Non-inflectional Multiple Exponence in Nuu-chah-nulth: The Case of Multiple Occurrences of Alternation-accompanying Affixes*

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This study examines word-internal base modifications (i.e., vowel lengthening/shortening and/or reduplication) accompanied with non-inflectional suffixes in Nuu-chah-nulth (Wakashan), focusing on multiple occurrences of the alternation-accompanying suffixes. When more than one such suffix occurs on any given word, the base modification occurs just once, regardless of vowel length adjustment or reduplication. This phenomenon is problematic to Templatic approaches in that the Template satisfaction condition of prosodic morphology is violated. This study provides a formal analysis within the framework of Word-and-Paradigm (WP), by expanding the WP approach to derivational morphology. By applying more than one Word Formation Rule to the same base, the lack of double reduplication/triple-long vowel is elegantly accounted for.

Keywords: base modification, alternation-accompanying affixes, Word-and-Paradigm, Nuu-chah-nulth, non-inflectional morphology

1. Introduction

This paper studies base-internal modifications (BMs henceforth) accompanied with[1)] non-inflectional suffixes in Nuu-chah-nulth (a

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1) I describe such processes as being 'accompanied with', rather than 'triggered by' suffixes in that I assume that two components (BM and a suffix) constitute multiple

Wakashan language), focusing on multiple occurrences of alternation-accompanying suffixes. Nuu-chah-nulth has a large number of derivational suffixes, which are also called lexical suffixes in traditional literature on Nuu-chah-nulth because such suffixes carry a lexical meaning, as in *-Piq* 'at the summit' and *-as* 'reaching to'. Derivational suffixes may accompany a few different types of BM. Some derivational suffixes accompany BMs, such as vowel lengthening (VL) *(/u-paal* → */uupaal* 'along with') and vowel shortening (VS) (*/iiH-aqaq* → */iH-aqaq* 'very big'); others appear with reduplication within a lexical base (*TuCiiH/iS* → *TuTuCiiH/iS* 'go to get sea urchins'); others can accompany both vowel length adjustment (VLA) and reduplication *(/ayajil/iS* → */aa/aayajil/iS* 'he is blaming lots'); and others are not associated with any of these processes (*hiixvatHiKuk/iS* → *hiixvatHiKuk/iS* 'someone looks angry'). Interestingly, when two or more such suffixes occur on any given word, alternations associated with the suffixes occur just once. For instance, as shown in (1a), if two VL-accompanying affixes, *-simj* and *-NaHi* co-occur in a word, the vowel in the first syllable is lengthened only once. Also, when any reduplication-accompanying suffixes, *yiml* and *-apa* co-occur in (1b), reduplication occurs once, rather than double reduplication appearing.

(1) a. /uusimjNahi
/u-simj[L][2]-NaHi[L]
REF[3]-to.do.ritual.for-ready.to
'ready to perform a ritual for it'
(Davidson 2002: 45)

b. MaaMaalyimlap
RED Mal-yiml[R]-apa[RL+L]
RED cold-at.shoulder-really
'He is really cold in the shoulders.'
(Rose 1981: 341)

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exponence. In this way, BMs in multiple exponence can be acknowledged as having a status that is equivalent or near-equivalent to that of suffixes.

2) [L] denotes that the suffix triggers vowel lengthening (VL) in the base; [R] reduplication; [RL] reduplication and VL in the reduplicant; [R+L] reduplication and VL in the base; [RL+L] reduplication and VL in the reduplicant as well as in the base; [R+S] reduplication and vowel shortening (VS) in the base; [L+S] the first syllable VL in the base and the second syllable VS in the base; [RS+S] reduplication and VS in the reduplicant as well as in the base

3) Abbreviations: 1 = first person; 3 = third person; S = single argument of canonical intransitive verb; IND = indicative; DEF = definite; DIM = diminutive; MOM = momentaneous; PASS = passive; PL = plural; POSS = possessive; PST = past tense; RED = reduplication; REF = referential base; REL = relative; REP.ITE = repetitive iterative

This study aims to formally account for such absence of double reduplication or triple vowel lengthening. Previous literature on VLA and reduplication-accompanying suffixes (Sapir and Swadesh 1939; Davidson 2002; ES Kim 2003, 2008; Stonham 2004, 2007) provides a consistent account of the patterns that result from these processes. Most studies successfully account for the relationship between process-triggering suffixes and the processes. However, importantly, when a word contains more than one such affix, templatic analyses (Davidson 2002; ES Kim 2003; Stonham 2004) have difficulties in formally accounting for the single realization of BM, violating the Template satisfaction condition (McCarthy and Prince 1990) of prosodic morphology.

The current study provides a formal account within the Word-and-Paradigm (WP) framework, expending the model to non-inflectional morphology. The WP model in this study is particularly designed to account for instances of multiple exponence (ME) that comprises a non-inflectional suffix and one or more than one BMs, occurring in derivational morphology of languages such as Nuu-chah-nulth, Central Yup'ik, and Korean. ME is a phenomenon in which two or more exponents are used simultaneously to express a particular morphosyntactic value in a word (Caballero 2008; Harris 2009; Matthews 1972, 1991, among others). The WP model has a few advantages over other morphological models in terms of an analysis for ME, both conceptually and practically. Firstly, the WP model considers a word or a stem as a unit of word formation. Thus, conceptually, this definition makes it possible to see a combination of co-occurring BM(s) and a suffix as a single constituent, rather than as separate morphemes. In this way, the analysis embraces these seemingly distinct processes (i.e., VLA and/or reduplication) as instances of one phenomenon: ME. Secondly, the WP model does not restrict the number of applications of WFRs that can apply to a single form. Practically, this characteristic makes it possible to account for the realization of more than one alternation. Thirdly, the WP model can properly account for a phenomenon that no double reduplication or a triple-long vowel occurs, even when there are two or more BM-accompanying suffixes in the same form. Thus, empirically, the

WP model demonstrates its advantage.

The remainder of this paper is organized as follows: §2 provides preliminary information on Nuu-chah-nulth. §3 examines multiple occurrences of accompanying affixes. §4 discusses theoretical assumptions for this study and proposes a WP model for non-inflectional morphology. §5 presents classification of affixes in Nuu-chah-nulth. §6 presents an analysis of ME of non-inflectional morphology in Nuu-chah-nulth within the framework of WP. §7 discusses alternative approaches. §8 summarizes and concludes.

2. Preliminaries

This section provides segmental inventories of Nuu-chah-nulth, the sources of the data used in the current study, and features of VLA and reduplication as a basis for understanding processes and the analysis.

2.1. Segmental inventory and data sources

Nuu-chah-nulth is a Southern Wakashan language spoken along the west coast of Vancouver Island, British Columbia, Canada. Like most other indigenous languages of the Northwest Coast, Nuu-chah-nulth is rich in consonants. Most stops, affricates, and sonorants have glottalized counterparts. Table 1 shows the consonant inventory in Nuu-chah-nulth. The alphabet in the inventory is in the Nuu-chah-nulth orthography.[4)]

In contrast, the vowel inventory is relatively simple. Three vowel qualities are phonemically distinctive: /i, u, a/; /u/ can be replaced by /o/ depending on the dialect. Also, the vowel length contrast is phonemically distinctive. Table 2 presents the Nuu-chah-nulth vowel inventory.

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4) IPA equivalents of the Nuu-chah-nulth (NCN) orthography

NCN	IPA	NCN	IPA	NCN	IPA
c	ts	J	tʃ’	Y	j’
C	ts’	X	x	y	j
S	ʃ	z	tl	H	ħ
j	t’	Z	tl’		

Table 1. *Nuu-chah-nulth Phonemic Consonant Inventory*

		Labial	Alveo-lar	Alveo-lateral	Alveo-palatal	Velar	Labio-velar	Uvular	Labio-uvular	Phary-ngeal	Lary-ngeal
Stops	Plain	p	t			k	kv	q	qv		
	Glottalized	P	T			K	Kv			?	/
Affricates	Plain		c	z	j						
	Glottalized		C	Z	J						
Fricatives			s	l	S	x	xv	X	Xv	H	h
Sonorants	Plain	m	n		y		w				
	Glottalized	M	N		Y		W				

Table 2. *Nuu-chah-nulth Phonemic Vowel Inventory*

	Front		Central		Back	
	Long	Short	Long	Short	Long	Short
Close	ii	i			uu	u
Open			aa	a		

The minimal pairs in (2) demonstrate the vowel length distinctions clearly.

(2) yaC 'dogfish' yaaC 'warped, bent out'
wa 'to coil' waa 'to say' (Stonham 1999: 33)

The data used in this study are drawn from various sources. The Ahousaht dialect (Central Nuu-chah-nulth) data include my field work with Mary Jane Dick. Much of the Ahousaht data comes from ES Kim (2003). References to the Tseshaht dialect (Southern Nuu-chah-nulth) draw on the work of Sapir and Swadesh (1939, 1955). Also, the Tseshaht data are drawn from the works of Davidson (2002) and Stonham (1999, 2004). The Kyuquot (Northern Nuu-chah-nulth) data are drawn from Rose (1981).

2.2. Traits of Vowel Length Adjustment

Vowel length adjustment (VLA) is one of the dominant processes in Nuu-chah-nulth that are known to be triggered by non-inflectional suffixes (Sapir and Swadesh 1939; Davidson 2001; ES Kim 2003, among others). VLA shows two properties: (i) the vowel-length changes are accompanied by certain suffixes and (ii) the VLA is restricted to vowels in the first disyllables of a word. These two traits are discussed here. First, VLA in Nuu-chah-nulth almost always occurs with non-inflectional affixes[5], although not all non-inflectional affixes are associated with VLA. Note that the vowel in the lexical base */u*, to which the non-inflectional affixes *-/umCu* is attached in (3), is short.

(3) **/u**/umCu/iS Kay nananiqsak
/u-/umCu-/iS Kay nananiqsak
REF[6]-serving -3S.IND Kay grandparents
'Kay is serving (a meal) to grandparents.'

However, as shown in (4), the vowel in */u* is lengthened when accompanied by the affix *-wik*.

(4) **/uu**wikjip/iS Yukviiqsak ciyapuxs
/u-wik [L]-jip-/iS Yukviiqsu-ak ciya-puxs
REF-on.the.head-for-3S.IND younger.sibling-POSS hat-to.wear
'S/he is wearing his/her younger sibling's hat.'

Also, (5) shows that non-inflectional affixes can lengthen the first vowel of any lexical base[7], in this case, */aya*. Compare (4) and (5): both contain the same affix, *-wik* but they have different bases. In all cases, the vowels of the bases are lengthened. These examples allow

5) The only case in which VL occurs independently is the 'graduative' aspect, observed in the Kyuquot dialect (Rose 1981).
6) REF refers to the referential base, which does not contain a lexical meaning but functions as a base of the word.
7) A lexical base, i.e., a root in the morphemic approach, refers to a linguistic unit to which no affixes are added.

us to conclude that VL in the base is not related to any intrinsic property of the lexical bases and that BM depends on affixes attached to the base.

(5) /**aa**yawik/iS Kay sajKaHs
/aya-wik [L]-/iS Kay sajk -'aHs
many-on.the.head-3S.IND Kay sharp(comb)–vessel (instrument)
'Kay is wearing many combs.'

Another notable property of VLA is the domain in which this process occurs. Vowels occurring only within the initial disyllable are adjusted when accompanied by certain affixes. Depending on the type of affix, VL can occur in the first syllable, as in (6).

(6) t**aa**?iikuk/iS Kay naYaqak
ta-/i l-iik [L]-uk-/iS Kay naYaqak
sick–inside–given.to–POSS-3S.IND Kay baby
'Kay's baby is very sickly.'

In addition, vowel length change can occur in the second syllable when accompanied with reduplication. The second syllable may be either lengthened (7a) or shortened (7b).

(7) a. /u/**uu**yuk/iS Ken
RED/u-yuk [R+L]-/iS Ken
REDREF-cry-3S.IND Ken
'Ken is crying.'

b. /ii/**i**H/iik
RED/iiHv-iik [R+S]
RED big-fond.of
's/he likes something big.'
(Sapir and Swadesh 1939)

Furthermore, depending on the suffix type, vowel length changes can occur both in the first and second syllables, as shown in (8), which also illustrates that vowel length may co-occur with reduplication.

(8) a. /uu/uukvil/iS Ken
RED/u-jil[RL+L]-/iS Ken
REDREF-to.blame-3S.INDKen
'Ken is blaming'

b. /aa/aayajil/iS Ken
RED/aya-jil [RL+L]-/iSKen
RED any-to.blame-3S.INDKen
'Ken is blaming lots of people.'

Above, various patterns of vowel-length change are illustrated in terms of where the changes occur; however, I have not found any evidence that VLA occurs beyond the initial disyllable. For instance, in (8b), both the first two vowels undergo VL, but the vowel in the third syllable, which is also part of the lexical base, */aya* is not lengthened. Thus, we may conclude that the domain of vowel length changes is the initial disyllable.

2.3. Traits of Reduplication

The behaviour of reduplication in Nuu-chah-nulth shows very similar properties to that of VLA in the sense that reduplication, in most cases, occurs with certain affixes[8]. Reduplication may co-occur with an affix that conveys either lexical meanings or aspectual status. Also, reduplication is closely connected to VLA in that both may co-occur in a form. Indeed, many derivational affixes (about 80 in the Nootka Texts of Sapir and Swadesh, 1939) are associated with both reduplication and VLA. Possible combinations of reduplication and VLA, yet not exhaustive, are illustrated in (9) below.

(9) a. *Reduplication*
TuTuCiiH/iS naniiq
RED TuCup–iiH[R] -/iS naniiq
REDsea.urchin–hunting-3S.IND grandparents
'Grandparents went to get sea urchins'

8) There is only one use of reduplication occurring on its own in Nuu-chah-nulth: plurality. To indicate plurality by reduplication, initial CV(V) segments are copied.

maamaHTi	taataayi
RED-maHTi	RED-taayi
PL–house	PL–old.brother
'houses'	'old brothers, seniors' (Stonham 2004:130)

b. *Reduplication with VL in reduplicant*

ZaaZamaas/aPat/iS Ken /uH/at Kay Cistuup
REDZam-aas[RL]-'ap-'at-/iS Ken /uH/at Kay Cistuup
REDstring-at.the.wrist-CAUS-PASS-3S.IND Ken by Kay rope
'Ken has a string on his wrist by Kay'

c. *Reduplication with VL in the base*

/u/uuyuk/iS Ken /um/iiqsakit/i
RED /u-yuk[R+L]-/iS Ken /um/iiqsu-ak-it-/i
RED REF-cry-3S.IND Ken mother-POSS-PST -DET
'Ken is crying about his late mother.'

d. *Reduplication with VL in both reduplicant and base*

/aa/aayajil/iS Ken
RED/aya-jil[RL+L]-/iS Ken
REDmany-to.blame-3S.IND Ken
'Ken is blaming lots of people.'

Generally speaking, reduplication may occur by itself, as in (9a); with VL in the reduplicant (9b); with VL in the base (9c); and with VL in the reduplicant and the base (9d). In most cases, the initial CV is copied. Interestingly, a whole syllable that includes coda(s) is copied only with aspectual suffixes attached to a mono-syllabic base, as illustrated in (10). Note that in (10a) the whole syllable of the base, *tuuh* is copied when the sporadic iterative *-S* is affixed; in (10b), *mitx* is reduplicated with the attachment of the repetitive iterative *-a*.

(10) a. tuuHtuuHS/iS/al TatNa/is
RED tuuH-S/j [R]-/iS/al TatNa -/is
RED to.get.frightened-SPO.ITE-3PL.IND children -DIM
'The children get frightened continually.' (ES Kim 2003: 141)

b. miitxmiitxa/iS
RED mitx-(y)a [RL+L]-/iS
RED to.spin-REP.ITE-3S.IND
'S/he spins continuously' (ES Kim 2003: 144)

More detailed patterns will be examined in §3 and §5. However, it is worth noting at this point that all the instances of reduplication are accompanied by certain affixes that specify a given pattern of reduplication.

3. Multiple Occurrences of Base Modification-accompanying Affixes

This section discusses forms which contain more than one affix that accompanies the same or different BMs. Previous research (Rose 1981, Davidson 2002, Stonham 2007) confirms that when affixes accompanying the same or different BM co-occur, nonetheless, BM occurs just once. For example, if two VLA-accompanying affixes (e.g., *-simj* and *-NaHi* in (11a) and *-HWal* and *-ma?kv* (11b)) co-occur in a word, then the vowel in the first syllable is lengthened only once.

(11) a. /uusimjNahi
/u-simj[L]-NaHi[L]
REF-to.do.ritual.for-ready.to
'ready to perform a ritual for it'
(Davidson 2002: 45)

b. XuutHWalma?kv
Xut-HWal[L]-ma?kv[L]
knife-to.use-expert.at
's/he is an expert at using a knife'
(Rose 1981: 342)

As for reduplication, the derived pattern seems inconsistent, although it is agreed that reduplication occurs just once. In some cases, BM associated with the rightmost affix surfaces, as shown in (12).

(12) a. [RL] and [RL+L]=[RL+L]
MaaMaal/asap
REDMal-'as [RL]-apa[RL+L]
RED cold-at.wrist-really
'He has really cold wrists.'

b. [R+L] and [RL+L]=[RL+L]
ZuuZuukvaNlap
REDZuk-aaNul[R+L]-apa[RL+L]
RED broad-at.leg-really
'His legs are really big'

In other cases, BM associated with the lefttmost affix surfaces, as in (13). The data in (12) and (13) are drawn from Rose (1981: 341-342).

(13) a. [R+L] and [RLc][9]=[R+L]
kukuucxaNlsTal
REDkucx-aaNul[R+L]-(c)sTal[RLc]
RED tickle-along.leg-reciprocally
'They were tickling each other's legs.'

b. [RL]and [RLc] = [RL]
miimitWissTal
REDmitxv-'as [RL]-(c)sTal[RLc]
RED turn-at.wrist-reciprocally
'They were twisting each other's wrists'

c. [Rc+L]and [RLc] = [Rc+L]
hichiisullsTal
RED his-(c)sul [Rc+L]-(c)sTal[RLc]
RED hit-at.eye-reciprocally
'They were hitting each other in the eye.'

Furthermore, when [Rc+L] occurs with [RL+L], a combined form [RLc+L] surfaces, rather than the rightmost or the leftmost, as in (14).

(14) [Rc+L] and [RL+L]= cumulative [RLc+L]
puucpuumalsulap
REDpumal-(c)sul[Rc+L]]-apa[RL+L]
RED itchy-at.eye-very
'He has really itch eyes.' (Stonham, 2007: 120)

In her study of Kyuquot, Rose (1981) suggests a hierarchy of patterns: [RL+L] > {[R+L], [Rc+L], [RL]} > [RLc]. Although the hierarchy covers the forms in (12) and (13), it cannot explain the combined form in (14). Moreover, the examples in (15) show an unpredictable form.

(15) [L] and [R] = [L]
a. /uuksnazaalKuk/iS taana
/u-ksnazaal[L]–Kuk[R]-/iS taana
REF–play.with-look.like-3S.IND money
'S/he is playing with a money-like object.'

9) c denotes a fixed segment, which occurs with certain suffixes.

b. /uuHCiiKuk/iS qaawic
/u-HCii[L]-Kuk[R]-/iS qaawic
REF-to.cook-look.like-3S.IND potato
'S/he seems to cook potato.'

(16) a. [L] and [RL+L]=[RL+L]
/uu/uuHWal ap
/u-HWal [L]-apa[RL+L]
REF-to.use-too
'(He) used it too much.'

b. [RL] and [L+S] = [RL]
/uu/utYikSii l
/u-itYik[RL]-Si(z)-'ii l [L+S]
REF-to.fear-MOM-SPO.ITE
'S/he started to fear it sometimes.'

Compare the example in (16a), drawn from Rose (1981: 340), with those in (15). In (15), the surface form is realized with VL ([L]), rather than reduplication ([R]). On the other hand, in (16a), a reduplicated form ([RL+L]), rather than a vowel-lengthened form ([L]) surfaces. (16b) also shows that a reduplication-associated affix ([RL]) survives over a VLA-related affix ([L+S]).

In conclusion, the surface form is not entirely predictable in the case of multiple occurrences of affixes that accompany distinct alternations, regardless of dialect, as shown above in (16) for the Kyuquot dialect (Northern Nuu-chah-nulth), in (14) for the Tseshaht dialect (Southern Nuu-chah-nulth), and in (15) the Ahousaht dialect (Central Nuu-chah-nulth). Such irregular forms can be formally accounted for within the WP framework (§6.2.3).

4. Theoretical Background

In the current study, a WP model is proposed to formally account for the complicated BM patterns and accompanying suffixes. §4.1 discusses VLA/reduplication as ME and two other assumptions adopted in the study. In §4.2, a WP model for derivational morphology is proposed, built on Anderson (1992) and Matthews (1991).

4.1. BM as exponents of Multiple Exponence (ME)

This section briefly introduces the criteria of ME developed for both derivational and inflectional morphology, and also examines whether BM(s) and an accompanying suffix constitute ME in Nuu-chah-nulth.

4.1.1. Criteria of ME

The current study proposes that particular BMs and their accompanying affixes are ME. ME or extended exponence refers to a phenomenon in which two or more exponents are used simultaneously to express a particular morphosyntactic value in a word. In contrast to studies of inflection, in which the definition of ME is well-established, the issue of ME in non-inflectional morphology has only recently come into focus (Caballero 2008; Caballero and Harris 2012). With a view to developing diagnostic criteria for ME in non-inflection morphology, therefore, the Latin perfective (inflectional morphology) in Matthews's (1972) study is used to illustrate ME.[10] Based on the examination of Matthews' study, I propose four criteria for ME that can be used for both inflectional and derivational morphology.

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10) In his study of Latin, Matthews (1972) raises questions about the principle of one-to-one mapping between function and form. ME is a challenge to this principle, because it involves the occurrence of more forms than grammatical functions. As an illustration of the problem, consider *re:ksistis* 'you (pl) ruled'. The word *re:ksistis* can be segmented into units as illustrated below.

/reg/ 'rule'	+	Perfective	+	[2nd plural]
re:k	+	*s* + ***is***	+	*tis*

In this example, three units denote semantic or grammatical meaning, but there are four segmented units, including an extra unit *is* that seems not to be associated with any meaning. *-tis* refers to the 2nd plural (cf. *fer-tis* 'you (pl) carry'). Also, *-s* appears to be the perfective suffix used independently, as it represents the perfective in *re:k-s-i:* 'I ruled'. Consequently, *is* appears to be an instance of meaningless segments (i.e., an empty morph): it has a phonological form but no meaning.

However, Matthews points out that *is* is not an empty morph. The segment sequence *is* is considered as one of the perfective exponents for the following reasons: (i) it is not phonologically conditioned; (ii) it always occurs with perfectives regardless of the shape of other perfective affixes; (iii) its phonological representation is invariant, and (iv) it can occur with any lexical base of the same morphological category (i.e., verbs in this case). See Lee (2013) for the detailed discussion.

(17) Criteria for ME

A pattern is defined as an instance of multiple exponence, if and only if the following two conditions are met:

(i) ***Non-phonological condition:*** no exponents are phonologically conditioned;

(ii) ***Consistent co-occurrence***: two or more exponents that signify the same expression co-occur.

The following two conditions may be met:

(iii) ***Phonological consistency***: phonological representations of the co-occurring exponents are consistent.

(iv) ***No exceptions on base selection***: an exponent may appear on any lexical base of a morphological category.

To explain each of the four criteria, the first criterion, *Non-phonological condition,* indicates that exponents of ME are not sensitive to the phonological environment of a form with which they occur. In other words, for instance, phonologically conditioned alternations are not part of ME. This criterion draws a sharp line between morphophonological alternations as ME and phonologically conditioned morphophonological alternations as non-ME.

The second criterion stipulates that exponents that signify a single function or meaning must invariably co-occur. One of the exponents may appear as an allomorph, but its co-occurrence must be regular. The first two criteria in (i) and (ii) must be satisfied for a set of co-occurring forms to be identified as ME.

The third criterion, *Phonological consistency,* is satisfied when the phonological shapes of all exponents are invariant and regular. However, this criterion is not always met. In other words, exponents of a single function may have phonological variations, i.e., allomorph.

The fourth criterion, *No exceptions on base selection* concerns the lexical base with which exponents occur. If exponents occur with a given lexical category such as verbs or adjectives, then the same exponents can occur on any lexical bases of that lexical category. The third and fourth criteria may or may not be satisfied.

4.1.2. VLA/Reduplication as ME as a subsidiary exponent of ME

Based on the criteria above, I will briefly examine whether reduplication and VLA meet the above criteria for the secondary exponent of ME. Due to the limited space, however, I will examine the first two crucial criteria, although the optional two criteria are also satisfied in the case of Nuu-chah-nulth. Readers may refer to SH Lee (2013) for the further discussion on this issue.

First, as for the criterion, *Non-phonologically conditioned process*, I examine two pieces of evidence suggesting that VLA is not phonologically conditioned: (1) the segmental environment for VLA varies; and (2) VLA is not motivated by the need to create well-formed foot structure in the initial two syllables. As for reduplication, it is generally assumed that reduplication is a morphological process[11]. One plausible phonological motivation for reduplication and VLA would be that the segmental environment of affixes or lexical bases may condition the processes. Specifically, if affixes starting with certain sounds always trigger VLA or reduplication and/or if only particular sounds undergo the processes, these phonological conditionings might be the reason for BMs. However, examination of a suffix list of Sapir and Swadesh (1939) reveals that the initial sounds in suffixes that occur with/without BMs are randomly distributed. Both VLA and reduplication are accompanied with suffixes starting with vowels /a, i/, stops /p, P, s, t, q, //, affricates /c, j, C/, fricatives /s, H/, or sonorant /m, M, n, N, y, Y, w, W/, which do not constitute natural classes.

Furthermore, BMs are not conditioned by the lexical bases on which the modifications occur. As can be seen in (18), different BMs occur in the same base. In (18), the lexical base, */aya,* which may not accompany any BM, accompaies VL (18a) or reduplication (18b). These examples provide evidence that VLA and reduplication are not

11) In the dual theory of reduplication, however, Inkelas (2008) claims that some cases of reduplication are phonological. Such cases are motivated by the need to provide "phonological content to an epenthetic or templatic segment" (p. 27). A possibly relevant phonological motivation for reduplication in Nuu-chah-nulth would be to provide an onset or nucleus for a syllable, thereby creating a well-formed syllable. This possibility is rejected, since in Nuu-chah-nulth, reduplication always involves copying a CV, a well-formed syllable.

dependent on the shape of the base.

(18) a. /**aa**yawik/iS Kay sajKaHs
/aya-wik [L]-/iS Kay sajk-'aHs
many-on.the.head-3S.IND Kay sharp (comb)–vessel
'Kay is wearing many combs.'

b. /a/ayil/iS Kay
RED /aya–il [R]-/iS Kay
RED many-sleeping.with-3S.IND Kay
'Kay is sleeping with lots (of people in the same room)'

Another important phonological motivation for VLA might be to create a well-formed foot, which is rejected here. Cross-linguistically, most cases of VLA are phonologically motivated to produce well-formed foot structures, such as iambs or trochees (Kager 1994; Hayes 1987; McCarthy and Prince 1990, among others). VLA in Nuu-chah-nulth, however, is not associated with the generation of well-formed foot structure. In her study of Ahousaht, ES Kim (2003) describes VLA as 'metrical requirements specified for suffixes attached to the root/stem morpheme' (p. 105). She maintains that the metrical requirements, however, are not phonologically motivated, but idiosyncratically enforced by the suffix to satisfy certain templates. In line with ES Kim, SH Lee (2008) argues that VLA in Nuu-chah-nulth is not a strategy to obtain a well-formed foot. Due to the limited space, I provide little justification for this issue. See ES Kim (2004) and SH Lee (2008) for more detailed discussion of the metrical structure of Nuu-chah-nulth.

In short, in Nuu-chah-nulth, VLA and reduplication are not phonologically conditioned with respect to segmental environment or metrical structure. Also, VLA does not occur to create well-formed feet. It is conclusive that VLA and reduplication meet the first, crucial criterion: *Non-phonological condition*.

Second, the criterion of *Consistent co-occurrence* will be met if VLA or reduplication occurs whenever a particular non-inflectional affix is

attached to any bases. In Nuu-chah-nulth, it is rare to find that VLA/ reduplication is accompanied by a given suffix in one circumstance but not in another. For instance, *-Hwaa/* co-occurs with VL in the first syllable and VS in the second syllable. All the examples in (19) show this pattern: The second syllables are consistently shortened, and the first syllables are lengthened, whether the second syllables belong to a base, as in (19a) and (19b) or not as in (19c) and (19d).

(19) a. k**uu**M**a**HWaa l
kuMaa-Hwaa l [L+S]
scarcely.any-to.use
'using hardly any'

b. T**uu**n**a**xHWaa l
Tunaax-Hwaa l [L+S]
tulle-to.use
'using a tulle'

c. C**ii**SXHW**a** l
CiSX-Hwaa l [L+S]
dirty-to.use
'using something dirty'

d. /**uu**HW**a** l
/u-Hwaa l [L+S]
REF-to.use
'to use' (ES Kim 2003: 107)

As for reduplication, the reduplicants vary but maximally comprise the first syllable of a base: CV, CVV, CVVC(C)(C), or CVC(C)(C). The type of reduplicant depends, however, on the affix that accompanies it. For example, ES Kim observed that the affix *-(C)ink* is associated with the copying of the first consonant and vowel of a base and that both the reduplicant and the base vowels are shortened, as in (20).

(20) a. **hu**hu/ajinksap/iS
RED hu/a-jink [RS+S]-sap-/iS
RED to.put.together-side.by.side-MOM.CAUS-3S.IND
'S/he puts engine back together'

b. **ci**ciqink/iS
RED ciq-(j)ink [RS+S]-/iS
RED to.speak-side.by.side-3S.IND
'S/he is praying'

c. CaCajink
RED –Caa –jink [RS+S]
RED –swiftly.moving.water -side.by.side
'going against the tide of swift current' (ES Kim 2003: 148)

In (20) above, the reduplicant copies only the initial consonant and vowel, regardless of the syllable type of the initial syllable, i.e., open (20a), closed (20b), or open with a long vowel (20c). These data demonstrate that the effect of suffixation is regular. Therefore, the second criterion, *Consistent co-occurrence*, is satisfied.

In conclusion, VLA and/or reduplication and suffixation together constitute ME in non-inflectional morphology, by satisfying all the criteria (only two crucial ones have been examined here).

4.1.3. Other assumptions for the study

This subsection provides two theoretical assumptions for the current study. First, this study assumes that derivational classes are organized according to the shapes of BM, building on previous studies that group derivational classes according to the types of BM (Alderete 2001; Aronoff 1976). A derivational class consists of a group of *affixes* that accompany non-phonologically conditioned BMs. Thus, the number of classes is equivalent to the number of attested non-phonologically conditioned BMs in each language.

Second, this study considers, for two main reasons, that affixation is the main exponent and BM is the secondary exponent. Firstly, affixation plays the main role in conveying semantic and/or syntactic information, as evidenced by the disparity between the number of affixes and the number of BM patterns. There are approximately 500 suffixes in Nuu-chah-nulth, while fourteen BM patterns are observed. Some suffixes do not accompany any BM (i.e., non-ME) and exhibit a one-to-one mapping between sound and meaning/function, whereas most BMs do not exhibit these properties. In addition, the 500 suffixes are grouped into at most 14 patterns of BM, which implies that a pattern of modification (or one class) comprises a number of

suffixes. In a class, therefore, when a suffix and a BM have a one-to-one correlation between form and meaning, the meaning comes from the suffix, rather than from the BM. Secondly, affixation is less marked than BM cross-linguistically. Also as Dressler (2005) argues, affixation is more natural than BM because it is more frequent and productive than BM and because morphological categories are rendered more transparent by affixation (e.g., *walk-ed* or *cat-s*) than by BM (e.g., *sang* or *men*).

4.2. Word-and-Paradigm: Schemas of Word Formation Rules

In his A-morphous morphology, in which he develops a WP model for inflectional morphology, Anderson (1992) suggests a possible extension of the model to derivational morphology. This study builds on Anderson's (1992) description of derivational WFRs and attempts to make actual derivations by employing WFRs.

In the current study, the WFRs differ significantly from those described by Anderson in two ways. First, I propose two different types of WFR: Suffixation Rules and BM Rules. Crucially, these two exponents differ in terms of the presence/absence of semantic and syntactic information. Only suffixation rules, which relate to main exponents, include such information. Second, while the morphological description in Anderson's Structural Description (SD) specifies the base, the morphological description in this study specifies the affix. This difference stems from the fact that class information in inflectional morphology is inherently encoded on a base, whereas non-inflectional suffixes in the current study contain such information. Therefore, a mechanism is required to assign a class to the base. I propose that the class of non-inflectional suffix is assigned to a base when the suffix is added to the base. Thus, class information appears in the Structural Change (SC) of suffixation rules, not in the SD.

In (21), I propose a schema for suffixation rules.

(21) Schema for Suffixation Rule

$$\begin{bmatrix} \\ \text{[X]LexicalCategory} \\ \text{'Meaning of X'} \end{bmatrix} \rightarrow \begin{bmatrix} \text{CLASS of suffix Z} \\ \text{XZ]LexicalCategory} \\ \text{'Meaning of XZ'} \end{bmatrix}$$

(a) **Structural Description**:
- *Phonological Description: X*
- *Syntactic Description:*
  Lexical category of the base
- *Semantic Description:*
  Meaning of the base

(b) **Structural Change**:
- *Phonological Change: XZ*
- *Syntactic Change:*
  Lexical category of the derived form
- *Semantic Change:*
  Meaning of the derived form
- *Morphological Description:*
  Classes of affixes

On the left side of the suffixation rule, the SD (21a) includes the phonological properties of the base (i.e., 'X'). The base 'X', a variant of a given phonological shape, undergoes a phonological change to 'XZ' in the SC ('Z' here refers to a suffix presented in the SC). The SD may include lexical category and/or subcategorization of the base. The syntactic description may or may not be changed. Any changed syntactic information is presented in the SC. Change in the semantic interpretation of the input base (i.e., 'meaning of X') in the SD is reflected in the SC (i.e., 'meaning of XZ'). Importantly, a class is assigned to the base when the suffix Z is added to the base, so that the base has the same class information as the suffix Z. As discussed in §4.1.3, syntactic and semantic information is provided in suffixation, the primary exponent. This is because more than 500 suffixes are organized into 14 patterns of BM in Nuu-chah-nulth. Thus, a number of suffixes are grouped into one class. Accordingly, when a suffix and BM constitute an instance of ME, the meaning comes from the suffix, rather than the BM.

In addition to the suffixation rule, another type of rule is required to account for BM. Based on the properties of BM, I propose a schema for BM rules as follows:

(22) Schema for BM Rule

$$\begin{bmatrix} \text{CLASS(ES)} \\ \text{'Meaning of X'} \end{bmatrix}$$

XZ → X'Z

(a) **Structural Description**:
- *Morphological Description: Class of affix Z*
- *Phonological Description: The base is X*

(b) **Structural Change** :
- *Phonological change: The base X is modified to X'*

The SD in (22a) includes the morphological description that specifies the class of the base assigned by the suffix. The class assigned in the suffixation, then, becomes the morphological description in the BM rule(s). As for the phonological description in the SD, the lexical base X undergoes a phonological change to X' in the SC (22b). In §6, I will discuss WFRs for the Nuu-chah-nulth ME.

5. Classification of Derivational and Aspectual Affixes in Nuu-chah-nulth

This section presents classification of non-inflectional suffixes in Nuu-chah-nulth, which has various patterns of BMs that comprise combinations of reduplication, VL, VS, and fixed segment *c*. Each pattern is identified as a single class. Accordingly, 14 classes are suggested. A very brief description of 14 patterns is provided below.

Table 3. *Description of Classes*

Classes of affix	Descriptions	Notations	1st σ - 2nd σ	Number of suffixes
CL 1	Derivational affixes (D_A) w/no stem modification	N/A	N/A	Approx 300
CL 2	D_A w/VL (VL) in the 1st σ	[L...D_A]	CVV(C)[12] - NS[13]	120
CL 3	D_A w/VL in the 1st σ and VS in the 2nd σ	[L+S...D_A]	CVV(C) - CV(C)	4
CL 4	D_A w/VS both in the 1st and 2dn σ	[S+S ...D_A]	CV(C) - CV(C)	1
CL 5	D_A w/reduplication (RED)	[R...D_A]	CV(V) - NS	37
CL 6	D_A w/RED and VL in the 1st σ	[RL... D_A]	CVV - NS	15
CL 7	D_A w/RED and VL in the 2nd σ	[R+L...D_A]	CV(V) - CVV(C)	18
CL 8	D_A w/RED and VL in both 1st σ and 2nd σ	[RL+L...D_A]	CVV - CVV(C)	9
CL 9	D_A w/RED and VL in the 1st σ and VS in the 2nd σ	[RL+S...D_A]	CVV - CV(C)	2
CL 10	Repetitive iterative w /RED and VL in both 1st σ and 2nd σ	[RL+L...A_{SP}]	CVV{C2, z, (C2)} - CVV(C2)	1
CL 11	Sporadic iterative and inceptive w/RED	[R...A_{SP}]	CV(V){C2, z, (C2)} - CV(V)(C2)	2
CL 12	-(c)su(l) 'at the eyes'	[Rc+L...D_A]	CV(V)c - CVV(C)	1
CL 13	-(c)supTaal 'competing in ...'	[RLc...D_A]	CVVc - CV(V)(C)	1
CL 14	-(q)Hsa 'at the brink'	[RLc+L...D_A]	CVVc - CVV(C)	1

In the table above, each class is described in the second column. In the third column, the notation adopts the traditional way of presenting alternations in Nuu-chah-nulth literature. See footnote 2 for the abbreviations. Unlike the traditional symbols, the notation includes [D_A] or [A_{SP}], e.g., [R... D_A] [R... A_{SP}]. [D_A] and [A_{SP}] denote a derivational affix and an aspectual affix, respectively. These symbols are used to distinguish CL5 from CL11 as well as CL8 from CL10. The fourth column shows the segmental patterns within each class. Since the alternations always occur on the initial disyllable, segments in the first two syllables are specified.

12) Codas can include up to three consonants. Thus, here, (C) does not imply that a coda consists of a single consonant. There could be two or three consonants in a cluster.

13) NS denotes No Specification.

6. Analysis of ME within the Word and Paradigm Framework

In this section, I present an analysis of ME in non-inflectional morphology in Nuu-chah-nulth using a WP model.

6.1. Word formation rules

As discussed in §4.2, two types of rule are required to account for ME in non-inflectional morphology: suffixation rules and BM rules. First, consider WFRs that derive suffixation. As there are a large number of suffixation rules, here I only present a schema for suffixation rules, which I repeat from (21), as in (23).

(23) Schema for Suffixation Rule

$$\begin{bmatrix} \\ \text{[X]LexicalCategory} \\ \text{'Meaning of X'} \end{bmatrix} \rightarrow \begin{bmatrix} \text{CLASS of suffix Z} \\ \text{[XZ]LexicalCategory} \\ \text{'Meaning of XZ'g of XZ'} \end{bmatrix}$$

(a) **Structural Description**:
- *Phonological Description: X*
- *Syntactic Description:*
  Lexical category of the base (e.g., NOUNS, VERBS)
- *Semantic Description:*
  Meaning of the base

(b) **Structural Change**:
- *Phonological Change: XZ*
- *Syntactic Change:*
  Lexical category of the derived form (e.g., PREDICATE)
- *Semantic Change:*
  Meaning of the derived form
- *Morphological Description:*
  Classes of affixes

In (23b), the syntactic description in the SC in Nuu-chah-nulth results in a predicate, marked as PRED outside the bracket because when derivational suffixes are added to a base, the stem becomes a predicate (Wojdak, 2005), regardless of the category of the base. In terms of rule ordering, the suffixation rule must operate prior to BM because lexical bases do not have class information, which is assigned by suffixation.

A second type of rule is required for BMs, of which the schema is repeated in (24).

(24) Schema for BM Rule

$$\begin{bmatrix}\text{CLASS(ES)} \\ \text{(Aspect)}\end{bmatrix}$$

$$XZ \quad \rightarrow \quad X'Z$$

(a) **Structural Description**:
- *Morphological Description:*
  Class of affix Z; Aspect
- *Phonological Description:*
  The base is X

(b) **Structural Change** :
- *Phonological change:*
  The base X is modified to X'

Following the schema provided in (24), I propose a total of nine WFRs for BMs. First, let us begin with three vowel length-associated rules that are restricted to the first and the second syllables.

(25) Rule 2 [Base-VL]

$$\begin{bmatrix}\text{CL 2, CL 3, CL7} \\ \text{CL 8, CL 10, CL 12}\end{bmatrix}$$

$$XZ = C_1V_1\mathbf{(V_1)}YZ \rightarrow C_1V_1\mathbf{V_1}YZ$$

Base-VL involves a number of classes of affix. The phonological condition or environment for vowels (i.e., $XZ = C_1V_1\mathbf{(V_1)}YZ$) indicates that a vowel may be long or short; the phonological change, then, specifies that the surface vowel must be long (i.e., $C_1V_1\mathbf{V_1}YZ$). If V occurs in parentheses (V_1), the vowel may or may not be long. C1 refers to an onset consonant; Y refers to any segments occurring after the nucleus; Z refers to the suffix added in the previous application of the suffixation rule. Rule (R)2 can be read as 'A base belonging to CL 2, 3, 7, 8, 10, or 12 is realized by lengthening the vowel in the first syllable'.

Rule 3 is construed as saying that the first base vowel must be short when a CL4 or CL9 affix is added.

(26) Rule 3 [First base-vowel shortening]

$$\begin{bmatrix}\text{CL 4, CL 9}\end{bmatrix}$$

$$XZ = C_1\mathbf{V_1(V_1)}\ YZ \rightarrow C_1\mathbf{V_1}YZ$$

R4 derives a short vowel in the second syllable of the base.

(27) Rule 4 [Second base-vowel shortening]
[CL 3, CL 4]
$XZ = C_1V_1(V_1).C_2\mathbf{V_2(V_2)}YZ \rightarrow C_1V_1(V_1).C_2\mathbf{V_2}YZ$

As for reduplicated forms, a few rules need to be formulated to derive various patterns. By and large, reduplication patterns are divided into three types: reduplication without coda copying, reduplication with coda copying, and reduplication with a fixed segment. Thus, rules are necessary to reflect these properties. Beyond aspectual reduplication, Nuu-chah-nulth has only one reduplication pattern, which is CV reduplication. Therefore, I propose only one rule for non-aspectual reduplication. R5 derives the CV reduplication.

(28) Rule 5 [CV(V) Reduplication]
[CL 5, CL 6, CL 7,
CL 8, CL 9]
$XZ = C_1V_1(V_1)\ YZ \rightarrow \mathbf{C_1V_1(V_1)}.C_1V_1(V_1)YZ$

Separating out the reduplication rule from the other rules accounts elegantly for the lack of double reduplication: The SD of the rule specifies the classes of base that can be reduplicated. Thus, even though a word may be specified for more than one class, the reduplication rule will still only apply once.

Now a WFR is required to derive coda copying, which implies repetitive/inceptive status. Repetitives are complex regarding coda copying depending on the number of syllables in the base and the presence of a coda. R6 derives the repetitive and the inceptive, in which the root is a closed monosyllable. The whole syllable is copied.

(29) Rule 6 [Aspect reduplication w/coda copying]
[CL 10, CL 11]
$XZ = C_1V_1C_2(C_3)(C_4).Z \rightarrow \mathbf{C_1V_1C_2(C_3)(C_4).}C_1V_1C_2(C_3)(C_4).Z$

R7 is proposed to further account for repetitives that has a monosyllabic base with no coda. In that case, a fixed segment *z* is inserted in the coda position of the reduplicant to fill the coda slot.

(30) Rule 7 [Aspect reduplication w/a fixed segment z]
[CL 10, CL 11]
$XZ = C_1V_1(V_1).Z \rightarrow \mathbf{C_1V_1(V_1)z.}C_1V_1(V_1)Z$

In addition, R8 applies when a lexical base is multisyllabic and no coda is present, in which case, coda copying does not occur.

(31) Rule 8 [Aspect reduplication w/multi-syllables]
[CL 10, CL 11]
$XZ = C_1V_1.C_2V_2Z \rightarrow \mathbf{C_1V_1}.C_1V_1C_2V_2Z$

Also, there are two rules that must occur after the reduplication rules. R9 derives VL in the reduplicant. A reduplicant vowel is lengthened in affixes belonging to CL 6, 8, 9, 10, 13, and 14.

(32) Rule 9 [Reduplicant VL]
[CL 6, CL 8, CL 9,
CL 10, CL 13, CL 14]
$XZ = C_1V_1\mathbf{(V_1)}.C_1V_1(V_1)YZ \rightarrow \mathbf{C_1V_1V_1}.C_1V_1(V_1)YZ$

Finally, R10 derives forms with a fixed segment *c*, observed in CL12, CL13, and CL14 affixes. When repetitive or inceptive aspect is affixed to a base whose root is a monosyllable, the fixed segment *c* is inserted after the copied CV, regardless of the length of the vowel.

(33) Rule 10 [Fixed segment c-insertion]
[CL 12, CL 13, CL 14]
$XZ = C_1V_1(V_1).C_1V_1(V_1)YZ \rightarrow \mathbf{C_1V_1(V_1)c}.C_1V_1(V_1)YZ$

R9 and R10 may apply on the same base when the affixes are CL13

and CL14. In that case, R9 must precede R10 because R10 would bleed the phonological environment of R9 by adding the segment *c*.

6.2. Blocks, rule ordering, and derivation

This study assumes that non-inflectional WFRs are organized into blocks, following Anderson's (1992) and Stump's (2001) analyses of inflection. WFRs in the same block are mutually exclusive. Thus, only one rule can apply within the same block. In other words, they may be disjunctively ordered (Chomsky and Halle, 1968; Anderson, 1986): if a rule within a block has applied to a base, the other rules in the same block are barred from applying to the same word even if the SD of the rules is satisfied. By contrast, WFRs in distinct blocks are compatible, such that more than one rule can apply to the same base. Among rules that belong to distinct blocks, extrinsic rule ordering (Chomsky and Halle, 1968) may be required.

6.2.1. Rule Blocks

Let us consider WFRs that are required to derive each class. As can be seen in Table 4, the suffixation rule, R1, operates for each class, since the suffix is the main exponent. Any rules operating on a class must not belong to the same block to ensure that the rules may apply to the same word. Table 4 illustrates which rules need to operate for each class. Table 5 presents the names of the rules.

Table 4. *Word Formation Rules in Operation for Each Class*

Classes of affix	Notations	WFRs in operation
CL 1	No notation	R1
CL 2	[L... DA]	R1, R2
CL 3	[L+S... DA]	R1, R2, R4
CL 4	[S+S ... DA]	R1, R3, R4
CL 5	[R... DA]	R1, R5
CL 6	[RL... DA]	R1, R5, R9
CL 7	[R+L... DA]	R1, R2, R5

Classes of affix	Notations	WFRs in operation
CL 8	[RL+L... DA]	R1, R2, R5, R9
CL 9	[RL+S... DA]	R1, R3, R5, R9
CL 10	[RL+L... ASP]	R1, R2, {R6, R7, or R8}, R9
CL 11	[R... ASP]	R1, {R6, R7, or R8}
CL 12	[Rc+L ... DA]	R1, R2, R5, R10
CL 13	[RLc ... DA]	R1, R5, R9, R10
CL 14	[RLc+L··· DA]	R1,R2, R5,R9, R10

Table 5. *Name of Rules*

Rules	Names	Rules	Names
Rule 1	Suffixation	Rule 6	Aspect RED w/coda copying
Rule 2	Base-VL	Rule 7	Aspect RED w/z
Rule 3	First base-VS	Rule 8	Aspect RED w/multi syllables
Rule 4	Second base-VS	Rule 9	Reduplicant VL
Rule 5	CV(V) Reduplication	Rule 10	Fixed segment c-insertion

Following the compatibility logic and common properties among BMs, WFRs are organized into blocks, as illustrated in Table 6.

Table 6. *Rule Blocks*

Blocks	Rules	Shared Properties
Block I	R1	Suffixation
Block II	R2, R3	VLA in the first base vowel
Block III	R5, R6, R7, R8	Reduplication
Block IV	R4, R9	VLA elsewhere
Block V	R10	Fixed segmentism

First, because the suffixation rule always occurs with any of the alternations, R1 must be organized into a distinct block (Block I). Second, base VL (R2) and Base V1 shortening (R3), which apply to the first base vowel, are organized into Block II. These two rules are disjunctively ordered and thus not compatible, since they apply to the same syllable of the base. Third, reduplication-associated rules (R5, R6, R7, R8) are

grouped into Block III, since they are not compatible with one another. Fourth, reduplicant VL (R9) co-occurs with all alternations other than second base VS (R4); thus, R9 and R4 are in Block IV. Second base VS (R4) occurs only with first base VS (R2). R4 can belong to either Block IV with R9 or Block III with the reduplication rules. Note that R4 is organized into Block IV, so that rules in the same block are coherent with respect to the types of alternation. Finally, fixed segment *c*-insertion (R10) is classified into Block V.

6.2.2. Rule ordering and derivations

This subsection explores the ordering among rules and demonstrates derivation using properly ordered WFRs. As for compatibilities between rules, rules belonging to the same block are mutually exclusive. For instance, R4 and R9 in Block IV never apply to a base at the same time. Also, the reduplication-associated rules in Block III are not applied together, because their conditions differ with respect to morphology (R5 and{R6, R7, or R8}) or phonology (R6, R7, and R8). I assume that rules in the same block apply disjunctively, if applicable. Note, however, that in Nuu-chah-nulth, rules within the same block, in fact, rarely meet the same SD requirement.

In terms of extrinsic rule ordering, as shown in (34), the suffixation rule (Block I), the operation that generates a main exponent, always occurs first and assigns a class to the base. Second, VLA rules that are restricted to the first base syllable (Block II) must occur before reduplication-associated rules (Block III). If reduplication occurs first, then the copied vowel, which becomes the first vowel, is affected by VLA rules. This point is illustrated using the word in (35). Also, rules associated with reduplication (Block III) must precede the reduplicant VL rule (R9) (Block IV), if the two phenomena co-occur. This order is necessary because the condition for VL is met only after the lexical base is reduplicated. Finally, the reduplicant VL rule must precede the fixed segment-*c* insertion rule (Block V). The reverse order will bleed the environment for reduplicant VL due to the segment, *c*.

(34) Rule ordering

a. Suffixation (R1) >> Base first VL/VS (R2, R3) >> Reduplication rules (R5, R6, R7, R8) >> Base second VS (R4), Reduplicant VL (R9) >> Fixed segment c-insertion (R10)

b. Block I >> Block II >> Block III >> Block IV >> Block V

An illustration of the rule ordering is partially supplied in (36), drawing on the example in (35), */uu/uʃjasji.*

(35) /uu/uʃjasji
RED/uuʃ-(k)jasji[RL+S]
REDsome–to.play (on.someone's.side)
'on someone's side in a team.'

(36) Rule 1 >> Rule 3 >> Rule 5 >> Rule 9

a. Schema of Rule 1 [Suffixation]

$$\begin{bmatrix} \\ \text{[X]LexicalCategory} \\ \text{'Meaning of X'} \end{bmatrix} \rightarrow \begin{bmatrix} \text{CLASS of suffix Z} \\ \text{[XZ]LexicalCategory} \\ \text{'Meaning of XZ'} \end{bmatrix}$$

Operation of Rule 1

$$\begin{bmatrix} \\ \text{[/uuʃ]NOUN} \\ \text{SOME} \end{bmatrix} \rightarrow \begin{bmatrix} \text{CLASS 9} \\ \text{[/uuʃjasji]PRED} \\ \text{'ON SOMEONE'S SIDE'} \end{bmatrix}$$

b. Rule 3 [First base-vowel shortening]

[CL 4, CL 9]

$XZ=C_1\mathbf{V_1(V_1)}YZ \rightarrow C_1\mathbf{V_1}YZ$

Operation of Rule 3

[CL 9]

//uuʃjasji / → /uʃjasji

c. Rule 5 [CV reduplication]

$\begin{bmatrix} \text{CL 5, CL 6, CL 7,} \\ \text{CL 8, CL 9} \end{bmatrix}$

$XZ = C_1V_1(V_1)YZ \rightarrow \mathbf{C_1V_1(V_1)}.C_1V_1(V_1)YZ$

Operation of Rule 5

[CL 9]

/uSjasji → /u/uSjasji

d. Rule 9 [ReduplicantVL]

$\begin{bmatrix} \text{CL 6, CL 8, CL 9,} \\ \text{CL 10, CL 13, CL 14} \end{bmatrix}$

$XZ = C_1V_1\mathbf{(V_1)}.C_1V_1(V_1)YZ \rightarrow C_1V_1\mathbf{V_1}.\ C_1V_1(V_1)YZ$

Operation of Rule 9

[CL 9]

/**u**/uSjasji → /**uu**/uSjasji

In (36a), in the affixation stage, CL9 is assigned to the base in the SC and the affixal predicate is formed, with the meaning 'on someone's side in a team'. Then, right after first base-VS (36b), the reduplication rule applies (36c), which provides the condition for R9. R3 and R5 are crucially ordered; the reverse order results in an incorrect form. If R3 applies after R5, then R3 is applied to the form, */u/uuS*. In that case, according to the phonological description in the rule, the first vowel becomes a copied vowel in */**u**/uuS,* rather than a base vowel. This process results in the base vowel not getting shortened. This ordering of the rules then produces **/uu/uuSjasji*. The ordering of R5 and R9 is also crucial; reversing the application of the two rules will yield an unattested form. For instance, when R9 applies prior to R5, R9 is not applicable, because there is no reduplicant vowel. R5 derives **/u/uSjasji,* an ungrammatical form that has a shortened reduplicant base vowel.

I have demonstrated the application of the WP model in a formal analysis of ME in non-inflectional morphology. A set of WFRs apply to the same base in order to derive the correct surface form.

6.2.3. Analysis of Multiple Occurrences of ME

Importantly, the WP approach has merit in dealing with the absence of the double occurrence of reduplication and/or lengthening. Recall that the BM occurs only once when more than one suffix accompanies BM. This advantage stems from the fact that the morphological description of a BM rule may specify multiple classes to which the rule may apply. In addition, a set of WFRs may apply to the same base, but each rule applies only once. Thus, for instance, although two or more cases of suffixation that accompany CV reduplication occur with the same base, the CV reduplication rule applies only once. Also, there are no other blocks of rules that reduplication occurs in.

Consider the word in (37), which contains two reduplication-associated suffixes, but reduplication occurs only once

(37) MaaMaalyimlapa
RED Mal-yiml[R]-apa[RL+L]
RED cold-at.shoulder-really
'He is really cold in the shoulders.' (Rose 1981: 341)

(38) illustrates the derivation of (37). Notice that R5 (CV Reduplication) is applied just once, since the rule is applied to both CL5 [R] and CL8 [RL+L]. Thus, double reduplication cannot occur, as expected. Following the rule ordering proposed, the derivation is illustrated.

(38) a. Schema of Rule 1 [Suffixation]

$$\begin{bmatrix} \\ \text{[X]LexicalCategory} \\ \text{'Meaning of X'} \end{bmatrix} \rightarrow \begin{bmatrix} \text{CLASS of suffix Z} \\ \text{[XZ]LexicalCategory} \\ \text{'Meaning of XZ'} \end{bmatrix}$$

Operation of Rule 1

$$\begin{bmatrix} \\ \text{[Mal]A} \\ \text{COLD} \end{bmatrix} \rightarrow \begin{bmatrix} \text{CLASS 5, CLASS 8} \\ \text{[Malyimlapa]PRED} \\ \text{REALLY COLD IN THE SHOULDER} \end{bmatrix}$$

b. Rule 2 [Base-VL]

$\begin{bmatrix} \text{CL 2, CL 3, CL7,} \\ \text{CL 8, CL 10,CL 12} \end{bmatrix}$

$XZ = C_1V_1(\mathbf{V_1})YZ \rightarrow C_1V_1\mathbf{V_1}YZ$

Operation of Rule 2

[CL 8]

Ma|yim|apa → Maa|yim|apa

c. Rule 5 [CV Reduplication]

$\begin{bmatrix} \text{CL 5, CL 6, CL 7,} \\ \text{CL 8, CL 9} \end{bmatrix}$

$XZ = C_1V_1(V_1)YZ \rightarrow C_1V_1.C_1V_1(V_1)YZ$

Operation of Rule 5 [CV Reduplication]

[CL 5, CL 8]

Maa|yim|apa → MaMaa|yim|apa

d. Rule 9 [Reduplicant-VL]

$\begin{bmatrix} \text{CL 6, CL 8, CL 9,} \\ \text{CL 10, CL 13, CL 14} \end{bmatrix}$

$XZ = C_1V_1(\mathbf{V_1}).C_1V_1(V_1)YZ \rightarrow C_1V_1\mathbf{V_1}.\ C_1V_1(V_1)YZ$

Operation of Rule 9

[CL 8]

MaMaa|yim|apa → MaaMaa|yim|apa

In particular, the WP model can account for irregular forms. Recall that surface alternations originating from more than one triggering suffix are irregular and thus sometimes unpredictable. Consider an irregular form, in which VL but not reduplication occurs, which is what happens when CL2 [L] and CL5 [R] affixes co-occur, as in (39).

(39) /**uu**ksnazaa|Kuk/iS taana
/u-ksnazaa|[L]–Kuk[R]-/is taana
REF–play.with-look.like-3S.IND money
'S/he is playing with a money-like object.'

It may be expected that the base is reduplicated (or reduplicated and lengthened), because reduplication is more salient than VL. Rather unexpectedly, the vowel is lengthened but the base is not copiedat all.

As demonstrated in (40), by operating suffixation (R1) and lengthening (R2) rules, the correct form is derived. The failure of the CV reduplication rule (R5) to operate can be understood as a gap in the paradigm, which is inherently unpredictable.

(40) a. Schema of Rule 1 [Suffixation]

$$\begin{bmatrix} \text{'Meaning of X'} \\ \text{COLD} \end{bmatrix} \rightarrow \begin{bmatrix} \text{CLASS of suffix Z} \\ \text{[XZ]LexicalCategory} \\ \text{'Meaning of XZ'} \end{bmatrix}$$

Operation of Rule 1

$$\begin{bmatrix} \text{[/u]REF} \\ \\ \\ \end{bmatrix} \rightarrow \begin{bmatrix} \text{CLASS 2, CLASS 5} \\ \text{[/uksnazaa}\mathsf{l}\text{Kuk]PRED} \\ \text{TO PLAY WITH S.TRESEMBLING} \end{bmatrix}$$

b. Rule 2 [Base-VL]

$$\begin{bmatrix} \text{CL 2, CL 3, CL7,} \\ \text{CL 8, CL 10,CL 12} \end{bmatrix}$$

$X = C_1V_1\mathbf{(V_1)}YZ \rightarrow C_1V_1\mathbf{V_1}YZ$

Operation of Rule

$\begin{bmatrix} \text{CL 2} \end{bmatrix}$

/uksnazaa$\mathsf{l}$Kuk → /uuksnazaa$\mathsf{l}$Kuk

A WP analysis successfully accounts for forms with multiple occurrences of affixes from different classes, including cases with unexpected realizations of the secondary exponent.

7. Alternative approaches

7.1. Stonham (2007)

Stonham (2007) accounts for cases of multiple appearances of reduplication-triggering suffixes. Observing several such patterns drawn from Rose (1981), he suggests that there always occurs "a single copy that selects the features required by all of the suffixes that appear" (p.121). For instance, when [R] and [RL] occur on the same base, a more comprehensive form [RL] surfaces. This observation, however, is sometimes incorrect because the realized shape is not always the form that encompasses all features.

Observing insightfully that double reduplication occurs only when both inflectional and derivational suffixes that trigger reduplication apply to the same base, Stonham adopts Stratal Optimality Theory (Kiparsky, 2000). He suggests that the occurrence/absence of double reduplication is made possible by the implementation of two distinct levels: stem level and word level. In both levels, a markedness constraint, *RedRed that prohibits double reduplication is ranked higher than faithfulness constraints, ensuring reduplication occurs only once.

While Stonham's analysis successfully accounts for the presence/absence of double reduplication, which is the goal of his analysis, this analysis is not capable of accounting for the pattern of BM that surfaces. For instance, consider the form, *MaaMaa*l*yim*l*ap* in (37) above, which has two suffixes: each of them accompanies distinct shapes of stem modification, [R] and [RL+L]. The resulting surface shape is the form, [RL+L] that *-apa* requires. Within Stonham's account, since both suffixes are part of derivational morphology, only a stem-level account is necessary. In Tableau 1, the double-reduplicated form is ruled out by violating *RedRed. However, note that the underlying form, RED-RED-*-Maa*l-yiml-ap should be *Ma*l with a short vowel, rather than *Maa*l with a long vowel. It is important to account for correct vowel length in that vowel length is phonemically contrastive in Nuu-chah-nulth.

Tableau 1. (ibid: 127)

RED-RED-–Maal–yiml–ap	*RedRed	FaithIO
☞MaaMaalyimlap		*
MaaMaaMaalyimlap	*!	

In Tableau 2, I provide an analysis using the correct underlying form, *Mal*. Within Stonham's framework, candidate (a) is incorrectly ruled out, because it violates the constraint, DEPIO, since a long vowel in the output is short in the input. Candidate (b), which has a short vowel in both the reduplicant and the base, is selected as the winner.

Tableau 2.

RED-RED-–Mal –yiml–apa	*RedRed	MAXIO	DEPIO	FAITHBR
☹a. MaaMaalyimlap		*	*(μ)!	
☞b. MaMalyimlap		*		
c. MaaMaaMaalyimlap	*!		*(μ)	

As illustrated above, the set of constraints suggested in Stonham (2007) does not select the optimal candidate as the winner when the underlying representation, *Mal* is present. In short, while Stonham's Stratal OT approach successfully accounts for the occurrence/inactivity of double reduplication, his model is insufficient to account for various patterns of BM attested in the language.

7.2. ES Kim (2003)

In her study of the Ahousaht dialect, ES Kim (2003) accounts for various phonological and morphological issues within the framework of Optimality Theory. As for VLA and reduplication, she proposes that VLA and the shapes of the reduplicant and the base occur to meet a metrical requirement specified in the template that accompanies the suffix. She classifies the shapes of VLA relative to three foot structures and reduplication/VLA in relation to six foot structures.

In this analysis, VLA receives two distinct accounts, depending on whether VLA occurs with reduplication or not. When VLA occurs by itself, unaccompanied by reduplication, it is accounted for by employing a set of general faithfulness constraints (e.g., MAXIO(μ) and DEPIO(μ)). In accounting for VLA that co-occurs with reduplication (e.g., [RL]) or for reduplication that occurs without VLA (i.e., [R]), her faithfulness constraints are domain-specified, i.e., constraints are applied only to the classes indicated. For instance, MAXIO(μ) $_{[I\text{-}IV,\ VII]}$ applies to foot types I, II, III, IV, and VII. In both analyses, the constraint MAXFF (A foot in the input must have a correspondent in the output) plays a crucial role in selecting a specified template as the winner.

While the analysis accounts for shapes of VLA and reduplication accompanied by a single suffix successfully, issues arise when multiple suffixes of different templates are added to the same base. If one of the suffixes is accompanied only by VLA and the other is accompanied by VLA and reduplication, then another set of constraints may be needed to account for the form. Also, a device that rules out a form that meets the high-ranked constraint MAXFootForm (MAXFF) is needed.

A similar problem arises when more than one reduplication-accompanying suffix is attached to the same base. It should be possible to account for the absence of double reduplication by postulating the constraint, INTEGRITY, since a candidate with a doubly copied form would violate INTEGRITY to a greater degree. However, issues arise when co-occurring reduplication-accompanying suffixes have distinct foot templates due to domain-specific constraints. She proposes distinct rankings for classes to account for the various patterns of BM in Nuu-chah-nulth (11 patterns in her classification). Her ranking of constraints is illustrated in (41).

(41) Ranking of constraints (ibid: 155)

MAX/DEPIO(SEG), MAXIO(μ)$_{[I\text{-}IV,VII]}$, DEPIO(μ)$_{[I\text{-}III,\ V\text{-}VI]}$ >> MAXFF >> MAXIO(μ)$_{[V,\ VI]}$, DEPIO(μ) $_{[IV,\ VII]}$ >> MAX/DEPBR $_{[I\text{-}1.\ IV,\ VII\text{-}1]}$ >> NOCODA >> MAX/DEPBR$_{[I\text{-}2,\ II,\ III,\ V,\ VI,\ VII\text{-}2]}$ >> INTEGRITY

Some of the constraints above are ranked differently according to domain. For example, the constraint MAXIO(μ) is ranked after MAXFF in Class

V and VI; while for the rest of the classes, it is ranked before the constraint MAXFF. Note also that DEPIO(μ) and MAX/DEPBR are ranked differently depending on the class of affixes. Therefore, when a Class IV suffix (i.e., [RL+L]) and a Class V suffix (i.e., [R]) co-occur on the same base, the orders specified for each set of constraints conflict.

This problem is inherent to an approach that, in line with co-phonology theory (Orgun 1996; Inkelas 2008, among others), adopts distinct constraint rankings for each class in contrast to approaches that adopt a single, fixed constraint ranking (McCarthy and Prince 1995; Urbanczyk 1996, among others). It might be inevitable to employ more than one constraint ranking to successfully account for the rich morphology of Nuu-chah-nulth. The approach, however, does not work when multiple suffixes with distinct specifications occurs in a single base.

8. Conclusion

This paper has examined BMs that are accompanied by non-inflectional suffixes observed in Nuu-chah-nulth. The current study has particularly focused on the phenomenon of the multiple occurrences of accompanying suffixes. That is, when more than one VLA/reduplication-accompanying suffix is affixed to a base, the alternation occurs only once.

This study characterizes the seemingly distinct processes (i.e., VLA and reduplication) in terms of subsidiary exponence within ME, thus providing a unified account. The BMs have been examined as subsidiary exponents of ME, based on ME criteria developed from Matthews' (1972) study of Latin: a subsidiary exponent (i) is not phonologically conditioned; (ii) always occurs with a main exponent; (iii) occurs in a consistent phonological form; and (iv) occurs with any base of certain lexical categories.

The ME phenomena have received a formal analysis within the WP framework. Identifying patterns of BM has implications for employing

the WP model. I have suggested that derivational classes can be organized in accordance with patterns of BM. Nuu-chah-nulth shows 14 types of BM; accordingly, 14 non-inflectional classes are proposed. I proposed two different types of WFR that account for ME in the current study: suffixation rules and BM rules. A crucial difference between the two types of rule is that a suffixation rule contains syntactic and semantic information in the SD and SC, as well as morphological and phonological descriptions, whereas BM WFRs contain only morphological and phonological information and phonological change. In addition, class information is assigned by a suffix in affixation. Therefore, class assignment is described in the SC in suffixation rules. The class information assigned by suffixation is, then, assigned to a lexical base in the SD of the BM rules. Thus, suffixation rules are crucially applied before BM rules.

In order to account for ME within the WP framework, a rule for the suffixation and rule(s) for the BM(s) must apply to the same base, which WP models allow. However, special devices are required that properly allow or block the application of WFRs to the same base. WFRs that apply to the same base are organized into distinct *blocks* and extrinsic rule ordering among such WFRs is enforced.

The WP model successfully accounts for the multiple occurrences of triggering suffixes. Since a single WFR (e.g., a CV reduplication rule) may specify to more than one class (i.e., CL5-CL9), regardless of the number of suffixes in a form, the WP model expects only one instance of reduplication to be realized in the surface form. I also discussed alternative studies: a Stratal OT approach (Stonham, 2007) and a Templatic approach (ES Kim, 2003), showing in both cases that these analyses have difficulties in accounting for the multiple occurrence of accompanying suffixes.

This study contributes to a theory of morphology not only in that seemingly distinct processes (i.e., reduplication, VLA, and deletion) receive a unified analysis as ME, but also in that the distinct processes are formally accounted for, expanding the WP approach to derivational morphology.

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