The full vs. partial reduplication in Korean *sālsal* and *sălili*: A case for over- and under-application[*]

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The reduplication in Kor. *sālsal* and *sălili* 'gently' presents interesting phonological problems in 1) what should be the underlying base, *sal or *salɨ*? and 2) how the length alternation should be explained. In this paper I first present a serial analysis in which these examples are explained as cases of over- and under-application, and then examine how it compares with a similar analysis in recent frameworks, e.g. the Correspondence Theory of McCarthy and Prince (1995), transderivational identity of Benua (1997) and the Stratal/ LPM-OT of Kiparsky (2000). The main conclusion drawn is that Wilbur's (1973) Identity Constraint, which facilitates explanation of the reduplicative identity in languages but causes all kinds of problems for traditional rule ordering, can be better understood if we take into account the rule persistency and productivity, as envisioned by Chafe (1968) and Chen (1972).

Keywords: reduplicative identity, over- and under-application in Korean reduplication, rule persistency and productivity.

1. Introduction

A set of full vs. partial reduplication examples in Korean exhibits a number of interesting phonological problems. Consider the data in (1):

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1) The full vs. partial reduplication in Korean: sample data

full red.	partial red.	gloss
sālsal	sălɨlɨ	gently
tōltol	tŏlɨlɨ	with a twirl
cūlcul	cŭlɨlɨ	flowing
tāltal	tălɨlɨ	stirring
tīltɨl	tĭlɨlɨ	smoothly
hwālhwal	hwălɨlɨ	furiously (fire)

The first question that arises is: What is the proper base form, *sāl- or *sălɨ-? Another question is: how are the two reduplicated forms, *sālsal* and *sălɨlɨ*, related to each other?

In the literature two positions exist regarding these questions: Y-S. Kim (1984) has assumed *sal- as the underlying base with (morphological) emphatic /l/-gemination and /ɨ/-epenthesis, while O-M. Kang (1998) contends that *salɨ- is a stem extended from *sal- although no explanation is offered of why such extension occurs only in this particular class of reduplication.

An important fact to keep in mind in answering these questions is the vowel length alternation: Although previously overlooked, the vowel is long in the first syllable of the fully reduplicated *sālsal* but short in the partially reduplicated *sălɨlɨ*. This shows that it is not just a question of whether the so-called minimal vowel /ɨ/ is inserted (as in Kim's analysis) or deleted (as in Kang's analysis) but also how the length alternation has arisen: Is it by lengthening from an underlying short vowel or by shortening from an underlying long vowel?[1]

2. Explanation of vowel length alternation

A similar length alternation occurs in certain irregular verbs of Korean:

2) Vowel length alternation in Korean verbs

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[1] The vowel length variation is much more complex than what appears here, due to the so-called 'expressive length' that often appears in sound symbolic words and the fact that the length contrast is in the process of being lost in modern Korean. Despite these complications, I regard the initial syllable to be *categorically* long in the fully reduplicated *sālsal* but short in the partially reduplicated *sălɨlɨ* believing that the variant short vowel sometimes observed in full reduplications, e.g. *sălsăl* is a problem that should be dealt with in a separate sociolinguistic study. A detailed analyis of this vowel length variation in ideophonic words will be included in the full version of the paper in preparation.

Infinitive	Continuative with a/ə	
kə̄t-ta	kə̆rə	"walk"
tō̆p-ta	tŏwa	"help"

Past analyses have maintained that the vowel is underlyingly long but becomes short before a vowel-initial suffix. (P-K. Lee 1979). But vowels are usually lengthened in an open syllable but shortened in a closed syllable e.g. OE *năma* ME *nāma* NE *name* but *kept* [kɛpt] <*kēp-t* (cf. inf. *keep* OE *cēpan*). A better analysis is thus made available if we assume that the vowel is originally short but lengthened, not in a closed syllable, but as a result of compensatory lengthening (CL):

3) Vowel lengthening explained:[2]

kətV-ta	kətV-ə	
"	kətə	vowel truncation: V → Ø / ___ + V
kətta	"	syncope
kə̄tta	"	compensatory lengthening
"	kərə	lenition: t → r /V__V

The additional vowel assumed in the stem final position is most likely to be /ɨ/ because in the same type of vowel length alternation observed in reduplication, this minimal vowel drops after /l/ compensatorily lengthening the preceding vowel:

4) Apocope and compensatory lengthening in the base of *sālsal*

sali
sal   apocope: ɨ → Ø / l___ #
sāl   compensatory lengthening

Although rarely mentioned in current phonological theories, such preferential elision of a vowel is quite common. Note, for example, Lt. nom. *homo* (<*homon) gen. *hominis* 'man' but Lt. nom. *caro* (<*caron) gen. *carnis* (<*caron-is) 'flesh' where medial /o/ weakens to /i/ in the former but drops out (by syncope) in the latter because it occurs after the liquid /r/. This preferential vocalic elision has to do with the greater sonority of the liquids over the nasals and obstruents,

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[2] See Ramsey (1978) for further details of this analysis.

although a detailed explanation is beyond this paper.[3]

3. Rule-based serial analysis

A traditional analysis with linear ordering of rules could derive the partially reduplicated *salɨlɨ* in (1) by final CV reduplication of the base **salɨ-*, while the fully reduplicated *sālsal* could receive an explanation summarized in (5):

5) Derivation of *sālsal*

    salɨ
    sal   apocope
    sāl   compensatory lengthening
    sālsāl   copy(reduplication)
    sālsăl   shortening in noninitial syllables

For examples of the last rule, note: *nūn* 'snow' but *hampaknŭn* 'large flakes of snow'.

    There are at least two problems with this analysis: 1) Why does the same combination of apocope and subsequent compensatory lengthening fail in the partially reduplicated *salɨlɨ* (i.e. why not *¢salɨl*[4])? 2) Why do the phonological processes of apocope and compensatory lengthening precede reduplication, a morphological process?

    An answer to the first question was provided by Wilbur (1973), who has proposed the constraint of reduplicative identity.

6) Reduplicative identity in *salɨlɨ*:

    salɨ-
    salɨ-lɨ   CV-suffixing reduplication
    salīl   apocope and compensatory lengthening
    salīlī   copy (identity constraint in reduplication)
    salɨlɨ   shortening in nonintial syllables

The failure of /ɨ/-apocope in the partially reduplicated *salɨlɨ* is thus a typical case of underapplication in reduplication: Apocope (and CL) should occur to this form according to the rules in Korean but it fails, or underapplies, due to the identity constraint in reduplication.

As for the second question, we could assume, as in (6) above, that reduplication, a morphological process, does precede any phonological rules, giving *salɨsalɨ*. Application of apocope and compensatory lengthening to this intermediate form yields *salɨsāl*, to which reduplicative copying applies again eventually leading to the correct surface form:
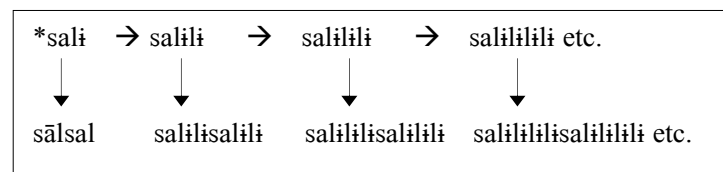
7) Reduplicative identity in *sālsal*:

    salɨ
    salɨ-salɨ   full reduplication[5]
    salɨsāl   apocope and compensatory lengthening
    sālsāl   copy (identity constraint in reduplication)
    sālsăl   shortening in noninitial syllables

This reanalysis shows that the reduplicative copying in *sālsăl* is indeed a case of overapplication: The effect of apocope and CL is carried over from the base to the reduplicant even though the condition for these rules is not met.[6]

Not all cases of full reduplication can be explained this way however. Consider the following expansion of full and partial reduplication, all from the base *salɨ*:

8) Expansion of reduplication from the base *salɨ*:

| *salɨ → salɨlɨ → salɨlɨlɨ → salɨlɨlɨlɨ etc. |
| sālsal   salɨlɨsalɨlɨ   salɨlɨlɨsalɨlɨlɨ   salɨlɨlɨsalɨlɨlɨlɨ etc. |

The above examples show that while the first full copy of the base occurs as in (7), a simple, naïve copying of the base (i.e. without apocope and CL) is productive with the bases newly created by the CV-suffixing partial reduplication.[7] A rule-based analysis equipped only with traditional linear ordering cannot cope with this productive reduplication, as will be discussed in more detail below. But let us first consider some recent proposals for reduplication analysis in Optimality Theory (OT).

4. Optimality-Theoretic analyses

The Correspondence Theory of M&P (1995) gives the following ranking schema for underapplication:

9) Ranking schema for underapplication

BR-identity, Blocker-constraint»Trigger constraint»IO-faithfulness

For an alternative analysis under this framework, we establish *Lɨ]$_w$ as the trigger constraint, which prohibits any surface /ɨ/ in word final position after a precedent liquid. For the blocker constraint, usually the antagonist of the trigger constraint, we could use the anti-apocope constraint *Final-V*. The following tableau then illustrates how this ranking correctly chooses the underapplication candidate as optimal:

10) Tableau for *salɨlɨ*

*salɨ-$_{partRED}$	Max-BR	Final-V	*Lɨ]w	Max-IO
☞salɨlɨ			*	
salɨl	*!	*		
sall		*!		*
sallɨ	*!		*	*

The replacement of the rule-based approach with a constraint-based one thus seems to work well for the partial reduplication case. But does it also work for the full reduplication case, e.g. *sālsal*?

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[7] Theoretically the partial copying (and the subsequent full reduplication) could go on *ad infinitum* but a Google search reveals that quadruplication is the practical maximum. The difference obviously has to do with the distinction between linguistic competence and performance.

According to M&P (1995), the ranking schema for overapplication is:

11) Ranking schema for overapplication

BR-identity, Well-formedness»IO-faithfulness

Here the constraints are the same as in the underapplication case, except the blocker constraint, *Final-V*, not required in the schema. But the problem is complicated by the vowel length incurred by apocope and compensatory lengthening, which presumably is compelled by *Lɨ]ᵥᵥ* dominating over the faithfulness constraint *Max-μ-IO*.[8] In addition, we need *(v̄,[σ__)* to ensure no surface long vowels in noninitial syllables (recall *nūn* 'snow' but *hampaknŭn* 'large flakes of snow'). Embedding these constraints into the overapplication ranking schema (11), however, results in selection of a wrong candidate.

12) Tableau for *sālsal*

fullRED-*salɨ(μμ)	*(v̄,[σ__)	Max-BR	*Lɨ]w	Max-μ-IO	Max-IO
☞salɨsalɨ			*		
salɨsāl	*!	*			*
salɨsăl		*		*!	*
☹sālsăl		*		*!	*
sālsāl	*!				*

This is because the two high ranking constraints, *(v̄,[σ__)* and *Max-BR*, are satisfied by the naïve copy candidate *salɨsalɨ*, but one of them is violated by *sālsăl* and *sālsāl*, the overapplication candidates. Since the violation marks in high ranking constraints are crucial, and both of these constraints should rank high to ensure reduplicative identity and no surface long vowel in noninitial syllables, there is no way to fix the problem by reranking the constraints.

4.1 Sympathy

Note, however, that opaque cases such as these have called for a new type of constraint, namely 'sympathy', which dwells on the output-to-output relation between the candidates (cf. McCarthy 1999). In (12) *sālsāl* is the most harmonic of the candidates that satisfy the selector constraint *Max-μ-IO*, which is thus the 'flower' candidate. The sympathy constraint, *Max-O⊛*, marks any violation of faithfulness between this flower candidate and the other candidates. As we can see in (13), due to this sympathy constraint the naïve application candidate *salɨsalɨ* loses out to the opaque candidate *sālsăl*.

13) Tableau for *sālsăl* under 'sympathy'

fullRED-*salɨ(μμ)	*(v,[σ__)	Max-O⊛	Max-BR	*Lɨ]w	Max-μ-IO	Max-IO
salɨsalɨ		**!		*		
salɨsāl	*!	*	*			*
salɨsăl		**!	*		*	*
☞sālsăl		*	*		*	*
⊛sālsāl	*!					*

Applying this sympathy analysis to the newly created productive reduplication *salɨlisalɨlɨ* in (8), however, will choose the incorrect overapplication candidate *¢salɨlsalɨl* as optimal. To have the correct form chosen, one has to abandon sympathy and go back to the analysis in (12). But this results in two different analyses for the same phenomenon of full reduplication in Korean. Another problem is how to explain the relationship between the two fully reduplicated forms: *sālsal* is based on the input **salɨ*, but *salɨlisalɨlɨ* on the input *salɨlɨ*. How is one to know that these two inputs are related to each other by partial CV-suffixing reduplication?
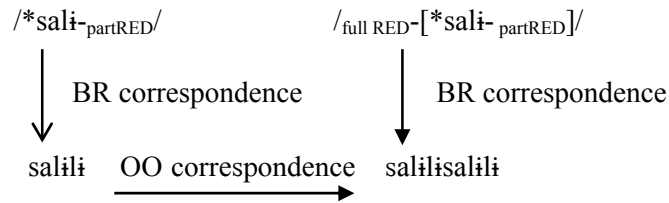
4.2 Transderivational identity

A way out of this problem is perhaps suggested by the 'transderivational identity' analysis of Benua (1997), where a new type of 'output-to-output' (OO) correspondence is set up between morphologically related output forms. In this framework, the reduplication in *sālsal* (based on the input **salɨ-*) may be explained by calculating BR correspondence but the reduplication in *salɨlisalɨlɨ*,

(based on the partially reduplicated 'output' form *salɨlɨ*), by calculating the OO correspondence, as in (14a) below. (14b) shows how these relations are evaluated in parallel against a recursive constraint hierarchy.

14)

    a. BR and OO correspondences:

/*salɨ-partRED/   /full RED-[*salɨ- partRED]/

      ↓ BR correspondence   ↓ BR correspondence

salɨlɨ   OO correspondence →   salɨlɨsalɨlɨ

    b. Tableaux for *salɨlɨsalɨlɨ*:

      Recursion (A)

*salɨ-partRED	Max-OO	Max-BR	Final-V	*Lɨ]w	Max-IO	>>
☞salɨlɨ				*		
salɨlɨ				*		
salɨl		*!	*			
salɨl		*!	*			

      Recursion(B)

>>	fullRED[*salipartRED]	Max-OO	Max-BR	Final-V	*Lɨ]w	Max-IO
	☞salɨlɨsalɨlɨ				*	
	salɨlɨsalɨl	*!		*		
	salɨlsalɨl	*		*		*
	salɨlɨsalɨl	*	*		*	

    Note, however, that since Benua's model deals only with the reduplication in *salɨlɨsalɨlɨ*, it would still need 'sympathy', which is another form of OO correspondence, to explain the reduplicative identity in *sālsal*. This means that we still need two different analyses for the same phenomenon of full reduplication, in addition to the BR correspondence and under-application ranking for partial reduplication in (10). But more importantly, there seems to be no theory-internal motivation for the OO correspondence other than the

fact that the analysis based on simple BR correspondence does not work.[9] This is in contrast to the revised serial analysis to be presented below where the seeming aberrant behavior of *salilisalili* is attributed to the time factor, namely that this reduplication in question is relatively a recent formation.

4.3. The Stratal/LPM-OT analysis

The LPM-OT, an Optimality Theoretic adaptation of traditional Lexical Phonology and Morphology, distinguishes three levels: stem-level, word-level and phrase level. Under this framework the reduplication of **sali-* to *salili* and *sālsal* occurs in the stem level, but the reduplication of *salili* to *salilili* and *salilisalili,* presumably, in the word-level. Since the stem-level naturally precedes the word-level (which in turn precedes the postlexical phrasal level), the reduplications based on the stem **sali-* should, by definition, precede those based on the (by now) word *salili*. This may render the sympathy constraints as well as the OO-constraints of Benua (2007) effectively unnecessary, still maintaining a measure of parallelism in each level (cf. Kiparsky 2000).

There are, however, problems with this analysis. Like the above Correspondence-Theoretic analysis, LPM-OT has to posit different constraint rankings not only between stem and word levels but also between lexical and postlexical levels. For the full reduplication in *sālsal*, on the stem level *Max-BR* and **Li]$_W$* have to dominate *Max-µ-IO* for the overapplication effect of 'apocope and compensatory lengthening' in **sālsāl*, which then shortens the noninitial vowel on the postlexical level by promoting the constraint **(V̄,[σ__]* to the top rank. For the productive reduplication in *sălilisălili* on the other hand, the underapplication ranking *Max-BR>>*Li]w>>Max-IO* has to hold in the stem level to yield the base *salili* which then undergoes full reduplication in the word level under the ranking *Max-IO >>*Li]w, Max-BR* to make sure the naïve application candidate *sălilisălili* wins over the overapplication candidate *¢salilsalil*.[10]

We note that LPM-OT does away with sympathy and OO

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[9] Note, for example, *sālsal* from **$_{fullRED}$sali* does not have the same OO correspondence with *salili*.

[10] Kiparsky (2007) suggests alliance of LPM-OT with Morphological Doubling Theory of Inkelas and Zoll (2005), which, he argues, negates any necessity not only of OO correspondence but also of BR and IR correspondences. But the same problems are encountered in this revised framework, as will be explained in the full version of this paper.

correspondence only at the expense of setting up three ordered levels, while the parallel OT of McCarthy (1999) and Benua (1997) has sympathy and OO correspondence but no ordered levels. This observation reveals an interesting point. Sometimes we fix the grammar to resolve problems, but these problems are so intrinsic that they will not go away: they only get 'displaced' to other corners of the grammar. This is like when one tries to push down one side of a sufficiently inflated balloon, the other side will bloat out and vice versa. This 'balloon effect' often indicates that the root of the problem is elsewhere. With the productive reduplications of the type *sălilisălili*, it has to do with the time factor, with the fact that these are new innovations based on the temporally precedent partial reduplication of the type *salili*.

5. A revisit to rule-based serial approach: the time dimension

Let us now look again at the serial model, which I believe still has many advantages such as listed in (14):

14) The advantages of the traditional serial approach:

1. The underlying stem **sali-* is shared by all reduplicative derivatives; the base groups the derivatives under one roof.
2. Apocope and compensatory lengthening are natural (universal) phonological processes, which occur in languages independent of reduplication.
3. The derivation, in which rules are linked in particular order, provides a natural explanation of opacity problems (such as observed in *sālsal* and *salili*) and is well suited to express the time dimension of rule interaction.
4. Thanks to Wilbur (1973) and M&P (1995), the identity constraint has been well established in reduplication, which, through interaction with apocope and compensatory lengthening relates the non-surface-apparent full reduplication such as *sālsal* to its partial reduplication sister *salili*.

Despite these advantages, the rule-based approach has been criticized for failing to constrain the power of the derivational machine, as in, for example, (5) where phonological processes are

freely allowed to apply prior to morphological operations. In response to these criticisms, we therefore propose the following principle of rule ordering in phonology.

15) Principles of rule ordering
    1. Morphological operations precede phonological operations.
    2. Rules may occur repeatedly in the course of a derivation as long as their structural description is met at the time of occurrence, which may result in interruption between rules.

Indeed we have already adhered to these principles while deriving the over- and under-application cases of reduplication in (6) and (7), which, presented here in a combined comparative derivation (16), shows the workability of a revised serialist model.[11]

(16) Linear derivation of *sālsal* and *salɨlɨ*:

salɨ	salɨ	
salɨ-salɨ	salɨ-lɨ	copy
salɨ-sāl	salī-l	apocope and CL
sāl-sāl	salī-lī	copy
sālsăl	salɨlɨ	shortening in noninitial syllable

    The central question regarding a persistent derivation such as this is: Why does copying operation occur repeatedly? The answer is that the repetition indicates the productivity and persistence of the morphological process of reduplication in Korean, a consequence of the reduplicative identity constraint (cf. Wilbur 1973). In keeping with this productive status in Korean, the copy mechanism occurs once again to the partially reduplicated *salɨlɨ*, however, this time without apocope and compensatory lengthening, giving *salɨlɨlɨ* and *salɨlɨsalɨlɨ*.

(17) Derivation of *sālsal, salɨlɨlɨ* and *salɨlɨsalɨlɨ*

salɨ	salɨ-	salɨ-	
salɨsalɨ	salɨlɨ	salɨlɨ	copy

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[11] M&P (1995) object to this type of 'persistent' serial derivation because in Malay over-application, iterative copying and nasal spreading sometimes results in endless pathological loop and the case of the base copying the reduplicant cannot be obtained in a serial analysis, in which copying operation could occur only in one direction: from the base to the reduplicant but not vice versa. For an alternative interpretation of Malay data, see Kiparsky (2007).

salɨsāl	salɨ̄l	salɨ̄l	apocope & CL
sālsāl	salɨ̄lɨ̄	salɨ̄lɨ̄	copy
sālsăl	salɨlɨ	salɨlɨ	shortening in noninitial syllable
N/A	salɨlɨlɨ	salɨlɨsalɨlɨ	copy[12]

But why should apocope and compensatory lengthening fail to occur again to these new reduplicative forms? Again the answer lies in rule productivity: unlike the reduplicative copying mechanism, these rules are no longer productive in modern Korean, as evinced by the failure of their application in loans such as e.g. *milɨ* 'Mir (name of the Russian space station)'.

These full and partial reduplications are a repetition of the old reduplication rule but a new addition in the language, and as Chafe (1968) notes, such newly added rules typically enter into the system as a productive rule, at depth I, where all the productive rules occur. In terms of time relations between rules as proposed by Chen (1972), there is an 'incorporating' relationship between the copying operation and apocope and CL, while it is competing with another productive rule, the shortening of long vowels in noninitial syllables.

A conclusion that emerges from this alternative serialist analysis is that when the source of opacity and other surface irregularity is in the 'time relations between rules', ignoring the time dimension lead to all kinds of difficulties in any framework attempting to explain such multiple opacity problems as the full and partial reduplication of the base *salɨ* in Korean.[13]

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[12] The fully reduplicated *sālsal* cannot undergo further reduplication because bases with a final consonant undergo partial reduplication in Korean only when that consonant is a velar, e.g. *culuk>cululuk*, (cf. H-S. Kim 2005: 297), while a copying (overwrite) operation could result in *sălsăl* with yet another vowel length identity between the reduplicant and the base. As mentioned in footnote (1), this short-vowel variant does appear in some dictionaries and in the speech of younger generation. The productive reduplicative copying, then, is one of the contributing factors for this variant, another being the loss of length distinction in progress in Korean.

[13] Readers are referred to the full version of this paper (in preparation) for a more elaborate discussion of these issues. For the concept of time dimension, see Wang (1969) whose theory of lexical diffusion is based on the tenet that 'phonological rules take time to be implemented'. Chen (1972) has given this tenet a substantive role in sound change, showing various types of time relation between rules.

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