

Learning Alternations in Korean Noun Paradigms

Young Ah Do

Massachusetts Institute of Technology

1. Introduction

Children learning to inflect Korean nouns are faced with various phonological alternations and the alternations are widely found especially among obstruent-final nouns. For sonorant-final nouns, nasals in coda positions do not undergo alternations (1a), and alternations of lateral final nouns are fully predictable from general Korean phonotactic processes, such as intersonorant flapping (1b). For obstruent-final nouns, on the other hand, not all alternations are motivated by the phonotactics of Korean; obstruents which show three-way laryngeal contrast are neutralized into their homorganic lenis stop in coda position, but they are alternating, such as to [s, t^h, c^h, c, t], when an inflectional suffix is added (2) (Ko 1989, Martin 1992, Hayes 1998, Albright 2005, 2008, Kang 2003a,b, Kim 2005).

(1) Underlying form	Isolation form	Inflected form	Gloss	
a. /san/	san	san-i _{nom}	‘mountain’	No alternation
b. /pal/	pal	par-i _{nom}	‘foot’	Intersonorant flapping

(2) Underlying form	Isolation form	Inflected form	Gloss
/pat ^h /	pat	pas-i _{nom} , pat ^h -i, pac ^h -i, pac-i, pad-i	‘field’
/mas/	mat	mas-i _{nom} , mat ^h -i, mac-i, mad-i	‘taste’
/cæc/	cæt	cæs-i _{nom} , pac ^h -i, pac-i, pad-i	‘milk’

Corpus studies and experimental investigations of adult Korean have found that speakers show systematic preferences among the five variants. Across all inflected forms, a variant [s] is most frequent among the five possible variants, followed by [c^h] and [t^h], and not many [c] and [t] variants are observed (Kim 2003, Choi 2004, Jun 2007). Such overall corpus frequency is well reflected in lexical-specific preferences; for example, the frequency hierarch of the nominative form of *kot* ‘a flower’ is [kos-i] >> [ko^h-i], [kot^h-i] >> [koc-i], [kod-i]. In addition, experimental investigations have shown that speakers’ preferences among the variants differ depending on the suffixes both for existing lexical items and for nonce words; for instance, an accusative suffix ‘-il’ prefers [c^h] over [t^h], while a locative suffix ‘-e’ prefers [t^h] over [c^h] (Choi 2004, Jun 2007, Jun 2010). Speakers’ preference among the five variants of obstruent-final nouns are summarized in (3).

- (3) a. Overall and lexical-specific preference
[s] >> [c^h], [t^h] >> [c], [t]
- b. Suffix-specific preference
Nominative [-i]: [s] >> [c^h], [t^h] >> [c], [t]
Accusative [-il]: [s] >> [c^h] >> [t^h] >> [c], [t]
Locative [-e], [-ege]: [s], [t^h] >> [c^h] >> [c], [t]

* I would like to thank the following people for wonderful comments and discussion: Adam Albright, Michael Kenwtowicz, Donca Steriade, Edward Flemming and the WCCFL 29 audience. All remaining errors are, of course, mine.

Given that the speech of adult Koreans show various alternations among obstruent-final nouns, in which not all of the alternations are directly motivated by phonotactics of Korean, and that speakers show lexical-specific as well as suffix-specific preference among the five variants, learning alternations of obstruent-final nouns would be a great challenge for Korean learners. The first goal of this study is to investigate the learning of alternations in Korean noun paradigms. Experimental results show that Korean learners go through two intermediate stages before they master alternations of noun paradigms. In the early stage, children aged 4;2-5;8 innovate forms that do not match any of adult forms; they inflect nouns across all suffixes by overusing an isolation form such as [mad-i], [mad-il] and [mad-e] for the inflection of *mat* ‘taste’. In the later stage, children aged 6;2-7;9 produce alternations reflecting suffix-specific preference among adults, but not reflecting lexical-specific preference. I argue that such intermediate learning stages are found because of a grammatical preferences among children to inflect forms faithful to a base form, which is assumed to be an isolated form (Kang 2003, Ko 2006).

The second goal of this paper is to show that the attested three stages of learning- total divergence from adult forms in the early stage, the mastery of suffix-specific preference among the variants in the later stage, and finally the mastery of lexical-specific preference- can be predicted by the grammar trained purely by the frequency of different alternations. I assume the grammar is a set of constraints and train a learning model to re-rank constraints according to the violation of constraints in corpus data; the more often a given alternation occurs in the data, the more the relevant constraints are demoted. It is shown that a statistical model works for learning alternations in Korean noun paradigms.

2. Experiments

2.1. Experiment 1

In order to access children’s noun inflection, I used a structured test-picture description test. The experiment elicited the inflection of 30 nouns, 15 obstruent-final and 15 sonorant-final ones. All 30 nouns were selected among 500 most frequent inflected nouns from the corpus compiled by the National Institute of the Korean Language augmented with token frequency information from Sejong Corpus (Kim and Kang 2000). Each picture with a frame sentence was shown to participants on computer screen, and participants were asked to describe the pictures by filling a position for a noun in a frame sentence. For example, in (4), the expectation was to elicit an accusative form of an obstruent-final noun, as *pat-il* ‘field-acc’. One third of pictures were designed to elicit a nominative form of each type of nouns (i.e., obstruent-final noun or sor sonorant-final nouns), another one third for accusative form and the remaining for locative form. All the frame sentences in this experiment asked only one noun and other parts of a sentence were given by the experimenter.

(4) An example of a picture description task



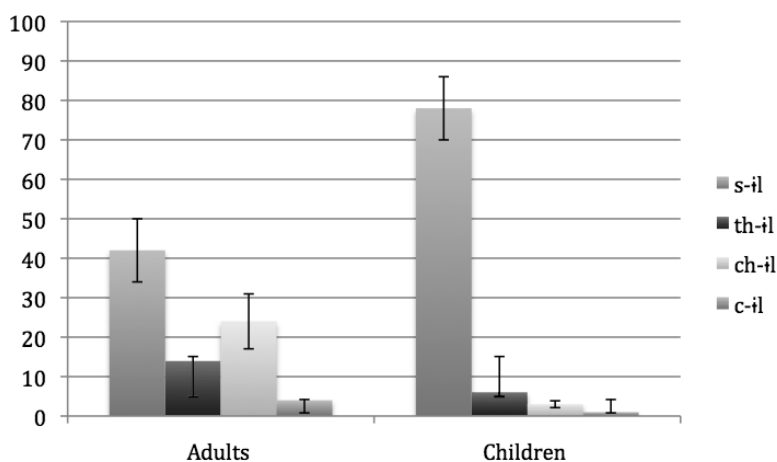
Nongbu-ga kyengungi-ro _____ kal-goit-t’a
Farmer-nom cultivator-by _____ plow-prog-decl. ‘A farmer is plowing _____ by cultivator.’

The participants in Experiment 1 were 16 Korean-speaking children aged 4;2-7;9, 10 girls and 6 boys. The same number of Korean adults, 9 females and 7 males, also participated in this experiment for comparison. Eight of children were aged 4;2-5;8 ($M = 4;7$, $SD = 0.4$) and eight were aged 6;2-7;9 ($M = 6;9$, $SD = 0.2$). The children study in regular kindergartens in Seoul and all adults participants were standard Seoul Korean speakers.

2.2. Results

The results of picture description test among children and adults are very distinctive. Except for two stimuli in which different nouns were chosen among adults (e.g., *pat* ‘field’ and *non* ‘paddy’ for the description of a picture (4)), adults generally answered with an inflected form of an expected noun. Sonorant-final nouns were inflected by reflecting phonotactic requirement such as intersonorant flapping (1), and obstruent-final nouns showed five-way alternations among [s], [c^h], [t^h], [c] and [t]. The preference for different variants reflects lexical frequency of them, and the tendency of lexical-specific preference and suffix-specific preference for each variant are in line with previous studies as summarized in (3); across all suffixed forms, the preference hierarchy was [s] >> [c^h], [t^h] >> [c], [t], and [c^h] was preferred over [t^h] before an accusative suffix, while [t^h] was preferred over [c^h] before a locative suffix. Children diverge from adults in two different ways depending on their age. For older children aged 6;2-7;9, only one variant for each suffixed form is dominantly observed and those are the most frequent suffix-specific variant among adults’ production: [s] for nominative and accusative and [t^h] for locative form. Graphs in (5) compares the distribution of variants among accusative forms of obstruent-final nouns among adults and older children.

(5) The distribution of variants among accusative forms of obstruent-final nouns



Among younger children aged 4;2-5;8, they prefer not to put a suffix after obstruent-final nouns especially when producing nominative (74%) and accusative forms (62%) of obstruent-final nouns. The results are very impressive, since they do know the morphology of noun suffixation; they in general put a suffix after sonorant-final nouns (87%). The reason for not putting a suffix especially after obstruent-final nouns could be simply because children know how to suffix sonorant-final nouns but not for obstruent-final nouns. Another possibility is that younger children avoid suffixation for obstruent-final nouns, even though they know alternations both for sonorant-final and obstruent-final nouns. Given that the inflection of obstruent-final nouns results in more radical alternations from an isolation form than the inflection of sonorant final nouns as in (6), children may want to avoid alternations by omitting a suffix after obstruent-final nouns.

(6) Isolation form	Inflected form	Gloss
a. san	san-il_{acc}	‘mountain’
pal	par-il_{acc}	‘foot’
b. pat	pas-il_{acc}, pac^h-il, pat^h-il, pac-il	‘field’

To see why younger children did not put a suffix after obstruent-final nouns, I designed Experiment 2, in which the context mandatorily requires suffixed form of nouns. If children fail to suffix nouns in this context, the results in Experiment 1 is due to the fact that children did not master how to suffix nouns. If children do put a suffix, on the other hand, the current results is due to children’s strategy to avoid alternations.

2.3. Experiment 2

Suffixed forms of nouns were elicited in Experiment 2, by presenting a pair of pictures. While nominative and accusative suffix can be optional in simple sentences in Korean, it is unnatural to put a suffix only to one clause in a coordinated sentence as in (7): either both counterpart nouns in coordinated clauses should have suffixes or none of them have suffixes.

- (7) a. John(-i) ka-go, Sue(-ga) ka-n-da.
 John(-nom) go-and, Sue(-nom) go-pres-decl.
 b. ??? John-i ka-go, Sue ka-n-da.
 ??? John ka-go, Sue-ka ka-n-da.

30 Pictures used in Experiment 1 were paired into 15 sets. Under each pair of pictures, a frame sentence was given as in (8), with using conjunct suffix either ‘-ko’ *and* or ‘-ciman’ *but*, depending on the relation of the two pictures. Half of pairs were designed to elicit obstruent-final nouns in the first clause followed by sonorant-final nouns and another half were for the opposite order. An example in (8) is for the second case, where the expected answer is ‘san-il’ *mountain-acc*, and ‘pat-il’ *field-acc*. The same participants from Experiment 1 conducted Experiment 2.

(8) An example of paired-picture description test



Yenchok namca-nin cacəngə-ro _____ ori-go, orinchok namca-nin kyengungi-ro ____ kal-goit-t'a.
 Left man-top bicycle-by _____ climb-and, right man-top cultivator-by _____ plow-prog-decl.
 A man on the left is climbing _____ by bicycle, and a farmer is plowing _____ by cultivator.

2.4. Results

The patterns of production among adults and older children are not different from the findings in Experiment 1; both adults and older children put a suffix after nouns both for obstruent-final and sonorant-final ones, and adult made alternations for obstruent-final nouns using the variants [s], [c^h], [t^h], [c], and [t] reflecting lexical-specific and suffix-specific preference in (3), while older children dominantly used only one variant for each suffixed form that is most preferred among adults' production. Younger children still avoided suffixation (82%) when the noun in the first clause is obstruent-final one. Once they avoided suffixation for the noun in the first clause, the counterpart sonorant-final noun in the second clause was also unmarked, with only one exception.

A very interesting finding is that younger children do know how to suffix obstruent-final nouns. When they inflected a sonorant-final nouns in the first clause (42%), they in general put a suffix after a sonorant-final nouns (91%). Once a sonorant-final noun was inflected in the first clause, the counterpart obstruent-final noun in the second clause was always suffixed, as required by the morphology of Korean coordination structure. Alternations of obstruent-final nouns were found here, and younger children prefer to use a variant using an isolation form before each suffix as in (9). Examples in (9) shows that outputs are minimally modified from an isolation form by applying phonotactic constraints in Korean such as intersonorant voicing.

(9) Isolation	NOM	ACC	LOC
pat	pad-i	pad-il	pad-e, pad-esə

This result is puzzling given that in production of adult Korean, using an isolation form of obstruent-final noun in inflection is the least preferred variant; a coronal obstruent followed by nominative form is not allowed at all in adult Korean since coronal obstruents should be modified as [c] before high front vocoid due to palatalization, and a coronal obstruent is rarely produced before accusative and locative suffix either (Choi 2004). The percentage of a variant using an isolation form by younger children and adults in the current study is given in (10). As clearly compared, it is only among younger children who prefer to use an isolation form in inflection. The findings suggest that it is not frequency in the input that determines the pattern of younger children's production, but rather their preference to produce form more faithful to an isolation form.

(10) The percentage of using a isolation form as a inflectional stem

	NOM	ACC	LOC
Younger children	74%	86%	93%
Adults	0%	0%	6%

In sum, younger children showed two different ways of alternations, either totally avoid alternation by not adding a suffix (Experiment 1) or by innovating a form by minimal modification when suffixation is required (Experiment 2). Older children, on the other hand, produce the most frequent variant for each suffixed form and adults show variants with suffix-specific as well as lexical-specific preference. As proved in Experiment 2, younger children do know how to suffix obstruent-final nouns. Therefore, I claim that the two strategies observed among younger children are to make forms faithful to an isolation form. Assuming that an isolation form is a base of Korean noun paradigms (Ko 2006), it is children's tendency to make inflected forms more faithful to a base form of a paradigm. In terms of OT constraints, children innovate forms that can better satisfy Base-Derived Identity (BD-IDENT) constraints. According to McCarthy (1998), the requirement for outputs to be faithful to other outputs in a paradigm, or a set of Output-to-Output Faithfulness constraints, are high a priori in child grammar, in order to learn the absence of some patterns of phonological alternations. Borrowing his idea, I claim that the observed younger children's production is to satisfy highly ranked BD-IDENT constraints, a type of Output-to-Output Faithfulness constraints.

If BD-IDENT constraints are too highly ranked in child grammar therefore that triggers younger children to deviate from adults, and if constraints that were wrongly promoted in child grammar will be re-ranked toward their preferred low positions (Hayes 2004), can we predict the observed three stages of learning by modeling a grammar in forms of constraint demotion? In other words, can the three stages of learning be emerging in the course of demoting highly ranked BD-IDENT constraints? Learning simulation in the following section shows that the grammar trained purely by the frequency of different alternations in Korean give rise to the attested three stages of learning.

3. Learning simulation

3.1. Training

The learner is assumed to have a set of constraints, and weights them according to the frequency of violations in the data. Following Hayes (2004), learning is simulated in two stages: phonotactic and morphological learning. The phonotactic learning stage models the fact that prior to learning morphology, learners may master some phonotactic distributions. From Sejong Corpus of spoken Korean (Kim and Kang 2000), 680 most frequent Korean nouns were categorized into 12 groups, according to the place and manner of articulation of a stem-final segment. Data was constructed by pairing each stem type with 10 most frequent affixes including nominative, accusative and locative markers, yielding 120 noun forms. Training data was given in forms of OT tableaux. The underlying form is assumed to be same as the output. A winner candidate gets its frequency based on the corpus.

(11) Training data for learning intervocalic voicing

UR	Output	Frequency	*[-SON,+V]	*[+V][-V][+V]	IDENT-IO (v)	IDENT-IO (v)/_(+SYL)
.. ibi	..ibi	12924	1			
	..ipi			1	1	1

When the model encounters surface forms violating constraints, it weight constraints according to the frequency of violations in the data by using Maximum Entropy. The training was helped by MaxEnt Grammar Tool (Hayes 2009), which enables to feed the model input data in forms of OT tableaux. After learning, a set of trained (MaxEnt) weight for a grammar is generated and the predicted probabilities are assigned to each candidate.

Phonotactic learning was successful, in that trained grammar was able to predict phonotactically legal outputs of nonce words, by correctly applying intersonorant voicing (12a), intersonorant flapping (12b), neutralization of laryngeal contrast to it's lenis stop counterpart at the coda position (12c), neutralization of consonant cluster at coda position (12d) and the combination of rules as in (12e).

- (12) a. apa → aba intersonorant voicing
 b. ala → ara intersonorant flapping
 c. akʰ → ak neutralization of laryngeal contrast
 d. alk → ak neutralization of consonant cluster
 e. alp^h → ap (c) and (d)

After phonotactic learning, the learner has a set of weights that serve as the starting point for morphological learning. Assuming that a learner initially has high-ranking BD-IDENT constraints, a set of BD-IDENT constraints was given initial weights higher than trained weights of Markedness constraints. And Input-Output Identity constraints were ranked below Markedness constraints.

BD-IDENT constraints demand forms to be faithful to the base, which was assumed to be an isolated form, following Ko (2006). The training for the morphological learning employed representative frequencies of different inflected forms according to the corpus. For obstruent-final nouns showing variations, multiple outputs were fed to the learner with their relative frequency, adapted from a survey by Jun (2009) and Choi (2004). The expectation was that the more often a given alternation occurs in the data, the more the relevant BD-IDENT constraints will be demoted.

The size of the input gradually increased, to model different stages of learning. The idea behind this way of simulation was simple; the older learner becomes, the more input it gets. The ratio of each input were constant and the actual size of input at each learning stage increased based on the ratio; for example, the ratio of the five variants of obstruent-final nouns was kept as 52% for [s], 21% for [ch], 18% for [th] 2% for [c] and 0% for [t] for accusative forms according to the corpus, and the input size gradually increased such as 5.2 of [s] at the first stage, 52 for the next and 5200 for a later stage. The more data a model has, the better it is able to approximate the weight of constraints. Therefore greater amount of data overcomes the bias, sigma², which prefers to stick to the original weight of constraint unless the model finds outputs that violate a constraint.

3.2. Results

The grammar started with higher weight for BD-IDENT constraints than Markedness constraints, but after it was fed input data, some of BD-IDENT constraints were demoted below Markedness constraints. At this stage, a set of IO-IDENT constraints still remained in very low ranking, therefore it did not influence outcome. Four of BD-IDENT constraints that were demoted below their relevant Markedness constraints are in (13). The grammar in (13) shows that the model is able to apply general phonotactics in Korean to inflected forms.

- (13) a. Intersonorant voicing
 *[+SON][-V][+SON] >> *[+SON, +V] >> BD-ID [V]
 b. Intersonorant flapping
 *[+SON][+LAT][+SON] >> *[r] >> BD-ID [LAT]
 c. Palatalization
 *[+SON][+ANT, -DIS][+SON] >> *[j] >> BD-ID[+ANT, -DIS]/_[-i]
 *[th][-i] >> BD-ID [th]/_[-i]
 BD-ID [t]/_[-i] >> *[t][-i] (not mastered yet)

Crucially, the grammar at this stage predicts the most probable inflected form of obstruent-final nouns as in (14), which is exactly what younger children produced in their early stage of learning. At this stage of simulation, the model prefers the minimally alternating paradigm, which is not like adult Korean but like early stage Korean.

- (14) The most probable outputs that the grammar predicts and younger children's production

	Grammar	Children
a. NOM: d-i	86%	74%
b. ACC: d-il	83%	86%
c. LOC :d-e	79%	93%

When the model was fed more data, it mastered palatalization (13c) by demoting BD-ID [t]/_[-i] below *[t][-i], and mastered alternations by demoting more BD-IDENT constraints as in (15). At this stage, the most probable inflected forms of obstruent-final nouns were changed from early stage of simulation and a variant [s] shows the highest probability before all inflectional suffixes, as in (16). There is a gap between the grammar's prediction and the experimental results, since [t^h] was most preferred for locative form by older children in the experiment. For nominative and accusative form, however, the most probable output is what older children produced, in which they choose a most frequent adult form for each suffixed forms.

- (15) ASSIBILATION >> BD-ID [STRID], BD-ID[STRID]/_[-i]
 *[t][-il] >> BD-ID [STRID], BD-ID[STRID]/_[-il]
 *[t][-e] >> BD-ID [STRID], BD-ID[STRID]/_[-e]
 *[t][-esə] >> BD-ID [STRID], BD-ID[STRID]/_[-esə]

- (16) The most probably outputs from the grammar's prediction and from older children's production

	Grammar	Children
a. NOM: s-i	91%	84%
b. ACC: s-il	85%	96%
c. LOC :th-e, s-e	23%, 63%	43%, 32%

When the model was fed more data, up to 500 times of initial input size, BD-IDENT constraints were all demoted below a set of Markedness constraints. This means that the learner is able to re-rank BD-IDENT constraints that had been ranked too high. The attested suffix-specific preference among adults is also predicted; for example, before a locative suffix [t^h] is preferred over [c^h] and before an accusative suffix, it was opposite, as it was observed in Experiment 1 and 2.

More data caused some Markedness constraints to be demoted below IO-IDENT constraints, which results lexical-specific variations. Specifically, different variants are predicted for different underlying forms of obstruent-final nouns and more faithful realization of underlying form is more favored as in (17). This tendency reflects the attested lexical-specific preference among adults in the current study, and it is in line with previous studies that revealed the preference of variants that are faithful to an underlying forms (Kim 2003, Choi 2004, Kang 2004).

(17) Lexical-specific preference

- a. /t^h-il/ : [s] (58%)>> [t^h] (26%)>> [c^h] (11%)>> [c] (5%), [t] (<1%)
 b. /c^h-il/ : [s] (62%)>> [c^h] (29%)>> [t^h] (4%)>> [c] (3%), [t] (<1%)

Thus, in the final learning stage, all of too highly-ranked BD-IDENT constraints are demoted below Markedness constraints and some of Markedness constraints are interacting with initially very low-ranked IO-IDENT constraints. As a result, the model was able to produce unmarked forms by overcoming a priori bias, which strongly requires to inflect forms faithful to its base form in a paradigm, and it also learned that preferred outputs for each lexical-item are different depending on its underlying form.

To conclude, the grammar trained purely on the frequency of different alternations was able to predict the attested three learning stages, in which younger children first produce only faithful variant to a base form, and they master suffix-specific preference of variants and finally adults' stage when lexical-specific variation is mastered. Therefore, the results demonstrate that the statistics of Korean can give rise to the attested learning stages.

4. Conclusion

Experiments in this study show two ways in which children's use of inflected forms in Korean deviate from adult usage, and provides a unified account. Either by avoiding suffixation or by applying minimal modification when suffixation is required, younger children aged 4;2 to 5;8 produce forms that are faithful to a base form of noun paradigms. I argue that this is due to grammatical preference among younger children that requires non-alternating paradigm (Kenstowicz 1996). Specifically, the constraints requiring outputs faithful to a base form, BD-IDENT constraints are very highly ranked in child grammar (McCarthy 1998), thus they avoid alternations in early stage of learning. In the later stage of learning, aged 6;2 to 7;9, older children master alternations reflecting suffix-specific preference, but not lexical-specific preference of obstruent-final nouns' variants among adults' production. As for adults, the current study using picture description task found that they show lexical-specific and suffix-specific preference for the alternation of obstruent-final nouns, as reported in previous corpus study (Choi 2004) and nonce word experiment (Jun and Lee 2007).

Assuming highly ranked BD-IDENT constraints (McCarthy 1998), learning simulation in this study investigated whether the attested learning stages can naturally emerge in the way of re-ranking sets of constraints. I fed the model with the frequency of alternations from an adult speech corpus and checked if the model can re-weight constraints just by exposing the rankings to probabilistic data from the corpus. The model was able to predict the attested three learning stages, in that predicted outputs match with the attested production data in each age group in the experiments. Therefore, the current study suggest that the three stages of learning Korean noun paradigms are predicted by training a grammar with statistical distribution of alternations.

References

- Albright, Adam (2005). The morphological basis of paradigm leveling. In *Paradigms in Phonological Theory*, ed. Laura Downing, Tracy Alan Hall, Renate Raffelsiefen, 17-43. Oxford: Oxford University Press.
- Choi, Hyewon (2004). A survey of standard pronunciation III. Seoul: The National Academy of Korean Language.
- Hayes, Bruce (1998). On the richness of paradigms, and the insufficiency of underlying representations in accounting for them. Handout for Stanford talk, Apr. 2, 1998.
- Hayes, Bruce. (2004). Kager, Rene, Pater, Joe, and Zonneveld, Wim, (eds.), *Fixing Priorities: Constraints in Phonological Acquisition*. Cambridge University Press.
- Jun, Jongho and Jeehyun Lee (2007). Multiple stem-final variants in Korean native nouns and loanwords. *Eoneohag* 47: 159-187.
- Kang, Yoonjung (2003a). Sound changes affecting noun-final coronal obstruents in Korean. In *Japanese/Korean Linguistics 12*, ed. W. McClure, 128-139. Stanford: CSLI
- Kang, Yoonjung (2003b). The emergence of phonetic naturalness in an analogical change: evidence from Korean nouns. Handout for LANYU Forum.

- Kenstowicz, Michael (1996). Base identity and uniform exponence: Alternatives to cyclicity. In J. Durand and B. Laks (Eds.), *Current Trends in Phonology: Models and Methods*, 363–394. University of Salford.
- Kim, Jin-hyung. (2005). A reconsideration of phonological leveling: A case of noun inflection in Korean. *Studies in Phonetics, Phonology and Morphology* 11.2: 259-274.
- Kim, Seoncheol (2003). A survey of standard pronunciation II [phyocunpalum silthecosa II] Seoul: The National Academy of Korean Language.
- Kim, Hung-gyu and Kang, Beom-mo (2000). Frequency analysis of Korean morpheme and word usage 1. Seoul: Institute of Korean Culture, Korea University.
- Ko, Kwang-Mo (1989). Explaining the noun-final change $t \rightarrow s$ in Korean. *Eoneohag* 11: 3-22.
- Ko, Heejeong (2006). Base-output correspondence in Korean nominal inflection. *Journal of East Asian Linguistics* 15: 195-243.
- Martin, S. E. (1992). *A reference grammar of Korean*. Tokyo: Charles E. Tuttle.
- McCarthy, John (1998). Morpheme structure constraints and paradigm occultation. *CLS* 34, *Vol. II: The Panels*.

Proceedings of the 29th West Coast Conference on Formal Linguistics

edited by Jaehoon Choi, E. Alan Hogue,
Jeffrey Punske, Deniz Tat,
Jessamyn Schertz, and Alex Trueman

Cascadilla Proceedings Project Somerville, MA 2012

Copyright information

Proceedings of the 29th West Coast Conference on Formal Linguistics
© 2012 Cascadilla Proceedings Project, Somerville, MA. All rights reserved

ISBN 978-1-57473-451-5 library binding

A copyright notice for each paper is located at the bottom of the first page of the paper.
Reprints for course packs can be authorized by Cascadilla Proceedings Project.

Ordering information

Orders for the library binding edition are handled by Cascadilla Press.
To place an order, go to www.lingref.com or contact:

Cascadilla Press, P.O. Box 440355, Somerville, MA 02144, USA
phone: 1-617-776-2370, fax: 1-617-776-2271, sales@cascadilla.com

Web access and citation information

This entire proceedings can also be viewed on the web at www.lingref.com. Each paper has a unique document # which can be added to citations to facilitate access. The document # should not replace the full citation.

This paper can be cited as:

Do, Young Ah. 2012. Learning Alternations in Korean Noun Paradigms. In *Proceedings of the 29th West Coast Conference on Formal Linguistics*, ed. Jaehoon Choi et al., 319-327. Somerville, MA: Cascadilla Proceedings Project. www.lingref.com, document #2717.