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# Cross-generational vowel changes in Gyeongsang Korean\*

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## Abstract

This study investigates vowel changes in South Gyeongsang Korean, focusing on the /ɰ/-/i/ split and the /o/-/u/ merger across four age groups: children, teenagers, young adults, and elderly speakers. The objective is to identify whether these changes exhibit a continuous age-related progression, an adolescent peak, or reflect influences from external dialects, such as Seoul Korean. A total of 37 native speakers produced target vowels in a CVCV format, with acoustic measurements (F1 and F2) taken at the vowel midpoint. The results reveal a discontinuous pattern of change across generations, with young adults demonstrating the most innovative phonetic patterns. Contrary to the notion of an adolescent peak, young adults, rather than adolescents, led the /ɰ/-/i/ distinction and the chain-like shift in /o/-/u/, likely due to increased exposure to Seoul Korean. Despite this external influence, Gyeongsang speakers adapted the changes internally, lowering /u/ instead of raising /o/, thereby maintaining a balanced vowel system. The findings position young adults as primary agents of phonetic innovation and illustrate how external linguistic influences and internal phonetic structure together shape the evolution of regional dialects.

**Keywords:** Korean vowels, Gyeongsang dialect of Korean, sound change

## 1. Introduction

The current study investigates how pre-adult and young adult speakers produce vowel contrasts undergoing sound change and aims to illustrate if and how internal or external motivations for the change are reflected in the vowel productions across successive generations. This study specifically examines the acoustic properties of vowels in a regional dialect of Korean, the South Gyeongsang dialect (spoken by the second largest population in the southeastern part of the Korean Peninsula), focusing on the split of /i/ and /ɰ/ and

the merger of /o/ and /u/, each of which undergoes a sound change. By exploring how the vowel production varies across three different young age groups (children, teenagers, young adults) relative to elderly speakers, this study aims to: i) understand the nature of the /i/-/ɰ/ and /o/-/u/ changes in relation to the roles of internal and external motivations in sound change, and ii) document an evolutionary stage of sound change in the regional dialect of Korean.

The vowels of South Gyeongsang Korean have historically diverged from those of standard Seoul Korean; South Gyeongsang

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Korean had six vowels (i.e., /i, e, a, o, u, i<sup>1</sup>/), whereas Seoul had eight (i.e., /i, e, ε, a, ʌ, o, u, i<sup>2</sup>/). But several evolutionary changes have been making the two vowel systems more uniform. The changes include the dispersion of /i/-/ʌ/ in Gyeongsang Korean (e.g., Choe & Lee, 2017; Lee & Jongman, 2016), the merger of /e/-/ε/ in Seoul Korean (e.g., Oh, 2013), and the merge tendency of /o/-/u/ in both Seoul and Gyeongsang Korean (e.g., Choe & Lee, 2019; Kang & Kong, 2016). Overall, the shared or independent changes between the two dialects have resulted in both dialects of Korean having similar vowel systems. However, although the outcome of the vowel systems may look similar between Seoul and Gyeongsang Korean, it is doubtful that the vowel systems of the two dialects of Korean have formed through an identical process. This is mainly because standard Seoul Korean holds greater linguistic prestige over the regional dialect. The influence of dialect prestige and phonetic adaptation has played a crucial role in shaping the vowel system of Gyeongsang Korean, particularly evident in the split of /i/ and /ʌ/ and the merger of /o/ and /u/.

First, recent studies indicate that younger speakers of Gyeongsang Korean (in their 20–30s) have started distinguishing between /i/ and /ʌ/, which had been merged, aligning their vowel system more closely with standard Seoul Korean (e.g., Lee & Jongman, 2016). This shift of Gyeongsang Korean vowels reflects influences of dialect prestige and phonetic adaptation. Specifically, Lee & Jongman (2016) showed that while older Gyeongsang speakers (in their 60–70s) did not differentiate /i/ and /ʌ/ in the F1 and F2 dimensions, younger speakers (in their 20s) clearly distinguished /i/ from /ʌ/ in both acoustic dimensions, resulting in seven monophthongs of Gyeongsang Korean consistent with Seoul Korean vowels. Based on the consistency of vowel systems between Seoul and Gyeongsang Korean, Lee & Jongman (2016) suggested the influence of standard Seoul Korean on the diachronic vowel change. Kang (2022) supports the notion of Seoul Korean influence. Kang (2022) investigates the merger of /i/ and /ʌ/ for mobile speakers who relocated from Seoul to Gyeongsang and Gyeongsang to Seoul. Kang (2022) tested if and how the merged /i/ and /ʌ/ of Gyeongsang Korean is adapted by mobile speakers of each region, considering factors like gender, duration of stay, and language attitudes. Results showed that both Seoul-to-Gyeongsang and Gyeongsang-to-Seoul mobile groups clearly exhibited the /i/ and /ʌ/ distinction without any significant vowel quality shift. Based on these findings, Kang (2022) concluded that dialect prestige influences speakers' attitudes towards regional dialects, leading Gyeongsang-to-Seoul speakers to adapt the distinctive vowels and Seoul-to-Gyeongsang speakers to retain their dispersed vowels.

Second, unlike the borrowed distinction between /i/ and /ʌ/ from the prestigious standard dialect, it is less clear whether the merger or approximation of /o/ and /u/ in Gyeongsang Korean is phonetically motivated or externally driven by the influence of Seoul Korean. This ambiguity arises from the ongoing merging tendency of /o/ and /u/, which is observed in both Gyeongsang Korean and Seoul Korean (e.g., Choe & Lee, 2019; Han & Kang, 2013; Kang & Kong, 2016). Previous studies (e.g., Han & Kang, 2013; Kang & Kong, 2016) examined the acoustic properties of vowels in Seoul Korean,

focusing on the raising of /o/ modulated by gender and age. The researchers indicated either the merger between the two vowels or chain-like vowel shift among the non-front high vowels, /i/, /ʌ/, /o/, and /u/. Specifically, Han & Kang (2013) observed cross-generational change in /o/ and /u/, noting that the two vowels were closer for females than males, and for speakers in their 20s compared to those over 30. Further acoustic studies not only confirmed the merging tendency but also indicated a chain-like vowel shift (e.g., Kang & Kong, 2016; Lee & Jongman, 2016); younger female speakers exhibited a more raised /o/ compared to older male speakers, and /o/ and /u/ appeared to be closer to each other in terms of vowel height (F1 dimension). However, /o/ was clearly distinct from /u/ in the F2 dimension (backness), with /o/ being more back than /u/ and /i/. Based on the clear differentiation between /o/ and /u/ in F2, Kang & Kong (2016) suggested a chain-like vowel shift rather than a complete merger between the two vowels, which was also confirmed in perception (Kong & Kang, 2020). Consistent with Seoul Korean, Choe & Lee (2019) observed a tendency for /o/ to merge with /u/ in South Gyeongsang Korean, particularly in the F1 dimension, a change led by female speakers. Choe & Lee (2019) suggested that this /o/-/u/ change may have been driven by increased exposure to standard Seoul Korean, influencing the regional dialects more than before. Overall, previous studies indicated that the vowel system of Gyeongsang Korean has become similar to that of standard Seoul Korean, suggesting the influence of standard Seoul Korean with high linguistic prestige.

Previous observations were primarily focused on young adults compared to elderly speakers, lacking cross-generational comparisons that include children and adolescents. Examining the speech of children and adolescent (i.e., pre-adults), however, may be crucial for understanding the motivation behind a sound change, particularly when considering the Neogrammarian distinction (e.g., Beckman et al., 2014) and an adolescent peak (e.g., Labov, 2001). Beckman et al. (2014) attempted to attest the two types of phonological changes, namely regular dialect-internal change and dialect borrowing. The first category involves regular sound change, characterized by its gradual nature, which should result in a consistent progression in phonological development across different ages within the speech community undergoing the change. Therefore, under this view of internally motivated sound changes, younger individuals are more likely to interact within innovative language networks, where new linguistic features are adopted and spread more readily. Thus, children and teenagers are hypothesized to display more innovative acoustic patterns compared to adults, reflecting the incremental nature of sound change. In contrast, dialect borrowing can lead to a sharp discontinuity in developmental patterns, reflecting a sudden shift due to specific socio-historical influences that initiate the change. In addition, Labov (2001) indicated an adolescent peak in which individuals, especially during adolescence (typically between the ages of 13 to 17), are at the height of adopting and innovating linguistic changes. During this period, adolescents are often the most active in pushing forward linguistic innovations, such as new slang, pronunciation patterns, or grammatical constructions. After adolescence, the rate of language

1 While the acoustic properties of /i/ in South Gyeongsang Korean may lie between /i/ and /ʌ/, it is closer to /i/ as indicated by the transcription.

2 /ʌ/ can be transcribed as a schwa depending on the phonetic context.

change tends to slow down as individuals stabilize in their speech patterns.

Based on the aforementioned points, the present study specifically aims to attest what motivates the split of /i/-/ɛ/ and the approximation of /o/-/u/ in Gyeongsang Korean by observing the vowel production across successive generations, children, teenagers, young adults and the elderly. If the split of /ɛ/-/i/ is indeed a result of borrowing vowels from Seoul Korean, namely an external linguistic factor, rather than an internal phonetic evolution, it is suspicious that the split of /ɛ/-/i/ exhibits continuous or an incremental pattern of sound change. In the case of dialect borrowing, the sound change would be more sudden, and children or adolescents would be less likely to be the most innovative among the four age groups. In addition, this study seeks to clarify if the /o/-/u/ change in Gyeongsang Korean is driven by the internal phonetic factor consistent with standard Seoul Korean, or if it is merely borrowed from Seoul Korean where the approximation of /o/-/u/ is in progress. If the motivation of the approximation of /o/-/u/ differs from the split of /ɛ/-/i/ in Gyeongsang Korean, the cross-generational pattern of the vowel changes would differ. Assuming if the merger of /o/-/u/ is due to internal phonetic factors in Gyeongsang Korean, it is more likely for pre-adult speakers to demonstrate continuous age-related variations in their /o/-/u/ production; children and teenagers are expected to exhibit more innovative language patterns compared to young adults. Children and adolescents represent crucial stages in language development, as they are actively acquiring and refining their linguistic skills. By examining both pre-adult and adult generations, the present acoustic study aims to trace the trajectory of sound change from its inception to its more established forms, documenting an evolutionary stage of sound change potentially influenced by different factors.

## 2. Methods: Perception Experiment

### 2.1. Participants

The present production study newly collected data from thirty-seven speakers of the South Gyeongsang dialect of Korean. The recruited participants were grouped into three age categories: children [15 children (12 females), mean age of 7.87 ( $SD=0.64$ )], middle school students [15 teenagers (15 females), mean age of 14.53 ( $SD=0.52$ )] and university students [7 young adults (7 females), mean age of 21.43 ( $SD=1.27$ )]. All participants were born and educated in the South Gyeongsang regions near Changwon city, and their parents were also speakers of the South Gyeongsang dialect. This study also compared the vowel production of these 37 speakers with that of 11 elderly South Gyeongsang speakers [11 females, mean age of 66.5 ( $SD=5.99$ ) at the time of recording] collected by Lee (2013). The participants were recruited in Community Child Center, private institutes and Kyungnam University. All the participants were literate in Korean orthography, including the child speakers. None of the participants reported language or speech disorder, and all were paid for their participation.

### 2.2. Speech Materials and Recording

This study recorded the target Korean monophthongs, /i/-/ɛ/ and /u/-/o/. Each of the four vowels were recorded in a non-word context /h(V)pa/ to minimize coarticulatory effect (Hillenbrand et al., 2001),

and to prevent any potential pitch accent effects. Two repetitions of each test word were recorded in isolation. In addition to the /u/-/o/ and /i/-/ɛ/ contrasts of primary interest, F1 and F2 measurements were taken from the eight monophthongs (/i, e, ɛ, a, ʌ, o, u, i/) in the same /h(V)pa/ context for further observation. In total, 592 tokens were newly recorded (8 stimuli<sup>2</sup> repetitions $\times$ 37 speakers), and 176 tokens of the eleven elderly speakers in Lee (2013) were later adopted for a comparison. The recording procedure was the same between the current study and Lee (2013). Participants were instructed to read each word written in Korean orthography as naturally as possible at a normal speaking rate. The recording procedure was consistent across all participants, except that some child participants took frequent breaks due to fatigue. Recordings were made in various quiet locations, such as the university campus, or Child Community Center using a Marantz Digital Recorder (PMD 671) and a Shure head-mounted microphone. The stimuli were recorded at a sampling rate of 44,100 Hz and analyzed using the software package Praat (Boersma & Weenink, 2018).

### 2.3. Acoustic and Statistical Analysis

The study measured the first and second formant frequencies (F1, F2) of the initial vowel in CVCV for each of the recorded item. Formant frequencies were obtained at the midpoint of the target vowel through LPC analysis using a 25 ms window. Vowel onset was identified as the initiation of the first formant, and vowel offset was determined as the offset of the second formant in the spectrogram. Automated extraction of formant values was cross-checked, and manual corrections were made for any identified errors. Additionally, if formants were not stable at the vowel midpoint on the spectrogram, F1 and F2 were measured in the nearest steady-state portion. The formant values were first measured in Hertz, and then normalized using the *Lobanov* method with *norm.lobanov* (Kendall & Thomas, 2010) in R, based on Adank et al. (2004) and Nearey (1977).

To understand the cross-generational variations in the production of the vowel contrasts under sound changes, this study analyzed normalized F1 and F2 values using mixed-effects regression models with the *lme4* package (Bates et al., 2015) in R (R Core Team, 2023). Separate models were built for each of the /ɛ/ vs. /i/ and /o/ vs. /u/ contrasts. Each model included the fixed variables AGE (childreference, teenager, young adult, elderly) and VOWEL (/ɛ/reference vs. /i/; /o/reference vs. /u/), as well as the interactions between these two fixed variables. Each model contained by-subject random effect. The variables were sum-coded (as +/−1) with the level shown in subscript ‘reference’ as the reference level.

## 3. Results

Table 1 summarizes the parameter estimates of F1 and F2 for VOWEL (/ɛ/ vs. /i/; /o/ vs. /u/) and AGE (child, teen, young adult, elderly) factors. Figures 1 and 2 show the boxplots of F1 (top) and F2 (bottom) for /ɛ/ vs. /i/ (Figure 1) and for /u/ vs. /o/ (Figure 2) across child, teenager, young adult and elderly groups.

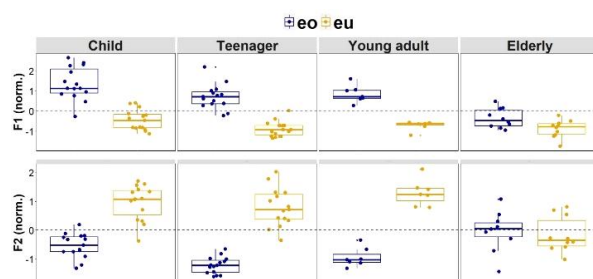
**Table 1.** Summary of the mixed effects logistic regression models

|                                              | F1              |                 | F2              |                 |
|----------------------------------------------|-----------------|-----------------|-----------------|-----------------|
|                                              | $\beta$ (SE)    | <i>t</i> -value | $\beta$ (SE)    | <i>t</i> -value |
| /ʌ/ ref. vs. /i/                             |                 |                 |                 |                 |
| (Intercept)                                  | 1.01<br>(0.11)  | <b>8.82</b>     | -0.77<br>(0.03) | <b>-23.80</b>   |
| Vowel <sub>/i/</sub>                         | -1.29<br>(0.08) | <b>-14.8</b>    | 0.52<br>(0.05)  | <b>9.40</b>     |
| Age <sub>teen</sub>                          | -0.44<br>(0.16) | <b>-2.78</b>    | -0.23<br>(0.04) | <b>-5.12</b>    |
| Age <sub>adult</sub>                         | -0.34<br>(0.20) | -1.73           | -0.13<br>(0.05) | <b>-2.35</b>    |
| Age <sub>elderly</sub>                       | -1.14<br>(0.21) | <b>-5.37</b>    | 0.19<br>(0.07)  | <b>2.70</b>     |
| Vowel <sub>/i/</sub> :Age <sub>teen</sub>    | 0.13<br>(0.12)  | 1.11            | 0.17<br>(0.08)  | <b>2.23</b>     |
| Vowel <sub>/i/</sub> :Age <sub>adult</sub>   | 0.16<br>(0.15)  | 1.04            | 0.25<br>(0.10)  | <b>2.58</b>     |
| Vowel <sub>/i/</sub> :Age <sub>elderly</sub> | 0.85<br>(0.17)  | <b>4.91</b>     | -0.60<br>(0.10) | <b>-5.87</b>    |
| /o/ ref. vs. /u/                             |                 |                 |                 |                 |
| (Intercept)                                  | -0.34<br>(0.07) | <b>-5.21</b>    | -1.08<br>(0.04) | <b>-28.40</b>   |
| Vowel <sub>/u/</sub>                         | -0.07<br>(0.07) | -0.99           | 0.14<br>(0.05)  | <b>3.17</b>     |
| Age <sub>teen</sub>                          | -0.33<br>(0.09) | <b>-3.59</b>    | -0.15<br>(0.05) | <b>-3.05</b>    |
| Age <sub>adult</sub>                         | -0.23<br>(0.11) | -1.97           | -0.13<br>(0.06) | <b>-2.19</b>    |
| Age <sub>elderly</sub>                       | 0.05<br>(0.13)  | 0.35            | -0.13<br>(0.09) | -1.42           |
| Vowel <sub>/u/</sub> :Age <sub>teen</sub>    | 0.10<br>(0.09)  | 1.03            |                 |                 |
| Vowel <sub>/u/</sub> :Age <sub>adult</sub>   | 0.35<br>(0.11)  | <b>3.08</b>     |                 |                 |
| Vowel <sub>/u/</sub> :Age <sub>elderly</sub> | -0.67<br>(0.14) | <b>-4.85</b>    |                 |                 |

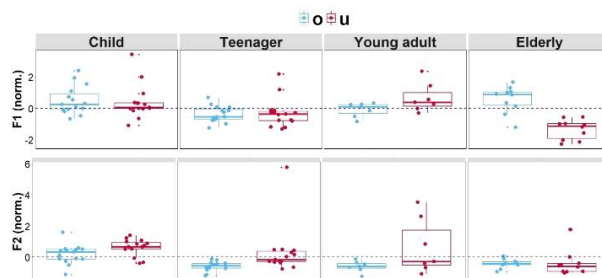
Statistically significant parameters ( $p < 0.05$ ) are in boldface, and marginally significant parameters ( $0.05 \leq p < 0.1$ ) are in italics.

For /ʌ/ vs. /i/ (Figure 1), the children's estimated F1 values of /i/ were significantly smaller than that of /ʌ/ (i.e., /i/ has higher tongue position than /ʌ/). F1 of /ʌ/ was significantly smaller for teenagers and the elderly compared to those of children, and it was marginally smaller for young adults relative to children (i.e., /ʌ/ is in a lower tongue position for children compared to the other older groups). Notably, interactions of VOWEL: AGE were present only for the elderly group. That is, the height distance between /ʌ/ and /i/ was made constantly across young aged groups under 25, whereas the elderly speakers did not maintain the height distinction for the two vowels as much as the younger speakers did.

The estimated F2 for /i/ was greater than that of /ʌ/ for children as seen in Figure 1 (bottom) (i.e., /i/ is fronted than /ʌ/). Compared to the children, F2 of /ʌ/ was significantly smaller for teenagers and young adults, but it was greater for elderly. Importantly, the significant interactions of VOWEL: AGE across all age groups showed that the F2 distance between /ʌ/ and /i/ was small to large in the order of 'elderly < child < teenager < young adult' in the absolute value. That is, the F2 difference between the two vowels was greater for children than for elderly, and it was even greater for teenagers and young adult speakers compared to children.



**Figure 1.** Boxplots overlaid with scatterplots of normalized F1 (top) and F2 (bottom) for children, teenagers, young adults and elderly Gyeongsang Korean speakers between /ʌ/ ('eo') and /i/ ('eu').



**Figure 2.** Boxplots overlaid with scatterplots of normalized F1 (top) and F2 (bottom) for children, teenagers, young adults and elderly Gyeongsang Korean speakers between /o/ and /u/.

For /o/ vs. /u/, the children's estimated F1 value of /u/ was not different from that of /o/ as seen in Figure 2 (top), indicating that /o/ and /u/ do not differ in terms of the tongue height. Compared to the children, F1 of /o/ was significantly and near-significantly smaller for teenagers and young adults, respectively, but it was not different from the elderly. This indicates that /o/ is in a higher tongue position for the teenagers and young adults than for the children, but there was no tongue height difference of /o/ between the children and the elderly. Note the interaction of VOWEL: AGE on F1, which indicates that the height difference between /o/ and /u/ increases in the following order, based on positive and negative values: young adults < children, teenagers < elderly. The interactions of VOWEL: AGE on F1 indicate that the /o/ and /u/ distance was similar for the two pre-adult groups. It is also noteworthy that while the coefficient of VOWEL: AGE<sub>adult</sub> is positive, it is negative for VOWEL: AGE<sub>elderly</sub>. This indicates that while /u/ is higher in the tongue position than /o/ for young adults, the pattern is opposite for the elderly. The estimated F2 for /u/ was greater than that of /o/ for children as seen in Figure 2 (bottom), indicating that /u/ is fronted than /o/. Compared to the children, F2 of /o/ was significantly smaller for teenagers and young adults, but there was no group difference between the children and the elderly. Finally, given the absence of the VOWEL: AGE interactions across all age groups, it was noted that the F2 distance between /o/ and /u/ did not differ across age groups.

To summarize, for /ʌ/ and /i/, this study showed that the two vowels were distinct in terms of the height and backness for Gyeongsang speakers under the age of 25, confirming the split of /ʌ/ and /i/ in the regional dialect among the pre-adult speakers. The novel finding was that while the /ʌ/ and /i/ contrast was well distinct for younger generations in both vowel height and backness, the

acoustic distinction was small for the children than for the teenagers and young adults. For /o/ and /u/, consistent with the previous observation in Seoul Korean, the vowel contrast was less distinct for the three younger speaker groups compared to the elderly, indicating the chain-like shift for /o/ and /u/ in Gyeongsang Korean as well as Seoul. But one noteworthy aspect was that it was the lowering of /u/ resulting the shift in this regional dialect, which differs from raising of /o/ in standard Seoul Korean.

#### 4. Discussion and Conclusion

The present study examined the production of Gyeongsang Korean vowels, focusing on /ʌ/, /i/, /o/ and /u/ across children, teenagers, young adults and elderly speakers. This study provides some novel findings as well as replicates previous observations. We confirmed that the /ʌ/-/i/ contrast was split for children and adolescents as well as young adults; also, we observed the merging tendency of /o/-/u/ for young Gyeongsang generations similar with Seoul Korean.

The findings of this study include several notable observations that should be discussed in relation to Beckman et al. (2014) and ‘adolescent peak’ in linguistic change (Labov, 2001). For the /ʌ/-/i/ distinction, the youngest child group did not show the most innovative pattern but were instead conservative in the phonetic change. In addition, contrary to the notion of adolescent peak, the teenagers did not have the most innovative pattern or distinct F2 relative to young adults. Conversely, the young adults in their 20s exhibited more innovative patterns than any other groups, particularly in F2, with the tongue position for /ʌ/ being further back than for /i/. This raises the question of whether the vowel patterns of young adults are still more innovative when compared to another generations, for example, the middle-aged speakers. Kim (2016), an apparent time study, examined the perception and production of /ʌ/ and /i/ among 42 South Gyeongsang speakers ranging from their 20s to their 50s, and showed that younger speakers were more innovative in both perception and production. Combining the present observations with those of Kim (2016), it is evident that young adults speaking South Gyeongsang Korean are the most innovative across generations ranging from children to elderly speakers. This suggests that the split of /ʌ/ and /i/ is actuated by young adults in their 20s, who then transmit the change to both previous and subsequent generations. This discontinuity in the /ʌ/ and /i/ split across generations supports the claim that the split is motivated or borrowed from standard Seoul Korean.

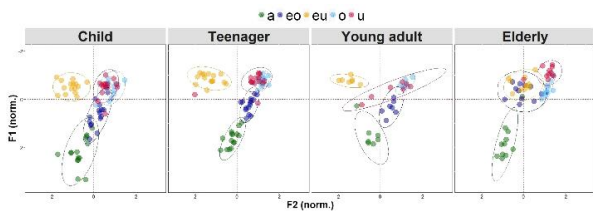
The social changes that young adults in their 20s experience upon entering college may contribute to young Gyeongsang adults leading the adoption of the /ʌ/-/i/ distinction (e.g., Kong et al., 2022). Increased exposure to and interaction with speakers from different regions or dialects in a college setting can drive young Gyeongsang adults to adopt this vowel distinction. Given standard Seoul Korean has a higher linguistic prestige compared to regional dialects, moving into larger linguistic setting may facilitate young adults to adopt the standard language. This mirrors Kang (2022), which found that moving to the Seoul region prompted Gyeongsang speakers to adapt their vowel pronunciation to align with the prestigious standard. Together with previous findings, the present observation indicates that young adult generations, who experience significant social mobility and are consequently exposed to new linguistic norms, are more likely to influence phonetic adaptation,

subsequently affecting the linguistic norms of entire generations.

The /o/ and /u/ merger or approximation in the Gyeongsang dialect shows both similarities and differences compared to the /o/-/u/ change in the Seoul dialect of Korean. A commonality between the two dialects is the merging tendency of the vowels. However, in Gyeongsang Korean, it was the lowering of /u/ that resulted in the merger, whereas in Seoul Korean, it was the raising of /o/ that led to the merger. Another notable observation is the significant individual variation in F2 among young adult speakers. While there was no statistically significant difference in backness between /o/ and /u/, some young adult speakers produced /u/ with more fronting than /o/. This variation suggests that the /o/ and /u/ vowels may be undergoing changes similar to those in Seoul Korean, and the young adult speakers’ fronting tendency may indicate that they innovatively lead the chain-like vowel shift among the non-front high vowels in Gyeongsang Korean. Based on these observations, the present study argues that the development of the /o/-/u/ change is discontinuous across generations, pointing to the abrupt borrowing of this change from Seoul Korean.

Notably, the lowering of /u/ instead of raising it suggests that, although the /o/-/u/ change is initially driven by external influences (i.e., Seoul Korean), it is modulated by the internal phonetic system. Thus, the prestigious influence of standard Seoul Korean and the internal phonetic evolution within the Gyeongsang Korean vowel system may both play a role in shaping the /o/-/u/ change in this regional dialect. In addition, the absence of an adolescent peak during adolescence suggests that the changes observed in young adults in their 20s result from an interaction between external influences and the internal phonetic system. Specifically, the changes in /o/ and /u/, influenced by the Seoul dialect, appear to have been adjusted to fit the Gyeongsang speakers’ phonetic system. This observation indicates the need to emphasize the importance of social mobility and early adulthood social experiences in shaping phonetic changes, rather than focusing solely on the innovation typically associated with adolescence in the case of Gyeongsang Korean.

Figure 3 shows the normalized F2 and F1 distributions of /ʌ, i, o, u/ for children, teenagers, young adults, and elderly speakers of Gyeongsang Korean, with the distribution of /a/ included to help estimate the vowel space of each age group. Figure 3 suggests that Gyeongsang speakers may have opted to lower /u/ rather than raise /o/ to economically maintain equal spacing across the high vowels. Specifically, if we assume that young adult Gyeongsang speakers had raised /o/ in line with Seoul Korean vowel changes, they would have created a 4-way height distinction for the non-front vowels (i.e., /u/-/i, o/-/ʌ/-/a/), disrupting the balance and symmetry of their vowel system. This disruption could have made the system more complex and harder to process in everyday speech. By lowering /u/ instead, Gyeongsang speakers preserve a more balanced and symmetric 3-way height distinction (i.e., /i, o, u/-/ʌ/-/a/). The lowering of /u/ suggests that an internal motivation to maintain a balanced phonetic inventory plays a role alongside external influences from the prestigious standard dialect. To sum up, the observations suggest that Gyeongsang speakers strategically adjust their vowel system, balancing internal phonetic needs with external influences.



**Figure 3.** Normalized F2 and F1 distributions of /ʌ, i, o, u, a/ for children, teenagers, young adults and elderly speakers of Gyeongsang Korean.

In conclusion, the present study found that the vowel change of the regional dialect of Gyeongsang Korean was discontinuous across children, teenagers, young adults and the elderly, and deviated from the notion of an adolescent peak in a linguistic change. The young adults in their 20s exhibited the most innovative phonetic patterns in the context of the vowel change, indicating that they were the primary drivers behind the split of /ʌ/ and /i/ and the chain-like shift related to /o/ and /u/. Consequently, the direction of the vowel changes led to a vowel system of Gyeongsang comparable to that of standard Seoul Korean. The age-related discontinuity of these change, the observed deviation from the expected adolescent peak and combined with the similarity of the vowel system between the two dialects suggest that vowel change in Gyeongsang Korean is externally motivated, specifically, by the Seoul Korean influence. However, the merging and fronting tendencies of /o/ and /u/ in Gyeongsang Korean did not perfectly mirror those in Seoul Korean, as they showed a lowering of /u/, rather than a raising of /o/. This indicates that while the vowel change is initiated due to the prestigious Seoul Korean influence, Gyeongsang speakers adapt the standard language considering their phonetic conditions. This highlights the interaction of both external and internal motivations in the process of sound change.

## References

- Adank, P., Smits, R., & van Hout, R. (2004). A comparison of vowel normalization procedures for language variation research. *The Journal of the Acoustical Society of America*, 116(5), 3099-3107.
- Bates, D., Mächler, M., Bolker, B., & Walker, S. (2015). Fitting linear mixed-effects models using lme4. *Journal of Statistical Software*, 67(1), 1-48.
- Beckman, M. E., Li, F., Kong, E. J., & Edwards, J. (2014). Aligning the timelines of phonological acquisition and change. *Laboratory Phonology*, 5(1), 151-194.
- Boersma, P., & Weenink, D. (2018). Praat: Doing phonetics by computer (version 6.0) [Computer program]. Retrieved from <http://www.praat.org>
- Choe, W. K., & Lee, D. (2017). Linguistic and social factors affecting the /i/ and /ʌ/ dispersion in Kyungsang Korean. *Phonetics and Speech Sciences*, 9(4), 69-76.
- Choe, W. K., & Lee, D. (2019). An acoustic study on the production of /o/ and /u/ in South Kyungsang Korean. *Journal of Language Science*, 26(2), 185-202.
- Han, J. I., & Kang, H. (2013). Cross-generational change of /o/ and /u/ in Seoul Korean I: Proximity in vowel space. *Phonetics and Speech Sciences*, 5(2), 25-31.
- Hillenbrand, J. M., Clark, M. J., & Nearey, T. M. (2001). Effects of consonant environment on vowel formant patterns. *The Journal of the Acoustical Society of America*, 109(2), 748-763.
- Kang, J., & Kong, E. J. (2016). Static and dynamic spectral properties of the monophthong vowels in Seoul Korean: Implication on sound change. *Phonetics and Speech Sciences*, 8(4), 39-47.
- Kang, Y. (2022). Production of the word-initial stop variation by Kyungsang Koreans in Seoul and Seoul Koreans in Kyungsang province. *The Sociolinguistic Journal of Korea*, 30(2), 1-38.
- Kendall, T., & Thomas, E. (2010). Vowels: Vowel manipulation, normalization, and plotting in R (version 1.1) [R package]. Retrieved from <http://ncslaap.lib.ncsu.edu/tools/norm/>
- Kim, B. (2016). Generational differences between /—/ and /ɿ/ in Busan dialect (Doctoral dissertation). Pukyong National University. Busan, Korea.
- Kong, E. J., & Kang, J. (2020). Cross-generational perception of Korean non-front vowels: Implication on sound change. *Language and Linguistics*, 87, 1-22.
- Kong, E. J., Holliday, J. J., & Lee, H. (2022). Post-adolescent changes in the perception of regional sub-phonemic variation. *Journal of Phonetics*, 90, 101114.
- Labov, W. (2001). *Principles of linguistic change: Social factors* (Vol. 2). Oxford, UK: Blackwell.
- Lee, H. (2013). Evidence of diachronic sound change: A comparative acoustic study of Seoul and Kyungsang Korean (Doctoral dissertation, University of Kansas).
- Lee, H., & Jongman, A. (2016). A diachronic investigation of the vowels and fricatives in Korean: An acoustic comparison of the Seoul and South Kyungsang dialects. *Journal of the International Phonetic Association*, 46(2), 157-184.
- Nearey, T. M. (1977). *Phonetic feature systems for vowels* (Doctoral dissertation). University of Alberta. Edmonton, AB.
- Oh, E. (2013). Formant transition shapes of Korean front vowels. *Phonetics and Speech Sciences*, 5(4), 195-200.
- R Core Team. (2023). R: A language and environment for statistical computing [Computer program]. Vienna, Austria: R Foundation for Statistical Computing. Retrieved from <https://www.r-project.org/>

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