

## **/n/-insertion in native Korean and Sino-Korean revisited<sup>\*†</sup>**

Soonhyun Hong  
(Inha University)

**Hong, Soonhyun. 2006. /n/-insertion in native Korean and Sino-Korean revisited.** *Studies in Phonetics, Phonology and Morphology*. 12.2. 391-413. Korean /n/-insertion is reanalyzed in this paper: e.g. /nic-yəlɪm/ [nɪnnyərim] 'late summer' in native Korean and /sik+yoŋ+yu/ [sikyoŋnyu] 'cooking oil' in Sino-Korean. There are two critical problems for the analysis of this phenomenon. First, /n/ is not an unmarked consonant in Korean. /t/ is reserved as an unmarked consonant (Kim 1987). Second, /n/-insertion is observed between a consonant and y in both native Korean and Sino-Korean. However, as native Korean and Sino-Korean have different morphology, it has been difficult to analyze the two sublexical aspects of /n/-insertion in a uniform way. For example, the insightful analyses of native Korean /n/-insertion (Kang 1992, Han 1994b, and Cho 1995a) equipped with the native Korean morphology-based Prosodic Word Formation, do not work in Sino-Korean /n/-insertion. This is because Sino-Korean has totally different morphology. This paper tries to address these problems and argues that a uniform analysis of the two sublexical aspects of /n/-insertion is possible in the framework of Optimality Theory. (Inha University)

Key words: *n*-insertion, unmarked *t*, native Korean morphology, Sino-Korean morphology, implicational constraint, anti-alignment constraint

### **1. Introduction**

The Korean Lexicon is assumed to be divided into three parts: the native Korean, Sino-Korean, and loanword sublexicon:

- (1) The Lexicon in the Korean language
  - a. Native Korean Sublexicon
  - b. Sino-Korean Sublexicon
  - c. Loanword Sublexicon<sup>1</sup>

Both in native Korean (hereafter, NK) and Sino-Korean (hereafter, SK), it is observed that /n/ is inserted between a consonant and y (and *i*) across certain morpheme boundaries. ([ ] = word which can appear alone; bold-faced **n** = an inserted /n/)

- (2) /n/-insertion at the inner compound boundary in NK compounds
  - a. [k<sup>h</sup>oŋ]+[yəs]      k<sup>h</sup>oŋ+**ny**ət      'bean candy'

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<sup>1</sup> /n/-Insertion in the Loanword Sublexicon will not be considered in this paper.

- b. [mahin]+[yətəlp] mahin +**ny**ətəl ‘forty-eight’

(3) /n/-insertion in NK prefixed words

- a. han-[yəlīm] han- yərim ‘mid summer’  
 b. nic-[yəlīm] nin-**ny**ərim ‘late summer’

However, morphological and phonological requirements for /n/-insertion are not exactly the same across the sublexica (i.e. NK vs. SK). The following comes from SK (“R” = root):

(4) /n/-insertion after [RR] in SK three-root compounds: [RR] **n** R

- a. [sik+yon]+yu sikyon+**ny**u ‘cooking oil’  
 b. [on+c<sup>h</sup>ən]+yok onc<sup>h</sup>ən+**ny**ok ‘hot spring bathing’

(5) /n/-insertion between words in SK four-root compounds: [RR][**n** RR]

- a. [man+c<sup>h</sup>an]+[yak+sok] manc<sup>h</sup>an+**ny**aks’ok ‘dinner appointment’  
 b. [cuŋ+kuk]+[yo+li] cuŋkuŋ+**ny**ori ‘Chinese food’

As we can see from the two sublexicon groups of /n/-insertion examples, the phonological requirements for /n/-insertion are the same: i.e. /n/ is inserted between a consonant and y. However, their respective morphological environments are different: /n/-insertion between two stems in compounds (2) and at a prefixal boundary in prefixed words (3) in NK, but /n/-insertion after two-root word in three-root compounds (4) and between two two-root words in four-root compounds (5). NK and SK have totally different morphological structures, and it becomes difficult to analyze both of them in a consistent and uniform way.

Another contingent theoretical problem in the analysis of /n/-insertion phenomena is: the inserted /n/ is more marked a consonant than unmarked /t/ in Korean (Kim 1987). We need to explain why more marked /n/ is preferred as an inserted consonant over less marked /t/.

In this paper, we are going to show that a unified but parameterized analysis of both types of /n/-insertion is possible within the Optimality Theory and that this kind of analysis is not possible in rule-based theories.

## 2. NK /n/-insertion phenomenon

In this section, we are going to show specifically what morphological and phonological environments trigger /n/-insertion in NK before analyzing the phenomenon within the framework of OT. For this purpose, we need to spell out the morphological word-formation in NK. NK morphology consists of prefixation, suffixation, and compounding:

(6) Word-formation in NK

- a. Prefixation: tās-os [tətot] ‘outer clothes’

- b. Suffixation:      kukyən-k'un    [kukyən̄k'un]    'spectator'  
                              mək-əs'-ə      [məkəs'ə]        'to eat-past-ending'  
 c. Compounding:    kət<sup>h</sup>+os            [kətot]            'outer clothes'

As shown below, /n/ is inserted phonologically between a consonant and *y* and morphologically at an inner compound boundary and a prefixal boundary:

(7) /n/-insertion at the inner compound boundary in NK compounds

- a. [k<sup>h</sup>oŋ]+[yəs]            k<sup>h</sup>oŋ+nyət        'bean candy'  
 b. [mahin]+[yətəlp]       mahin+nyətəl    'forty-eight'

(8) /n/-insertion in NK prefixed words

- a. han-[yəlīm]              han- yərim        'mid summer'  
 b. nic-[yəlīm]              nin-nyərim       'late summer'

However, suffixal boundaries are not the target of /n/-insertion:

(9) No /n/-insertion in NK suffixed words

- a. mək-i-ə                  məkyə            'to feed-suffix'  
 b. kyənti-ə                kyəntyə          'to endure-suffix'

Based on the examples so far, we can derive the following generalizations:

(10) Generalization of NK /n/-insertion

/n/-insertion takes place

- a. phonologically between C and *y*<sup>2</sup>  
 b. morphologically: prefix \_\_[stem] and [stem]\_\_[stem] excluding [stem]\_\_suffix (where \_\_ is the target place of /n/-insertion)

### 3. Previous Analyses for /n/-insertion in NK

For the analysis of NK /n/-insertion, Kang (1992) and Han (1994b) appeal to Prosodic Word Formation in Korean (Kang (1992)) to explain (10b) above. They try to unify the morphological structures prone to /n/-insertion: prefix \_\_[stem] and [stem]\_\_[stem].

According to Prosodic Word Formation proposed by Kang (1992), a prefix in a prefixed word forms a separate PrWd from a following stem and each member of a compound forms a separate PrWd (Nespor & Vogel 1986, Selkirk 1984). Her proposal is based on the insightful observation of overapplication of Coda Neutralization and underapplication of Palatalization, observed at the inner compound boundary and the prefixal boundary. But we will show here only the former case due to space limit:

<sup>2</sup> Actually /n/-Insertion might be sometimes observed between C and *i* but we are going to ignore this case for the moment. See section 4 for further discussion.

- (11) No Coda Neutralization at the suffixal boundary in suffixed words  
 a. /pat<sup>h</sup>/    pat.    ‘field’    citation form  
 b. /pat<sup>h</sup>-e/    pa.t<sup>h</sup>-e    ‘field-Acc’    [stem-suffix]
- (12) Overapplication of Coda Neutralization at [prefix-stem] and inner compound boundaries  
 a. /təs-os/    tət.ot    ‘outer garment’    [prefix-stem]  
 b. /os+an/    o.t+an    ‘inside of the garment’    [stem+stem]

In (11b), the stem-final /t<sup>h</sup>/ is syllabified as the onset of the following syllable and Coda Neutralization is not observed. In (12b), on the other hand, the stem-final /s/ is coda-neutralized even though it is realized in the onset of the following syllable. Hence, Coda Neutralization has overapplied in (12), even though the consonant in question is not in coda.

Based on this, Kang observes that the prefix and the first member of a compound pattern together and these two elements should be prosodified as a PrWd separately from the following morphological elements, as shown below:

- (13) Prosodic configurations for NK (Kang 1992)  
 a. Prefixed words followed by a suffix:  
 (PREFIX)<sub>PrWd</sub> (NOUN-SUFFIX)<sub>PrWd</sub>  
 e.g. /təs-os-i/    (tət)<sub>PrWd</sub>(os-i)<sub>PrWd</sub>    ‘outer-clothes-Nom’  
 b. Compounds followed by a suffix:  
 (NOUN)<sub>PrWd</sub> (NOUN-SUFFIX)<sub>PrWd</sub>  
 e.g. /pat<sup>h</sup>+kolaŋ-i/    (pak)<sub>PrWd</sub>(k’oraŋ-i)<sub>PrWd</sub>    ‘field+furrow-Nom’

Since /n/-insertion is observed at the prefixal boundary and at the inner compound boundary, Han (1994b) (and Kang 1992) adopts the Korean Word Formation and proposes the following rule for /n/-insertion in NK:

- (14) /n/-insertion Rule for NK (Han 1994b)<sup>3</sup>  
 $\emptyset \rightarrow n / ( \dots C )_{PrWd} PrWd( \_ y \dots )$

Since both “prefix\_\_stem” and “stem\_\_stem” are prosodified as “( )<sub>PrWd</sub> PrWd( )”, /n/ is predicted to be inserted at a prosodic word juncture, between the first PrWd-final C and the second PrWd-initial y according to (14). Though such a prosodic analysis of /n/-insertion is an insightful idea, however, this analysis requires too specific prosodic environment for /n/-insertion: phonological information in two separate prosodic domains should be simultaneously referred to. Since the specified rule environment is too specific for NK /n/-insertion, it becomes difficult to explain /n/-insertion in SK, in which the morphological structure for /n/-insertion is totally different (even though the phonological requirements are the same):

<sup>3</sup> The original rule in Han (1994b) is:  $\emptyset \rightarrow n / ( \dots C )_{PrWd} PrWd( \_ i/y \dots )$ . However, I intentionally removed “i” for simplicity. The reason for this will be discussed in section 4.

- (15) SK /n/-insertion after [RR] in [RR]R compounds in SK: [RR]**n**R
- a. [sik+yoŋ]+yu      sikyoŋ+**nyu**      ‘cooking oil’  
     ‘edible’ ‘oil’
- b. [on+c<sup>h</sup>ən]+yok      onc<sup>h</sup>ən+**nyok**      ‘hot spring bathing’  
     ‘hot spring’ ‘bath’
- (16) SK /n/-insertion between words in SK [RR][RR] compounds:  
     [RR][**n**RR]
- a. [man+c<sup>h</sup>an]+[yak+sok]      manc<sup>h</sup>an+**nyaks**’ok      ‘dinner appointment’
- b. [cuŋ+kuk]+[yo+li]      cuŋkuŋ+**nyori**      ‘Chinese food’

Given the /n/-insertion examples in SK, we cannot maintain the rule in (14). SK /n/-insertion requires a totally different morphological environment: /n/ is inserted within different compound structures. The NK Prosodic Word Formation does not work in SK. There is no evidence in favor of the existence of a prosodic word juncture at the target positions of SK /n/-insertion, as shown bold-faced in (15) and (16) (cf. Kang 1992). Neither overapplication of Coda Neutralization nor underapplication of Palatalization is observed at the target position. (We will try to solve this morphological mismatch problem in section 4 for NK and section 6 for SK) Therefore, the NK Prosodic Word Formation approach will not be valid to explain SK /n/-insertion. If we would maintain such a prosodic approach, we might have to devise another complex but totally different rule with more specific prosodic (and/or morphological) environments for SK /n/-insertion. However, this has not been successful in Kang (1992) and thereafter in the literature.

In the OT framework, Cho (1995a) implements the rule in (14) directly as an OT constraint:

- (17) Cho (1995a)’s constraint in OT
- \*C)<sub>PrWd PrWd</sub>(Y
- A sequence of a consonant and y is not allowed at a PrWd juncture.

The constraint in (17) is problematic as a OT constraint. This constraint is too specific for an OT constraint. Furthermore, it also cannot explain the SK /n/-insertion with different morphological or prosodic structures. Another crucial problem is that since the constraint in (17) is an OT constraint, such an analysis additionally needs to explain why more marked /n/ is inserted than unmarked /t/ (see section 5.1 for detailed discussion). For this reason, we are not going to pursue the Prosodic Word structure in our analysis. Rather, we are going to appeal to the “purely” morphological structure for our analysis.

#### 4. Assumptions for a new OT analysis of NK /n/-insertion

We are going to show in our analysis that /n/-insertion is the result of the conspiracy of simpler and more general constraints. We assume the following morphological structures for Korean word formation<sup>4</sup>:

(18) Assumed morphological structure

- a. Stem:  $\langle [\text{ilim}]_w \rangle_{\text{MW}}$
- b. Prefix-Stem:  $\langle \text{təs} [\text{pəsən}]_w \rangle_{\text{MW}}$
- c. Stem-Suffix-Suffix:  $\langle [\text{yaŋmal}]_w \text{təl e} \rangle_{\text{MW}}$
- d. Prefix-Stem-Suffix:  $\langle \text{təs} [\text{pəsən}]_w \text{e} \rangle_{\text{MW}}$
- e. Compound:  $\langle [\text{cip}]_w [\text{ilim}]_w \rangle_{\text{MW}}$

where  $\langle \rangle_{\text{MW}}$  = morphological word as an element of a sentence  
and  $[\ ]_w$  = word which can appear alone

As for notations, we use  $\langle \rangle_{\text{MW}}$  to refer to a morphological word, which is defined as a syntactic element of a sentence. On the other hand,  $[\ ]_w$  refers to a (“stem-level”) word, which is formally defined to have the ability to appear independently. Since the word is on the stem-level, it is yet a “full-fledged” syntactic element of a sentence. Note that  $\langle \rangle_{\text{MW}}$  is a higher morphological unit than  $[\ ]_w$ . For example, each of Prefix-Stem, Prefix-Stem-Suffix, and Compound as shown above, has the highest morphological word status  $\langle \rangle_{\text{MW}}$ , syntactic element within a sentence. On the other hand,  $[\ ]_w$  is the second highest stem-level unit, depending purely on whether a given morpheme can appear alone. Note that one or more words ( $[\ ]_w$ ) form(s) one morphological word  $\langle \rangle_{\text{MW}}$ , which, in turn, is a syntactic element of a sentence. Actually, this distinction is not new, since “morphological word” and “word” in our definition may correspond loosely to the old terms “word” and “stem,” respectively, in the literature on Korean morphology. However, the use of these old terms would cause a lot of confusion and complication in defining the morphology of NK and SK. In NK, for example, a compound is a word in a classical sense, but a monostemic word is also a word. Hence, “word” might refer to a syntactic element in a sentence. However, a compound consists of two words. Then “word” in this sense refers to a stem, not a syntactic level word any more.

Another problem arises in SK morphology with the classical division “word”/“stem”. We cannot use “stem” to refer to a two-root SK compound word (e.g. *sa+ki* ‘morale’), as the term, stem, may refer to either a monomorphemic word, a prefixed word or a suffixed word, but not a compound. If we tried to maintain the “stem”/“word” distinction in SK, it would become extremely difficult to define SK compounding morphology in line with NK morphology. As we will see in detail in section 6, the adoption of the “morphological word”/“word” distinction offers a unified analysis of

<sup>4</sup> The concept of the morphological word (or MWord) was first introduced in Hong (1997) to unify the morphological structures of NK and SK.

NK and SK morphology with respect to /n/-insertion. In our analysis of NK /n/-insertion in section 5, the left edge of the newly defined “word” will be crucially referred to. In the analysis of SK /n/-insertion in section 6, on the other hand, the right edge of “word” will play an important role.

Before we go on, we are going to restrict our data for analysis to /n/-insertion before /y/. The reason is that NK /n/-insertion is **not productive** before /i/. Furthermore, the appearance of [n] is limited to some specific morphemes with an underlying initial /n/ as a historical trace:

- (19) /n/-initial stems with /n/ as a historical trace in NK: not productive

Rule: /n/ → Ø /<sub>MW</sub> < \_\_ i

- |  |          |                |
|--|----------|----------------|
| a. < [nil] <sub>w</sub> > <sub>MW</sub>                                      | il       | ‘work’         |
| b. < [cip] <sub>w</sub> + [nil] <sub>w</sub> > <sub>MW</sub>                 | cimnil   | ‘house work’   |
| c. < [nilaŋ] <sub>w</sub> > <sub>MW</sub>                                    | iraŋ     | ‘furrow’       |
| d. < [pat <sup>h</sup> ] <sub>w</sub> + [nilaŋ] <sub>w</sub> > <sub>MW</sub> | panniraŋ | ‘field furrow’ |

The morphemes in (19) have /n/ underlyingly as in (19a) and (19c), and /n/ does not surface when they appear alone. However, when they form a compound with a preceding C-final stem, /n/ surfaces. The [n] in these examples is perhaps a historical trace, as these examples are contrasted with the following *i*-initial morphemes, in which /n/ never surfaces productively:

- (20) NK /i/-initial stem: productively no /n/-insertion

- |   |         |              |
|---|---------|--------------|
| a. < [ilim] <sub>w</sub> > <sub>MW</sub>                      | irim    | ‘name’       |
| b. < [cip] <sub>w</sub> + [ilim] <sub>w</sub> > <sub>MW</sub> | cipirim | ‘house name’ |
| c. < [ik’i] <sub>w</sub> > <sub>MW</sub>                      | ik’i    | ‘moss’       |
| d. < [tol] <sub>w</sub> + [ik’i] <sub>w</sub> > <sub>MW</sub> | torik’i | ‘rock moss’  |

Furthermore, /n/-insertion is never observed before /i/ in SK, as is shown below:

- (21) SK compounds: no /n/-insertion before [i]

- |                       |              |                  |
|-----------------------|--------------|------------------|
| a. [han+kuk]+in       | hankuk+in    | ‘Korean people’  |
| cf. [sik+yon]+yu      | sikyong+nyu  | ‘cooking oil’    |
| b. [han+kuk]+[in+sam] | hanjuk+insam | ‘Korean ginseng’ |
| cf. [cuŋ+kuk]+[yo+li] | cuŋkuŋ+nyori | ‘Chinese food’   |

For this reason, we are going to analyze in this paper only the productive /n/-insertion phonologically between a consonant and *y* under the assumption that /n/ is not inserted between a consonant and *i*. We will further show that this position enables us to provide a uniform analysis of both NK and SK /n/-insertion. Of course, further study is needed for the cases in (19).

## 5. Analysis of /n/-insertion in NK

### 5.1 Inserted /n/: not an unmarked consonant

The first question we need to address in /n/-insertion in the framework of OT is why more marked /n/ is preferred over the least marked /t/ (Kim 1987). In Korean, /t/ is an unmarked consonant, since /t/ is inserted at an inner compound boundary to signify ‘possessive *’s or of*’ in some ‘sub-compounds’ (for more discussion, see Sohn (1987)):

- (22) Bindung-*s* phenomenon in sub-compounds  
 a. [næ] t [ka] nækk’a ‘river side, a side of a river’  
 b. [cənsɛ] t [cip] cənsɛt’ip ‘leased house, a house of lease’

As (22) suggests, /t/ seems to be the least marked consonant in Korean. However, more marked /n/ is inserted in /n/-insertion. The question is: why is /n/ preferred over unmarked /t/ in /n/-insertion?

The reason for the preference of /n/ as an inserted consonant in /n/-insertion can be found in the phenomenon that the *ty* sequence is extremely rare in Korean:

- (23) Rare surface [ty] sequence in Korean in terms of phonological phenomena  
 a. Morpheme-internal [ty] is not observed  
 b. /t-y/ with a suffixal boundary will be palatalized: [cy]<sup>5</sup>  
 c. /t-y/ with a prefixal boundary will be subjected to /n/-insertion.  
 d. /t+y/ with an inner compound boundary will be subjected to /n/-insertion.

The rare exceptions we found are the derived [ty] as in /kyənti-ə/ [kyəntyə] ‘to endure-suffix,’ /titi-ə/ [tityə] ‘to step-suffix.’ This suggests that the markedness constraint \**ty* is relatively high ranked in Korean.<sup>6,7</sup> We

<sup>5</sup> Actually this is unattested in Korean. The input *ty* sequence at a suffixal boundary is not found in Korean. However, if it were found, the sequence would be subject to Palatalization: *t* → *c* / \_\_ {i, y}. E.g. *mat-i* *maci* ‘first son.’

<sup>6</sup> Compared with the rarity of the surface *ty* sequence, the *ny* sequence is relatively more frequently observed: e.g. *nyəsək* ‘guy,’ *nyən* ‘tramp,’ *onya* ‘yes,’ *-nyək<sup>h</sup>* ‘around,’ and also all the ample examples of /n/-insertion among others.

<sup>7</sup> A reviewer points out that *t<sup>h</sup>*, *t’*, *l*, and *s* may be less marked than *n*. Though we need further study, the rarity of *t<sup>h</sup>y* and *t’y* suggests that \**ty* may be reformulated to further constrain the sequences *t<sup>h</sup>y* and *t’y* along with *ty*. In the case of *s*, we assume that *s* is more marked than *n* in that *s* is continuant, when compared with the least marked non-continuant *t*. Finally, *l* in Korean is highly marked in that *l* is realized in coda (e.g. *tal* ‘moon’) or doubly linked to coda and onset (e.g. *məlli* ‘far away’). Surface *l* is heavily dependent on the syllable structure position, and hence we assume that *l* more marked than *n*. The allophonic *r*, an *l*-variant in Korean, is realized as flapped in an intervocalic position. Flapping itself is a highly marked phenomenon. Based on this, we assume that surface *l* and *r* are more marked than *n*. Furthermore, in /pul+yəu/ [pullyəu] ‘shrew,’ the second *l* is not the result of /l/-insertion. Instead, *n* is inserted between *l* and *y* and



propose the following constraint ranking to explain why /n/ is preferred over /t/ in /n/-insertion:

- (24) Proposed constraint ranking for the inserted consonant in Korean
- \*ty
  - MAX(C), DEP(C)
  - Constraint ranking  
MAX(C) >> \*ty >> DEP(C)

The partial constraint ranking \*ty >> DEP(C) penalizes if /t/ is inserted in the configuration C\_\_y. Note in /n/-insertion that /n/ is inserted between C and y when we ignore the required morphological environments for the moment. Given the sequence C\_\_y, we can think of the following possible scenarios:

- (25) Given C\_\_y for /n/-insertion and the ranking in (24c)
- If /t/ were inserted, higher ranked \*ty (and DEP(C)) is violated.
  - If /n/ were inserted, lower ranked DEP(C) is violated.
  - Assumed markedness hierarchy:  
t is less marked than n, which, in turn, is less marked than the other remaining consonants.

Under the assumption that unmarked /t/ is the best candidate as an inserted consonant and the next possible candidate is /n/, /t/ cannot be inserted in the C\_\_y configuration for /n/-insertion, due to a fatal violation of \*ty (and DEP(C)) (25a). When the second unmarked /n/ is inserted (25b), only the violation of lower ranked DEP(C) is incurred, as shown in the tableau below. In the following tableau, we assume for the moment that C\_\_y is not an acceptable surface configuration, and hence either a consonant insertion or deletion should occur:

- (26) /n/ is preferred over /t/ as an inserted consonant

*C__y	MAX(C)	*ty	DEP(C)
a. C t y		*!	*
b. <del>C</del> n y			*
c. y	*!		

This explains why /n/ is preferred over /t/ as an inserted consonant in /n/-insertion.

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then nasal lateralization occurs. The latter phenomenon is frequently observed independently from /n/-insertion: e.g. /pul+napan/ [pullapan] 'garden tiger moth' in NK and /sam+il+na-sa/ [samillasa] 'Samil Screw (company name)' in SK.

## 5.2 Constraints for the morphological and phonological environments

We need to consider two more aspects: morphological environments and phonological environments for NK /n/-insertion. Let us consider the following configurations:

- (27) Configurations for NK /n/-insertion:  
 a. Prefixed morphological word: C<sub>prefix</sub> w[ n y  
 b. Compound morphological word: C<sub>w</sub> w[ n y

From a purely phonological perspective, /n/ is observed between C and y in both cases in (27). Note that the preceding morphological environments are different: a prefix in (27a) and a word in (27b). /n/ is inserted between any morpheme and a word from the morphological perspective. Furthermore, the preceding phonological environment is the same: C. Given the two configurations, we can derive the common morphological and phonological environment intersected by two types of /n/-insertion environments: a prefixed word and a compound.

- (28) The intersected configuration for /n/-insertion in prefixed words and compounds
- C<sub>w</sub>[  y
- a. Phonological requirement: between C and y
  - b. Morphological requirement: between any morpheme and a word
  - c. Preceding environment: C
  - d. Following environment: <sub>w</sub>[y

The configuration in (28) says that a consonant is inserted after a consonant and before word-initial *y*. Given the intersected configuration, the existence of a consonant is the only requirement as a preceding environment for /n/-insertion (28c). On the other hand, the following environment for /n/-insertion is “<sub>w</sub>[y” (28d).

To summarize, /n/ is inserted before y-initial word when preceded by a consonant, which may be in any morpheme-final position. The morphological structure of the preceding morpheme is not important in /n/-insertion but only the preceding phonological environment, C, is: i.e. there should be a consonant as the preceding environment for /n/-insertion. On the other hand, the following morphological structure and phonological environment are crucially referred to: /n/ is inserted before word-initial y.

We are now decomposing the configuration in (28) into two separate and easily violable constraints, which will be based on (28c) and (28d). The anti-alignment constraint below prevents the appearance of *y* in a word-initial position and this implements (28d)<sup>8</sup>:

<sup>8</sup> Anti-alignment constraints are first proposed by Buckley (1994, 1998) and Downing (1994).

- (29) \*AlignL[y]<sup>9</sup>  
 \*Align(y, Word, L)

A violation is assessed when the left edge of a word aligns with y. This constraint is easily violable as shown in the following examples and will be ranked relatively low:

- (30) \*AlignL[y] is easily violable:  
 a. /yəu/ <[yəu]<sub>W</sub>><sub>MW</sub> 'fox'  
 b. /yəmso/ <[yəmso]<sub>W</sub>><sub>MW</sub> 'goat'  
 c. /yəmul/ <[yəmul]<sub>W</sub>><sub>MW</sub> 'chaff'

To implement as an OT constraint the required preceding C environment in (28c), we are going to implement an implicational constraint. For example, Smolensky (1996:12) offers the following implicational constraint:

- (31) Smolensky (1996)  
 $C \supset CV$ :  
 C (is allowed) only if V follows it (the appearance of an onset consonant constrained)

Smolensky proposes an implicational constraint in (31) to constrain the appearance of an onset consonant: if there is a C, then a vowel should follow it. This constraint is easily violable when the consonant in question is followed by another consonant: i.e. a violation mark for the VCCV sequence. Hence, this constraint is different from the constraint Onset.<sup>10</sup>

Using this type of implicational constraint, we propose the following constraint for (28c):

- (32) Implicational constraint for /n/-insertion  
 $C_2 \supset C_1 C_2$   
 $C_2$  (is allowed) only if  $C_1$  precedes it, where  $C_1, C_2 \neq$  glides.

A violation is assessed when a consonant ( $C_2$ ) is not preceded by another consonant ( $C_1$ ). All surface consonants are subject to this constraint. The effect of this constraint is to force any consonant to be preceded by another consonant, which in turn is also subject to the constraint. It also demands that even an inserted consonant should be preceded by another consonant.

<sup>9</sup> This anti-alignment constraint may be reformulated as “\*[y,]” which says that a word does not begin with y.

<sup>10</sup> An implicational constraint is not necessarily a licensing constraint. The former can be violable whereas the latter is not. Smolensky's implicational constraint is violated when the consonant in question is followed by another consonant. Note that Coda and Onset terms are not involved, but only the implicational relation of a consonant with a neighboring vowel is constrained. Hence, this constraint is different from the constraint Onset.

The implicational constraint is easily violable. The following shows the effects of the constraint:

- (33) The effect of  $C_2 \supset C_1 C_2$
- VCCV: one violation mark for the first C
  - VCV: one violation mark for the intervocalic C
  - VNV: one violation mark for the inserted N (if N is an inserted C)
  - VCNV: one violation mark for the first C (if N is an inserted C)

The constraint  $C_2 \supset C_1 C_2$  is easily violable, as seen in (33) and we rank it below MAX(C), as illustrated in the following overall constraint ranking:

- (34) Constraint ranking for NK /n/-insertion
- ```

MAX(C)
>>  $C_2 \supset C_1 C_2$ , *ty
>> *AlignL[y]
>> DEP(C)

```

### 5.3 Interaction of constraints

In this subsection, we are going to demonstrate how the proposed constraint ranking works in NK /n/-insertion. The first case to be considered is a y-initial word independently forming a morphological word: no /n/-insertion case:

- (35) A case of a mono-morphemic word: no /n/-insertion

| ${}_w[y\text{ə}ki]$    | MAX<br>(C) | $C_2 \supset$<br>$C_1 C_2$ | *ty | *AlignL<br>[y] | DEP<br>(C) |
|------------------------|------------|----------------------------|-----|----------------|------------|
| a. ${}_w[y\text{ə}ki]$ |            | *                          |     | *              |            |
| b. $[n\ y\text{ə}ki]$  |            | **!                        |     |                | *          |
| c. $[t\ y\text{ə}ki]$  |            | **!                        | *   |                | *          |
| d. $[n\ y\text{ə}\ i]$ | *!         | *                          |     |                | *          |
| e. $[y\text{ə}\ i]$    | *!         |                            |     | *              |            |

Given the y-initial morphological word, if an input consonant deletes (i.e. *k*-deletion), it incurs a fatal violation of the highest ranked MAX(C). For this reason, candidates in (35d) and (35e) are ruled out whether /n/ is inserted or not. All the remaining three candidates receive a violation mark for  $C_2 \supset C_1 C_2$ , due to the intervocalic *k*. This is because *k* is not preceded by another consonant. Candidates in (35b) and (35c) additionally incur a fatal violation of  $C_2 \supset C_1 C_2$  due to the insertion of a consonant. As a result, candidate (35a) with no /n/-insertion turns out to be optimal. No consonant insertion is correctly predicted in a y-initial morphological word.

Then, what will the proposed constraint ranking predict when a y-initial word is preceded by either a vowel or a consonant? No /n/-insertion should

be predicted when a y-initial word is preceded by a vowel, but /n/-insertion should be when a y-initial word is preceded by a consonant:

- (36) (The lack of) /n/-insertion in a y-initial word preceded by either a V-final or a C-final prefix

a. sɛ-[yaŋmal] sɛ-yaŋmal 'new sock' Prefixed word

b. nic-[yɔlim] nin-nyɔrim 'late summer' Prefixed word

| V <sub>w</sub> [y]              | MAX<br>(C) | C <sub>2</sub> ⊃<br>C <sub>1</sub> C <sub>2</sub> | *ty | *AlignL<br>[y] | DEP<br>(C) |
|---------------------------------|------------|---------------------------------------------------|-----|----------------|------------|
| a. $\text{I,OP} \text{V [y]}$   |            |                                                   |     | *              |            |
| b. V [t y]                      |            | *!                                                | *   |                | *          |
| c. [n y]                        |            | *!                                                |     |                | *          |
| C <sub>w</sub> [y]              | MAX<br>(C) | C <sub>2</sub> ⊃<br>C <sub>1</sub> C <sub>2</sub> | *ty | *AlignL<br>[y] | DEP<br>(C) |
| d. C [y]                        |            | *                                                 |     | *!             |            |
| e. [y]                          | *!         |                                                   |     |                |            |
| f. C [t y]                      |            | *                                                 | *!  |                | *          |
| g. $\text{I,OP} \text{C [n y]}$ |            | *                                                 |     |                | *          |

In the upper tableau, a case of a V-final prefix followed by a y-initial word, the insertion of either /t/ (36b) or /n/ (36c) incurs a fatal violation mark for C<sub>2</sub>⊃C<sub>1</sub>C<sub>2</sub> and the latter case (36c) additionally receives a violation mark for \*ty. However, candidate (36a) with no C-insertion, violates lower ranked \*AlignL[y], as y aligns with the left edge of a word.

In the lower tableau, a case of a C-final prefix followed by y-initial word, (36e) is a candidate in which input C is deleted. However, the deletion of the C results in a fatal violation of MAX(C). All the remaining candidates incur a violation mark for C<sub>2</sub>⊃C<sub>1</sub>C<sub>2</sub>, since C is not preceded by another consonant. Note that the inserted [t] in (36f) and [n] in (36g) do not violate C<sub>2</sub>⊃C<sub>1</sub>C<sub>2</sub>, due to the preceding C. However, [t] in (36f) additionally and fatally violates \*ty. The candidate in (36d) additionally incurs a fatal violation of \*AlignL[y], since y aligns with the left edge of the word. Hence, /n/-insertion is correctly predicted: (36g) is optimal.

As shown in the lower tableau in (36), we can witness the conspiracy of the constraints C<sub>2</sub>⊃C<sub>1</sub>C<sub>2</sub>, and \*AlignL[y] to try to insert a consonant in C<sub>w</sub>[y] configuration but \*ty prevents [t] from being inserted. Hence, /n/-insertion ensues according to our proposal.

The following tableaux show how the constraint ranking predicts (the lack of) /n/-insertion in compounds. Since the configuration for /n/-insertion, C<sub>w</sub>[y], is shared by prefixed words and compounds, the evaluation in the tableaux below patterns exactly the same as in (36). This is because we covertly assume that the right edge of a word is transparent to /n/-insertion; the left edge is opaque. Namely, /n/-insertion sees only the left edge of a word.

- (37) (The lack of) /n/-insertion after either a V-final or a C-final word in compounds

- a. [sɛk'i]+[yəu]      sɛk'i+yəu      'baby fox'      Compound  
 b. [mahin]+[yətəlp]      mahin+nyətəlp      'forty-eight'      Compound

| $V]_w$ [y]             | MAX<br>(C) | $C_2 \supset$<br>$C_1 C_2$ | *ty | *AlignL<br>[y] | DEP<br>(C) |
|------------------------|------------|----------------------------|-----|----------------|------------|
| a. $_{L \neq} V$ [y]   |            |                            |     | *              |            |
| b. $V$ [ty]            |            | *!                         | *   |                |            |
| c. $V$ [n y]           |            | *!                         |     |                | *          |
| $C]_w$ [y]             | MAX<br>(C) | $C_2 \supset$<br>$C_1 C_2$ | *ty | *AlignL<br>[y] | DEP<br>(C) |
| d. $C$ [y]             |            | *                          |     | *!             |            |
| e. $]$ [y]             | *!         |                            |     |                |            |
| f. $C$ [ty]            |            | *                          | *!  |                |            |
| g. $_{L \neq} C$ [n y] |            | *                          |     |                | *          |

Another case we need to consider is the configuration,  $C_w[_V]$ , in which V is not [y] and /n/-insertion does not take place, (i.e. prefixed words and compounds), as shown below:

- (38) No /n/-insertion before a word-initial non-high-front V  
 a. hot<sup>h</sup>-[qs]      hot-ot      'unlined clothes'      Prefixed word  
 b. [puək<sup>h</sup>]+[an]      puək+an      'inside of the kitchen'      Compound

| $C_w$ [a]            | MAX<br>(C) | $C_2 \supset$<br>$C_1 C_2$ | *ty | *AlignL<br>[y] | DEP<br>(C) |
|----------------------|------------|----------------------------|-----|----------------|------------|
| a. $_{L \neq} C$ [a] |            | *                          |     |                |            |
| b. $]$ [a]           | *!         |                            |     |                |            |
| c. $C$ [t a]         |            | *                          |     |                | *!         |
| d. $C$ [n a]         |            | *                          |     |                | *!         |
| $C]_w$ [a]           | MAX<br>(C) | $C_2 \supset$<br>$C_1 C_2$ | *ty | *AlignL<br>[y] | DEP<br>(C) |
| e. $_{L \neq} C$ [a] |            | *                          |     |                |            |
| f. $]$ [a]           | *!         |                            |     |                |            |
| g. $C$ [t a]         |            | *                          |     |                | *!         |
| h. $C$ [n a]         |            | *                          |     |                | *!         |

In the upper tableau for a prefixed word case, candidate (38b) in which C is deleted, fatally violates MAX(C). All the other candidates violate  $C_2 \supset C_1 C_2$ , due to C. However, consonant insertion cases in (38c) and (38d) additionally receive a fatal violation mark for DEP(C). Hence, candidate (38a) with no /n/-insertion is predicted to be optimal.

Finally, let us show how the proposal works in the suffixed words, in which /n/-insertion is never observed:

## (39) The lack of /n/-insertion before a y-initial suffix

| mæk-i-ə      məkya    ‘to feed-suffix’    Suffix word |            |                       |     |                |            |
|-------------------------------------------------------|------------|-----------------------|-----|----------------|------------|
| C-i-ə                                                 | MAX<br>(C) | $C_2 \supset C_1 C_2$ | *ty | *AlignL<br>[y] | DEP<br>(C) |
| a. $\text{LBP} \text{C} y \text{ə}$                   |            | *                     |     |                |            |
| b.     yə                                             | *!         |                       |     |                |            |
| c.   C t yə                                           |            | *                     | *!  |                | *          |
| d.   C n yə                                           |            | *                     |     |                | *!         |

## 6. /n/-insertion in SK

In this section, we review the /n/-insertion phenomenon in SK, which has totally different morphology from NK. As a result, SK /n/-insertion requires different morphological requirements. We will show SK morphology first, and then show SK /n/-insertion examples.

In SK, the basic morphological unit is a root, which forms one syllable. For the SK morphology, we will again use the “morphological word”/“word” division, as defined in NK morphology in section 5<sup>11</sup>. Most SK roots cannot appear alone except for a limited number of one-root words, which directly forms a morphological word, as in (40a). Two roots form one word to be realized as one morphological word in the sentence level, as in (40b). There are two types of three-root morphological words, depending on whether the last two roots form a word (Type1) or the first two roots form a word (Type2), as in (40c). A four-root morphological word generally consists of two two-root words (40d):

<sup>11</sup> Note that the two terms “morphological word” and “word” here are the same terms as those for NK in section 4. To refresh the memory, “morphological word” is defined as a syntactic element of a sentence whereas “word” defined as having the ability to appear alone. “Word” is further defined as morphological element within the morphological word. Therefore, “word” may loosely correspond to classical “stem” in NK. Note, however, that we can not use the classical term “stem” to refer uniformly to the NK stem and the SK two-root compound. For this reason, we will use “word” (rather than classical “stem”) to refer to the NK stem and the SK two-root compound word, which can appear independently. The reason for this “morphological word”/“word” division is important in that the four-root compound with two two-root words, the two-root compound and the three-root compound receive the same syntactic status in the sentence. In morphology, however, the four-root compound consists of two independent words whereas the two-root compound and the three-root compound retain one independent word. In a classical sense, confusion and complication arise between the compound-level word (i.e. syntactic level: morphological word) and the lower-level word (or stem-level in NK) below the syntactic level (i.e. morphological level: word). This suggests that we need to distinguish between the “full-fledged” syntactic level in a sentence (“morphological word” in our definition) and the classical stem level below the syntactic level (“word” in our definition). This section demonstrates that this division offers a uniform analysis of SK morphology in line with NK morphology discussed in section 5. This concept is a pending question for further study.

(40) SK Word-formation<sup>12</sup>

[ ] = word depending on independence appearance,  
 < > = morphological word as a syntactic element of a sentence; see  
 section 4 for terminology and also see footnote 7)

(Note that an SK root is of a single syllable and cannot appear alone  
 as a word.)

- a. One-root word: <[R]<sub>w</sub>><sub>MW</sub> ex) <[yak]<sub>w</sub>><sub>MW</sub> 'medicine' (rare)
- b. Two-root word: <[RR]<sub>w</sub>><sub>MW</sub> ex) <[pok+sa]<sub>w</sub>><sub>MW</sub> 'copy'
- c. Three-root words:  
 Type1: <R [RR]<sub>w</sub>><sub>MW</sub> ex) <kyəŋ+[cən+c<sup>h</sup>əl]<sub>w</sub>><sub>MW</sub> 'light-subway'  
 Type2: <[RR]<sub>w</sub> R><sub>MW</sub> ex) <[pi+həŋ]<sub>w</sub>+ki><sub>MW</sub> 'flight-machine'
- d. Four-root word:  
 <[RR]<sub>w</sub>[RR]<sub>w</sub>><sub>MW</sub> ex) <[ki+c<sup>h</sup>o]<sub>w</sub>+<[koŋ+sa]<sub>w</sub>><sub>MW</sub> 'foundation work'

In our analysis of SK /n/-insertion, the right edge of the word, [ ]<sub>w</sub> will be  
 crucially referred to in a similar fashion as the left edge of the word is  
 referred to in the analysis of NK /n/-insertion (e.g. \*AlignL[y] in NK), as  
 shown in the previous section.

Let us consider what kinds of morphological and phonological environments  
 are required in SK /n/-insertion. Two /n/-insertion cases are observed in SK:  
 <[RR]nR> (40c Type2) and <[RR][nRR]> (40d), as shown in (41) and (42):

- (41) /n/-insertion after [RR] in <[RR]<sub>w</sub>R><sub>MW</sub> in SK: <[RR]nR>  
 a. <[sik+yəŋ]<sub>w</sub>+yu><sub>MW</sub> sikyən+nyu 'cooking oil'  
 'edible' 'oil'  
 b. <[on+c<sup>h</sup>ən]<sub>w</sub>+yok><sub>MW</sub> onc<sup>h</sup>ən+nyok 'hot spring bathing'  
 'hot spring' 'bath'
- (42) /n/-insertion between words in SK <[RR]<sub>w</sub>[RR]<sub>w</sub>><sub>MW</sub>: <[RR][nRR]>  
 a. <[man+c<sup>h</sup>ən]<sub>w</sub>+<[yak+sok]<sub>w</sub>><sub>MW</sub> manc<sup>h</sup>ən+nyaks'ok  
 'dinner appointment'  
 b. <[cuŋ+kuk]<sub>w</sub>+<[yo+li]<sub>w</sub>><sub>MW</sub> cuŋkuŋ+nyori 'Chinese food'

Except for these two cases, /n/-insertion is never observed, as illustrated  
 in (43) and (44) ('n' refers to the lack of the inserted /n/):

- (43) No /n/-insertion before [RR]<sub>w</sub> in <R[RR]<sub>w</sub>><sub>MW</sub>: <R[n RR]>  
 a. <kyəŋ+[yaŋ+sik]<sub>w</sub>><sub>MW</sub> kyəŋ+yaŋsik 'light Western food'  
 'light' 'Western food'

<sup>12</sup> The SK Word-formation in (40) is not exhaustive since a limited number of SK words do  
 not belong to any of the categories defined in (40). Since exceptional one-root words can  
 concatenate with other roots: e.g. [R]R [yək]+caŋ 'stationmaster,' R[R] yaŋ+[yak] 'western  
 medicine,' [R][RR] [sək]+[yu+li] 'colored glass,' [RR][R] [tə+cən]+[yək] 'Taejeon Station.'  
 This point is due to an anonymous reviewer. Further study is needed for detailed  
 categorization.



- b. <myəŋ+[yən+ki]<sub>w</sub>><sub>MW</sub> myəŋ+yənki ‘excellent performance’  
 ‘fame’ ‘performance’

- (44) No /n/-insertion between two roots within <[RR]<sub>w</sub>><sub>MW</sub>: <[R **ŋ** R]>  
 a. <[min+yo]<sub>w</sub>><sub>MW</sub> min+yo ‘folk song’  
 b. <[wən+yu]<sub>w</sub>><sub>MW</sub> wən+yu ‘crude oil’

The following summarizes (the lack of) /n/-insertion in SK compounds:

- (45) Morphological configurations for (the lack of) /n/-insertion in SK compounds  
 (where R = root, R<sub>c</sub> = root ending with a consonant, <sub>y</sub>R = root beginning with y, and “**ŋ**” = lack of the inserted /n/)  
 a. <[RR]<sub>w</sub>><sub>MW</sub>: <sub>w</sub>[R **ŋ** R]  
 b. <R[RR]<sub>w</sub>><sub>MW</sub>: R <sub>w</sub>[**ŋ** RR]  
 c. <[RR]<sub>w</sub>R><sub>MW</sub>: R R]<sub>w</sub> **ŋ** R  
 d. <[RR]<sub>w</sub>[RR]<sub>w</sub>><sub>MW</sub>: R R]<sub>w</sub> <sub>w</sub>[**ŋ** R

We need to figure out what morphological and phonological environments are intersected by the two /n/-insertion configurations in (45c) and (45d). The common phonological environment for SK /n/-insertion is between C and y, which is exactly the same as in NK.

- (46) Shared phonological environment for SK /n/-insertion  
 Between C and y

On the other hand, the shared preceding morphological environment for /n/-insertion is a word, as shown bold-faced in (45c) and (45d). However, the following morphological environment after the first word, need not be specified: any morpheme will do as far as y begins the morpheme. This is illustrated below. Note that R<sub>c</sub> = root ending with a consonant, <sub>y</sub>R = root beginning with a vowel.

- (47) Common morphological environment for SK /n/-insertion  
 R<sub>c</sub>]<sub>w</sub> \_\_\_ <sub>y</sub>R

The left edge of the following morpheme (after the first word), whether a root (45c) or a word (45d), is transparent to /n/-insertion. Namely, /n/-insertion does not see the left edge the morpheme. Since the preceding phonological requirement for /n/-insertion is the same (i.e. C precedes the inserted /n/) in both NK and SK, we can still use the constraint C<sub>2</sub> ⊃ C<sub>1</sub>C<sub>2</sub>, which has been proposed for NK previously. What is observed in (47) is that y gets misaligned with the right edge of a word when /n/-insertion takes place, and we devise the following anti-alignment constraint for SK:

## (48) Anti-alignment constraint for SK

\*AlignR[y]<sup>13</sup>\*Align(y, Word, R): \* if the right edge of a word aligns with y (outside).<sup>14</sup>

A violation is assessed when the right edge of a word aligns with y (outside). The following is the constraint ranking in SK:

(49) Constraint ranking for SK<sup>15</sup>

MAX(C)

>> C<sub>2</sub> ⊃ C<sub>1</sub>C<sub>2</sub>, \*ty

&gt;&gt; \*AlignR[y]

&gt;&gt; DEP(C)

Note in (49) that the proposed SK constraint ranking is minimally different from the NK ranking in that \*AlignR[y] replaces \*AlignL[y], with everything else equal.

Let us first consider the two cases in which /n/-insertion takes place (40c Type2) and (40d). Since the two cases share the same environment for /n/-insertion, and only one tableau is provided below. Note that “R” = a root, “R<sub>c</sub>” = root-final C, “<sub>y</sub>R” = y-initial root, “C” = root-final consonant, “]” = the right edge of a word, and “y” = root-initial y:

(50) <[R R<sub>c</sub>]<sub>w</sub> n<sub>y</sub>R><sub>MW</sub> (40) and <[R R<sub>c</sub>]<sub>w</sub> w[n<sub>y</sub>R R]><sub>MW</sub> (41)

a. <[sik+yon]<sub>w</sub>+yu><sub>MW</sub> sikyon+nyu ‘cooking oil’  
 b. <[cun+kuk]<sub>w</sub>+li><sub>MW</sub> cun+kun+nyori ‘Chinese food’

|    | [RR C] y R   | MAX(C) | C <sub>2</sub> ⊃<br>C <sub>1</sub> C <sub>2</sub> | *ty | *AlignR<br>[y] | DEP(C) |
|----|--------------|--------|---------------------------------------------------|-----|----------------|--------|
| a. | [RR C] y R   |        | *                                                 |     | *!             |        |
| b. | [RR ] y R    | *!     |                                                   |     | *              |        |
| c. | [RR C] t y R |        | *                                                 | *!  |                | *      |
| d. | [RR C] n y R |        | *                                                 |     |                | *      |

The input in (50) is the configuration preferring /n/-insertion. The candidate in (50b) is ruled out since the input C is deleted, violating high ranked MAX(C). All the other candidates violate C<sub>2</sub> ⊃ C<sub>1</sub>C<sub>2</sub>, since C is not preceded by another consonant. Candidate (50c) additionally receives a fatal violation mark for \*ty, which results from /t/-insertion. (50a) is out since [y] aligns

<sup>13</sup> This anti-alignment constraint may be reformulated as “\*[y]<sub>w</sub> y,” which says that a word is never followed by y.

<sup>14</sup> To simplify the definition, we don't need “outside” in the definition, since a word never ends with y in Korean: \*y]<sub>w</sub>. However, \*AlignR[y] and \*AlignL[y] need not necessarily be of the same nature. The two constraints are independent from each other in that the former refers to the y outside a word whereas the latter the y inside a word. They are separate constraints, though all the other constraints involved are the same. For further clarification, see section 7.

<sup>15</sup> For a comparison, the constraint ranking for NK /n/-Insertion is as follows, repeated from (34): MAX(C) >> C<sub>2</sub> ⊃ C<sub>1</sub>C<sub>2</sub>, \*ty >> \*AlignL[y] >> DEP(C).

with the right edge of a word, fatally violating \*AlignR[y]. Hence, The candidate in (50d), in which /n/ is inserted, is evaluated to be optimal.

In the case of (40c Type2) and (40d), when the word in question ends with a vowel, /n/-insertion does not take place:

- (51)  $\langle [R \ R_v]_w \ \mathfrak{n} \ yR \rangle_{MW}$  and  $\langle [R \ R_v]_w \ w[\mathfrak{n} \ yR \ R] \rangle_{MW}$  (the preceding environment: V)

- a.  $\langle [yo+li]_w + yo\eta \rangle_{MW}$  yori+yoη ‘cooking purpose’  
b.  $\langle [ho+cu]_w + [yo+li]_w \rangle_{MW}$  hocu+yori ‘Australian dish’

| $[RR \ V] \ y \ R$        | MAX(C) | $C_2 \supset C_1 C_2$ | *ty | *AlignR<br>[y] | DEP(C) |
|---------------------------|--------|-----------------------|-----|----------------|--------|
| a. $[RR \ V] \ y \ R$     |        |                       |     | *              |        |
| b. $[RR \ V] \ t \ y \ R$ |        | *!                    | *   |                | *      |
| c. $[RR \ V] \ n \ y \ R$ |        | *!                    |     |                | *      |

An insertion of a consonant, either /n/ or /t/, incurs a fatal violation of higher ranked  $C_2 \supset C_1 C_2$ , and hence candidates in (51b) and (51c) give way to the optimal y-misaligned candidate in (51a).

We need to consider two remaining cases in which /n/ is not inserted:  $\langle R_c \ w[\mathfrak{n} \ yR \ R] \rangle_{MW}$  (40c Type1) and  $\langle w[R_c \ \mathfrak{n} \ yR] \rangle_{MW}$  (40b), in which no right edge of the word is involved. Let us consider the former first:

- (52)  $\langle R_c \ w[\mathfrak{n} \ yR \ R] \rangle_{MW}$  (39c Type1)  
 $\langle ky\eta\eta + [ya\eta + sik]_w \rangle_{MW}$  ky\eta\eta+ya\etasik ‘light Western food’

| R C [y RR]                | MAX(C) | $C_2 \supset C_1 C_2$ | *ty | *AlignR<br>[y] | DEP(C) |
|---------------------------|--------|-----------------------|-----|----------------|--------|
| a. $R \ C \ [y \ RR]$     |        | *                     |     |                |        |
| b. $R \ [y \ RR]$         | *!     |                       |     |                |        |
| c. $R \ C \ [t \ y \ RR]$ |        | *                     | *!  |                | *      |
| d. $R \ C \ [n \ y \ RR]$ |        | *                     |     |                | *!     |

Candidate (52b) with the C-deletion is ruled out due to a fatal violation of MAX(C). All the other candidates violate  $C_2 \supset C_1 C_2$ , since C is not preceded by another consonant. (52c) additionally incurs a fatal violation mark for \*ty due to the inserted [t]. (52d) additionally violates low ranked DEP(C) due to the inserted /n/. However, (52a) does not incur any additional violation: the optimal candidate.

The following tableau demonstrates that /n/-insertion does not occur in a two-root compound and the evaluation within the tableau is the same as in  $R_c \ w[\mathfrak{n} \ yR \ R]$  case in (52) above:

- (53)  $\langle [R_c \ \mathfrak{n} \ yR]_w \rangle_{MW}$  (44)  
 $\langle [\min + yo]_w \rangle_{MW}$  min+yo ‘folk song’

| $[R \ C \ y \ R]$        | MAX(C) | $C_2 \supset C_1 C_2$ | *ty | *AlignR<br>[y] | DEP(C) |
|--------------------------|--------|-----------------------|-----|----------------|--------|
| a. $[R \ C \ y \ R]$     |        | *                     |     |                |        |
| b. $[R \ y \ R]$         | *!     |                       |     |                |        |
| c. $[R \ C \ t \ y \ R]$ |        | *                     | *!  |                | *      |
| d. $[R \ C \ n \ y \ R]$ |        | *                     |     |                | *!     |

## 7. Summary and conclusion

So far we have tried to show several problems with regard to /n/-insertion. The most basic but important aspect of /n/-insertion within the framework of OT is to address why more marked /n/ is inserted than unmarked /t/; this question is first raised in Hong 2002. We might assume that both /t/ and /n/ are unmarked consonants in Korean: e.g. Hong (2003) following Hume (2003). However, the assumption of two unmarked consonant in a given language still requires some stipulation: we cannot help retaining an ad hoc rule like “ $\emptyset \rightarrow n$ ” in /n/-insertion along with an OT analysis. For example, McCarthy (1993) uses “ $\emptyset \rightarrow r$ ” for the OT analysis of Boston *r*-intrusion. According to him, this rule is a “phonologically arbitrary stipulation” and is outside the system of Optimality Theory.

In this paper, we have taken a different approach, still maintaining the markedness hierarchical relation between unmarked /t/ and more marked /n/. We build \*ty as a violable constraint, based on the observation that the *ty* sequence is very difficult to surface. Once the sequence surfaces, it is penalized. The second unmarked /n/ as the inserted consonant in /n/-insertion avoids the violation of \*ty. On the other hand, the [ty] from the input /t/ is also penalized but higher ranked MAX(C) strictly prevents the deletion of input /t/. Hence, [ty] surfaces.

The next problem we have tried to solve is what kinds of morphological and phonological environments induce a consonant insertion. In NK, we derived the intersected environments by all /n/-insertion cases, and decomposed the environments into parts. And then we implemented each of the partial environments into separate constraints, which seem to be more general than the rule environment in Han (1994b) and the OT constraint in Cho (1995a). The relative ranking of those constraints exactly simulates the conspiracy of the constraints trying to insert a consonant in the overall /n/-insertion environment. Then due to high ranked \*ty, the inserted consonant turns out to be /n/. The same procedure was followed again in SK /n/-Insertion.

The final problem we have faced is the difference of /n/-insertion between two sublexica: NK and SK. We observed that the phonological requirement for /n/-insertion is exactly the same between NK and SK: between C and *y*. But the problem is that the morphological requirement does not pattern together. This is because NK and SK have different morphology. For this problem, we define two separate morphological structures each for NK and SK with a uniform fashion with the morphological terms: “morphological word” and “word.” With other constraints equal in the ranking, we devised two different but still general anti-alignment constraints: \*AlignL[y] for NK and \*AlignR[y] for SK. The major difference between the two anti-alignment constraints lies in how [y] is aligned with a specific edge of a word, left or right, and also inside or outside.

If we try to maintain the constraint reranking approach across sublexica (in the sense of Ito and Mester (1995)), we may say that the lowest ranked \*AlignR[y] is added to the proposed ranking for NK. On the other hand, \*AlignL[y] is added to and ranked lowest in the proposed constraint ranking in SK.

Before we conclude, we are going to mention two future research questions among others with respect to the current proposal. The first one is to explain how we handle the morphological structures of the concatenation of NK and SK morphemes, or vice versa. The following represents only a few of them:

- (54) Concatenation of NK and SK morphemes or words
- |                                 |            |                    |       |
|---------------------------------|------------|--------------------|-------|
| a. [puək <sup>h</sup> ]+[yo+li] | puəŋnyori  | ‘kitchen work’     | NK+SK |
| b. [pu+san]+[yəu]               | pusannyəu  | ‘vixen from Busan’ | SK+NK |
| c. təs-[yaŋ+mal]                | tənnyaŋmal | ‘oversocks’        | NK-SK |

The second research question is how to address (the vacuousness of) the interaction among /n/-insertion, nasal-lateralization after a lateral, and word-initial /n/-deletion before i/y:

- (55) Interaction
- /n/-insertion and nasal-lateralization  
 [sin+kil]+[yək]      sinkillyək      ‘Shinkil Station’  
 (→ sinkil+nyək (n-insertion) → sinkil+lyək (nasal-lateralization))
  - vacuous /n/-deletion and /n/-insertion  
 [ul+san]+[nyə+ca]      ulsan nyəca      ‘Ulsan woman’  
 (→ ulsan+yəca (/n/-deletion) → ulsan+nyəca (/n/-insertion))

The example in (55a) will have to be handled in the analysis of nasal-lateralization, which is a separate phenomenon. On the other hand, (55b) will have to be addressed in conjunction with the *n*-avoidance phenomenon in the word-initial position (Heo 1985:268).

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Soonhyun Hong  
Inha University  
Department of English Language and Literature  
253 Yonghyun-dong, Nam-gu  
Incheon, 402-751, Korea  
E-mail: shong@inha.ac.kr  
Fax: 82-32-868-9580

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