KOREAN AFFRICATES AND CONSONANT-TONE INTERACTION

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1 Introduction

Korean has a three-way laryngeal contrast ( lax, aspirated, and tense (Kim, 1965)) in obstructions which interacts with tone on a following vowel (Silva, 2006; Wright, 2007). While stops and affricates display the full three-way contrast, fricatives do not. The lax fricative is absent in Korean as shown in (1). While this division between fricatives versus non-fricatives with respect to consonant-tone interaction might be explained by appealing to the feature [continuant], we argue that [continuant] is irrelevant for this interaction. Only laryngeal features interact with tone in Korean, as seen cross-linguistically (Lee, 2008).

(1) affricates      /lax/ "sleep"      /lal/ "moon"      N/A      L
     /tense/ /tseun/ "a moment" /t*al/ "daughter" /t*aun/ "to be cheap" H
     /aspirated/ /t*am/ "very" /t*al/ "made" /t*aun/ "to buy" H

Note: The place of articulation of affricates is represented following Kim (1999). Affricates have characteristics of both stops and fricatives. This ambivalence is accounted for in several different theoretical proposals. Jakobson et al. (1952) posited that affricates are [–

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2 An Experiment

In the past, the three-way laryngeal contrast in Korean was described as a three-way contrast in voice-onset-time (VOT). However, recent studies have shown that Korean is undergoing a change where this VOT contrast between aspirated and lax obstruents is neutralizing (Silva, 2006, Wright, 2007). Even so, the three-way laryngeal contrast is maintained by Korean speakers. It has been suggested that the introduction of a tonal contrast has replaced the VOT contrast between aspirated and lax obstruents. The following experiment measures VOT and F0 following obstruents, including affricates, to supplement the results of Silva, who looked at stops only.

2.1 Method

Two female native speakers of Seoul Korean were recorded at the Phonetics and Field Research Laboratory (PFRIL) of Rutgers University. The participants' voices were recorded using a Marantz PMD 671 solid-state recorder, while wearing a Shure W/10 handheld microphone. The sampling rate was 44,100 Hz. They read from powerpoint slides that automatically advanced every five seconds. There were fifty-five sentences, including some distractors. These were repeated four times and presented in random order. The target words began with stops and affricates varying in terms of place of articulation and manner of articulation. Disturbing stimuli with bilabial and alveolar nasal onsets were also included. The first vowel in the target words varied between [i] or [a]. All possible combinations of vowel quality and onset type were included.

(2) Carrier Phrase
0129_020712_8112.
"This is called ___".

The sound files were manually segmented in Praat (Boersma and Weenink, 2007) using visual and audio cues. An automated script computed F0 at the onset of the vowel.

Table 1. F0 measurements at the onset of a vowel following affricates

<table>
<thead>
<tr>
<th>Initial F0</th>
<th>Standard error</th>
</tr>
</thead>
<tbody>
<tr>
<td>[a, lax]</td>
<td>[zähl]</td>
</tr>
<tr>
<td>[b, tense]</td>
<td>[zählt]</td>
</tr>
<tr>
<td>[c, aspirated]</td>
<td>[zählten]</td>
</tr>
</tbody>
</table>

Table 1. F0 measurements at the onset of a vowel following affricates

<table>
<thead>
<tr>
<th>Mean Initial F0</th>
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<tbody>
<tr>
<td>123.37Hz</td>
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</table>

Figure 1. Initial F0 for stops and affricates (speaker 201)
Though controversial, we interpret this result as the emergence of tone in Korean, as suggested by Silva (2006). The traditional three-way contrast between the stops was attributed to differences in voice-onset time (VOT) (Kim, 1965 among others). However, Silva (2006) showed that in younger generations of Seoul Korean speakers, the extent of the VOT contrast between aspirated and lax stops is lessened. Figure 2 shows that this neutralization of VOT contrast holds for our speaker 201. For each of the three stops and the affixate, clearly the tense sounds have lower VOT than do lax and aspirated sounds. Laryngeal manner has a significant effect on VOT \( F(1, 72.97) = 0.01 \). On the other hand, aspirated stops have only slightly higher VOT than do lax stops, whereas lax affixates have slightly higher VOT than do tense affixates. Statistically, these slight differences in VOT between lax and aspirated articulations are insignificant: An ANOVA performed on a subset of the data that included all lax and aspirated (but not tense) stops, showed there is no difference in VOT between lax and aspirated stops \( F(1, 72.97) = 0.01 \). However, it was discovered that affixates and stops have different effects on VOT \( F(1, 72.97) = 0.01 \). In summary, tense stops and affixates have lower VOT compared to their lax and aspirated counterparts.

Articulatorily, affixates consist of a stop closure followed by fricative release. This stop closure works in concert with laryngeal activity, and so segments with [-continuant] are better anchors for tone than [+continuant] segments (cf. Beresford, 1994). Affixates and stops share the feature [-continuant], (cf. affixates and fricatives share the feature [+continuant]).

Figure 2. Voice-onset-time (VOT) of Korean obstruents (speaker 201)

3 Implications for phonological features of affricates

Based on our findings, stops and affixates have the same effect on tone in Korean: Aspirated stops and affixates and lax stops respectively allow high and low tone following them. Fricatives, on the other hand, do not allow low tone following them. Sagay (1986) treats affixates as an ordered pair of [-continuant] and [+continuant] features. This ordering implies that phonological processes that are sensitive to [-continuant] would treat affixates as [-continuant] in a preceding environment, but as [+continuant] in a following environment. Lombardi (1990), on the other hand, treated affixates as an unordered pair of [-continuant] features. Unordered [-continuant] specifications would imply that either value, [-continuant] or [+continuant], could potentially interact with following or preceding environments.

3.3 Featural representation of affixates

Lombardi 1990: 381
-continuant
Root

[+continuant]

Sagay 1986: 96

[+continuant]

Root

A third possible view of affixates treats them as strident stops, [-continuant, [+strident]] (Jakobson et al., 1952: 124). This third representation of affixates would allow [-continuant] to interact with tone, like Lombardi’s account. Only Sagay’s account would be problematic for an interaction between [-continuant] and tone.

3.4 Featural representation of affixates by Jakobson et al. (1952)

[-continuant]
Root

[+strident]

When considering facts of Korean phonology, affixates can only be represented as [-continuant, [+strident]] as in Jakobson et al. (1952). There are no lax fricatives but there are lax affixates in Korean. In a theory where affixates have both [-continuant] and [+continuant] values, fricatives and affixates can pattern together. A constraint that bans lax fricatives ([+sonorant, [-continuant], [-constricted glottis, [+spread glottis]]), would also necessarily ban lax affixates. Therefore, in Korean, where lax fricatives are absent, one would expect that lax affixates should also be absent. However, this is not the case and so affixates cannot bear a [+continuant] value.

One possible explanation is that in fact, this gap is only apparent, and that lax and aspirated fricatives are both present but do not contrast on the surface. Since fricatives are always produced with spread glottis, it might not be possible to maintain such a contrast. In this case, lax
fricatives should act like other lax obstruents phonologically and should be voiced intervocally. This pattern is attested, in fact, in Hmong (/ok/, 1989, Green, 2001, Lee, 2009). However, this is not the case in Korean, implying that affricates are not [+continuant], but only [−continuant] as suggested by Jakobsen et al. (1952).

Furthermore, affricates’ influence on the pitch of the following vowel comes only from the laryngeal feature associated with obstructions. Since stridency distinguishes stops from affricates and fricatives, it is not relevant because consonant-tone interaction groups stops and affricates together as a class. The continuant specification for stops and affricates is also irrelevant for consonant-tone interaction. Lax fricatives are absent due to a phonotactic constraint banning them, rather than any constraint involving consonant-tone interaction. Therefore, a constraint banning lax obstruents preceding H tone need not even refer to fricatives at all. It can apply freely to all obstruents, and in fact if Korean had lax fricatives, we would expect them to be banned with H tone.

We have shown that consonant-tone interaction in Korean concerns laryngeal features only following cross-linguistic observations (Peng, 1992, Bradda, 1999, Lee, 2008, Teng, 2008 among others).

4 An OT analysis

In this section, an analysis of affricate-tone interaction in Korean is proposed using Optimality Theory (Prince and Smolensky, 1993/2004). Lee (2008) formalizes the difference of tone associated with consonants and tone associated with vowels since the former involves a direct association of tone, which is only restricted by markedness constraints. This is enforced in the way constraints are defined, as below.

(5) Constraints

a. MORA→T
   - Assign a violation mark to moras not linked to a tone.

b. ROOTNODE→T
   - Assign a violation mark to root nodes (including non-moraic consonants) not linked to a tone.

c. [+SPREADGLOTTIS]/L
   - Assign a violation mark if [+a, g] segments are directly associated with L tone.

d. IDENT-T
   - Corresponding segments associated to a mora have identical values for the tonal feature T.

This version of IDENT-T is more restricted than the previously proposed IDENT-T constraint (Yip, 2002), in that it is only violated by tone associated with moronic segments. There is no faithfulness constraint that preserves the association between non-moraic segments and tone. Thus, tone can never be cross-attested on non-moraic segments.

1 Affricates may be [+continuant] in addition to [−continuant] in other languages. Midda (2005) shows that liquids and nasals can pattern with assimilates or with obstructions on a language-by-language basis. The tone might hold of affricates patterning with assimilates or not on a language-by-language basis (although they should always potentially pattern with assimilates). This is a topic for future research.

The OT analysis should capture the following descriptive generalizations. Tense and aspirated affricates do not occur with L tone (1b, c), implying that an underlying sequence of tense or aspirated affricates followed by L tone must map to some other surface form. This requirement is accommodated by changing underlying L to H tone on the surface. Similarly, lax affricates do not occur with H tone on the surface (1a). This requirement is accommodated by changing H to L tone (see Lee and Perkins (2008) for an analysis where consonant-tone interaction in lax obstruents is accounated for).

Table (6) shows that sequences of tense affricates and underlying L tone vowels do not surface faithfully. As mentioned, underlying L tone changes to surface H tone. Candidate (6b) fatally violates ROOTNODE→T because the tone affix is not linked to a tone on the surface. Candidate (6c) fatally violates [+a, g]/L because the tense affix is linked to a L tone on the surface. Candidate (6d) satisfies both of the aforementioned constraints, while violating IDENT-T. Since IDENT-T is ranked lower than ROOTNODE→T and [+a, g]/L, candidate (6a) is optimal.
The same holds for aspirated affricates as shown in tableau (7) below. Sequences of aspirated affricates and underlying L tone vowels do not surface faithfully. Underlying L tone changes to surface H tone. Candidate (7a) fatally violates RootNode→T because the aspirated affricate is not linked to a tone on the surface. Candidate (7c) fatally violates [+sg, Y]L because the aspirated affricate is linked to a L tone on the surface. Candidate (7a) satisfies both of the aforementioned constraints, while violating IDENT-T. Since IDENT-T is ranked lower than RootNode→T and [+sg, Y]L, candidate (7a) is optimal.

<table>
<thead>
<tr>
<th></th>
<th>L</th>
<th>RootNode→T</th>
<th>[+sg, Y]L</th>
<th>IDENT-T</th>
</tr>
</thead>
<tbody>
<tr>
<td>a.</td>
<td>[a,a]</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>b.</td>
<td>[a,a]</td>
<td>W *</td>
<td></td>
<td>L</td>
</tr>
<tr>
<td>c.</td>
<td>[a,a]</td>
<td>W *</td>
<td></td>
<td>L</td>
</tr>
</tbody>
</table>

Markedness constraints on consonant-tone interaction outrank the tonal faithfulness constraint (IDENT-T). Under this ranking, the change of tone is allowed to satisfy the markedness requirements. In this analysis, consonant-tone interaction results from constraint interaction, and not from representational requirements (i.e. Bresnan (1999) among others).

5 Conclusion

Consonant-tone interaction in Korean involves only laryngeal features on consonants, as is observed cross-linguistically. The seemingly relevant continuancy feature proves to be a separate issue. A constraint that bans lax fricatives can only account for the presence of lax affricates in Korean, if the former are [+contourless] and the latter are not. This suggests that Jakobson et al. (1952) were correct in positing that affricates are strident stops.

A phonetic experiment was conducted to measure VOT and F0 following obstruents, including affricates. The results showed that VOT is neutralized between lax and aspirated stops and affricates and that an F0 difference does exist. We have proposed an OT analysis of consonant-tone interaction for Korean affricates based on Lee (2008).

References

A COMPARATIVE SYNTAX OF ELLIPSIS IN JAPANESE AND KOREAN*

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Duk-Ho Ah  
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1 Introduction

Japanese and Korean are known to be very similar in syntax. The task of Japanese-Korean comparative syntax is then to shed light on the nature of general principles based on their common properties and to investigate micro-parameters that explain their differences. This paper examines ellipsis in the two languages, focusing on argument ellipsis, "slicing," and N'-ellipsis. We argue that the relevant phenomena provide evidence for the LF copying analysis of ellipsis over the PF deletion analysis. We also show that N'-ellipsis obtains in Japanese but not in Korean and attribute this difference to a micro-parameter in the genitive marker insertion rule.

It has been known since Kim 1999 and Oku 1998 that argument-ellipsis applies in the same way in Japanese and Korean. Examples from the two languages are shown in (1)-(2).

(1) a. John-wa [cr-[ga zibun-no ni]-ga sainyosseru-to] omotteiru  
    [top self-gen proposal-nom be.adopted-comp think  
     'John thinks that his proposal will be adopted.'

    b. Mary-no [cr sainyosseru-to] omotteiru  
    [also be.adopted-comp think  
     'Mary also thinks that her proposal will be adopted.'

* This is a shortened version of the paper presented at WALS 6, held at Nagoya University on September 4-6, 2000. An earlier version was presented in seminars at the University of Connecticut and MIT, and in workshops at Nagoya University and the University of York. We would like to thank the audiences at these places for helpful comments. The research leading up to this paper was conducted when the second author was a post-doctoral fellow at Nagoya University. We thank the Japanese Ministry of Education and Science for its grant to the Nagoya Center for Linguistics, which made this collaborative work possible.