



# Phonetic realization of the suffix-suppressed Accentual Phrase in Korean<sup>\*</sup>

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## Abstract

Suffixes can surface or can be suppressed depending on context in Korean. Shin (1982) argues that the case marker-marked phrases deliver new information, while the case marker-suppressed phrases given information. The tonal pattern of the Accentual Phrase in Korean, LHLH, is not specific to morphological constituents within the phrase but is a property of the phrase (Jun 1993). Given that prosody often distinguishes pragmatic meanings, this study aims to find the phonetic characteristics of the suffix-suppressed Accentual Phrase through a phonetic experiment. The results indicate that the case marker-marked and -suppressed phrases are realized differently with respect to the degree of AP-final rising and AP-final tone realization. Different phonetic realizations reflect that the suffix-suppressed AP functions differently from the suffix-marked AP in discourse.

## 1. Introduction

Postpositions and suffixes are good indicators for detecting the Accentual Phrase (hereafter AP) boundary in Korean (Song et al. 1999). However, case marker suppression prevails in everyday conversation in Korean as shown in (1).

- (1) na(n)\n mikuk(e) kanta 'I'll go to America'  
'I (Topic) 'America' 'to' 'go'

Topic and direction indicating suffixes in parentheses in (1) may not surface depending on context. Shin(1982) argues that case markers perform not only a grammatical function but also a pragmatic function to indicate speaker's special intention. She maintains that case marker-marked phrase denotes new information, while case marker-suppressed phrase deliver given information which the speaker assumes to be in the consciousness of the addressee at the time of utterance. Given that prosody often helps distinguish pragmatic meanings, we can test whether suffix-marked and suffix-suppressed phrases exhibit a different behavior with respect to tonal patterns.

Jun(1993) proposes the tonal pattern of the Accentual Phrase in Seoul Korean as LHLH (a rise-fall-rise contour).<sup>1</sup>The tonal pattern of the AP is not specific to a lexical item but is a property of the phrase; The AP-final H is usually placed on the AP-final suffix but it does not necessarily have to be linked to the suffix due to suffix suppression. Kim et al.(1999) compared the acoustic

characteristics of the accusative case marker, {-l}\}, marked and the accusative case marker-suppressed phrases. They contend that the pitch range between the lowest and highest tones within the AP is larger in the case marker-marked AP compared to the case marker-suppressed AP due to the higher AP-final H pitch value. They also observe that the AP-final tone is often realized as L when the accusative case marker is suppressed.

This study aims to investigate the phonetic characteristics of the suffix-suppressed AP in terms of pitch contour. Extending Kim et al's (1999) study, this study compares the nominative case and accusative case marker-marked APs and case marker-suppressed APs. This study also examines gender difference in tonal realizations.

## 2. Experiment

### 2.1. The corpus

15 sentences given in (2) were designed by varying the number of syllables within an AP to investigate which acoustic features are employed to distinguish the case suffix-marked and case suffix-suppressed APs.

#### (2) A. 2 syllable-AP (marked by bold-face)

- a. **ne-ga** morančaj -e kayo  
'I (NOM)' 'Moran market' 'to' 'go'  
"I am going to Moran market."  
b. **na-n\n** morančaj -e kayo  
'I (TOP)'  
"I am going to Moran market."  
c. **nuna** morančaj -e kayo  
'elder sister'  
"Sister is going to Moran market."  
d. is↔nsæŋ-\n **nar\l** miw↔hačianayo  
'teacher Lee(TOP)' 'me(OBJ)' 'do not hate'  
"Teacher Lee doesn't hate me"  
e. is↔nsæŋ-\n **nuna** miw↔hačianayo  
'teacher Lee(TOP)' 'sister' 'do not hate'  
"Teacher Lee doesn't hate sister"

#### B. 3 syllable-AP (marked by bold-face)

- a. **nuna-ga** morančaj -e kayo  
'sister (NOM)'  
"Sister is going to Moran market."  
b. **nuna-n\n** morančaj -e kayo

- ‘sister (TOP)’  
 “Sister is going to Moran market.”  
 c. **↔m↔ni** morančaj -e kayo  
 ‘mother’  
 “Mother is going to Moran market.”  
 d. is↔nsæŋ-n **nunar**l miw↔hač ianayo  
 ‘teacher Lee(TOP) ‘sister (ACC)’ ‘do not hate’  
 “Teacher Lee doesn’t hate sister.”  
 e. is↔nsæŋ-n **↔m↔ni** miw↔hač ianayo  
 ‘teacher Lee(TOP) ‘mother’ ‘do not hate’  
 “Teacher Lee doesn’t hate mother.”  
 C. 4 syllable-AP (marked by bold-face)  
 a. **↔m↔ni-ga** morančaj -e kayo  
 ‘mother (NOM)’  
 “Mother is going to Moran market.”  
 b. **↔m↔ni-n** morančaj -e kayo  
 ‘mother (TOP)’  
 “Mother is going to Moran market.”  
 c. **ačum↔ni** morančaj -e kayo  
 ‘aunt’  
 “Aunt is going to Moran market.”  
 d. is↔nsæŋ-n **↔m↔nir**l miw↔hač ianayo  
 ‘teacher Lee(TOP) ‘mother (ACC)’ ‘do not hate.’  
 “Teacher Lee doesn’t hate mother.”  
 e. is↔nsæŋ-n **ačum↔ni** miw↔hač ianayo  
 ‘teacher Lee(TOP) ‘aunt’ ‘do not hate’  
 “Teacher Lee doesn’t hate aunt.”

Both case suffix-marked and case suffix-suppressed phrases were designed to constitute a single AP by placing them before a long phrase which constitutes an AP on its own. They were placed either in sentence-initial or sentence-medial positions. In (2), case suffixes include /ga/ ‘nominative case marker’, /n)n/ ‘topic marker’, and /l)l/ ‘accusative case marker’. The examples in (c,e) in each set of data show the case suffix-suppressed APs.

## 2.2. Subjects

Two male and two female speakers of the standard Korean dialect participated in the experiment. Two male subjects aged 23 and 25 and two female subjects aged 22 and 23. All subjects were college students at the time of data collection.

## 2.3. Procedure

Speakers read randomized sentences four times in an anechoic room at Yeojoo Institute of Technology. The speech was digitized and pitch track was analyzed by PitchWorks software (Scicon). Kim et al’s (1999) study shows that the pitch range between the lowest L tone and the highest H tone within the AP is larger in the case marker-marked AP than in the case marker-suppressed AP. In this study, f0 values of the AP-penultimate and final syllables, which have the lowest f0 and the highest f0, respectively, were measured in the middle of the target syllables.

# 3. Results and discussion

## 3.1. The pitch range

Table 1 shows the results of pitch value difference between the AP-final and AP-penultimate syllables in 2, 3, and 4 syllable-APs depending on whether the APs are suffix-marked or not.

Table 1. Pitch range between the AP-penultimate and AP-final syllables (\*= p<0.05)

Gender	Number of syllables within AP	Case marker	Pitch difference between the AP-penultimate and AP-final syllables (Hz)	t-test for pitch difference
Female	2 syllables	Yes	39.58	0.727
		No	37.43	
	3 syllables	Yes	34.26	0.17
		No	23.2	
	4 syllables	Yes	21.73	*0.0008
		No	2	
Male	2 syllables	Yes	33.83	*0.005
		No	26.06	
	3 syllables	Yes	23.62	*0.01
		No	16.76	
	4 syllables	Yes	21.91	*0.0007
		No	15	

The pitch range between the AP-penultimate and AP-final syllables is always larger in the suffix-marked AP than that in the suffix-suppressed AP. The result is in line with Kim et al’s (1999) study. However, notice that the difference is not significantly different in the suffix-marked 2 and 3 syllable APs for females. Next subsection discusses the characteristics of female speech.

## 3.2. AP-final two syllables in the suffix-suppressed AP

It was shown that the pitch range between the AP-final and AP-penultimate syllables is larger when the AP is suffix-marked than when it is suffix-suppressed in the previous subsection. Kim et al. (1999) attributes the pitch range difference to the higher pitch of the suffix-marked AP-final syllable. Table 2 shows the averaged pitch values of the AP-final and AP-penultimate syllables for female and male speakers.

Table 2. Pitch values of the AP-final two syllables (\*= p<0.05)

Gender	AP-final two syllables	Case marker	Pitch values (Hz)	t-test for pitch values between suffix-marked and no suffix marked-APs
Female	AP-penultimate	Yes	233.185	*0.026
		No	245.953	
	AP-final	Yes	265.157	0.57
		No	268.069	
Male	AP-penultimate	Yes	142.422	*0.005
		No	150.255	
	AP-final	Yes	168.943	0.704
		No	169.907	

Table 2 shows that the AP-final H tones are not significantly different between the suffix-marked AP and the suffix-suppressed AP in contrast to Kim et al’s (1999) study. Then where does the significantly different pitch range difference between the suffix-marked AP and the suffix-suppressed AP come from? Table 2 clearly illustrates that it derives from the different pitch values in the AP-penultimate syllables. The pitch values of the AP-penultimate syllables in the suffix-

marked APs are significantly lower than those in the suffix-suppressed APs.

Table 3 shows that pitch values of the AP-final and AP-penultimate syllables with respect to the number of syllables within the AP.

Table 3. Pitch values of the AP-final two syllables within the AP consisting of different number of syllables (\*=  $p < 0.05$ )

#### A. Females

Number of syllables within an AP	AP-final two syllables	Case marker	Pitch values (Hz)	t-test for pitch values between suffix-marked and suffix-suppressed APs
2 syllables	AP-penultimate	Yes	215.2	*0.046
		No	228	
	AP-final	Yes	254.8	0.267
		No	265.4	
3 syllables	AP-penultimate	Yes	239.1	0.53
		No	245.6	
	AP-final	Yes	273.3	0.659
		No	268.9	
4 syllables	AP-penultimate	Yes	246.1	*0.012
		No	268.4	
	AP-final	Yes	267.9	0.739
		No	270.4	

#### B. Males

Number of syllables within an AP	AP-final two syllables	Case marker	Pitch values (Hz)	t-test for pitch values between suffix-marked and suffix-suppressed APs
2 syllables	AP-penultimate	Yes	129.8	*0.003
		No	139.1	
	AP-final	Yes	163.7	0.712
		No	165.1	
3 syllables	AP-penultimate	Yes	147.3	0.191
		No	151.9	
	AP-final	Yes	170.9	0.591
		No	168.7	
4 syllables	AP-penultimate	Yes	150.4	*0.022
		No	161.5	
	AP-final	Yes	172.3	0.375
		No	176.5	

Table 3 shows that the pitch values of the suffix-suppressed AP-final syllables are by large higher than those of the suffix-marked AP-final syllables except for the 3 syllable-APs. However, t-test results show that pitch values of AP-final syllables are not significantly different depending on case marker-markedness. On the other hand, the pitch values of the AP-penultimate syllables exhibit the significant difference between the two typed APs except for the 3 syllable-APs.

As for the 2 syllable-APs, AP-final rising is at the same time AP-initial rising. As for the 4 syllable-APs, both AP-final rising and AP-initial rising are realized together: LHLH. Suffix-marked AP-penultimate L and no suffix-marked AP-penultimate L are significantly different from each other for the 2 and 4 syllable-APs: The AP-penultimate L in no suffix-marked AP is higher in pitch in the 2 and 4 syllable-APs. On the other hand, as for the 3 syllable-APs, AP-initial rising conflicts with AP-final rising and the AP-initial H (-H in K-ToBI) can be realized as either L or H. That conflict results in non-significant difference in pitch between suffix-marked and suffix-suppressed 3 syllable-APs.

Close scrutiny shows that females and males exhibit a different tonal pattern with respect to the pitch values of the

AP-penultimate syllables in the 3 syllable-APs: More salient difference for males compared to females. Why is that so? Different gender realizes AP-initial H differently: Females tend to respect the AP-initial rising more than males (Oh 2003). For instance, the IP-final AP with 3 syllables is realized as LLL% and HLL% for males but as LHL% and HHL% for females in declaratives when the AP begins with a laryngeal consonant. In other words, the AP-initial H tone is maintained in the penultimate syllable of the 3 syllable IP-final AP for females. It suggests that males and females would show the different pitch values in the AP-penultimate syllables between suffix-marked and suffix-suppressed APs: The difference in pitch values of the AP-penultimate syllables between suffix-marked and suffix-suppressed APs would be less for females than for males. That prediction is born out in the 3 syllable-APs. The pitch values of the AP-penultimate syllables for females do not show any significant difference between suffix-suppressed and suffix-marked APs as shown in Table 3:  $p = 0.53$ . In contrast, males show bigger difference in the pitch values of the AP-penultimate syllables between suffix-suppressed and suffix-marked APs compared to females:  $p = 0.19$ . In a nutshell, the AP-penultimate tone coincides with the AP-initial H in 3 syllable-APs. Females tend to preserve the AP-initial rising. Maintenance of the AP-initial H in 3 syllable-APs prohibits the significant difference in pitch values between AP-final two syllables in the suffix-marked and suffix-suppressed APs for females.

To conclude this subsection, AP-final tonal realizations are not different between in the AP with a case marker and in the AP without a case marker. However, the degree of AP-final tone rising is significantly different as examined in the previous subsection. Pitch values of the AP-penultimate syllable are higher when a case marker is suppressed than when the AP ends with a case marker. In other words, the significant difference in pitch range between AP-final and AP-penultimate syllables results from the higher pitch values in the AP-penultimate syllable of the suffix-suppressed AP as opposed to the higher pitch values in the final syllable of the suffix-marked AP.

### 3.3. AP-final L realization

Table 1 shows that, as for males, the degree of AP-final rising indicated by the pitch range is significantly small in the 2, 3, and 4 syllable-APs when the suffix is suppressed. On the other hand, as for females, it is significantly small only in the 4 syllable-AP when the suffix is suppressed. Close examination of the pitch range reveals that the significantly different AP-final rising comes from AP-final L tone realization for females. The AP-final L is observed in 40 % of the 4 syllable APs for females. Jun (2000) suggests that the AP-final tone is sometimes realized as L phonetically. However, she does not specify the environment where such AP-final tone lowering takes place. The results in this study suggest one of the possible environments: When the AP ends with a content word without a suffix and has more than 4 syllables within it. Kim et al. (1999) also reports that the AP-final L is observed in the 4 syllable-AP. It suggests that the AP-final L result from the fact that the object and the following verbal phrase tend to constitute one AP. The results of this study yield two objections on to the suggestion. In this study, the target phrase was designed to form an AP on its own but still it tends to have AP-final L when the suffix-suppressed AP is long enough. Thus, the AP-final L results from the acoustic

characteristic of the suffix-suppressed AP rather than dephrasing. The second objection to Kim et al.'s (1999) study concerns the number of syllables within an AP. In their study, the AP-final L does not show up in 3 syllable-APs but in over 4 syllable-APs. The smaller number of syllables tends to constitute an AP with the following word. Then if suffix-suppressed 4 syllable-AP constitutes an AP with the following word, suffix-suppressed 3 syllable-AP would be more expected to form an AP with the following word. However, they report the AP-final L only in 4 syllable-AP but not in 3 syllable-AP. Thus, the AP-final L does not have to do with accentual phrasing with the following word.

Kim et al. (1999) also accounts for the AP-final L in terms of undershoot. Phonetic undershoot is usually related to the timing and the number of syllables within a phrase. It is highly expected when the phrase in question is not given enough duration. According to Kim et al.'s (1999) study, the suffix-suppressed-AP has longer duration than the suffix-marked AP in sentence-initial position. But the AP-final L is still observed in the suffix-suppressed AP located in the sentence-initial position. That strongly suggests that the AP-final L does not have to do with undershoot. The fact that the suffix-marked AP with the same number of syllable has the AP-final H does not support the interpretation of undershoot either. Rather the AP-final L in the AP with more than 4 syllables is one of the phonetic characteristics of suffix-suppressed AP.

#### 4. Conclusion

Pitch range difference functions in many ways in utterance. For instance, it is employed to express emotion and focus in discourse phonetically. This study shows that it also plays a role in cueing the case marker markedness. Pitch range between the AP-final and AP-penultimate syllables is smaller in the suffix-suppressed AP than in the suffix-marked AP. The reduced pitch range in the suffix-suppressed AP is achieved in two ways. One is by way of high tone realization in the AP-penultimate syllable. Contrary to Kim et al.'s (1999) study, it was shown that the AP-final tone remains the same regardless of case marker existence but the adjacent tone rather cues case marker existence. The AP-penultimate tone is low enough and AP-final rising is salient when the AP ends with a case marker. The other way to reach the reduced pitch range in suffix-suppressed AP is via AP-final tone lowering. That strategy is mostly observed in 4 syllable-APs for females, which is in line with Kim et al.'s (1999) results.

The suffix-marked AP and the suffix-suppressed AP are different with respect to the degree of AP-final rising and the AP-final tone realization. These results reflect their different pragmatic function in discourse. This study can provide a basis for the phonetic implementation of the AP in Korean. Furthermore, these results will serve the purpose for speech synthesis and recognition.

#### 5. References

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\* This work was supported by the Korea Research Foundation Grant. (KRF-2002-042-A00026)

<sup>1</sup> In this work, we use the model of Korean prosodic structure of Jun (1993) where prosodic levels are defined by intonational correlates: Intonational Phrase (IP), Accentual Phrase (AP), and the prosodic Word plus any intra-Word domains.