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F0 Perturbation as a Perceptual Cue to Stop Distinction in Busan and Seoul Dialects of Korean

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ABSTRACT

Recent investigation of acoustic correlates of Korean stop manner contrasts has reported a diachronic transition in Korean stops: young Seoul speakers are relatively more dependent on the F0 characteristics of the stops than on the VOT characteristics in aspirated and lenis stop distinction. This finding has been examined against tonal dialects of Korean and the results suggested that the speakers of tonal dialects are not sharing the transition. These results also suggested that F0 function for segmental stop classification interferes with the function for lexical tone classification in their tonal speech. The current study investigated these findings in terms of perception. Perceptual behavior of Seoul and Busan speakers of Korean was examined in a comparative manner through the measurement of perceptual cue weight of F0 and VOT in particular. The results from regression and correlation analyses revealed that Busan speakers are closer to older Seoul speakers than to younger Seoul speakers in that the cue weight for VOT and F0 were comparable in the aspirated-lenis stop distinction. This result was in contrast to the perceptual behavior of younger Seoul speakers who showed clear dominance of F0 over VOT for the same distinction. These findings provided perceptual evidence of the dual function of F0 for segmental and lexical distinctions in tonal dialects of Korean

Keywords: Korean stop, perceptual cue weight, tonal dialect

1. Introduction

As far as phonetic investigation of plosive sounds is concerned, Korean stops have been an old but ever-attractive object of investigation in phonetics. Examining the acoustic correlates of Korean stop contrasts, some of the recent studies (Kang and Guion, 2008; Silva, 2006; Wright 2007) have reported that the stop system is experiencing diachronic changes, such that young Seoul speakers are relatively more resorting on F0 than VOT to differentiate the aspirated and lenis stops and this trend is not yet conspicuous among old speakers of the Seoul dialect. For regions where other dialects are used, this transition has not been extensively investigated. Most recently, Lee & Jongman (2012) examined the tone of South Kyungsang Korean in terms of F0 as a cue to the laryngeal contrast distinction. Kenstowicz & Park (2008) investigated the similar questions with a comparison of the Seoul and Kyungsang dialects, and Kang & Han (2012) examined the role of F0 in terms of potential differences between tonal and non-tonal dialects of Korean. All these studies, however, only used acoustic measures for the question of F0 as a cue to the stop distinction. The current study aims to link the previous acoustic findings to perceptual findings through the measurement of perceptual cue weight of the acoustic correlates of Korean stop contrasts including F0.

The investigation of interaction between F0 perturbation as a product of different laryngeal settings and F0 as a correlate of tonal contrast in some dialects of Korean dates back to Kenstowicz & Park (2008), where Busan and Daegu speech was studied. Confirming the lexical High and Low tone in

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Kyungsang dialects, smaller aspirated/tensed and lenis stop F0 difference was explained as suggesting that in Kyungsang speech F0 space is shared by both of the lexical tone and laryngeal contrast. In addition, in the most recent study on Kyungsang Korean, Lee & Jongman (2012) investigated the question of the role of F0 as a cue to the stop distinction in South Kyungsang speech. The question was that if the role of F0 as a segmental cue is weak in Kyungsang speech, then other cues would compensate the degraded F0. The results first replicated the previous findings that greater F0 weight for Seoul, greater VOT weight for Kyungsang, and no difference in H1-H2 and these results led to the interpretation that the use of lexical tonal accent in South Kyungsang speech is related to the different F0 weight between the two dialects. In other words, south Kyungsang speech still uses tone for lexical pitch accent and the smaller F0 difference between lenis-fortis stops in tonal distinction (especially, Low tone fortis and High tone lenis stops) suggests the reduced role of F0 in segmental stop distinction.

Kang & Han (2012) investigated the similar question by asking how F0 functions differently in tonal and non-tonal dialects of Korean in relation to the F0 as a cue to segmental distinction. The Seoul and Pyungan (PA) dialects (non-tonal) and the Hamkyung (HK) dialect (tonal) were examined for whether F0 in Hamkyung speech cued the stop distinction as reliably as in the non-tonal Seoul and Pyungan dialects. First, the northern dialects revealed differences from the Seoul dialect. Both Pyungan and Hamkyung dialects showed smaller VOT difference between lenis and fortis stops and greater H1-H2 difference compared with Seoul speech. This was interpreted as compensation of the weaker durational contrast. Besides, VOT difference between aspirated and lenis stops was evidently large for the northern dialects unlike the Seoul speakers, especially than young female Seoul speakers. The difference between the two northern dialects lied at the F0 difference between the aspirated and lenis stops. Less F0 difference in the HK dialect than PA was explained to indicate that F0 was less systematically utilized to contrast the stop types and this function is still executed by VOT in the HK dialect. In contrast the same function was replaced by F0 among speakers of a non-tonal dialect, especially young Seoul speakers.

These studies on F0 in tonal dialects so far have shown that F0 as a segmental cue interacts with F0 as a correlate of tone contrast and the segmental cueing function is then relatively limited in tonal speech. The results are, however, all about acoustic patterns. Perceptual patterns may be different from acoustic patterns. The current study attempts to directly link acoustic space to perceptual space by measuring perceptual cue weight. Specifically, perceptual behavior of Busan speakers still carrying a tonal contrast in their speech is examined against perceptual behavior of Seoul speakers. The specific prediction of the study was that the perceptual cue weight of VOT, F0, and H1-H2 for young Busan speakers would be similar to older Seoul speakers rather than younger Seoul speakers. In short, less cue weight of F0 was expected for Busan speakers.

2. Perception experiment

2.1 Participants

Eleven native speakers of Korean participated in a forced-choice identification task. All of the 11 listeners were in 20s for their age except one male participant (mean = 22.4 years). They were recruited all at a university located in Busa n.[2] All of them were born and raised in Busan and South Kyungsang province. This language background was verified with a questionnaire inquiring for the demographical information of the participants' parents and their own foreign language learning experience as well. The questionnaire also indicated that none of the participants had any history of language or hearing disorders.

2.2 Perception stimuli

The perception task stimuli were identical to those used in Kang (2010) where speakers of the Seoul dialect were examined for perceptual cue weight. A source production from a male speaker of the Seoul dialect (36 years old) was re-synthesized. He recorded /ta/ (다), /t^ha/(타), and /t^*a/(따) syllables and this source syllables were edited and manipulated for VOT, H1-H2, and F0 to measure perceptual cue weight in the stop manner distinction. After the re-synthesis process, the stimuli varied in 6 steps for VOT (10, 25, 40, 55, 70, and 85 ms), 3 steps for H1-H2 (6.5, 1.5, and -3.6 dB), and 4 steps for F0 (110, 120, 130, and 140 Hz). As a result, 72 stimuli (six VOT × three H1-H2 × four F0 types) of /ta/, /t^ha/, and /t^*a/ syllables were created in total. Detailed stimulus preparation procedures can be

2) Educated young Busan speakers were examined in comparison to Seoul younger and older speakers. Older speakers of the Busan area were not considered for investigation assuming that older speakers would show more traditional values in acoustic and perceptual measures.

found in Kang (2010).

2.3 Procedure

Listening to each of the 72 stimuli, listeners were instructed to decide which of the three syllable types they heard. The three response categories were provided in Korean orthography, such that /ta/, /t^{h}a/, and /t*a/ were displayed on a computer screen and listeners used a mouse click to record their responses. The stimuli were delivered to both ears through a headset. Each of the 72 stimuli was presented 10 times, 1 time for each of the 10 randomized blocks and 720 responses were elicited from each of the 11 listeners. Since most of the re-synthesized stimuli did not perfectly match the naturally spoken /ta/, /t^{h}a/, and /t*a/, the listeners were told that the stimuli they hear may not sound like any of the three response choices and then asked to use their instant impressions to make a decision. The Multiple Forced Choice (MFC) function of Praat for speech perception experiment was used to administer the perception task. The task progressed at the listeners' own pace and each listener typically used 35 to 40 minutes to complete the task. 30 stimuli were presented during a practice session beforehand and short breaks were offered between the blocks to their own convenience. Each listener was paid a reward for participation.

2.4 Statistical analyses

The primary purpose of the perception experiment was to measure the cue weight used for the stop manner distinction. To this end, two sets of statistical analyses were performed. First, multinomial logistic regression was used as it is a common method for treating perceptual second language data (Morrison, 2007). Multinomial, instead of binary, analysis was adopted as the experiment was to predict three outcome categories (/ta/, /t^{h}a/, /t*a/). For dependent variables, given that the focus of the analyses was to determine the perceptual contribution of VOT, H1-H2, and F0 to the aspirated and lenis distinction (i.e., /t^{h}a/-/ta/), /ta/ was selected as a reference category. The analyses in turn consisted of two comparisons, /t^{h}a/-/ta/ and /t*a/-/ta/. The predictor variables were VOT, H1-H2, and F0 (the six levels of VOT were encoded in the sequence of 10, 25, 40, 55, 70, and 85 ms; the three levels of H1-H2 were encoded in the sequence of 6.5, 1.5, and -3.6 dB; the four levels of F0 were encoded in the sequence of 110, 120, 130, and 140 Hz).

The perceptual weight of the three predictors was assessed by correlation analyses as well (Holt & Lotto, 2006). The computation process started from obtaining correlation coefficient *r* values between each of the three acoustic correlates (VOT, H1-H2, F0) and the response percentage (each stimuli was presented 10 times) for each response category, /ta/, /t^{h}a/, /t*a/. As a result, 9 correlation coefficient *r* values (3 acoustic correlates × 3 response categories) were obtained for each of the 11 listeners. Next, for each response category for each listener, the obtained correlation coefficient *r* values for the three acoustic correlates were summed together. Then, the *r* value for each acoustic correlate was divided by the summed *r* value of the three acoustic correlates. The equation below shows the computation process.

$$\text{proportional coefficient } r = \frac{r \text{ of VOT (or H1-H2 or F0)}}{r \text{ of VOT} + r \text{ of H1-H2} + r \text{ of F0}}$$

Thus, the outcome values represented a proportion of the sum, and this means that these values equaled to 1 if they are summed together for VOT, H1-H2, and F0. The proportional values then represented a relative contribution of each correlate over the three acoustic correlates, that is, the relative weight of each acoustic correlate over the three acoustic correlates for each response category, /ta/, /t^{h}a/, /t*a/.

3. Results

3.1 Multinomial logistic regression analyses

The logistic regression analyses aimed to reveal the weight of VOT, H1-H2, and F0 to the perceptual distinction of Korean stop manner contrasts. The focus of the analyses was on /ta/-/t^{h}a/ contrast as this contrast was at center of the prediction that Busan younger speakers would show more similar patterns to older Seoul speakers than to younger Seoul speakers regarding the greater F0 weight over VOT for younger Seoul speakers (Kang 2010; Kang & Guion, 2008; Silva, 2006).

3.1.1 The general patterns in Busan group

First, for the overall fit of the final model, likelihood ratio tests with all three predictors against a constant-only model (i.e., baseline model) indicated that the final model was significant, $\chi^2(6)=7.87$, $p < .001$. This indicates that the model with three predictors was significantly a better fit than the baseline model, $R^2=0.63$ (Cox & Snell), 0.71 (Nagelkerke). With all of the three predictor variables, correct classification rates were 71% for /ta/

response, 74% for /t^{h}a/ response, and 85% for /t*a/ with an overall correct classification rate of 77%.

Next, for the individual contribution of the three predictors, let us see Table 1. Note that the table is split into two halves. This is because the predictor variables were examined for pairs of response categories. /ta/ was specified as a reference category; therefore, the upper half of the table is comparing this category with /t^{h}a/, whereas the bottom half of the table shows the /ta/ response compared with /t*a/ response.

Table 1. Individual contribution of VOT, H1-H2, F0 to perceptual distinction of Korean stops for Busan speakers

Response	Predictor variables	*B* (*SE*)	Wald (*df* = 1)	Odds Ratio (*Exp*(*B*))
/t^{h}a/	VOT	0.97 (.02)	1264.3*	2.6
	H1-H2	-0.44 (.06)	51.9*	0.6
	F0	1.26 (.04)	1009.5*	3.5
	Constant	-5.71 (.18)	978.3*	
/t*a/	VOT	0.28 (.02)	66.6*	1.2
	H1-H2	2.76 (.06)	1723*	15.9
	F0	1.06 (.04)	701.2*	2.9
	Constant	-8.79 (.21)	1645.7*	

(The reference category is /ta/. For confidence interval of *Exp(B)*, both of the lower and upper values did not cross 1 for all three variables. B, the logistic coefficient represents the log of the odds of an event occurrence for one-unit change in the predictor variable. Wald statistic tells whether the predictor in question makes a significant contribution to the outcome. The odds ratio (*Exp(B)*) represents the relative strength of the variables for the prediction of the outcome. An odds ratio of greater than 1 indicates that the odds of event occurrence increases when one-unit change is made in a predictor variable. An odds ratio of less than 1 indicates that the odds of event occurrence decreases when one-unit change is made in a predictor variable. Asterisks indicate significant effects, $p < .05$.)

For the /ta/-/t^{h}a /comparison, comparison, all of the three predictors were significant and this indicates that the three acoustic cues all significantly contributed to the perceptual distinction of /ta/-/t^{h}a/ contrast. More importantly, odds ratio (*Exp*(*B*)) values indicate that as VOT and F0 increased the likelihood of /t^{h}a/ response over /ta/ response increased as well (both values are greater than 1). This greater than 1 value, that is, increased likelihood of /t^{h}a/ response makes good sense with the higher VOT and F0 value of /t^{h}a/ category. The value for F0 is a little greater than that for VOT (3.5 vs. 2.6), and this means that the likelihood of /t^{h}a/ response was slightly greater when one-unit increase in F0 was made than when the same change was made for VOT (3.5 times vs. 2.6 times greater compared with before the increase). In other words, F0 was a slightly more weighted cue than VOT for /ta/-/t^{h}a/ discrimination even though the difference was small.

Odds ratio for H1-H2 was less than 1 and this indicates that as H1-H2 increased the likelihood of /t^{h}a/ response decreased, but the decrease was marginal because the value, 0.6 was close to 1, which indicates no change in the likelihood. This decreasing pattern is associated with the breathier quality of /t^{h}a/ type (note that the H1-H2 variable was encoded in sequence of less breathier values. See section 2.4). To summarize, VOT and F0 was predominant cues for perceptual distinction of /ta/-/t^{h}a/ contrast and the contribution of H1-H2 was trivial compared with the other two correlates.

The distinction of /ta/-/t*a/ contrast can also be reliably explained by the odds ratio values as the /ta/-/t^{h}a/ distinction showed well-matched odds ratio values with the acoustic properties of /t/ and /t^{h}a/ categories. As can be seen from Table 1, one unit change in H1-H2 increased the likelihood of /t*a/ response over /ta/ response 16 times greater, and this perfectly matches the tensed voice quality of /t*a/ category. The larger odds ratio for F0 (2.9 compared with 1.2 for VOT) indicates the greater weight of F0 in the /ta/-/t*a/ distinction.

3.1.2 Comparison with Seoul groups

The perceptual behaviors of Busan young speakers here did not show surprising divergence when viewed in light of the acoustic generalities of Korean stops. They sensibly responded to the VOT and F0 differences between /ta/ and /t^{h}a/ categories as indicated by the great cue weight in the /ta/-/t^{h}a/ distinction. The voice quality difference with /t*a/ was well reflected on the dominance of H1-H2 weight in the /ta/-/t*a/ distinction. However, as stated in Introduction, the current study predicts that the Busan speakers would show differences from younger Seoul speakers in their perceptual behaviors for Korean stop distinction and thus, dialectal differences are examined in this section. Specifically, for /ta/-/t^{h}a/ / distinction the relative cue weight for VOT and F0 would be similar to that of older speakers than to younger speakers. Tables 2 and 3 below present perceptual cue weight of VOT, H1-H2, and F0 for

Seoul speakers.[3)]

Table 2. Individual contribution of VOT, H1-H2, F0 to perceptual distinction of Korean stops for older Seoul speakers

Response	Predictor variables	*B* (*SE*)	Wald (*df* = 1)	Odds Ratio (*Exp*(*B*))
/t^{h}a/	VOT	0.8 (.02)	834.1*	2.2
	H1-H2	-0.18 (.05)	9.6*	0.8
	F0	1.46 (.04)	1208.2*	4.3
	Constant	-6.9 (.2)	1183.6*	
/t*a/	VOT	-0.19 (.02)	57.9*	0.8
	H1-H2	1.94 (.06)	1042.8*	15.4
	F0	1.3 (.04)	940.1*	3.6
	Constant	-8.6 (.22)	1482.1*	

The reference category is /ta/.

Table 3. Individual contribution of VOT, H1-H2, F0 to perceptual distinction of Korean stops for younger Seoul speakers

Response	Predictor variables	*B* (*SE*)	Wald (*df* = 1)	Odds Ratio (*Exp*(*B*))
/t^{h}a/	VOT	0.87 (.02)	1005*	2.4
	H1-H2	-.18 (.05)	11.4*	0.8
	F0	1.9 (.04)	1617.3*	6.7
	Constant	-7.51 (.2)	1319.6*	
/t*a/	VOT	0.11 (.02)	21.3*	1.1
	H1-H2	1.94 (.06)	1042.8*	6.9
	F0	1.6 (.04)	1262.3*	5.1
	Constant	-8.6 (.22)	1498.7*	

The reference category is /ta/.

The odds ratio for /ta/-/t^{h}a/ distinction is compared in three ways across Tables 1, 2, and 3 here. As reported in Kang (2010) the younger Seoul speakers show markedly greater F0 weight over VOT (6.7 vs. 2.4) and this indicates that for young Seoul speakers perceptual distinction of /ta/ and /t^{h}a/ / is far more heavily contingent on F0 difference of the two stop types than VOT difference. This greater dependency on F0 quite diminishes in the old Seoul speakers as indicated by the reduced odds ratio difference (4.3 vs. 2.2). Then, the young Busan speakers in this study shows striking similarities to the older Seoul speakers. Odds ratio values are 3.5 and 2.6 for F0 and VOT and these values are much closer to that of the older speakers. These results suggest that for young Busan speakers /ta/-/t^{h}a/ distinction is primarily made by the combination of VOT and F0 cues and this matches the traditionally established findings about the Korean stop manner distinction. Similarities to the old speakers are found with /ta/-/t*a/ distinction as well. Odds ratio for H1-H2 is distinctly large for older Seoul speakers and Busan speakers (15.4 and 15.9, respectively). The value for young Seoul speaker is much smaller and is rather comparable to that of F0 (6.9 for H1-H2 and 5.1 for F0). These results, along with results for /ta/-/t^{h}a/ contrast, suggest that the perceptual behavior of the younger Seoul speakers were more weighted towards F0 property of Korean stops compared with the other two groups, and young Busan speakers were least dependent on F0 for the stop manner distinction. For /ta/-/t*a/ distinction as well, odds ratio for F0 is lowest for Busan speakers. Compare 5.1 for Seoul younger, 3.6 for Seoul older, and 2.9 for Busan speakers over the Tables 1 through 3.

3.2 Correlation analyses

The perceptual weight of the three acoustic correlates revealed from the regression analyses was supplemented by the measure of correlation between acoustic cues and response percentage. Table 4 below shows coefficient correlation *r* values for the three speaker groups of Busan group, younger Seoul and older Seoul groups.

3) The results reported here are excerpted from Kang (2010). Each of the younger and older Seoul group consisted of 10 participants. The results are presented here for comparison to Busan speakers in the current study. Here the statistic used for analyses is multinomial logistic regression due to three dependent variables and binary logistic regression statistic was used in a repetitive fashion in Kang (2010). The results from the two statistics were identical enough to draw the same interpretation.

Table 4. Coefficient correlation *r* values between VOT, H1-H2, F0 and response percentage for /ta/, /t^{h}a/,/t*a/ responses for younger Seoul, older Seoul and young Busan speakers. The values are pooled across 11 speakers for Busan group and 10 speakers for Younger and Older Seoul groups.

Response	Speaker group	VOT	H1-H2	F0
/ta/	Busan	0.31	0.36	0.32
	Older	0.16	0.35	0.49
	Younger	0.23	0.19	0.58
/t^{h}a/	Busan	0.44	0.30	0.26
	older	0.39	0.30	0.31
	Younger	0.37	0.27	0.35
/t*a/	Busan	0.12	0.73	0.15
	older	0.20	0.60	0.20
	Younger	0.18	0.56	0.26

What is first noted from the table is that the overall trend is very similar to the findings from logistic regression analyses. The *r* values for VOT and F0 of Busan group were comparable to each other (0.31 vs. 0.32) and this suggested that neither of VOT or F0 was a dominantly weighted cue to the young Busan speakers. In contrast, for younger and older Seoul speakers F0 was clearly dominant over VOT for /ta/ selection (0.58 for younger and 0.49 for older). In addition to this, *r* value for F0 was consistently smallest for all three response choices in Busan group, whereas it was consistently largest for younger Seoul group. Another similarity to regression analyses is that for /t*a/ response younger Seoul speakers showed relatively little H1-H2 weight (o.56) and great F0 weight (0.26) compared with other two groups. Combined with findings from the regression analyses, these results suggest that F0 is surely a more weighted cue to younger Seoul speakers for Korean stop distinction and for Busan speakers F0 is less weighted and the three correlates are more comparably weighted to one another.

4. Discussion

In this study perceptual cue weight for Korean stop classification was investigated over the three speaker groups of younger and older Seoul speakers and Busan speakers. The results of perceptual distinction experiment revealed that young Busan speakers were more similar to older Seoul speakers than younger Seoul speakers. In logistic regression analyses, for /ta/-/t^{h}a/ contrast VOT and F0 weight was quite comparable to each other for Busan speakers, whereas younger Seoul speakers showed clear dominance of F0 over VOT. The older Seoul speakers lied between the two groups (Tables 1 through 3). This result of more balanced cue weight between VOT and F0 for Busan speakers was supplemented by the similar results from correlation analyses (Table 4). The Busan speakers were also alike to older Seoul speakers with the clear dominance of H1-H2 over the other two cues for /ta/-/t*a/ distinction. These results suggest that VOT is still a reliable cue to the aspirated-lenis stop distinction in Kyungsang Korean and the role of VOT is being replaced by F0 in Seoul Korean as evidenced by the acoustic measures in the previous studies as well. Thus, the comparisons over the three speaker groups indicate a compensatory cue relation between VOT and F0.

The cue interaction in multiple cue settings is observed with the H1-H2 weight as well. This cue trading relation is commonly observed when a setting for one acoustic cue changes and thus the phonetic percept of a category are disturbed by that. Another cue may compensate possible changes in the percept of the category (Repp, 1982, 1983). As shown in Table 2, odds ratio for /ta/-/t*a/ distinction shows far less weight of H1-H2 for younger Seoul speakers (6.9 compared with 15.9 for Busan, 15.4 for older). In contrast, F0 weight is greatest for younger Seoul speakers (5.1 for younger, 3.6 for older, and 2.9 for Busan). This opposing pattern between F0 and H1-H2 suggests that the weaker dependency on voice quality among young Seoul speakers is supplemented by relatively stronger F0 weight to secure solid distinction of /ta/-/t*a/ contrast. This interaction of F0 with H1-H2 indicates, along with the interaction of F0 with VOT for /ta/-/t^{h}a/ contrast, shows that for young Seoul speakers the role of F0 is more salient and comprehensive in general in the Korean stop classifications, not locally limited to the changes associated with aspirated-lenis contrast as reported in the production-based investigations previously. Thus, the compensatory behavior among multiple cues is found among younger Seoul speakers in particular around F0 weight.

What is finally noteworthy is the progressive F0 pattern over the three speaker groups. The F0 weight increases in the sequence of Busan, older Seoul, and younger Seoul speakers for both /ta/-/t^{h}a/ and /ta-t*a/ contrasts (Tables 1 through 3 and Table 4 for both regression and correlation analyses). In other words, the F0 weight of older Seoul speakers consistently stays middle between the two groups. Let us note the fact that the ‘older Seoul’ group in Kang (2010) consisted of middle aged speakers of 40’s and 50’s (mostly 40’s). Regarding this, an

arising question is whether the cue weight changes in Korean stop system reported here is occurring in this age group, not only in the 'younger Seoul' group. If middle-aged speakers are experiencing the same change, the diachronic transition started quite a while ago but is expanding slowly to 'older' speakers. Otherwise, the transition might have been more recently initiated. In order to answer to this question, further investigations with elderly participants are needed. If an elderly Seoul speaker group like of over 65 years old shows similar behavior to that of Busan speakers, this means that the transition is occurring among the middle-aged speakers in question as well. If the results are the other way, that is, elderly speakers are similar to 'older' speakers, it then means that the cue settings are inherently different between the two dialects, and only younger Seoul speakers are experiencing the changes.

5. Conclusion

The current study explored the role of F0 as a cue to Korean stop distinction in Busan speakers by comparing the Busan and Seoul dialects of Korean. It also provided perceptual evidence of the diachronic changes occurring in Seoul speech again through a comparison with a change-resisting dialect. The results suggested that the F0 function for consonantal laryngeal contrast is interfered by the same function for lexical tone contrast. At the same time, the traditional cue settings for Korean stop contrasts are held unaffected in Busan speech, whereas younger Seoul speakers have entered a new classification paradigm for the cue weight. Together with the findings of the previous studies on acoustic correlates in tonal dialects of Korean, the current results suggested that F0 is primarily taking a functional load for lexical tonal contrast rather than segmental laryngeal contrast in Kyungsang speech. Besides, correspondence between acoustic space and perceptual space was confirmed here, at least in relation to production and perception of Korean stops.

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