Causative Allomorphy in Korean

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1. Distribution of the Suffixes

There are seven lexical causative suffixes recognized in traditional studies (cf. Choi 1971): *i-*, *hi-*, *li-*, *ki-*, *u-*, *ku-*, c^hu. Among these, however, *i-*, *hi-*, *li-*, and *ki-* are the major ones which have much wider range of distribution, where as the rest of the suffixal forms have very limited distribution. Nevertheless, it has been considered to be impossible to set a single underlying representation in order to account for the seven types of suffixal allomorphs. For example, K-M. Lee(1973:94-95)'s proposal for the diachronic **ɣi* > *gi* > *ɦi* > *i* change is not accepted from a synchronic point of view. On the other hand, those synchronic proposals by Kim(1973) and Bak(1982) showed certain phonological relations in the distribution of the suffixal forms but could not succeed in their attempts for the derivation of those allomorphs from a single underlying representation, i.e. /hi/. Their attempts also raised a certain abstractness controversy.[1]

Considering the problems of the earlier studies, Ahn(1989, 1992) presumed that there would be no possible way to derive the various causative forms from one source, and proposed instead the following allomorphy rules to predict the various causative forms,

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1 Kim(1973)'s main argument is based on the following description of suffixal distribution.

-hi after stem-final lax stops and affricates	(e.g. tat-hi-ta 'close')
-ki after stem-final nasals	(e.g. kam-ki-ta 'wash hair')
-i after stem-final vowels	(e.g. po-i-ta 'see')

in which the *-i* allomorph is regarded as the default case.[2] Therefore, as for the major *-i, -hi, -li, -ki* suffixations, the following allomorphy rules were proposed.

(1) [CAUS] → *hi* / $\begin{bmatrix} \text{-cont} \\ \text{-tense} \\ \text{-back} \end{bmatrix}$ + ____

(e.g. p'op-hi-ta, kup-hi-ta, cap-hi-ta, əp-hi-ta, kut-hi-ta, tat-hi-ta, mac-hi-ta, anc-hi-ta, etc.)

(2) [CAUS] → *ki* / $\left\{ \begin{bmatrix} \text{+nasal} \end{bmatrix} \\ \begin{bmatrix} \text{+cons} \\ \text{+cont} \end{bmatrix} \right\}$ + ____

(e.g. us-ki-ta, s'is-ki-ta, as-ki-ta, kam-ki-ta, sin-ki-ta, an-ki-ta, etc.)
(exceptions: t'ɨt-ki-ta, mat^h-ki-ta)

(3) [CAUS] → i, elsewhere

What we see here is that *-ki* and *-hi* suffixations, along with the *-ku, -u,* and c^hu suffixations, are considered to be the special cases. Thus the special allomorphy rules (1) and (2) apply first. Otherwise, we get *-i* suffixation by the Elsewhere Condition (cf. Kiparsky 1982).

On the other hand, as for the minor cases of *-u* suffixation, the following rule was proposed.

(4) [CAUS] → *u* / $\begin{bmatrix} \text{+syll} \\ \text{-back} \end{bmatrix}$ + ____

(e.g. k'i-u-ta, kali-u-ta, c'i-u-ta, nɛli-u-ta
c^hi-u-ta, pi-u-ta, p^hi-u-ta, i-u-ta
mɛ-u-ta, k'ɛ-u-ta, sɛ-u-ta, etc.)

Note that these are cases where *-i* suffixation is predicted, since *-i* is suffixed after a vowel-final root. Therefore, these were interpreted as a case of the Obligatory Contour Principle (cf. McCarthy 1986) prohibiting a [-back][-back] sequence.

[2] The data were mainly drawn from Han(1984).

Finally, as for the *-li* suffixation, it was assumed that *-li* is derived from *-i* by *l*-gemination, following Bak's earlier proposal.[3]

(5) l → ll / ___ + i]caus

(e.g. nol-li-ta, ul-li-ta, nɨl-li-ta, mal-li-ta, tol-li-ta, kolh-li-ta, k'ulh-li-ta, etc.)

However, it should be noted that there are many counterexamples, as shown in (6a), which take *-i*, rather than the predicted *-hi*, unlike the other examples shown in (6b).[4] There was no explanation for this problem in the earlier studies.[5]

(6) a. mək-i-ta, cuk-i-ta, sak-i-ta, s'ək-i-ta, nok-i-ta

b. palk-hi-ta, ik-hi-ta, ilk-hi-ta, kɨlk-hi-ta

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[3] As for rule ordering, this rule follows *ɨ*-deletion and *h*-deletion.

/puli/ + /i/	'call'		/t'ulh/ + /i/	'penetrate'	
pul	i	*ɨ*-deletion	t'ul	i	*h*-deletion
pull	i	*l*-gemination	t'ull	i	*l*-gemination

[4] In passives, where only four suffixal variants exist, this dissimilation process seems to be much less active. Thus, after all non-tensed plosives, *-hi-* is suffixed without exception.

[5] Besides these, there are apparently exceptional cases of *-ku* and *-c^hu* suffixation. In Ahn(1989), it was proposed to simply list the cases in the lexicon, since there are only four examples found for each case. (*tot-ku-ta* may not be regarded as a genuine counterexample since *tot-u-ta* is often used alternatively.)

(a) sot-ku-ta 'raise', tot-ku-ta 'encourage'
il-ku-ta 'plow', tal-ku-ta 'heat'

(b) nac-c^hu-ta 'lower', kac-c^hu-ta 'install'
nɨc-c^hu-ta 'postpone', mac-c^hu-ta 'assemble'

In the case of (b), it was also mentioned that these are cases where *-hi* suffixation is expected. (From a synchronic point of view, these forms can be regarded as semantically noncompositional. In other words, they can be viewed as simple verbs not implying any process of causative suffixation.) If *-hi* is used, however, the /c + hi/ sequence would create two palatal consonants in a row, [c + c^h], which is prohibited by the Obligatory Contour Principle.

2. Optimality and the Representation

2.1. Optimality Theory

Optimality Theory (OT henceforth) is a model of constraints and constraint interactions, whereas the standard generative theory is a model of rules and derivations (cf. Prince & Smolensky 1993; McCarthy & Prince 1993, 1994). Therefore, in OT, the inputs do not need to share any specifiable structure and there is no single transformation such as 'X → Y' that affects them (X and Y). Instead, we allow all possible candidate outputs and then we evaluate them with a set of relevant constraints. The process is schematically represented as follows (cf. Prince & Smolensky 1993:4).

(7) Structure of Optimality-theoretic Grammar

a. Gen ($Input_k$) → {$Output_1$, $Output_2$, ...}

b. H-eval ($Output_i$, $1 \leq i \leq \infty$) → $Output_{real}$

As shown above, a set of GEN(erator) of structure-building operations applies to a given input representation, producing a set of output candidates. Then the output candidates are evaluated with respect to an ordered set of constraints in accordance with the Harmonic Ordering of Forms.[6]

The main analytical proposal of Optimality Theory is that constraints are ranked in a hierarchy of relevance. Lower ranked constraints can be violated in an optimal output form to success on higher-ranked constraints.[7] Therefore, a real output can be

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[6] Harmonic Ordering of Forms

The real output is the optimal, where

a. Form A is more optimal than From B with respect to constraint C iff Form B contains more violations of C, and

b. Form A is more optimal than Form B if it is more optimal than B with respect to the highest constraint in which they differ in optimality ("Strict Domination").

[7] Moreover, the candidate analyses are drawn from a broad range of possibilities, supplied by GEN. McCarthy & Prince(1994:88) state three principles underlying the theory of GEN (the first two taken from Prince & Smolensky(1993).

a candidate violating certain low-ranked constraints minimally. The constraints mentioned here are not the language-particular ones used in generative phonology. Rather they are essentially universal and of very general formulation. Therefore, individual grammar consists of a ranking of these constraints and typology is the study of the range of systems that re-ranking permits.

As a general approach to the role of well-formedness constraints, the major principles for OT are summed up as follows.

(8) a. Violability

Constraints are violable; but violation is minimal.

b. Ranking

Constraints are ranked on a language-particular basis; the notion of minimal violation is defined in terms of ranking.

c. Inclusiveness

The constraint hierarchy evaluates a set of candidate analyses that are admitted by very general considerations of structural well-formedness.

In OT, inputs representations would be unsyllabified and underspecified. They are submitted to GEN and all the candidates generated by GEN are then evaluated by reference to constraints. The following constraints are employed in this paper.

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a. Freedom of Analysis: Any amount of structure may be posited.

b. Containment: No element may be literally removed from the input form. The input is thus contained in every candidate form.

c. Consistency of Exponence: No changes in the exponence of a phonologically-specified morpheme are permitted.

By Freedom of Analysis, GEN may supply candidates with featural, syllabic, moraic, or other phonological structures, ranging from empty nodes through fully specified segments. Containment is a specific hypothesis about the morphology-phonology relationship. It means that segmental deletion phenomena involve underparsing a segment of the input rather than explicit replacement of a segment by Ø. Consistency of Exponence means that the lexical specifications of a morpheme can never be affected by GEN. For example, epenthesis or underparsing of segments will not change the morphological affiliation. Therefore, any given morpheme's phonological exponents must be identical in underlying and surface form.

(9) a. GEN

i) Associate segments to syllables

ii) Parse underspecified segments.

b. Syllable structure constraints

ONS: Every syllable must have an onset.

NO CODA: No syllable may have a coda

FILL: Syllable positions are filled with a segmental material.

*COMPLEX (Prince & Smolensky 1993:87):

No more than one C or V may associate to any syllable position node.

c. Faithfulness constraints

*STRUCT : Do not add further specification unnecessarily.[8]

PARSE-F : All segmental representations must have full feature specification.

2.2. OCP Constraints and the Ranking

First of all, as for the representation of the suffix-initial consonant, I adopt the underspecified underlying representation of the suffix-initial consonant proposed in Ahn(1994b).

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(10)  [+cons]
      [     ]
      /     \
     L      PL
             |
           [+bk]
```

In other words, the underlying representation of the suffix-initial consonant should be underspecified for its manner and laryngeal properties as shown below. This proposal is based on the K-M. Lee's earlier proposal on *γi: as the velar fricative can be attested only historically, I will represent the causative suffix as /-Ci-/ in which the capital C represents an underspecified consonantal segment.

On the other hand, it is proposed that the most important effect in causative

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[8] See Prince & Smolensky(1993:25, fn13) for an earlier version.

suffixation is the OCP. The basic concept for OCP was first proposed by Leben(1973) for tones but the following statement by McCarthy (1986) has been accepted in general.

(11) Obligatory Contour Principle
At the melodic level, adjacent identical elements are prohibited.

As for features, however, the following revised statement is proposed in this paper.[9]

(10) OCP (Revised): $[\ ...\ F\ F...\ ]_T$
(Adjacent identical feature specification may not be allowed at the designated tier T.)

Here, within a standard model of Feature Geometry (Clements 1985, Hulst 1991), the tier T can be Place, Laryngeal, and Manner. Therefore, the general OCP constaint can be divided into three sub-OCP constraints for features as shown below.

(11) a. OCP-P(lace)
b. OCP-L(aryngeal)
c. OCP-M(anner)

As will be discussed below, OCP-P plays a major role in the surface realization of the minor cases, such as *u-*, *ku-*, and *c^hu-*. OCP-L provides a preference of *hi-* after a stem-final [tense] consonant such as *-k'* or *-p^h*. Finally, the realization of *ki-* is allowed by the OCP-M.

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[9] Other versions such as the following have been proposed.
a. Yip(1989): *[...F F...] (Adjacent identical features are disallowed.)
b. Myers(1993): Two identical specifications must not be tier-adjacent.
c. Truckenbrodt(1994): *[...F F...]
(Unless the first F stands in a dominance-relation with a feature G and the second F stands in a dominance-relation with a feature F, and G and H contrast with one another.)

3. OCP Effects in OT analyses

3.1. OCP-Manner: *-ki, -hi,* and *-i* suffixations

First of all, the major cases of *ki-* and *hi-* suffixation are determined by the OCP of the Manner tier. For example, after an /s/-final stem, *ki-* is selected due to the contimuancy constrast between the stem-final /s/ and the suffix-initial /k/. In order to account for this process, the following derivation was proposed for *ki-* realization in my earlier analysis (cf. Ahn 1994b).

```
(12)  [+cons] [+cons]    ⇒  tier of scansion   ∴ [  ] → [-cont]
      [+cont] [      ]
        / \     / \
       L ..    L   PL
       |            |
     [+s.g.]      [+bk]     (e.g. us-ki-(ta), as-ki-(ta), s'is-ki-(ta), etc.)
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As the manner of the suffix-initial consonant is specified as [-cont], the consonant is realized as *k*, because the place node already has [+bk] specification underlyingly.[10]

Within OT, however, GEN allows all the three major candidates, for which OCP-M and PARSE play the deciding role evaluating the optimality of the candidates. (For now, the constraint ranking is not relevant, we may use the dotted lines for the OCP columns. Moreover, constraint violations are recorded with the mark *, and blankness indicates success on the constraint. Furthermore, ! marks the "crucial" failure for each suboptimal candidate (Prince & Smolensky 1993: 18).)

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[10] The following examples have roots ending with /t/ or /t^h/, which would normally lead us to affix *-hi* or *-i*. According to Yu(1964), however, these words had the roots ending with /s/ in Middle Korean.

tɨt-ki-ta	'make someone hear'
t'ɨt-ki-ta	'make someone take off something'
mat^h-ki-ta	'leave something in one's charge'

(13) us- 'to laugh' → us-ki-ta

Candidates	OCP-M	OCP-L	OCP-P	PARSE
☞ a. us-ki-ta				
b. us-hi-ta	*!			
c. us-<C>i-ta				*

In the above tableau, the second candidate (13b) is discarded due to the two adjacent [+continuant] features on the Manner tier.[11] Therefore, all the cells below OCP-M are shaded as they do not participate in the decison. On the other hand, (13c) is not subject to any OCP violation but it violates PARSE since the underspecified suffix-initial consonant does not get full specification. Therefore, (13a) is the only candidate not commiting any vioaltion and thus taken as the optimal candidate. And we use the symbol ☞ to draw the eye to the optimal candidate.

On the contrary, the *hi-* suffixation occurs after a [-continuant] stem-final stops such as /p, t, k/: e.g. *kup-hi-ta, p'op-hi-ta, kut-hi-ta, ik-hi-ta, sik-hi-ta, ilk-hi-ta, palk-hi-ta, nilk-hi-ta*, etc. (As will be discussed below, *hi-* occurs only after a "plain" stop which has no laryngeal specification. If a stem-final consonant is a "tense" stop with the laryngeal [s.g]/[c.g] specification, the optimality is determined by OCP-L. Then we would get *i-* suffixation.)

(14) sik-ta become cool' → sik-hi-ta

Candidates	OCP-M	OCP-L	OCP-P	PARSE
a. sik-ki-ta	*			
☞ b. sik-hi-ta				
c. sik-<C>i-ta				*

Just like the evaluation procedure in (13), *hi-* is selected after a [-continuant] plain stop due to the continuancy of /h/.

[11] If any OCP violation is fatal, the "!" symbol is used to represent this fatal OCP violation. The colums ranked below this should be out of consideration and thus be shaded. In this case of causative suffixation, however, no fatal violation seems to be enforced.

As this way of selection applies to all [-continunant] plain stops, *hi-* occurs after a stem-final *p-* and *t-* as well.

(15) a. kup-ta 'bake' → kup-hi-ta

	Candidates	OCP-M	OCP-L	OCP-P	PARSE
	a. kup-ki-ta	*			
☞	b. kup-hi-ta				
	c. kup-<C>i-ta				*

b. kut-ta 'become solid' → kut-hi-ta

	Candidates	OCP-M	OCP-L	OCP-P	PARSE
	d. kut-ki-ta	*			
☞	e. kut-hi-ta				
	f. kut-<C>i-ta				*

In my earlier analysis(Ahn 1994b), I had proposed the following account, assuming that the plain stops /p, t, k/ were specified as [-continuant].[12]

(16)
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[+cons] [+cons]
[-cont] [[   ]]   ⇒   [  ] → [+cont]
  / \     / \
... L   L   PL
             |
           [+bk]
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In (16), as the negative value [-continuant] appears in the underlying representation, the suffix consonant takes the value [+cont] by dissimilation. Therefore, the suffix-initial C is realized as an /h/ because there is no specified feature for the

[12] Iverson (1989) proposed that /h/ has [+cont, +s.g] specification. In this paper, however, the following representations are assumed for /h, s, s'/.

/h/	/s/	/s'/
[cont]	[cont, s.g.]	[cont, c.g.]

laryngeal node. (As for the the place specification [+back], it was assumed in Ahn(1994b) that the sufffix-initial C is delinked after the specification of the laryngeal node, since /h/ should not have any place specification.)[13] This proposal was, however, based on the negative [-continuant] specification of the stem-final consonant: if the negative fearure value is not specified, there would no way of handling this case. And this way of underspecfication contradicts the general assumption of featural underspecification in which only privative specification is allowed. In the current OT approach, however, this kind of problem does not occur.

Unlike the consonantal OCP-M, however, the surface realization of *-i* suffix after a vowel-final stem needs a different interpretation: *po-i-ta* 'show'. If we assume that OCP-M applies, focussed on the [continuant] property of the stem-final vowel, there would be no explanation why the suffix begins with the vowel *-i*, rather than a [-continuant] segment, i.e. stop. For this problem, it was suggested in Ahn(1994b) that if there is no consonant to trigger dissimilation, the underspecified suffix-initial C cannot surface since there is no way to assign dissimilatory values to the underspecified slots.

Based this suggestion, it is described here that there is no trigger of OCP-M in a vowel-final stem, the underspecified suffix-initial consonant can not get full feature specification. Therefore, if there is no stem-final consonant for evaluating OCP-M, the onsetless suffix *-i* occurs, obeying *STRUCT but minimally violating PARSE. And we see the ranking between *STRUCT and PARSE as "*STRUCT ≫ PARSE".

(17) po-ta 'see' → po-i-ta 'show'

Candidates	*STRUCT	OCP-M	OCP-L	OCP-P	PARSE
a. po-ki-ta	*!				
b. po-hi-ta	*!	*			
☞ c. po-<C>i-ta		*			*

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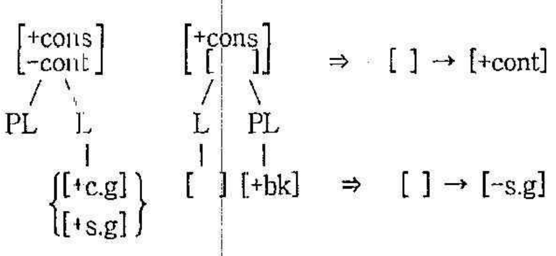
[13] As /h/ is not specified for the place node, the prelinking of [+back] is not in conflict. Due to the well-formedness condition, this already linked [+back] is simply delinked after the laryngeal specification of /h/. However, since /s/ needs its own coronal place specification (even though it may be underspecified), the suffix-initial consonant cannot be realized as an /s/.

Both (17a) and (17b) violate *STRUCT by illegitimately specifying the suffix-initial consonant. Moreover, (17b) violates OCP-M as well since the illegitmately specified suffix-initial [h] has to share the feature [+continuant] with the stem-final vowel. (17c) also violates OCP-M and PARSE. Therefore, in terms of the number of violation, it violates two constraints just like (17b) does, while (17a) violates only one. But the optimality is decided on the constraint ranking as well as the minimality of violation, rather than the number of violations. As for the ranking, *STRUCT is ranked the highest, while PARSE is the lowest and any candidate violating *STRUCT is considered "fatal". Therefore, (17c) is selected as the optimal form since the violation is minimal, as PARSE being ranked as the lowest

3.2. OCP-Laryngeal: *-i* suffixation

As mentioned above, we get *-i* suffixation after a plosive with a laryngeal specification such as [+spread glottis] or [+constricted glottis] (e.g. *təp^h-i-ta, k'ak'-i-ta,* etc. In other words, unlike in cap-ta 'hold' to which -hi is added for causative formation, *-hi* cannot occur after a tense] stop. In order to explain this process, it was proposed to scan two different tiers in the feature tree in Ahn(1994b).

(18)



In Ahn(1994b), it was claimed that the suffix-initial consonant takes its manner feature as [+cont], opposite to that of the root-final consonant. Moreover, since the laryngeal property ([spread glottis]/[constricted glottis]) of the verb-final consonant is already specified underlyingly, [-s.g] or [-c.g] is filled in for the laryngeal node of the suffix consonant. This two-way dissimilatory process leads us to the segmental deletion of the consonant. In other words, if the initial segment is [+cont], it should be an /h/ which takes the [+s.g] feature specification by default. This segment, however, can surface since the second feature specification [-s.g]/[-c.g] prohibits the surface realization of the laryngeal /h/. This account, however, is not only overly complex by scanning two separate tiers simultaneously. Moreover, [-tense] (or [-s.g]) specification should be enforced first to block the surface realization of *hi*-suffixation.

Within the OT framework, we do not require any rule ordering for scanning or any unnecessary step of segmental deletion. The only necessary procedure is the constraint ranking in which OCP-L or OCP-M are ranked higher than PARSE.

(19) kak'-ta 'cut' → kak'-i-ta

Candidates	OCP-M	OCP-L	OCP-P	PARSE
a. kak'-ki-ta	*			
b. kak'-hi-ta		*		
☞ c. kak'-<C>i-ta				*

Both (19a) and (19b) violate OCP constraints ranked higher than PARSE. Especially (19b) violates OCP-L since the stem-final consonant /k'/ has the laryngeal property and the suffix intial consonant /h/ also has the laryngeal specification on the surface. Therefore, due to OCP-L, the underlying suffix-intial C does not get the full feature specification. Consequently, the (19c) with the unpased suffix-initial C is chosen as the optimal form even though it minimally violates the lower constaint PARSE. The same procedure applies to the following case as well, where the stem-final consonant has the laryngeal property [+s.g].

(20) təp^h-ta 'cover' → təp^h-i-ta

Candidates	OCP-M	OCP-L	OCP-P	PARSE
a. təp^h-ki-ta	*			
b. təp^h-hi-ta		*		
☞ c. təp^h-<C>i-ta				*

3.3. OCP-Place: *-i*, *-u*, *-c^h u* suffixations

As mentioned above, there is a series of exceptional cases which take the unexpected *-i* suffixation as shown in (21a), rather than the expected *-hi* suffixation as shown in (21b).[14]

(21) a. mək-i-ta, cuk-i-ta, sak-i-ta, sək-i-ta, s'ək-i-ta, sok-i-ta, suk-i-ta, nok-i-ta, nuk-i-ta, etc.
b. ik-hi-ta, sik-hi-ta, etc.

Note that the exceptional verbs have back vowels and they end with the velar consonant /k/ specified as [+back]. Thus, in order to avoid this ill-formed triple [+back] sequence, the expected suffix-initial consonant does not surface. In other words, due to the backness of the verb-final segments, the suffix-initial consonant cannot get specified because a sequence of three consecutive [+back] segments is prohibited.[15] On the contrary, as for the regular cases in (21b), this further application of OCP does not apply since the verbs have front vowels which do not generate the triple [+back] sequence. Thus, after the regular *-hi* suffixation, the causative verbs undergo aspiration.

In order to account for these cases, we need another unviolable constraint OCP-P.[16]

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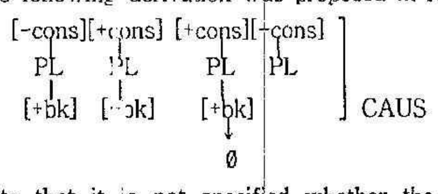
[14] In those cases with root-final double consonants, *-hi* is always used: e.g. *ilk-hi-ta, palk-hi-ta, nəlk-hi-ta*, etc. This might be due to the resyllabification process which changes the final coda consonant to an aspirated onset consonant.

[15] The following derivation was proposed in Ahn(1994b).



Note that it is not specified whether the would-be suffix initial consonant is /k/ or /h/. Because it is simply discarded in order to avoid the ill-formed triple [+back] sequence, we need not worry about the status of this consonant.

[16] Moreover, as shown in Ahn(1994b), causative *-hi* and *-i* suffixes often alternate for several verbs, although they are regarded as substandard: e.g. *sak-i-ta/sak-hi-ta, s'ək-i-ta/s'ək-hi-ta, nok-i-ta/nok-hi-ta, nuk-i-ta/nuk-hi-ta, muk-i-ta/muk-hi-ta.* For these cases,

(22) mək-ta 'eat' → mək-i-ta

Candidates	OCP-M	OCP-L	OCP-P	PARSE
a. mək-ki-ta	*		*	
b. mək-hi-ta			*	
☞ c. mək-<C>i-ta				*

In (22b), we see a possible violation of OCP-P even though /h/ is assumed not to have any place specification. However, /h/ becomes a [+back] segment [k^h] due to aspiration, violating OCP-P.

This aspect is unique for causative suffixation, not for passive suffixation. In fact, the passive counterpart for *mək-ta* takes *-hi* suffixation as expected, i.e. *mək-hi-ta*. The difference occurs due to the vowel length of the passive suffix, e.g. [məkhi:da]. (The passive suffix is known to have a long vowel, while the causative form has a short one.[17])

The application of OCP-P gains further support from *-u* suffixation since *-u* is suffixed after a front vowel; e.g. *k'i-u-ta, c'i-u-ta, c^hi-u-ta, pi-u-ta, p^hi-u-ta, i-u-ta, me-u-ta, k'ɛ-u-ta, sɛ-u-ta*, etc. As previously mentioned, this is a process prohibiting a sequence of two front vowels in causative formation.

(23) pi-ta 'to be empty' → pi-u-ta

Candidates	*STRUCT	OCP-M	OCP-L	OCP-P	PARSE
a. pi-ki-ta	*!				
b. pi-hi-ta	*!	*			
c. pi-<C>i-ta		*		*	*
☞ d. pi-<C>u-ta		*			*

Both (23a) and (23b) are discarded as they are violating *STRUCT fatally. Now, between the two remaining candidates, (23c) and (23d), we take (23d) which does not violate OCP-P. Although, having a VV sequence on the surface, both (23c) and (23d)

Ahn(1994b) claimed that the further dissimilatory process is still active synchronically, changing the place property. This aspect is also found in the *-u* and *-c^hu* suffixation, which will be discussed below.

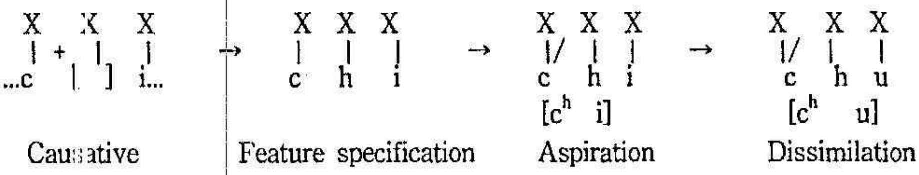
[17] See Ahn(1990) for the details on phonological differences between passivization and causativization.

violate two constraints OCP-M and PARSE, (23d) is chosen as the better candidate, by not violating OCP-P. Therefore, just as the OCP-P determines the unparsing of the suffix-initial consonant in *mək-i-ta* 'feed', so a similar evaluation procedure is applied to vowels, leading us to the selection of the optimality of *-u*.[18] (We also note that OCP-M is a violable constraint when it applies to vowels.)

Finally, the current OT description on OCP can be further extended to those cases in which consonantal and vocalic place features interact. As a minor case of causative suffixation, *-c^{h}u-* is suffixed only to certain verb stems as shown below.

(24)	nac-c^{h}u-ta	'make it lower'
	kac-c^{h}u-ta	'make it prepared'
	nɨc-c^{h}u-ta	'make it slow down'

In my earlier allomorphy approach (Ahn 1989), I suggested marking them in the lexicon, since the distribution is so limited. In my later approach (cf. Ahn 1994b), however, these examples were regarded as another case of dissimilation in which the suffix vowel *-i* is changed to *-u* in order to avoid a [-back][-back] sequence. (Note that all the verbs in this category have the coronal stem-final consonant /c/, specified as [-back]. After aspiration, we have two front segments in a row, i.e. c^h + *i*. Then the latter vowel is changed to *u* by place dissimilation.)[19]

(25)


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[18] As mentioned in Ahn(1994b), this process applies only to causatives, not to passives. For example, *k'i-* 'to insert', *me-* 'to cover', and *k'ε-* 'to wake up' take *-i* for passives but *-u* for causatives as shown below:

Root	Passive	Causative
k'i-	k'i-i	k'i-u
me-	me-i	me-u
k'ε-	k'ε-i	k'ε-u

[19] After the consonantal spreading for aspiration, it is not obligatory to delink the spreading segment from the original timing slot. Therefore, we may get one palatal segment phonetically in casual speech, as in [mac^{h}uda], but we can also get *mac-c^{h}u-ta* [matc^{h}uda] in careful speech.

In our current OT approach, we can think of four possible candidates as shown in (26), in which (26d) is chosed as the optimal form. (The suffix-initial [h] can be used as the aspiration part of the preceding segment or can form a separated aspirated segment. The orthographic representation reflects the latter: *nac-c^{h}u-ta.*)

(26) nac-ta 'be low' → nac-hu-ta

Candidates	OCP-M	OCP-L	OCP-P	PARSE
a. nac-ki-ta	*!			
b. nac-<C>i-ta				*
c. nac-hi-ta			**!	
☞ d. nac-hu-ta				

(26a) violates OCP-M due to the [-cont] property of the stem-final consonant, whereas (26b) violates PARSE. Therefore, by focusing on the OCP nature of the surface realization of the suffix-initial consonant, we expect (26c) as the optimal form. However, as (26c) allows two consecutive [-back] specifications, it commits the fatal violation of OCP-P. Consequently, (26d) remains the only possible candidate, which does not violate any major constraints.[20]

In this section, we have observed that an optimal form of the causative suffix is determined by a series of the constraint evaluation procedures. And, as for the dominance hierarchy, *STRUCT dominates OCP constraints and PARSE is ranked as the lowest. Moreover, we have observed that the evaluation of OCP-P can also account for a consonant-vowel interaction, as well as the previously observed consonantal OCP effects.

3.4. More on OCP-Manner: *-ki* and *-li* suffixations

There remains one problem to be resolved, namely the explanation of the *-ki* suffixation after nasal-final stems.

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[20] There is a couple of cases in which both *-hi* and *-c^{h}u* are possible, even though the variants might be dialectal. These cases show the violablity of OCP-P: e.g. *mac-hi-ta/ mac-c^{h}u-ta* 'make it hit', *cac-hi-ta/cac-c^{h}u-ta* 'boil dry'.

(27) nam-ki-ta 'leave something', sum-ki-ta 'hide', olm-ki-ta 'move'
an-ki-ta 'make someone hug', sin-ki-ta 'make someone wear shoes'

If nasals are simply regarded as a stop, i.e, [-continuant], our current approach would predict *-hi* incorrectly, rather than *-ki*. Thus there seems to be no explanation for the unexpected appearance of *-ki*. Therefore, in Ahn(1994b), it was simply conjectured that there might be a sonority dissimilation at play between the stem-final consonant and the suffix-initial consonant.

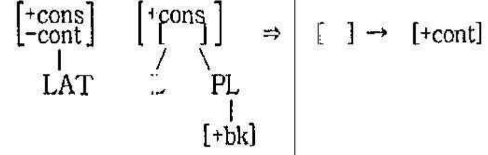
In our current framework of OT, I argue that the stem-final nasal is specified only for [+sonorant, +labial]. Thus we would take the [-sonorant] segment (i.e. in *ki-*) which is specified as [-continuant] by default.

(28) nam-ta 'remain' → nam-ki-ta

Candidates	OCP-M	OCP-L	OCP-P	PARSE
☞ a. nam-ki-ta				
b. nam-hi-ta	*			
c. nam-<C>i-ta				*

In (28), we have three possible candidates. First of all, (28b) is discarded by OCP-M since the stem-final consonant and the suffix-initial one are both [-cont]. On the other hand, (28c) has the unparsed segment, violaing PARSE. In other words, as the stem-final segment is a consonant, the underspecified suffix-initial segment must be parsed, by being specified in featural representation. Therefore, not violating any constraint, (28a) is selected as the optimal form.

The last problem to be solved is in the surface realization of *-i* suffix after a *-l* final stem. In my recent proposal (Ahn 1994b), citing Chomsky & Halle(1968:318), I assumed that the lateral /l/ is specified as [-cont], triggering [+cont] specification of the underspecified suffix-initial consonant.[21] The suffix-initial *-h* then undergoes

21 

intersonorant *h*-deletion, a very productive rule in Korean phonology (cf. Kim-Renaud 1974), because *h*-deletion leaves the skeletal slot unattended, the root-final /l/ spreads to this empty slot, producing a geminate *-ll*.

```
(29)  X + X  X   =>  X + X  X   =>  X  X  X   =>  X  X  X
      |   |  |       |   |  |       |  ǂ  |       |/    |
      l   [ ] i      l   h  i       l  h  i       l     i
      [-cont]           [+cont]
      suffixation    feature specificaton  h-deletion  l-spreading
```

Like the earlier proposal on the major cases of *-hi* suffixation, however, this account brings a problem to the general theory of (radical) underspecification in which only the positve value is specified underlyingly. In this paper, therefore, I will propose a different solution based on phonotactics. As any complex codas may not be allowed in Korean syllable structure, I will employ the following universal constraint. (Prince & Smolensky 1993)

(30) *COMPLEX: Complex codas may not be allowed.

As this constraint is to be obeyed strictly, it dominates other constraints in the dominace hierarchy.

On the other hand, the underlying representation of the stem-final *-l* is proposed to have two skeletal slots, as shown below.

```
(31)  CVCC  CV
      |||/  | |
      nal   t a  'to fly'
```

The empirical basis for this double skeletal representation can be found in the earlier proposals in Korean phonology (cf. Kim-Renaud 1974): when a consonant-initial suffix follows this stem, only one *-l* appears on the surface but if a vowel-initial suffix follows the unsyllabified skeleton, it can be resyllabified with the suffix, producing *-ll*, *e.g. nal-ta* [nalda] but *nal-ita* [nallida] 'to fly'.

Based on these assumptions, I now propose the following tableau for evaluating

Based on these assumptions, I now propose the following tableau for evaluating possible candidates.

(32) nal-ta 'to fly' → nal-li-ta

Candidates	*COMPLEX	OCP-M	OCP-L	OCP-P	PARSE
CVCC CV CV |||/ || || a. nal- li -ta	*!	*			
CVCC CV CV |||/ | || b. nal- hi -t a	*!		*		
CVCC <C>V CV |||/ | | || ☞c. nal- <C> i- t a					*

In (32), the two candidates fatally violating *COMPLEX are easily discarded. Moreover, (32b) violates OCP-L as well. In other words, as *-hi* appears only after a plain stop to which the laryngeal property [s.g] can be added, (32b) is violating OCP-L. On the other hand, as the stem-final lateral can be regarded as [-cont], (32c) violates OCP-M as well. Consequently, (32c) minimally violating PARSE is selected as the optimal form. Furthermore, the surface realization, *nal-li-ta,* oftne called "doubling" (Bak 1982) is viewed as a consequence of resyllabification.

(33)
```
      σ          σ     σ
     /|\       ↗  \   / \
    C V C C <C>V   C V
    | | |/     | |   | |
    n a l    <C>i    t a
```

4. Conclusion

In this paper, I have showed that the overall allomorphy aspect for Korean causative suffixation can be accounted for in terms of OCP constraints. For this purpose, I employed the framework of Optimality Theory and several general constraints. I also proposd a dominance hierarchy concerning the relevant constraints including the three the occurrence of *-ki* after *s'is-* 'wash' can be accounted for by the OCP constraint on Manner. On the other hand, the suffixation of *-hi* to *sik-* 'get cold' is explained by the OCP constraint on Laryngeal: due to the unmarked laryngeal specification of the root-final /k/, -*hi* is chosen due to [+spread glottis] of /h/. On the other hand, as for the occurrence of *-i* after *mək-* 'eat', the determining factor is the constraint OCP-Place dominating OCP-Manner. In other words, due to the two [+back] specifications of the root, any suffixal form with an initial [+back] specification, like *-ki,* does not occur. Thus, the underparsed *-i* is chosen, minimally violating *STRUCT. Moreover, in the case of *-li* suffixation, we can achieve an additional advantage by accounting for the formerly mysterious *l*-gemination process (i.e., *-li* affixation) by invoking the universal constraint *COMPLEX which, along with OCP-M and OCP-L, dominates *PARSE

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