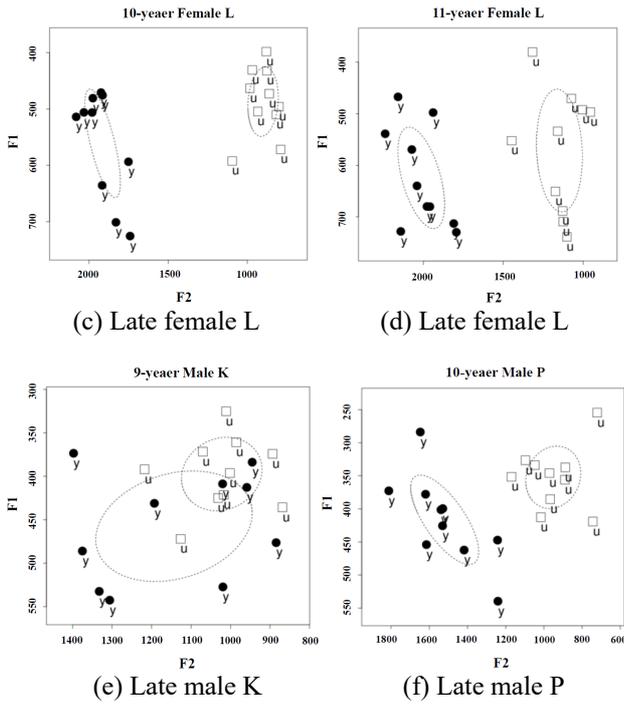


Figure 1 shows the ellipses of the two vowels with standard deviation of all speakers individually. Vowel distance, calculated by using the Euclidean distance formula, is shown in Figure 2.

Figure 2: Euclidean Distances between /u/ and /u/ (Hz)

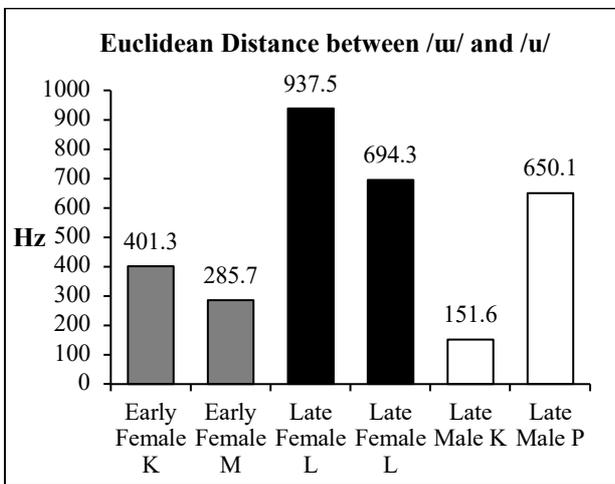


Figure 2 displays the vowel distance between /u/ and /u/ for each speaker. The results in Table 1 indicate that average ED of the early group is shorter than that of the late group in female subjects.

Table 1. Mean Euclidean distance by length of residence in South Korea (Hz) (females only)

	Early group	Late group
Mean ED	343.50	815.9

The results of an ANOVA found that these differences in ED are statistically significant [ $F(1,78) = 480.12, p < .001$ ]. A two sample one-tailed t-test found a main effect of length of residence in South Korea, such that the ED of the early group is significantly less than that of the late group [ $t(78) = 21.91, p < .001$ ].

Average EDs by gender in the late group are given in Table 2. This indicates that EDs of male refugees are less than those of females.

Table 2. Mean Euclidean distance by gender (Hz) (late group only)

	males	females
Mean ED	400.85	815.90

An ANOVA test reveals that the ED differences are significant [ $F(1,78) = 87.352, p < .001$ ]. A two sample one-tailed t-test found a main effect of gender, such that male refugees show shorter EDs than females [ $t(78) = 9.35, p < .001$ ].

#### 4.2 F2 standard deviation of /u/ for vowel dispersion

F2 standard deviation is used to inspect a range of backness variation in the vowel /u/. The results are presented in Figure 3 below.

Figure 3. F2 standard deviation of /u/

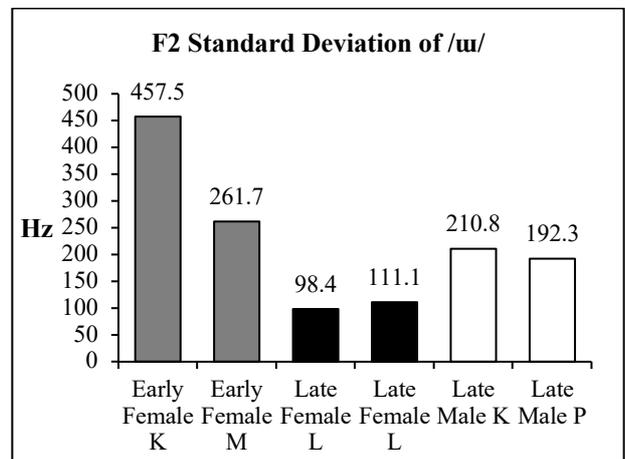


Figure 3 shows that the late group's F2 SDs are less than the early group's in females. The mean values of females' F2 SDs by length of residence in South Korea are given in Table 3.

Table 3. Mean F2 SD of /u/ by length of residence in South Korea (Hz) (females only)

	Early group	Late group
Mean F2 SD	359.80	104.75

An ANOVA test reveals that the differences in F2 SDs are significant [ $F(1,78) = 262.52, p < .001$ ]. A two sample one-tailed t-test also reveals that the early group's F2 SD of /u/ is significantly greater than the late group's [ $t(78) = 16.202, p < .001$ ].

There is also a significant difference between males and females in F2 SDs. Average F2 SDs by males and females are given in Table 4 below.

**Table 4.** Mean F2 SD of /u/ by gender (Hz) (late group only)

	male	female
Mean F2 SD	201.80	104.75

An ANOVA test reveals that the differences in F2 SDs are significant [ $F(1,78) = 3027.7, p < .001$ ]. A two sample one-tailed t-test found a main effect of gender such that the males' F2 SD of /u/ is significantly greater than the females' [ $t(78) = 55.025, p < .001$ ].

## 5. DISCUSSION

The present findings demonstrate that both length of residence in South Korea and gender affect the degree of back vowel demerger in North Korean refugees. In terms of Euclidean distance, the results indicate that late refugees show longer distances between the two vowels /u/ and /u/ than early refugees. This means that the late group tends towards the non-merging South Korean vowel system, while the early group has not yet accomplished the phonetic distinction between the two vowels. Males' vowel distances are shorter than females', indicating that females show the demerger to a greater extent than males. This result is indirectly consistent with [4], who reported that males have less dispersed vowel spaces than females and, therefore, are more likely to lead vowel mergers. Conversely, it is probable that females with more dispersed vowel spaces might lead demergers.

For the F2 SDs for the vowel /u/'s dispersion, the results show that there are effects of residence duration. That is, the early refugee group shows more dispersion of F2 frequencies than the late refugee group. This may mean that early refugees' attempts to demerge the vowel /u/ from /u/ are unsuccessful, contributing to a high F2 SD, as was found in the 1-year Female K in Figure 3. Gender effects are also found in F2 SDs indicating that males show preference for a greater dispersion among F2 frequencies than females. This suggests that females may accomplish demergers at a faster rate than males.

## 6. CONCLUSION

The current study examines the effect of length of residence and gender on the degree of back vowel demerger in North Korean refugees in South Korea, operationalized as the separate dependent variables of vowel distance, as measured via Euclidean distance, and vowel dispersion, as measured via F2 SD.

Findings suggest that North Korean refugees in South Korea exhibit variable changes in vowel quality, as predicted by their length of residence in South Korea and gender, indicating varying degrees of demerger. The longer their length of residence in South Korea, the greater the extent of the vowel demerger they exhibit. Females are more likely to show demergers separating the two vowels /u/ and /u/. The results of vowel dispersion reflect that early refugees tend to show more dispersed F2 values of /u/ than late refugees, and that males tend to show more dispersed F2 values of /u/ than females.

Future research should investigate a larger range of refugee groups, including those who have lived in South Korea for an intermediate length of five years (a level not represented in this study), as well as those who have lived in South Korea well beyond ten years.

## 7. ACKNOWLEDGEMENTS

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