博士論文

論文題目　**Accentuation and *Rendaku* in Japanese Deverbal Compounds: A Comparison with Noun Compounds**
(日本語の動詞由来複合語におけるアクセントと連濁
—名詞複合語との比較**—)**

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1. Introduction

1.1. Research topics

In Japanese deverbal compounds, verb stems (*ren'yookei*) appear as the second element. It has been pointed out that their phonological behavior depends on the grammatical relationship between the first and second elements. Put simply, deverbal compounds where the first element is an object of the verb are more likely to be accented and resist a morpho-phonological process called *rendaku* (sequential voicing), which voices the initial voiceless obstruent of the non-initial element of a compound; in contrast, compounds where the first element modifies the verb tend to be unaccented and undergo *rendaku* (Kawakami 1953, 1984, Kindaichi 1976, Okumura 1984, Sato 1989, NHK 1998, Akinaga 2001, Sugioka 1996, 2002, Ito and Sugioka 2002).

These differences are illustrated by the examples in (1).[1] *Karuta'-tori* 'playing *karuta*' and *hituzi'-kai* 'shepherd' in (1)-(a) have antepenultimate accent and the first element of the verb stem remains voiceless, resisting *rendaku*. In contrast, *nizyuu-dori* 'receiving double payment' and *hanasi-gai* 'pasturing' are unaccented and the first segment of the verb stem is changed to voiced (i.e. t→d, k→g). Tentatively, these two types are called 'Object Type' and 'Adjunct Type'.

(1) Phonological differences between Object Type and Adjunct Type

a. Object Type (object + verb stem): accented, resist *rendaku*

ka'ruta + $tori_{acc}$ → karuta'-tori '*karuta* + taking; playing *karuta*'

hituzi + kai_{acc} → hituzi'-kai 'sheep + keeping; shepherd'

b. Adjunct Type (adjunct + verb stem): unaccented, undergo *rendaku*

nizyuu + $tori_{acc}$ → nizyuu-dori 'double + taking; receiving double payment'

$hanasi_{acc}$ + kai_{acc} → hanasi-gai 'releasing + keeping; pasturing'

However, these phonological differences do not tend to hold in longer compounds: both types are likely to be accented and undergo *rendaku* if the length of the second element is more than two morae (Kindaichi 1976, NHK 1998, Akinaga 2001). Consider the examples in (2). *Yasai-du'kuri* 'vegetable growing' and *umi-bi'raki* 'the beginning of the swimming season' in (2)-(a) undergo *rendaku* although the first element is the object of the verb;

[1] Unless otherwise stated, the author follows NHK (1998), a pronunciation dictionary of Standard Japanese, in judging the presence or location of the accent. When a compound has more than one pattern of accentuation, the most dominant pattern is shown.

niwaka-du'kuri 'hastily made' and *soto-bi'raki* 'opening outward' in (2)-(b) are accented although they belong to Adjunct Type.

(2) Disappearance of phonological difference in longer compounds

a. Object Type: accented, undergo *rendaku*

yasai + tukuri_{acc} → yasai-du'kuri 'vegetable + making; vegetable growing'

u'mi + hiraki_{acc} → umi-bi'raki

'sea + opening; the beginning of the swimming season'

b. Adjunct Type: accented, undergo *rendaku*

ni'waka + tukuri_{acc} → niwaka-du'kuri 'sudden + making; hastily made'

so'to + hiraki_{acc} → soto-bi'raki 'outside + opening; opening outward'

The tendencies in (1) and (2) are summarized in (3) below.

(3) Tendencies pointed out in previous studies

	Object Type	Adjunct Type
second element: ~2 morae	[+accented, -rendaku]	[-accented, +rendaku]
second element: 3 morae~	[+accented, +rendaku]	[+accented, +rendaku]

Another important point regarding the phonological behavior of deverbal compounds is that the accent and *rendaku* sometimes show complementary distribution: that is, *rendaku* is likely to occur if a deverbal compound is unaccented, while it is not likely to occur in accented compounds (Sato 1989), as illustrated in (4).

(4) Complementary distribution of accent and *rendaku*

a. [+accented, -rendaku]

boosi + kake_{acc} → boosi'-kake 'hat + hanging; hat-rack'

yasumono + kai → yasumono'-kai 'cheap article + buying; buying cheap articles'

b. [-accented, +rendaku]

hiyake + tome → hiyake-dome 'sunburn + stopping; sunscreen'

koromo + kae → koromo-gae 'clothes + changing; seasonal change of clothing'

1.2. The goals of this study

Although there are many theoretical analyses of the accentuation and *rendaku* of noun compounds, less attention has been paid to those of deverbal compounds in the field of phonology. The aims of this study are to examine accentuation and *rendaku* in deverbal compounds carefully with a comprehensive corpus study and to better understand the mechanism that gives rise to them.

With regard to the first aim, this study investigates the percentages of [+accented] and [+rendaku] and the presence of the complementary relationship between accent and *rendaku*, employing a pronunciation dictionary (NHK 1998). The investigation verifies the tendencies that have been pointed out in previous studies (i.e. (3)), giving more detailed description.

In order to achieve the second aim, Object Type compounds and Adjunct Type compounds are compared with noun compounds, which have been studied in detail in previous studies. The differences in accentuation and *rendaku* among these three kinds of compounds are analyzed as the differences in constraint ranking within the framework of Optimality Theory (OT) (Prince and Smolensky 1993/2004). With regard to accentuation, it is shown that the 'lexical category' of compounds has some influence. The complementary distribution of accent and *rendaku* is also accounted for by constraint interaction. In addition, some relevant issues are discussed with regard to the analysis of accentuation, such as the difference between simplex words and compounds, the accentuation of *ren'yookei*, and deaccenting morphemes in noun compounds.

1.3. The organization of this study

This study consists of five chapters. First, the remainder of this chapter reviews some background information on Japanese phonology and morpho-phonology and provides theoretical background, especially regarding Optimality Theory. In addition, this chapter reviews the classification of deverbal compounds and the characteristics of each group based on previous studies. Second, Chapter 2 presents the results of the investigation of a pronunciation dictionary. Although the results are consistent with what has been pointed out in previous studies, more detailed description is given in this chapter. Third, Chapter 3 analyzes the difference in accentuation between Object Type and Adjunct Type, based on the previous analyses of noun compounds. The differences among the three kinds of compounds are analyzed as differences in constraint ranking, and it is shown that the ranking itself is motivated by the 'lexical category' of compounds. This chapter also deals with the differences between simplex words and compounds, the accentuation of *ren'yookei*, and deaccenting morphemes in noun compounds. Fourth, Chapter 4 deals with the difference in *rendaku* among Object Type compounds, Adjunct Type compounds, and noun compounds, discussing the complementary distribution of *rendaku* and accent. Lastly, Chapter 5 summarizes the discussion and points out issues for future research.

1.4. Background information on Japanese phonology and morpho-phonology

As a preliminary to the discussion in the following chapters, this chapter presents some background information on Japanese phonology and morpho-phonology. Although Japanese has various dialects, this study deals with Standard (Tokyo) Japanese. First, 1.4.1 shows the inventory of phonemes in Japanese, making the system of notation in this study clear. Next, 1.4.2 explains syllable structure, referring to morae in Japanese. 1.4.3 illustrates how verb stems (*ren'yookei*), which are the second element of deverbal compounds, are formed. The system of accentuation is briefly reviewed in 1.4.4. Finally, the process of *rendaku* is explained in 1.4.5.

1.4.1. Phoneme inventory and notation

Japanese has five vowel phonemes: /i, u, e, o, a/. As /u/ in Japanese tends to be unrounded, /ɯ/ (i.e. high, back, unrounded) is a more precise notation; however, /u/ is adopted for the sake of simplicity in this study. Each phoneme has a contrast in length. In this study, short and long vowels are represented in the following way.

(5) Representation of vowels
   a. Short vowels: i, u, e, o, a
   b. Long vowels: ii, uu, ee, oo, aa

Japanese has fourteen consonant phonemes, leaving aside palatalized consonants, as shown in (6). Some of these phonemes have allophones; for instance, /t/ is pronounced as [tʃ] before /i/ (e.g. /miti/→[mitʃi] 'road'). (7) shows the representation of the consonants in Romanization. Note that palatal glide /j/ is represented as *y*.

(6) Plain consonants: /p, b, t, d, k, g, s, z, h, m, n, r, w, j/

(7) Representation of plain consonants in Romanization: p, b, t, d, k, g, s, z, h, m, n, r, w, y

As shown in (8), Japanese also has several palatalized consonants. (9) shows the representation of the palatalized consonants in Romanization.

(8) Palatalized consonants: /p^j, b^j, tʃ, k^j, g^j, ʃ, (d)ʒ, ç, m^j, ɲ, r^j/

(9) Representation of palatalized consonants in Romanization:

py, by, ty, dy, ky, gy, sy, zy, hy, my, ny, ry

This study employs the Japanese system of Romanization (i.e. *Nihon-siki*) instead of phonetic transcription in order to make the voicing alternations clear. For example, *isi+tukuri→isi-dukuri* 'stone + making; built of stone' is pronounced as [iʃi-zukuri]. In contrast to [z], *d* clearly shows that it is the result of *rendaku*. Although there are two other systems of Romanization, they represent [z] as *z* (e.g. *isi-zukuri* in the *Kunrei* system and *ishi-zukuri* in the Hepburn system). The table in (10) is the Japanese syllabary in the Japanese system of Romanization, which is used in this study.

(10) The Japanese system of Romanization

a	i	u	e	o
ka	ki	ku	ke	ko
sa	si	su	se	so
ta	ti	tu	te	to
na	ni	nu	ne	no
ha	hi	hu	he	ho
ma	mi	mu	me	mo
ya	yi	yu	ye	yo
ra	ri	ru	re	ro
wa	wi	wu	we	wo
ga	gi	gu	ge	go
za	zi	zu	ze	zo
da	di	du	de	do
ba	bi	bu	be	bo
pa	pi	pu	pe	po

kya	kyu	kyo
sya	syu	syo
tya	tyu	tyo
nya	nyu	nyo
hya	hyu	hyo
mya	myu	myo
rya	ryu	ryo
gya	gyu	gyo
zya	zyu	zyo
dya	dyu	dyo
bya	byu	byo
pya	pyu	pyo

The table in (11) shows the phonetic transcription of (10). Note that there is no phonetic contrast between *zi* and *di*: both tend to be pronounced as [ʒi] between vowels in normal speech and as [dʒi] when they are pronounced carefully. The same holds true for *zu/du*, *zya/dya*, *zyu/dyu*, and *zyo/dyo*. In addition, it must be noted that the transcriptions [tʃ, ʃ, (d)ʒ] are inaccurate; [cɕ, ɕ, (ɟ)ʑ] are more accurate transcriptions although [tʃ, ʃ, (d)ʒ] are widely used.

(11) Phonetic transcription of (10)

a	i	ɯ	e	o
ka	ki	kɯ	ke	ko
sa	ʃi	sɯ	se	so
ta	tʃi	tsɯ	te	to
na	ni	nɯ	ne	no
ha	çi	ɸɯ	he	ho
ma	mi	mɯ	me	mo
ja	(i)	jɯ	(e)	jo
ɾa	ɾi	ɾɯ	ɾe	ɾo
wa	wi	(ɯ)	we	o
ga	gi	gɯ	ge	go
za	(d)ʒi	(d)zɯ	ze	zo
da	(d)ʒi	(d)zɯ	de	do
ba	bi	bɯ	be	bo
pa	pi	pɯ	pe	po

k^{j}a	k^{j}ɯ	k^{j}o
ʃa	ʃɯ	ʃo
tʃa	tʃɯ	tʃo
ɲa	ɲɯ	ɲo
ça	çɯ	ço
m^{j}a	m^{j}ɯ	m^{j}o
ɾ^{j}a	ɾ^{j}ɯ	ɾ^{j}o
g^{j}a	g^{j}ɯ	g^{j}o
(d)ʒa	(d)ʒɯ	(d)ʒo
(d)ʒa	(d)ʒɯ	(d)ʒo
b^{j}a	b^{j}ɯ	b^{j}o
p^{j}a	p^{j}ɯ	p^{j}o

1.4.2. Syllable structure and mora

Syllable structures allowed in Japanese are only CV(V), V(V), CV(V)C, and V(V)C. That is, complex onsets and complex codas are not allowed (i.e. *CCVC, *CVCC). In addition, consonants that can appear in coda position are limited to stops, fricatives, and nasals. Stops and fricatives in coda position, which are traditionally called *sokuon*, must be followed by the identical consonant, as illustrated in (12). In these examples, dots represent syllable boundaries.

(12) Stops and fricatives in coda position

a.	kap.pa.tu	'active'	tep.pai	'abolition'
b.	kat.too	'conflict'	tet.tai	'withdrawal'
c.	kak.ki	'vigor'	te'k.ki	'ironware'
d.	ko's.si	'outline'	tos.sin	'dash'

Nasals in coda positions, which are traditionally called *hatuon*, must share the place of articulation with the subsequent consonant if it is a stop or a nasal, as shown in (13). Nasal codas in word-final position are pronounced as uvular nasals.[2]

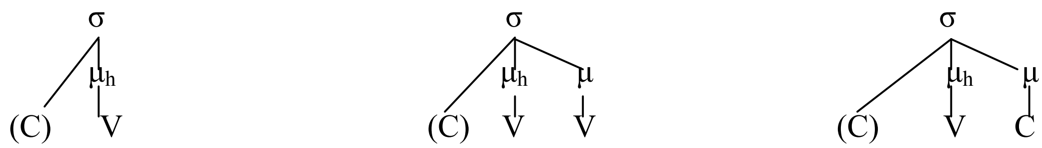
(13) Nasals in coda position

a.	Labial:	zim.mee	'person's name'	si'm.po	'progress'
b.	Coronal:	han.noo	'reaction'	ken.too	'examination'
c.	Velar:	he'ŋ.ka	'change'	teŋ.koo	'weather'

This study represents all coda nasals with *n* to simplify the notation.

Another important property of coda consonants in Japanese is that they are counted as a mora. The diagrams in (14) show the relationship between mora and syllable in each type of syllable structure.

(14) a. (C)V (light syllable) b. (C)VV (heavy syllable) c. (C)VC (heavy syllable)



As shown in (14)-(b, c), the second vowel in (C)VV syllables and the coda consonant in (C)VC syllables are considered to be a mora. That is, (C)VV syllables and (C)VC syllables are heavy syllables, while (C)V syllables are light syllables. In heavy syllables, not all morae have the same status; that is, a segment in the nucleus of a syllable is a 'head mora (μ_h)' (Zec 2007), while the second vowel in (C)VV syllables and the coda consonant in (C)VC syllables is a non-head mora.

1.4.3. Verb stems (*ren'yookei*)

The restrictions on syllable structures reviewed in 1.4.2 also affect verbal conjugation. What is the most relevant to this study is the formation of verb stems (*ren'yookei*), which are the second element of deverbal compounds.

Roots of Japanese verbs are classified into two groups based on the final segment: vowel-final roots and consonant-final roots. If a root is vowel-final, the verb stem has the same shape as its root; in contrast, a verb stem is formed by adding /i/ to the verb root if the root is consonant-final. Some examples are shown in (15).

[2] See Son (2011) for a discussion of word-final nasals in Japanese.

(15) Formation of verb stems (*ren'yookei*)

	Root	Stem	
a. Vowel-final root	tome	tome	'stop'
(*itidan-doosi*)	koe	koe	'get over'
	atae	atae	'give'
b. Consonant-final root	kas	kasi	'lend'
(*godan-doosi*)	tur	turi	'hang'
	nozom	nozomi	'hope'

With regard to vowel-final roots, which are traditionally called *itidan-doosi*, it is not necessary to add /i/ because vowel final syllables are allowed in Japanese. In contrast, consonant-final roots, which are traditionally called *godan-doosi*, cannot appear as they are because coda consonants are not allowed in word-final position except for uvular nasals. The classification of these two kinds of roots is also relevant in analyzing the accentuation of verbal conjugation, as shown in Chapter 3.

1.4.4. Accentuation

There is a considerable literature on accent patterns in Japanese, including McCawley (1968), Haraguchi (1977), Higurashi (1983), Poser (1984), Yamada (1990a, b), Kubozono (1995, 1997), and Tanaka (2001, 2005a). It has been argued that Japanese is a pitch-accent language, and the pitch pattern is predictable based on accentedness (i.e. whether a word has the accent or not) and the location of the accent. In this language, the unit which carries accent is a syllable, while the unit which bears tone is a mora (Kubozono and Ota 1998, Tanaka 2005a). This study puts the mark of the accent (') after the head mora (μ_h) of the accented syllable.

If a word carries accent on a non-initial syllable then the initial mora and morae which follow the head mora of the accented syllable have a low tone (L), and the remaining morae have a high tone (H) (e.g. *yama-za'kura* 'wild cherry tree' LHHLL). If a word carries accent on the initial syllable then the initial mora has a high tone and other morae have a low tone (e.g. *ka'makiri* 'mantis' HLLL). In contrast, if a word is unaccented, the initial mora has a low tone and the remaining morae have a high tone (e.g. *midori-iro* 'green' LHHHH). Although these generalizations suggest that the tone pattern of unaccented words is the same as that of final-accented words (e.g. *hanasi'* 'talk' LHH), attaching the case particle *-ga* reveals the difference: *-ga* has a high tone in the former case, while it has a low tone in the latter case (e.g.

midori-iro ga ‘green (nominative)’ LHHHHH vs. *hanasi' ga* ‘talk (nominative)’ LHHL). These patterns are summarized as follows. Note that the pitch changes to L in the mora which follows the head mora of the accented syllable.

(16) Presence and location of accent and pitch patterns

Presence of accent	Location of Accent	Pitch pattern	Example
Accented	Initial [e.g. σ'σσσσ (*ga*)]	HLLLL (L)	ka'makiri (ga) ‘mantis’
	Middle [e.g. σσσ'σσ (*ga*)]	LHHLL (L)	yama-za'kura(ga) ‘wild cherry tree’
	Final [e.g. σσσσσ' (*ga*)]	LHHHH (L)	hanasi' (ga) ‘talk’
Unaccented	[e.g. σσσσσ-(*ga*)]	LHHHH (H)	midori-iro (ga) ‘green’

Accentedness and the location of the accent, if any, are unpredictable in simplex nouns. If a word has *n* syllables, *n*+1 patterns are possible: *n* accented patterns and one unaccented pattern. For example, two-syllable words have three patterns, such as *a'me* ‘rain’, *yama'* ‘mountain’, and *mizu* ‘water’. Likewise, three-syllable words have four patterns, such as *mi'dori* ‘green’, *koko'ro* ‘heart’, *otoko'* ‘man’, and *sakura* ‘cherry tree’.

In contrast, accentuation of verb roots shows only two types: accented or unaccented, as exemplified in (17).

(17) Accentuation of verb roots

a.	Accented roots:	tabe_{acc}	‘eat’	yom_{acc}	‘read’
b.	Unaccented roots:	tome	‘stop’	kas	‘lend’

With regard to accented roots, the location of the accent is predictable based on the inflectional form. For instance, the accent is on the penultimate syllable in the non-past tense and it is on the syllable which contains the antepenultimate mora in the past tense (e.g. *tabe'ru* ‘eat.non-past’, *ta'beta* ‘eat. past’).

What is the most relevant here is the accentuation of verb stems. As pointed out in Sugioka (1996, 2002) and Ito and Sugioka (2002), verb stems have two functions and each function shows different patterns of accentuation. As exemplified in (18), the verb infinitive has an accent on the penultimate syllable, while the deverbal nominal is final-accented.

(18) Verb stem of the root yom_{acc} ‘read’

a. Verb infinitive: yo'mi ni iku ‘go to read’

b. Deverbal nominal: yomi' ga asai ‘reading is shallow’

An important issue is whether a verb stem which appears in a deverbal compound is penultimate-accented or final-accented. In addition, there is the additional possibility of underspecification because the accent location is predictable based on the inflectional form. That is, there are three theoretical possibilities as summarized in (19).

(19) Possibilities of accent location in a verb stem

a. Penultimate-accented: e.g. yo'mi

b. Final-accented: e.g. yomi'

c. The position is underspecified: e.g. yomi_{acc}

In this study, underspecification is tentatively adopted because there are two possibilities with regard to the accentuation of unaccented roots (see 3.2.4). However, it will be argued that underspecification is not assumed in deverbal compounds, as discussed in 3.2.5.

1.4.5. *Rendaku*

There is a large literature on *rendaku* (see Motoori 1822, Lyman 1894, Yamada 1904, Ogura 1910, Nakagawa 1966, McCawley 1968, Kindaichi 1976, Otsu 1980, Vance 1987, 2005, Takayama 1999, Rosen 2001, 2003, Ito and Mester 2003, Irwin 2005, 2009, Nishimura 2007, 2013). As exemplified in (20)-(a), *rendaku* is a morpho-phonological process where the initial voiceless obstruent of the second element of a compound is changed to voiced. Therefore, if the initial segment of the second element is a voiceless obstruent, *rendaku* is possible, although it does not always occur, as shown in (20)-(b).

(20) Occurrence of *rendaku*

a. *Rendaku* occurs.

ude' + $\text{tamesi}_{\text{acc}}$ → ude-da'mesi 'skill + trying; trying one's skill'

wa'ra + huki → wara-buki 'straw + roofing; thatched'[3]

b. *Rendaku* does not occur.

netu' + $\text{samasi}_{\text{acc}}$ → netu-sa'masi /*netu-za'masi 'heat + cooling; antipyretic'

inku + kesi → inku'-kesi /*inku'-gesi 'ink + erasing; ink eraser'

Although all of the examples in (20) are deverbal compounds, *rendaku* is found in other types of word formation, especially in noun compounds.

[3] A voiceless fricative /h/, which was formerly /p/ in Japanese, is changed into a voiced stop /b/ in the process of *rendaku*. See Ueda (1898) for /p/ in Japanese.

On the other hand, *rendaku* is impossible in two cases, as illustrated in (21). First, it is simply irrelevant when the initial segment of the second element is a voiced obstruent or a sonorant. For example, *rendaku* is not possible because /m/ is a sonorant in (21)-(a). In addition, *rendaku* is blocked in almost all cases where the second element already includes a voiced obstruent, by Lyman's Law (Lyman 1894).[4] For instance, it is blocked because *kurabe* contains a voiced obstruent /b/ in (21)-(b).

(21) Cases where *rendaku* is impossible

a. *Rendaku* is irrelevant.
   kusa' + musiri → kusa-mu'siri 'grass + plucking; weeding'

b. *Rendaku* is blocked by Lyman's Law.
   ude' + kurabe → ude-ku'rabe /*ude-gu'rabe 'skill +comparing; contest of skill'

Although these cases may seem trivial, they are crucial in analyzing a certain aspect of deverbal compounds. As *rendaku* and accentuation sometimes correlate in a complex way, the pure pattern of accentuation can be seen in cases where *rendaku* is impossible by setting aside the effect of *rendaku*.

1.5. Theoretical background

This section provides theoretical background as the basis for the analysis in the following chapters. First, 1.5.1 compares the traditional rule-based theory and Optimality Theory, which is a constraint-based approach proposed in Prince and Smolensky (1993/2004). Then, 1.5.2 shows the basic framework of Optimality Theory, discussing constraints and input in detail.

1.5.1. Rule-based theory vs. Optimality Theory

In the history of phonological theory, rule-based theory had been the mainstream of generative phonology until the beginning of the 1990s. As shown in (22), the underlying representation is mapped into a surface representation by rules in the process of derivation. Rules are ordered serially, and the output of Rule (k-1) becomes the input to the next Rule k. If there are n rules, there are (n-1) intermediate representations.

4 Lyman's Law has very few exceptions, such as *nawa-ba'sigo* 'rope ladder', *hun-ziba'ru* 'to bind something violently', and *syoo-zaburoo* 'Syoozaburoo (first name)' (Otsu 1980, Haraguchi 2000).

(22) Rule-based theory

Underlying Representation

↓ Rule 1

Intermediate Representation 1

↓ Rule 2

Intermediate Representation 2

…

↓ Rule (n-1)

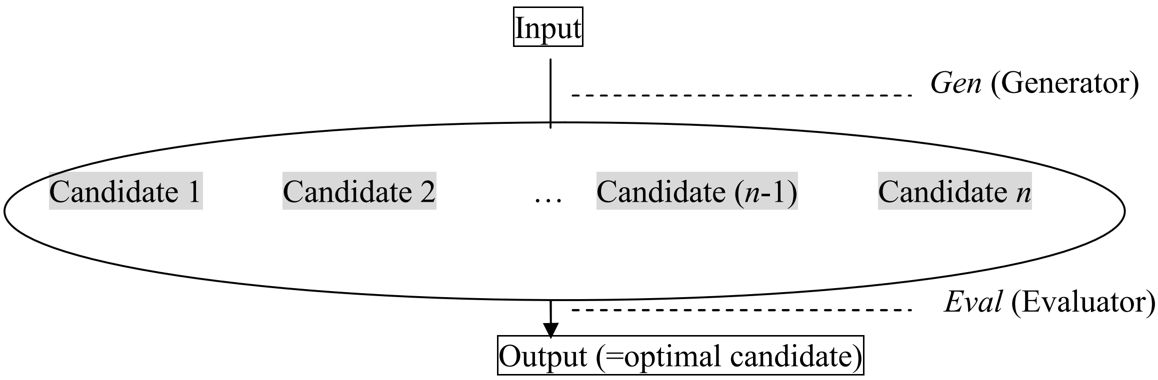
Intermediate Representation (n-1)

↓ Rule n

Surface Representation

In contrast, there are no intermediate representations in Optimality Theory, which allows only two levels (i.e. input and output). In this theory, candidates are produced from an input in *Gen* (Generator), and the optimal one is selected as an output in *Eval* (Evaluator) through interaction of constraints, as shown below.

(23) Optimality Theory



As shown in (24), the evaluation is demonstrated in a 'tableau'. In a tableau, candidates are shown in the left column. Constraints are arranged in the top row based on their ranking; if a constraint C_k dominates another constraint C_l ($C_k >> C_l$), C_k is located to the left of C_l in the row. Asterisks (*), which are called violation marks, indicate that a candidate violates the constraint, and the pointing finger (☞) shows that the candidate is optimal.

(24) Tableau in OT

/Input/	Constraint 1	Constraint 2	…	Constraint (*n*-1)	Constraint *n*
Candidate 1		*!			
☞Candidate 2					*
…					
Candidate (*n*-1)				*!	
Candidate *n*	*!				

In the example in (24), Candidate 1, Candidate 2, Candidate (*n*-1), and Candidate *n* violate Constraint 2, Constraint *n*, Constraint (*n*-1), and Constraint 1, respectively. As Constraint 1, Constraint 2, and Constraint (*n*-1) are ranked higher than Constraint *n*, the violations of the three constraints are fatal to Candidate *n*, Candidate 1, and Candidate (*n*-1), respectively. As a result, Candidate 2 is optimal and is selected as the winner, although it violates Constraint *n*.

The tableau in (24) illustrates a case where each candidate violates one constraint for the simplicity of explanation. Then, how is the winner selected in (25)?

(25) Strict domination

/Input/	C1	C2	C3
☞Candidate (a)		*	*
Candidate (b)	*!		

In this tableau, candidate (a), which violates two constraints, is the winner, although candidate (b) violates only one constraint. That is, one violation mark of a higher-ranked constraint is more influential than the violation marks of two lower-ranked constraints; this is called 'strict domination'.

However, there are some phenomena where a candidate which violates a higher-ranked constraint is excluded due to a simultaneous violation of two lower-ranked constraints within a certain domain δ (e.g. segment, morpheme). As shown in (26), these cases are accounted for by local conjunction of constraints.

(26) Local conjunction of C2 and C3

/Input/	$[C2\&C3]_{\delta}$	C1	C2	C3
Candidate (a)	*!		*	*
☞Candidate (b)		*		

The conjoined constraint $[C2\&C3]_{\delta}$ is violated if and only if both C2 and C3 are violated within a domain δ.

Before moving on to the next subsection, let us review three types of tableaux (see McCarthy 2008): violation tableau, comparative tableau, and combination tableau. As illustrated in (27)-(a), violation tableaux show how each candidate violates each constraint. In contrast, comparative tableaux focus on the comparison of the winner (i.e. actual output) and the losers (i.e. candidates which cannot be the output). In (27)-(b), 'W' means that Constraint 1 and Constraint 4 favor the winner (i.e. Candidate (b)) and 'L' means that Constraint 2 and Constraint 3 favor the loser (i.e. Candidate (a)). In the row of a loser, *at least one* constraint which has 'W' dominates *all* constraints which have 'L'. For example, Constraint 1 dominates Constraint 2 and Constraint 3 in (27)-(b). Lastly, a combination tableau combines a violation tableau with a comparative tableau, including both violation marks and 'W/L' symbols. This study employs violation tableaux in principle, but combination tableaux are often used for arguing constraint ranking.

(27) Three types of tableaux

a. Violation tableau

/Input/	C1	C2	C3	C4
Candidate (a)	*!			*
☞Candidate (b)		*	*	

b. Comparative tableau

/Input/	C1	C2	C3	C4
Candidate (a)	W	L	L	W
☞Candidate (b)				

c. Combination tableau

/Input/	C1	C2	C3	C4
Candidate (a)	*W	L	L	*W
☞Candidate (b)		*	*	

1.5.2. Basic framework of Optimality Theory

Constraints in Optimality Theory are roughly divided into two categories: markedness constraints and faithfulness constraints. The former is a constraint on the output form, such as features, syllable structures, and prosodic hierarchy. On the other hand, faithfulness constraints militate against the disparity between the elements standing in 'correspondence', such as deletion, epenthesis, or changes in features. The notion of ‘correspondence’ is defined as follows, by McCarthy and Prince (1995: 262).

(28) **Correspondence.** Given two strings S_1 and S_2, correspondence is a relation ℜ from the elements of S_1 to those of S_2.

Correspondents. Elements $\alpha \in S_1$ and $\beta \in S_1$ are referred to as correspondents of one another when $\alpha ℜ \beta$.

‘Correspondence’ is found in various relationships, such as Input-Output (I-O), Base-Reduplicant (B-R), and Output-Output (O-O).

For example, consider the example of the Japanese loanword in (29). In Japanese, the English loanword *web* /web/ is pronounced as [webu] with the epenthetic vowel [u] because [b] cannot appear as a coda consonant (See (12)).

(29) Correspondence diagram for epenthetic vowels in Japanese loanwords

Input:	w	e	b	
	|	|	|	
Output:	w	e	b	u

In this example, [w], [e], and [b] in the output have input correspondents. On the other hand, [u] lacks an input correspondent, which is the violation of the faithfulness constraint DEP-IO.

(30) DEP-IO: Output segments must have input correspondents.

The tableau in (31) shows the interaction of a faithfulness constraint and a markedness constraint in /web/ → [webu]. DEP-IO is a faithfulness constraint which prohibits epenthesis and CODA CONDITION is a markedness constraint which limits the distribution of coda consonants. As shown in the tableau, [webu] is selected as the winner because CODA CONDITION dominates DEP-IO.

(31) Vowel epenthesis in Japanese loanwords

/web/	CODA CONDITION	DEP-IO
web	*!	
☞webu		*

Another example of the interaction of faithfulness constraints and markedness constraints is a restriction in segment inventory. For instance, a voiced fricative /v/ is not allowed in Japanese (see 1.4.1). In the traditional view, the lack of /v/ is considered to be the stipulation that ‘the phoneme /v/ does not exist in Japanese’. However, it is explained by the interaction of constraints in Optimality Theory: there is no need to exclude /v/ from the input. As shown in (32), the ranking ‘**v* (markedness constraint) >> IDENT-IO [continuant] (faithfulness constraint)’ excludes [v] in the output even if there is /v/ in the input.[5]

(32) The lack of /v/ as the result of constraint interaction (Input: /v/)

/v/	*v	IDENT-IO [continuant]
v	*!	
☞b		*

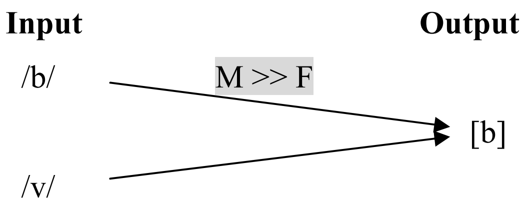
This ranking selects the correct winner when the input is /b/. In the following tableau, [v] is excluded due to the violation of **v* and IDENT [continuant].

(33) The tableau where the input is /b/

/b/	*v	IDENT-IO [continuant]
v	*!	*
☞b		

In this way, the difference at the input level is neutralized at the output level as a markedness constraint dominates a faithfulness constraint. This is schematized as below.

(34) Neutralization



In contrast, the ranking of **v* and IDENT [continuant] is the opposite in languages that have both [b] and [v] such as English. As shown in (35), the input is preserved irrespective of the value of [continuant] because the faithfulness constraint dominates the markedness constraint.

[5] IDENT-IO [continuant] requires that the value of [continuant] in the input and that in the output should be identical.

(35) The presence of [b] and [v] (e.g. English)

a. Input: /v/

/v/	IDENT-IO [continuant]	*v
☞v		*
b	*!	

b. Input: /b/

/b/	IDENT-IO [continuant]	*v
v	*!	*
☞b		

In other words, the contrast at the input level is preserved at the output level without neutralization because the faithfulness constraint dominates the markedness constraint.

(36) No neutralization (Preservation of contrast)

Input **Output**

/b/ ⟶ [b]

F>>M

/v/ ⟶ [v]

As suggested in (34) and (36), the difference at the level of the output is explained by the difference in constraint ranking, rather than by restriction at the level of the input. This is called Richness of the Base (ROB) (Prince and Smolensky 1993/2004), which is one of the important concepts in Optimality Theory. To put it simply, Richness of the Base is summarized as follows.

(37) Richness of the Base: no constraints hold at the level of underlying forms.
(Kager 1999: 19)

1.6. Classification of deverbal compounds

As discussed in previous studies (Kageyama 1982, 1993, Sugioka 1996, 2002, Sugioka and Kobayashi 2001, Ito and Sugioka 2002), deverbal compounds are classified into groups based on the relationship between the first and second elements. First, this section reviews the classification of deverbal compounds and the characteristics of each group based on previous studies. Then, the section presents a more detailed classification for the survey in Chapter 2 and the theoretical analysis in Chapter 3.

1.6.1. Restriction on the first element

A deverbal compound consists of two elements. The second element is a verb stem (*ren'yookei*); in contrast, various types of morphemes can appear as the first element (Kageyama 1982), as exemplified in (38).

(38) Various types of morphemes in the first element of deverbal compounds

a. Noun: tume + $kiri_{acc}$ → tume-ki'ri 'nail + cutting; nail clippers'

b. Verb stem: $tati_{acc}$ + $yomi_{acc}$ → tati-yomi 'standing + reading; browsing'

c. Adjective root: usu + $kiri_{acc}$ → usu-giri 'thin + cutting; thinly sliced'

d. Mimetic root: gabu + $nomi_{acc}$ → gabu-nomi 'gulping + drinking; guzzling'[6]

However, the first element is restricted in terms of its grammatical relationship with the second element.[7] Kageyama (1993) shows that an external argument (i.e. the subject of a transitive verb and an intransitive unergative verb) cannot appear as the first element of a deverbal compound. For example, it is impossible to form the compounds in (39).

(39) a. Subject of a transitive verb + Verb stem[8]

*kodomo + $yomi_{acc}$ → kodomo-yomi 'child + reading; child's reading'

b. Subject of an intransitive unergative verb + Verb stem

*kodomo + naki → kodomo-naki 'child + crying; child's crying'

On the other hand, internal arguments and adjuncts are allowed as the first element. The next section reviews how these two types differ based on Ito and Sugioka (2002).

1.6.2. Classification by Ito and Sugioka (2002)

1.6.2.1. Internal argument/Adjunct

Ito and Sugioka (2002) classify deverbal compounds into two types. One is the cases where the first element is an internal argument of the verb. In the other type, the first element modifies the verb as an adjunct. Ito and Sugioka (2002) also show that each type has different denotations, as exemplified in (40) and (41).

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[6] The accentuation of mimetic roots is not clear.

[7] See Roeper and Siegel (1978), Selkirk (1982), and Lieber (1983) for deverbal compounds in English.

[8] There are a few exceptions to this restriction, such as *ka'mi+kakusi*$_{acc}$ →*kami-ka'kusi* 'god + concealing; being spirited away'(Kageyama 1993).

(40) Deverbal compounds which include an internal argument

a. Act: kusa' + kari → kusa-ka'ri 'grass + cutting; mowing'

tera' + $mairi_{acc}$ → tera-ma'iri 'temple + visiting; visiting a temple'

b. Phenomenon: yuki' + $toke_{acc}$ → yuki-doke 'snow + thawing; thaw'

a'me + $huri_{acc}$ → ame'-huri 'rain + falling; rainfall'

c. Agent: kane + kasi → kane-ka'si 'money + lending; moneylender'

hituzi + kai_{acc} → hituzi'-kai 'sheep + keeping; shepherd'

d. Instrument: se'n + nuki → sen-nu'ki 'cork + pulling; corkscrew'

tume + $kiri_{acc}$ → tume-ki'ri 'nail + cutting; nail clippers'

e. Property: kane + $moti_{acc}$ → kane-mo'ti 'money + having; rich'

tu'mi + $tukuri_{acc}$ → tumi-tu'kuri 'sin + making; sinful'

f. Place: kuruma + yose → kuruma-yose 'car + closing; porch'

mono' + $hosi_{acc}$ → mono-ho'si 'thing + hanging out; drying place'

mizu + tamari → mizu-tamari 'water + gathering; puddle'

g. Time: yo' + ake → yo-ake' 'night + dawning; dawn'

yo' + $huke_{acc}$ → yo-huke' 'night + getting late; small hours'

(41) Deverbal compounds which include an adjunct

a. Act: $tati_{acc}$ + $yomi_{acc}$ → tati-yomi 'standing + reading; browsing'

nori' + $tuke_{acc}$ → nori-duke 'glue + attaching; pasting'

$taka_{acc}$ + nozomi → taka-no'zomi 'high + hoping; aiming too high'

b. State: ku'ro + $koge_{acc}$ → kuro-koge 'black + burning; burned black'

mizin + $kiri_{acc}$ → mizin-giri 'piece + cutting; minced'

As mentioned in 1.1, Ito and Sugioka (2002) also point out that the two types of deverbal compounds show different phonological behavior. That is, deverbal compounds which include an internal argument tend to be accented and resist *rendaku*, while deverbal compounds which include an adjunct tend to be unaccented and undergo *rendaku*. Their analysis of these differences is reviewed in Chapter 3 and Chapter 4.

1.6.2.2. Function as a predicate

Ito and Sugioka (2002) also argue that deverbal compounds which include an adjunct are predicates. The examples in (41)-(a) can be used as verbs when they co-occur with the light verb -*suru* 'to do', as shown in (42). That is, they have the feature [+V].

(42) Deverbal compounds in (41)-(a) followed by *-suru* 'do'

a. syuuka'nsi o tati-yomi suru 'to browse a weekly magazine'
   weekly magazine ACC browsing do

b. kitte o nori-duke suru 'to paste a stamp'
   stamp ACC pasting do

c. taka-no'zomi suru 'to aim too high'
   aiming too high do

Second, the deverbal compounds in (41)-(b) can be followed by *-da* (copula) or *-no* (genitive), forming stative predicates. Consider the examples in (43).

(43) Deverbal compounds in (41)-(b) followed by *-da* (copula) or *-no* (genitive)

a. Sakana ga kuro-koge da. 'The fish is burned black.'
   fish NOM burned black COP

b. mizin-giri no yasai 'minced vegetables'
   minced GEN vegetables

Some of the deverbal compounds which include an internal argument denote an act or property, as shown in (40)-(a, e). Are these compounds also predicates? First, the deverbal compounds in (40)-(e) can be followed by *-na* (copula) or *-no* (genitive).

(44) Deverbal compounds in (40)-(e)

a. kane-mo'ti no otoko' 'rich man'
   rich GEN man

b. tumi-tu'kuri na kotoba' 'sinful word'
   sinful COP word

c. oya-o'moi na seenen 'a young man who is considerate to his parents'
   considerate to parents COP young man

In contrast, those in (40)-(a) require *o* (accusative) before *-suru* 'do' unlike (41)-(a), as shown in (45). This implies that these compounds have the feature [-V].

(45) Deverbal compounds in (40)-(a)

a. kusa-ka'ri o suru (*kusa-ka'ri suru) 'to mow grass'
   mowing ACC do

b. tera-ma'iri o suru (*tera-ma'iri suru) 'to visit a temple'
visiting a temple ACC do

The restriction against the co-occurrence with -*suru* 'do' holds true for common nouns, as exemplified in (46).

(46) a. yakyuu o suru (*yakyuu suru) 'to play baseball'
baseball ACC do
b. tegami o ka'ku (*tegami suru) 'to write a letter'
letter ACC write

However, -*suru* 'do' follows deverbal compounds which include an internal argument in some cases (Kageyama 1999, Ito and Sugioka 2002, Yumoto 2010). In the examples in (47), -*suru* 'do' follows *aku-nuki* and *pakku-dume* although both *aku* 'bitterness' and *pa'kku* 'pack' are internal arguments of the verb stems.

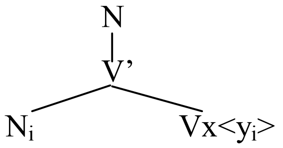
(47) a. goboo o aku-nuki suru 'to reduce the burdock's bitterness'
burdock ACC taking out bitterness do
b. go'han o pakku-dume suru[9] 'to pack rice'
rice ACC stuffing into a pack do

1.6.2.3. Internal structure of deverbal compounds

Ito and Sugioka (2002) argue that the two types of deverbal compounds have different internal structures. As illustrated in (48), deverbal compounds which include an internal argument are nouns which have the feature [-V]. In contrast, deverbal compounds which include an adjunct and denote an act are verbal nouns which have the feature [+V] (i.e. (49)-(a)). If deverbal compounds which include an adjunct denote a state, they are nouns as a whole (i.e. (49)-(b)). The two structures in (49) are endocentric structures, where the right-hand element is a head and its feature percolates to the whole compound, while the structure in (48) is an exocentric structure.

[9] The accentuation of *pakku-dume* (unaccented) is based on the author's intuition.

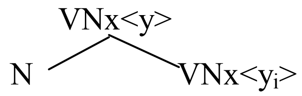
(48) Deverbal compounds which include an internal argument [exocentric structure]



kusa' + kari → kusa-ka'ri

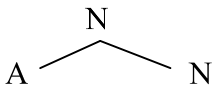
(49) Deverbal compounds which include an adjunct [endocentric structure]

a. Act



nori' + tuke$_{acc}$ → nori-duke (suru)

b. State



usu + kiri$_{acc}$ → usu-giri (da)

1.6.2.4. Deverbal compounds which denote products

Ito and Sugioka (2002) refer to another type of deverbal compounds, where the first element is the internal argument and the whole compound denotes a product. Some examples are shown in (50).

(50) Deverbal compounds which denote products

a. ume + hosi$_{acc}$ → ume-bosi '*ume* (Japanese apricot) + drying; pickled *ume*'

b. ni'nsoo + kaki$_{acc}$ → ninsoo-gaki 'looks + writing; person's description'

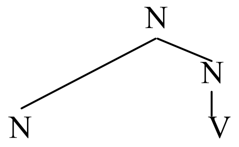
c. tama'go + yaki → tamago-yaki 'egg + cooking; Japanese omelet'

d. wa'sabi + tuke → wasabi-duke

'*wasabi* (Japanese horseradish) + soaking; *wasabi* preserved in *sake* lees'

As the formation of this type of deverbal compound is found only for some verbs and the meanings of the compounds are not very transparent, Ito and Sugioka (2002) do not consider this type as deverbal compounds, positing the structure in (51). Also, compounds of this type tend to be unaccented and undergo *rendaku*, which is different from other deverbal compounds which include an internal argument. The properties of this type are discussed in Chapter 4.

(51)



ume + hosi$_{acc}$ → ume-bosi

1.6.3. Classification in this study

This section presents a more detailed grouping of deverbal compounds in order to classify the data collected in the survey in Chapter 2. First, Ito and Sugioka (2002) point out that internal arguments in deverbal compounds can be connected with three different case particles in a sentence: *o* (accusative), *ga* (nominative), and *ni* (dative). Some examples are shown in (52).

(52) a. *o* (accusative): hituzi + kai$_{acc}$ → hituzi'-kai 'sheep + keeping; shepherd'
(hituzi o ka'u 'to keep a sheep')
tume + kiri$_{acc}$ → tume-ki'ri 'nail + cutting; nail clippers'
(tume o ki'ru 'to cut nails')
kusa' + kari → kusa-ka'ri 'grass + cutting; mowing'
(kusa' o karu 'to mow grass')

b. *ga* (nominative): mizu + tamari → mizu-tamari 'water + gathering; puddle'
(mizu ga tamaru 'A puddle forms.')
yo' + ake → yo-ake' 'night + dawning; dawn'
(yo' ga akeru 'Day breaks.')
a'me + huri$_{acc}$ → ame'-huri 'rain + falling; rainfall'
(a'me ga hu'ru 'The rain falls.')

c. *ni* (dative): hu'ne + nori → huna'-nori 'ship + riding; sailor'[10]
(hu'ne ni noru 'to get on board')
tera' + mairi$_{acc}$ → tera-ma'iri 'temple + visiting; visiting a temple'
(tera' ni ma'iru 'to visit a temple')
pa'kku + tume$_{acc}$ → pakku-dume 'pack + stuffing; stuffing into a pack'
(pa'kku ni tume'ru 'to stuff into a pack')

(52)-(a) shows examples where the case particle is *o* (accusative): the verb is transitive and the first element is the object of the verb. In (52)-(b), the case particle is *ga* (nominative). The

[10] /e/ in *hu'ne* is changed into /a/ in *huna'-nori*. This /e/~/a/ alternation is found in some compounds (e.g. kane + mono' → kana-mono 'metal + thing; hardware').

verb is an unaccusative intransitive verb and the first element is the subject of the verb. (52)-(c) shows examples where the case particle is *ni* (dative), including both transitive and intransitive verbs. The verb is intransitive in *huna'-nori* ‘sailor’ and *tera-ma'iri* ’visiting a temple’ while it is transitive in *pakku-dume* ‘stuffing into a pack’.

Second, some deverbal compounds which include an adjunct denote a product, although modification by a noun is necessary in some cases, as shown in (53)-(a, b).

(53) a. kara' + age → kara-age ‘empty + frying; deep-fried’
⇒ tori no kara-age ‘fried chicken’
chicken GEN deep-fried
b. syooga + yaki → syooga-yaki ‘ginger + grilling; grilled with ginger’
⇒ buta-niku no syooga-yaki[11] ‘ginger-flavored slices of grilled pork’
pork GEN grilled with ginger
c. abura + age → abura'-age ‘oil + frying; deep-fried bean curd’
d. asa + tuke → asa-duke ‘lightly + pickling; lightly pickled vegetables’
e. kusi' + yaki → kusi-yaki ‘skewer + grilling; grilled meat on skewers’

This type of function may not be as productive as those in (41). As Kageyama (1993: 188-189) points out, however, the meaning of a state which results from some change (i.e. the state of *x* becoming *y*) leads to a result nominal (Grimshaw 1990) (i.e. the result of *x* becoming *y*). Therefore, the examples in (53) can be considered as an extension of the denotation of ‘State’ in (41)-(b). Likewise, the deverbal compounds which include an internal argument and denote a product discussed in 1.6.2.4 are result nominals.[12] This similarity in denotation explains the fact that they show the same tendency in accentuation (i.e. unaccented) as deverbal compounds which include an adjunct.

Third, deverbal compounds have various denotations as discussed above. In addition, some deverbal compounds have more than one denotation in some cases. Consider the following examples.

(54) a. sake + $nomi_{acc}$ ‘alcoholic + drinking’ → sake-no'mi
i) Agent: drinker
ii) Act: drinking alcohol

[11] The accentuation of *syooga-yaki* (unaccented) is based on the author’s intuition.
[12] This point is also discussed in Suzuki (2008).

b. mono' + siri ‘thing + knowing’ → mono-si'ri

i) Agent: knowledgeable person

ii) Property: knowledgeable

c. maru + yaki ‘whole + grilling’ → maru-yaki

i) State: barbecuing (e.g. *buta o maru-yaki ni suru* ‘to roast a pig whole’)

ii) Product: barbecue (e.g. *buta no maru-yaki* ‘a pig roasted whole’)

Although these factors make it difficult to rigidly classify all deverbal compounds, they can be roughly classified into three categories based on their meaning and co-occurrence with -*suru*: verbal, adjectival, and nominal, as shown in (55). What has to be noted is that (55) is not a morphological classification. From a morphological viewpoint, verbs and adjectives have conjugational endings, as in *tabe'-ru* ‘eat (non-past)’ and *taka'-i* ‘high (non-past)’. On the other hand, deverbal compounds are nouns morphologically.

(55) a. Verbal: denote act, co-occurring with -*suru* without *o* (ACC)

b. Adjectival: denote property or state

c. Nominal: denote agent, instrument, place, time, phenomenon, or act (not verbal)

First, ‘verbal’ deverbal compounds denote an act, co-occurring with -*suru* without *o* (ACC), such as *tati-yomi* (*suru*) ‘browsing’ in (41)-(a). Although most of them include an adjunct, they are also found among deverbal compounds which include an internal argument (e.g. aku-nuki ‘taking out bitterness’). Second, ‘adjectival’ deverbal compounds denote a property or state, such as *mizin-giri* (*no*) ‘minced’ in (41)-(b) and *tumi-tu'kuri* (*na*) ‘sinful’ in (40)-(e). Third, ‘nominal’ deverbal compounds denote an agent, instrument, place, time, phenomenon, or act, such as *hituzi'-kai* ‘shepherd’ in (40)-(c). In this category, those which denote an ‘act’ cannot co-occur with -*suru* without *o* (ACC), such as *kusa-ka'ri* (*o suru*) ‘mowing’ in (40)-(a).

Based on these three categories, this study adopts the classification in (56). Of course, deverbal compounds are not pure nouns/adjectives/verbs, but this classification may help to provide a bird’s-eye view. Categories of deverbal compounds are discussed in 3.3 in relation to accentuation.

(56) Classification of deverbal compounds

denotation \ first element		Internal argument			Adjunct
		o (acc)	*ga* (nom)	*ni* (dat)	
Nominal	a. Agent	hituzi'-kai 'shepherd'		huna'-nori 'sailor'	
	b. Instrument	tume-ki'ri 'nail clippers'			
	c. Place	kuruma-yose 'porch'	mizu-tamari 'puddle'		
	d. Time		yo-ake' 'dawn'		
	e. Phenomenon		ame'-huri 'rainfall'		
	f. Act [-V]	kusa-ka'ri 'mowing'		tera-ma'iri 'visiting a temple'	
Adjectival	g. Property	tumi-tu'kuri 'sinful'			
	h. State				mizin-giri 'minced'
Verbal	i. Act [+V]	aku-nuki 'taking out bitterness'	ne-sagari 'declining in price'	nakama-iri 'joining a group' pakku-dume 'stuffing into a pack'	tati-yomi 'browsing'

2. Survey of accentuation and *rendaku* in deverbal compounds

This chapter investigates accentuation and *rendaku* in deverbal compounds by employing a pronunciation dictionary, NHK (1998). 2.1 summarizes what has been pointed out in previous studies and 2.2 explains the methodology of the survey. The deverbal compounds collected from the dictionary are classified into four types: Type I, Type II, Type III, and Type IV. Type I and Type IV correspond to Object Type and Adjunct Type in 1.1, respectively. 2.3 and 2.4 present the results for Type I and Type IV, and 2.5 compares the two types. 2.6 presents the results for Type II, where the second element is an unaccusative intransitive verb and the first element is the subject of the verb. 2.7 deals with Type III, where the first element is an internal argument whose case particle is *ni* (dative). 2.8 compares the four types of deverbal compounds and 2.9 summarizes the results of the survey.

2.1. Generalization in previous studies

As mentioned in Chapter 1, deverbal compounds where the first element is an internal argument are more likely to be accented and resist *rendaku*, while deverbal compounds where the first element modifies the verb tend to be unaccented and undergo *rendaku* (Kawakami 1953, 1984, Kindaichi 1976, Okumura 1984, Sato 1989, NHK 1998, Akinaga 2001, Sugioka 1996, 2002, Ito and Sugioka 2002).[13] However, these phonological differences do not tend to hold in longer compounds: both types are likely to be accented and undergo *rendaku* if the length of the second element is more than two morae (Kindaichi 1976, NHK 1998, Akinaga 2001). These tendencies are summarized as below.

(57) Tendencies of accentuation and *rendaku* in deverbal compounds

1st element / 2nd element	Internal argument	Adjunct
~2μ	**[+accented, -rendaku]** ka'ruta + tori$_{acc}$ → karuta'-t̲ori 'playing *karuta*'	**[-accented, +rendaku]** nizyuu + tori$_{acc}$ → nizyuu-d̲ori 'receiving double payment'
3μ~	**[+accented, +rendaku]** yasai + tukuri$_{acc}$ → yasai-d̲u'kuri 'vegetable growing'	**[+accented, +rendaku]** ni'waka + tukuri$_{acc}$ → niwaka-d̲u'kuri 'hastily made'

13 Nakamura and Vance (2002) argue that native speakers of Japanese actually do internalize the difference in rendaku between the two types of compounds based on the results of a production task experiment.

In addition, *rendaku* is likely to occur if a deverbal compound is unaccented, although this is limited to the cases where the second element has two morae (Sato 1989). For example, *koromo* + *kae* → *koromo-gae* 'clothes + changing; seasonal change of clothing', which is unaccented, undergoes *rendaku*, although *koromo* 'clothes' is the object of *kae* 'changing'. On the other hand, *rendaku* tends not to occur in accented compounds. For instance, *rendaku* is not applied to *sakana* + *turi* → *sakana'-turi* 'fish + fishing; fishing', which is accented. That is, the combinations of [-accented, +rendaku] and [+accented, -rendaku] are favored, which is a kind of complementary distribution of *rendaku* and accent.[14]

Although Yamaguchi (2011) confirms the differences between the two types of deverbal compounds by using a database (Amano and Kondo 1999), the relationship between accentuation and *rendaku* is not fully examined. Yamaguchi and Tanaka (2013) examine the complementary distribution of *rendaku* and accent based on NHK (1998), which is a dictionary of Japanese pronunciation, but the investigation is not comprehensive. This study extends the research of Yamaguchi and Tanaka (2013) and offers a comprehensive description of the phonology of deverbal compounds. The survey of the corpus not only verifies the tendencies pointed out in previous studies but also reveals patterns of accentuation and *rendaku* which are not shown in (57) by examining the data in detail.

2.2. Survey methodology

2.2.1. Construction of the database

In an effort to be systematic and comprehensive, this study utilized *Nihongo Hatsuon Akusento Jiten* [A dictionary of Japanese pronunciation and accentuation] (NHK 1998), which lists words, including many compounds, with their Standard Japanese pronunciations. 2480 deverbal compounds were extracted from NHK (1998), and they are classified into the four types in (58) according to the grammatical function of the first element. Type I does not include deverbal compounds which denote a product because they are different from deverbal compounds whose first element is the object but do not denote a product in accentuation and *rendaku* (Ito and Sugioka 2002).

[14] The term 'complementary distribution' is generally used to explain the relationship between allophones of a phoneme. For example, [s] and [ʃ] are allophones in Japanese; /s/ is pronounced as [ʃ] before /i/ and as [s] before the other vowels. [s] appears in the environments where [ʃ] does not appear, and the reverse is also true.

(58) Four types of deverbal compounds based on the first element

a. Type I: Internal argument [*o* (accusative)] 【denotation: non-product】

e.g. hituzi + kai_{acc} → hituzi'-kai ‘sheep + keeping; shepherd’

(hituzi o ka'u ‘to keep a sheep’)

b. Type II: Internal argument [*ga* (nominative)]

e.g. a'me + $huri_{acc}$ → ame'-huri ‘rain + falling; rainfall’

(a'me ga hu'ru. ‘Rain falls.’)

c. Type III: Internal argument [*ni* (dative)]

e.g. tera' + $mairi_{acc}$ → tera-ma'iri ‘temple + visiting; visiting a temple’

(tera' ni ma'iru ‘to visit a temple’)

d. Type IV: Adjunct

e.g. usu + $kiri_{acc}$ → usu-giri ‘thin + cutting; thinly sliced’

(usuku ki'ru ‘to slice [something] thin’)

After extracting these four kinds of deverbal compounds, I counted the number of morae of each element to investigate effects of word length. The table in (59) shows the classification of compounds based on the length of each element and the type (i.e. I-IV).

(59) The number of compounds in each type

Length \ Type	Internal argument			IV. Adjunct	Sum
	I. *o* (acc)	II. *ga* (nom)	III. *ni*(dat)		
a) 2μ+1μ	9	2	0	26	37
b) 3μ+1μ	3	0	0	12	15
c) 4μ+1μ	1	0	0	1	2
d) 1μ+2μ	73	34	12	77	196
e) 2μ+2μ	347	70	68	452	937
f) 3μ+2μ	95	14	20	141	270
g) 4μ+2μ	53	13	9	61	136
h) 5μ+2μ	0	0	1	0	1
i) 1μ+3μ	46	33	9	38	126
j) 2μ+3μ	191	67	34	191	483
k) 3μ+3μ	67	23	19	70	179
l) 4μ+3μ	21	7	2	25	55
m) 5μ+3μ	1	0	0	1	2
n) 1μ+4μ	5	1	0	1	7
o) 2μ+4μ	11	1	0	16	28
p) 3μ+4μ	0	0	0	4	4
q) 4μ+4μ	1	0	0	1	2
Sum	924 (37%)	265 (11%)	174 (7%)	1117 (45%)	2480 (100%)

Although there are seventeen combinations of element length in (59), this study focuses on the following eight groups, which include a relatively large number of compounds: 1μ+2μ, 2μ+2μ, 3μ+2μ, 4μ+2μ, 1μ+3μ, 2μ+3μ, 3μ+3μ, and 4μ+3μ. These groups correspond to the gray cells in (59), which account for about 96% of the total.

As reviewed in 2.1, it has been pointed out that accentuation of deverbal compounds depends on the length of the second element in general: whether the second element has two morae or more than two morae is crucial. However, the accentuation pattern of the compounds where each element is two morae or below is different from that of the other compounds (Akinaga 2001). In particular, compounds which have four morae are more likely to be unaccented (Takana 2001). Also, it is necessary to confirm whether the length of the first element is irrelevant or not in the other cases. Therefore, this study classifies the data based not only on the length of the second element but also on that of the first element.

2.2.2. Analysis of the database

To analyze the database, I calculate the percentage of the compounds which are accented or which undergo *rendaku* for each gray cell in (59), revealing the influence of type (i.e. I-IV) and length on the phonological behavior of deverbal compounds. In particular, this study focuses on Type I and Type IV, which have been compared in many previous studies.

Some important details about dealing with the data are noted here. First, not a few compounds allow variation in accentuation. In some cases, as many as three patterns of accentuation are possible, as in *a'se* + *tori*$_{acc}$ → *ase-to'ri* (penultimate) > *ase'-tori* (antepenultimate) > *ase-tori* (unaccented) 'sweat + taking; undergarment for soaking sweat up'.[15] In this study, only the most dominant variant is considered for the sake of simplification in showing the results, although the variation is often referred to.

Second, the two units 'syllable' and 'mora' are necessary to express the position of accent, as Kubozono and Ota (1998) point out. Consider the following examples.

(60) The necessity of the two units 'syllable' and 'mora'

a. The antepenultimate mora is the head mora of the accented syllable.

ka'ruta + tori$_{acc}$ → karuta'-tori '*karuta* + taking; playing *karuta*'

tikara' + moti$_{acc}$ → tikara'-moti 'power + having; strong man'

hituzi + kai$_{acc}$ → hituzi'-kai 'sheep + keeping; shepherd'

[15] A > B means that the pattern A is preferable to the pattern B. For example, *ase-to'ri* is the most dominant in the case of *a'se* + *tori*$_{acc}$.

b. The pre-antepenultimate mora is the head mora of the accented syllable.[16]
syakki'n + $tori_{acc}$ → syakki'n-tori 'debt + taking; debt collector'
i'syoo + moti $_{acc}$ → isyo'o-moti 'wardrobe + having; having a large wardrobe'
kokuban + huki → kokuba'n-huki 'blackboard + wiping; board eraser'

In all of the examples in (60), the second element has two morae. The head mora of the accented syllable is antepenultimate in (60)-(a), while it is pre-antepenultimate in (60)-(b). Although these two patterns may seem different, they can be generalized based on the unit 'syllable'. As the antepenultimate mora is a non-head mora of a syllable in (60)-(b), the head mora of the accented syllable can never be antepenultimate. The following generalization explains both (60)-(a) and (60)-(b).

(61) The syllable which contains the antepenultimate mora is accented.

In this way, the pattern in (60)-(b) is considered to be 'antepenultimate' in this study.

Third, this study employs the notations in (62) and (63) with regard to accentuation and *rendaku*. With regard to accentuation, the presence and the location of accent is transcribed using numbers from -4 to 0.

(62) Notation regarding accentuation
a. Accented ([+accented])
i. Pre-antepenultimate: -4 (e.g. tada-ba'taraki 'working for nothing')
ii. Antepenultimate: -3 (e.g. inku'-kesi 'ink eraser')
iii. Penultimate: -2 (e.g. tume-ki'ri 'nail clippers')
iv. Final: -1 (e.g. yo-ake' 'dawn')
b. Unaccented ([-accented]): 0 (e.g. tati-yomi 'browsing')

With regard to *rendaku*, there are four cases as shown in (63), although (63)-(c) is a rare case. The percentage of forms exhibiting *rendaku* is calculated by counting the numbers of forms in cases (63)-(b) (forms where *rendaku* occurs) and (63)-(a) (forms where *rendaku* could occur but does not) and using the formula in (64). This percentage thus excludes the cases where *rendaku* occurs optionally (cases (63)-(c)) and the cases where *rendaku* is irrelevant or is blocked by Lyman's Law (cases (63)-(d)).

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[16] *Kintya'ku-kiri* 'money pouch + cutting; pickpocket', where /u/ is devoiced, also belongs to this group. In this example, the accent avoids a syllable which contains a devoiced vowel. As discussed in Tanaka (2005b), devoiced vowels tend not to carry the accent.

(63) Four cases of *rendaku*

a. [-rendaku]: *Rendaku* is possible but does not apply.
(e.g. inku + kesi → inku'-kesi 'ink + erasing; ink eraser')

b. [+rendaku]: *Rendaku* is possible and does apply.
(e.g. ude' + $tamesi_{acc}$ → ude-da'mesi 'skill + trying; trying one's skill')

c. [±rendaku]: *Rendaku* is possible and the application of *rendaku* is optional.
(e.g. yoko + $taosi_{acc}$ → yoko-taosi / yoko-daosi
'side + throwing down; falling sideways')

d. *Rendaku* is impossible. [=(21)]
(e.g. kusa' + musiri → kusa-mu'siri 'grass + plucking; weeding'
ude' + kurabe → ude-ku'rabe 'skill +comparing; contest of skill')

(64) Percentage of [+rendaku] = {B/(A+B)}×100 (%)

(A: the number of forms where *rendaku* could occur but does not
B: the number of forms where *rendaku* occurs)

Fourth, there are two ways of counting the data. As the survey in this study is based on a dictionary, all collected compounds are different items. However, some compounds have the same verb stem as the second element. For instance, the table in (65) lists Type I deverbal compounds whose second elements are *huki* 'wiping', *suri*$_{acc}$ 'rubbing' or *hiki* 'pulling' and whose first element has two morae.

(65) Type I deverbal compounds whose second element is *huki*, $suri_{acc}$ or *hiki* (2μ+2μ)

Verb stem Accentuation / *Rendaku*	huki 'wiping'	$suri_{acc}$ 'rubbing'	hiki 'pulling'
0 (unaccented) / [-rendaku]	—	goma-suri	kaze-hiki, zei-hiki, maku-hiki, kyaku-hiki
-1 (final) / [-rendaku]	asi-huki'	—	ami-hiki', mizu-hiki'
-2 (penultimate) / [-rendaku]	—	aka-su'ri, momi-su'ri	—
-3 (antepenultimate) / [-rendaku]	mado'-huki, ase'-huki	—	—
0 (unaccented) / [+rendaku]	—	asi-zuri	nuno-biki, boo-biki, roo-biki, kuzi-biki
-1 (final) / [+rendaku]	—	hoo-zuri'	—

There are eighteen deverbal compounds in (65). On the other hand, there are nine types which differ in the verb stem and accentuation/rendaku: {*huki*, -1, [-rendaku]}, {*huki*,-3, [-rendaku]}, {$suri_{acc}$, 0, [-rendaku]}, {$suri_{acc}$, -2, [-rendaku]}, {$suri_{acc}$, 0, [+rendaku]}, {$suri_{acc}$, -1, [+rendaku]}, {*hiki*, 0, [-rendaku]} , {*hiki*, -1, [-rendaku]}, and {*hiki*, 0, [+rendaku]}. In other words, these compounds are counted as 'eighteen' in terms of token frequency and are counted as 'nine' in terms of type frequency from the viewpoint of the verb stem. This study shows the results based not only on token frequency but also on type frequency because token frequency may be skewed by some specific verbs.

Lastly, the table in (66) illustrates the way of presenting the results in the following sections. In order to examine the relationship between accentuation and *rendaku*, the data are classified in terms of the combinations of accentuation and *rendaku* application. For instance, *a* in the cell at the upper left indicates the number of compounds which are unaccented and resist *rendaku*, and *b* in the next cell indicates the number of compounds which are accented and resist *rendaku*. This second cell also includes information on accent location ($b=b_1+b_2+b_3$). For example, b_1 shows the number of compounds which have accent on the final syllable. In the next cell, *c* is the sum of *a* and *b*. The percentages *A*% and *B*% are the results of $(a/c)\times100$ (%) and $(b/c)\times100$ (%), respectively. As $(a/c)\times100$ and $(b/c)\times100$ are rounded off, the sum of the two values is not necessarily 100. The percentage of [+rendaku] (*P*%) is the result of {*f*/(*c*+*f*)}×100 (%). The overall percentage of [+accented] (*N*%) is (*n*/*o*)×100 (%). *K*% is the percentage of [+accented] in the cases where *rendaku* is impossible, which is useful for setting aside the effect of *rendaku*.

(66) Presentation of results

<table>
<tr><td colspan="2" rowspan="2">Accentuation / *Rendaku*</td><td>[-accented]</td><td colspan="3">[+accented]</td><td rowspan="2">Sum</td><td rowspan="2">Percentage of [+rendaku]</td></tr>
<tr><td>0</td><td>-1</td><td>-2</td><td>-3</td></tr>
<tr><td rowspan="6">Possible</td><td rowspan="2">[-rendaku]</td><td rowspan="2">**a (A%)**</td><td colspan="3">**b (B%)**</td><td rowspan="2">**c (100%)**</td><td rowspan="4">**{f/(c+f)}×100 ≒ P%**</td></tr>
<tr><td>b_1</td><td>b_2</td><td>b_3</td></tr>
<tr><td rowspan="2">[+rendaku]</td><td rowspan="2">**d (D%)**</td><td colspan="3">**e (E%)**</td><td rowspan="2">**f (100%)**</td></tr>
<tr><td>e_1</td><td>e_2</td><td>e_3</td></tr>
<tr><td rowspan="2">[±rendaku]</td><td rowspan="2">**g (G%)**</td><td colspan="3">**h (H%)**</td><td rowspan="2">**i (100%)**</td><td rowspan="2"></td></tr>
<tr><td>h_1</td><td>h_2</td><td>h_3</td></tr>
<tr><td colspan="2" rowspan="2">Impossible</td><td rowspan="2">**j (J%)**</td><td colspan="3">**k (K%)**</td><td rowspan="2">**l (100%)**</td><td rowspan="2"></td></tr>
<tr><td>k_1</td><td>k_2</td><td>k_3</td></tr>
<tr><td colspan="2" rowspan="2">Sum</td><td rowspan="2">**m (M%)**</td><td colspan="3">**n (N%)**</td><td rowspan="2">**o (100%)**</td><td rowspan="2"></td></tr>
<tr><td>n_1</td><td>n_2</td><td>n_3</td></tr>
</table>

2.3. Results for Type I (Internal argument, [*o* (accusative)])

This section presents the results for Type I deverbal compounds, where the first element is the object of the verb. The compounds are classified into eight groups based on the length of each component: 1μ+2μ, 2μ+2μ, 3μ+2μ, 4μ+2μ, 1μ+3μ, 2μ+3μ, 3μ+3μ, and 4μ+3μ.

2.3.1. 1μ+2μ

The tables in (67) show the results for the cases where the first element has one mora and the second element has two morae. (67)-(a) is based on token frequency, where compounds which have the same verb as the second element are treated as different items. On the other hand, (67)-(b) shows the results in terms of type frequency, counting more than one compound which has the same verb as the second element and has the same pattern of accentuation and *rendaku* application as one item.

(67) Percentages of [±accented] and [+rendaku] (Type I [accusative], 1μ+2μ)

a. Token frequency

Rendaku \ Accentuation		[-accented] 0	[+accented]	-1	-3	Sum	Percentage of [+rendaku]
Possible	[-rendaku]	**6 (40%)**	**9 (60%)**	9	0	**15 (100%)**	**17/32 ≒53%**
	[+rendaku]	**14 (82%)**	**3 (18%)**	3	0	**17 (100%)**	
Impossible		**26 (63%)**	**15 (37%)**	13	2	**41 (100%)**	
Sum		**46 (63%)**	**27 (37%)**	25	2	**73 (100%)**	

b. Type frequency

Rendaku \ Accentuation		[-accented] 0	[+accented]	-1	-3	Sum	Percentage of [+rendaku]
Possible	[-rendaku]	**5 (38%)**	**8 (62%)**	8	0	**13 (100%)**	**16/29 ≒55%**
	[+rendaku]	**13 (81%)**	**3 (19%)**	3	0	**16 (100%)**	
Impossible		**17 (61%)**	**11 (39%)**	9	2	**28 (100%)**	
Sum		**35 (61%)**	**22 (39%)**	20	2	**57 (100%)**	

The results in the two tables are consistent: about 40% of the compounds are accented and about half of the compounds undergo *rendaku*. In addition, there is a tendency toward complementary distribution of accent and *rendaku*. If a compound is accented, *rendaku* tends not to occur; in contrast, if a compound is unaccented, *rendaku* tends to be applied. That is, many compounds are classified into two types: [+accented, -rendaku] or [-accented, +rendaku].[17] The examples in (68) illustrate this complementary distribution.

[17] There are some cases of [-accented, -rendaku] in (67); that is, [-accented] is possible even if rendaku does not occur. This is probably related to the fact that half of words which have three morae are unaccented in general (Akinaga 2001).

(68) Complementary distribution of accent and *rendaku*

a. [+accented, -rendaku]

e' + $kaki_{acc}$ → e-kaki' 'picture + drawing; painter'

te' + huki → te-huki' 'hand + wiping; hand towel'

hi' + $tuke_{acc}$ → hi-tuke' 'fire + lighting; arson'

b. [-accented, +rendaku]

ke + some → ke-zome 'hair + dyeing; hair dyeing'

ti + tome → ti-dome 'blood + stopping; styptic'

tya + $tati_{acc}$ → tya-dati 'tea + giving up; abstinence from tea'

The examples in (68) also illustrate the relationship between the accentuation of compounds and that of the first element. As Akinaga (2001) points out, the accentuation of 'noun + verb' compounds that have three morae depends on that of the noun: they tend to be unaccented if the noun is unaccented, and they tend to have accent in the final syllable if the noun is accented although some are unaccented.[18] The examples in (68) are consistent with this generalization.

Another characteristic of 1μ+2μ compounds is that many of them show variation in accentuation, although the tables in (67), which focus on only the most dominant pattern, do not show this fact. Some examples of variation are shown below. Most of the compounds which have variation belong to (69)-(a) or (69)-(b).

(69) Variation in accentuation

a. 0>-1: hi + $yoke_{acc}$ → hi-yoke > hi-yoke' 'sun + avoiding; sunshade'

b. -1>0: wa' + tome → wa-dome' > wa-dome 'wheel + stopping; brake'

c. -1>-3: te' + ire → te-ire' > te'-ire 'hand + putting in; repair'

d. -1>-2>0: hi' + kesi → hi-kesi' > hi-ke'si > hi-kesi 'fire + putting out; firefighter'

2.3.2. 2μ+2μ

The two tables in (70) show the results for the cases where the first and second elements have two morae. (70)-(a) is based on token frequency, while (70)-(b) is based on type frequency.

[18] This generalization in Akinaga (2001) also applies to 2μ+1μ compounds and compounds where the noun modifies the verb.

(70) Percentages of [±accented] and [+rendaku] (Type I [accusative], 2μ+2μ)

a. Token frequency

Rendaku \ Accentuation		[-accented] 0	[+accented]	-1	-2	-3	Sum	Percentage of [+rendaku]
Possible	[-rendaku]	**42 (31%)**	**94 (69%)**	31	35	28	**136 (100%)**	**62/198 ≒31%**
	[+rendaku]	**56 (90%)**	**6 (10%)**	4	2	0	**62 (100%)**	
	[±rendaku]	**1 (100%)**	**0 (0%)**	0	0	0	**1 (100%)**	
Impossible		**100 (68%)**	**48 (32%)**	21	16	11	**148 (100%)**	
Sum		**199 (57%)**	**148 (43%)**	56	53	39	**347 (100%)**	

b. Type frequency

Rendaku \ Accentuation		[-accented] 0	[+accented]	-1	-2	-3	Sum	Percentage of [+rendaku]
Possible	[-rendaku]	**22 (31%)**	**49 (69%)**	19	15	15	**71 (100%)**	**26/97 ≒27%**
	[+rendaku]	**20 (77%)**	**6 (23%)**	4	2	0	**26 (100%)**	
	[±rendaku]	**1 (100%)**	**0 (0%)**	0	0	0	**1 (100%)**	
Impossible		**34 (56%)**	**27 (44%)**	9	11	7	**61 (100%)**	
Sum		**77 (48%)**	**82 (52%)**	32	28	22	**159 (100%)**	

The results in the two tables are consistent: about half of the compounds are accented and about 30% of the compounds undergo *rendaku*. Also, like the 1μ+2μ cases, accentuation and *rendaku* show the tendency toward complementary distribution, as illustrated in (71). Although there are quite a few cases of [-accented, -rendaku] in (70), this is probably related to the fact that compounds which have four morae tend to be unaccented (Tanaka 2001).

(71) Complementary distribution of accent and *rendaku*

a. [+accented, -rendaku]

mimi' + $kaki_{acc}$ → mimi-ka'ki ‘ear + picking; earpick’

i'ne + kari → ine'-kari ‘rice plant + reaping; harvesting rice’

mono' + siri → mono-si'ri ‘thing + knowing; well-informed person’

b. [-accented, +rendaku]

a'me + koi_{acc} → ama-goi ‘rain + requesting; praying for rain’

ku'zi + hiki → kuzi-biki ‘lot + drawing; lottery’

seki' + tome → seki-dome ‘cough + stopping; cough medicine’

Like the 1μ+2μ cases, many of the compounds in (70) show variation in accentuation. There are many types of variation, as illustrated below.

(72) Variation in accentuation

a. 0>-1: kane + $tuki_{acc}$ → kane-tuki > kane-tuki' ‘bell + tolling; tolling a temple bell’

b. 0>-1>-2: uo + turi → uo-turi > uo-turi' > uo-tu'ri ‘fish + fishing; fishing’

c. 0>-2: usi + kai_{acc} → usi-kai > usi-ka'i ‘cow + keeping; cowherd’

d. 0>-3: yuki' + humi → yuki-humi > yuki'-humi ‘snow + treading; treading snow’

e. -1>0: otya + kumi → otya-kumi' > otya-kumi ‘tea + ladling; serving tea’

f. -1>-2: i'do + $hori_{acc}$ → ido-hori' > ido-ho'ri ‘well + digging; digging a well’

g. -1>-2>0: hizi' + $kake_{acc}$ → hizi-kake' > hizi-ka'ke > hizi-kake ‘elbow + hanging; armrest’

h. -2>0>-1: kusa' + kari → kusa-ka'ri > kusa-kari > kusa-kari' ‘grass + cutting; mowing’

i. -2>-1: tiri+ $tori_{acc}$ → tiri-to'ri > tiri-tori' ‘dust + taking; dustpan’

j. -2>-1>0: mizu + $kaki_{acc}$ → mizu-ka'ki > mizu-kaki' > mizu-kaki ‘water + paddling; web, paddle’

k. -3>0: ya'ne + huki → yane'-huki > yane-huki ‘roof + thatching; roofing’

l. -3>-1: tama' + tuki → tama'-tuki > tama-tuki' ‘ball + pushing; billiards’

m. -3>-2: ka'zi + $tori_{acc}$ → kazi'-tori > kazi-to'ri ‘rudder + taking; steering’

2.3.3. 3μ+2μ

This section shows the results for cases where the first element has three morae and the second element has two morae. (73)-(a) is based on token frequency, while (73)-(b) is based on type frequency.

(73) Percentages of [±accented] and [+rendaku] (Type I [accusative], 3μ+2μ)

a. Token frequency

Rendaku \ Accentuation		[-accented] 0	[+accented] -3	Sum	Percentage of [+rendaku]
Possible	[-rendaku]	**0 (0%)**	**26 (100%)**	**26 (100%)**	**36/62 ≒ 58%**
	[+rendaku]	**35 (97%)**	**1 (3%)**	**36 (100%)**	
Impossible		**18 (55%)**	**15 (45%)**	**33 (100%)**	
Sum		**53 (56%)**	**42 (44%)**	**95 (100%)**	

b. Type frequency

Rendaku \ Accentuation		[-accented] 0	[+accented] -3	Sum	Percentage of [+rendaku]
Possible	[-rendaku]	**0 (0%)**	**12 (100%)**	**12 (100%)**	**17/29 ≒ 59%**
	[+rendaku]	**16 (94%)**	**1 (6%)**	**17 (100%)**	
Impossible		**14 (67%)**	**7 (33%)**	**21 (100%)**	
Sum		**30 (60%)**	**20 (40%)**	**50 (100%)**	

The results in the two tables are again consistent: about 40% of the compounds are accented and about 60% of the compounds undergo *rendaku*. The location of the accent is antepenultimate in all cases. The tendency toward complementary distribution of accent and *rendaku* can be seen in these cases, as exemplified in (74). This tendency is the same as in the 1μ+2μ and 2μ+2μ cases, but 3μ+2μ is different from 1μ+2μ and 2μ+2μ in that [-accented, -rendaku] is not found.

(74) Complementary distribution of accent and *rendaku*

a. [+accented, -rendaku]

boosi + kake$_{acc}$ → boosi'-kake 'hat + hanging; hat-rack'

goyo'o + kiki → goyo'o-kiki 'order + listening (asking); order taker'

abura + sasi$_{acc}$ → abura'-sasi 'oil + pouring; oilcan'

b. [-accented, +rendaku]

hiyake + tome → hiyake-dome 'sunburn + stopping; sunscreen'

koromo + kae → koromo-gae 'clothes + changing; seasonal change of clothing'

kurai + tori$_{acc}$ → kurai-dori 'numerical position + taking; putting a decimal point'

Some of the compounds show variation in accentuation, as exemplified in (75). Although the final-accented pattern is not found in (73), it is allowed as a variant (e.g. inoti-gake > inoti-gake').

(75) Variation in accentuation

a. 0>-1: i'noti + kake$_{acc}$ → inoti-gake > inoti-gake' 'life + risking; desperate'

b. 0>-3: tatami + kae → tatami-gae > tatami'-gae
'*tatami* mat + changing; re-covering a *tatami* mat'

c. -3>0: akari + tori$_{acc}$ → akari'-tori > akari-tori 'light + taking; fanlight'

2.3.4. 4μ+2μ

The two tables in (76) show the results for the cases where the first element has four morae and the second element has two morae. (76)-(a) is based on token frequency, while (76)-(b) is based on type frequency.

(76) Percentages of [±accented] and [+rendaku] (Type I [accusative], 4μ+2μ)

a. Token frequency

<table>
<tr><td colspan="2" rowspan="2">Accentuation / *Rendaku*</td><td>[-accented]</td><td colspan="2">[+accented]</td><td rowspan="2">Sum</td><td rowspan="2">Percentage of [+rendaku]</td></tr>
<tr><td>0</td><td>-3</td><td>-4</td></tr>
<tr><td rowspan="4">Possible</td><td rowspan="2">[-rendaku]</td><td rowspan="2">**0 (0%)**</td><td colspan="2">**17 (100%)**</td><td rowspan="2">**17 (100%)**</td><td rowspan="4">**12/29 ≒41%**</td></tr>
<tr><td>17</td><td>0</td></tr>
<tr><td rowspan="2">[+rendaku]</td><td rowspan="2">**10 (83%)**</td><td colspan="2">**2 (17%)**</td><td rowspan="2">**12 (100%)**</td></tr>
<tr><td>2</td><td>0</td></tr>
<tr><td colspan="2" rowspan="2">Impossible</td><td rowspan="2">**11 (46%)**</td><td colspan="2">**13 (54%)**</td><td rowspan="2">**24 (100%)**</td><td rowspan="2"></td></tr>
<tr><td>12</td><td>1</td></tr>
<tr><td colspan="2" rowspan="2">Sum</td><td rowspan="2">**21 (40%)**</td><td colspan="2">**32 (60%)**</td><td rowspan="2">**53 (100%)**</td><td rowspan="2"></td></tr>
<tr><td>31</td><td>1</td></tr>
</table>

b. Type frequency

Rendaku \ Accentuation		[-accented]	[+accented]		Sum	Percentage of [+rendaku]
		0	-3	-4		
Possible	[-rendaku]	**0 (0%)**	**9 (100%)**		**9 (100%)**	**9/18 ≒ 50%**
			9	0		
	[+rendaku]	**8 (89%)**	**1 (11%)**		**9 (100%)**	
			1	0		
Impossible		**5 (45%)**	**6 (55%)**		**11 (100%)**	
			5	1		
Sum		**13 (45%)**	**16 (55%)**		**29 (100%)**	
			15	1		

The results in the two tables are consistent: about 60% of the compounds are accented and about 40-50% of the compounds undergo *rendaku*. The location of accent is antepenultimate in almost all cases.[19] In addition, there is a tendency toward complementary distribution of accent and *rendaku*, as exemplified in (77).

(77) Complementary distribution of accent and *rendaku*

a. [+accented, -rendaku]

yasumono + kai → yasumono'-kai 'cheap article + buying; buying cheap articles'

rooso'ku + $tate_{acc}$ → roosoku'-tate 'candle + standing; candlestick'

yoohuku + $kake_{acc}$ → yoohuku'-kake 'clothes + hanging; coat hanger'

b. [-accented, +rendaku]

zookin + $kake_{acc}$ → zookin-gake 'floorcloth + administering; wiping with a cloth'

tuukoo + tome → tuukoo-dome 'traffic + interrupting; closed to traffic'

seekaku + $tuke_{acc}$ → seekaku-duke 'character + giving; characterizing'

Some of the compounds show variation in accentuation, as illustrated in (78).

(78) Variation in accentuation

a. 0>-3: kansyaku + $moti_{acc}$ → kansyaku-moti > kansyaku'-moti

'temper + having; having a terrible temper'

[19] There is one exception where the pre-antepenultimate syllable has the accent: *mudabo'ne-ori* 'wasted effort + breaking; making a vain effort'. It is probably because *mudabone* is a compound of *muda* 'useless' + *hone'* 'bone': *bo* in *mudabo'ne-ori* is located at the boundary of the two words.

b. -3>0: hiyamesi + kui_{acc} → hiyamesi'-kui > hiyamesi-kui

'cold rice + eating; parasite'

2.3.5. 1μ+3μ

This section shows the results for cases where the first element has one mora and the second element has three morae. (79)-(a) is based on token frequency, while (79)-(b) is based on type frequency.

(79) Percentages of [±accented] and [+rendaku] (Type I [accusative], 1μ+3μ)

a. Token frequency

Rendaku \ Accentuation		[-accented] 0	[+accented] -3	Sum	Percentage of [+rendaku]
Possible	[-rendaku]	**0 (0%)**	**2 (100%)**	**2 (100%)**	**14/16 ≒ 88%**
	[+rendaku]	**2 (14%)**	**12 (86%)**	**14 (100%)**	
Impossible		**2 (7%)**	**28 (93%)**	**30 (100%)**	
Sum		**4 (9%)**	**42 (91%)**	**46 (100%)**	

b. Type frequency

Rendaku \ Accentuation		[-accented] 0	[+accented] -3	Sum	Percentage of [+rendaku]
Possible	[-rendaku]	**0 (0%)**	**2 (100%)**	**2 (100%)**	**13/15 ≒ 87%**
	[+rendaku]	**2 (15%)**	**11 (85%)**	**13 (100%)**	
Impossible		**2 (8%)**	**23 (92%)**	**25 (100%)**	
Sum		**4 (10%)**	**36 (90%)**	**40 (100%)**	

The results in the two tables are, once more, consistent: about 90% of the compounds are accented and about 90% of the compounds undergo *rendaku*. That is, most of the compounds where *rendaku* is possible are [+accented, +rendaku]: therefore, the tendency toward complementary distribution of accent and *rendaku* is not evident. The location of the accent is antepenultimate in all cases. Some examples are shown in (80).

(80) me' + samasi$_{acc}$ → me-za'masi 'eye + waking up; alarm clock'
zi' + katame → zi-ga'tame 'ground + hardening; leveling the ground'
ni' + tukuri$_{acc}$ → ni-du'kuri 'load + making; packing'
ki + kubari$_{acc}$ → ki-ku'bari 'mind + distributing; attention'
ha' + migaki → ha-mi'gaki 'tooth + polishing; toothpaste'

Some of the compounds show variation in accentuation, as illustrated in (81). Although the final-accented pattern is not found in (79), where only the most dominant pattern is counted in each case, it is allowed as a variant.

(81) Variation in accentuation

a. 0>-1: ki + yasume$_{acc}$ → ki-yasume > ki-yasume'
'mind + resting; empty words of comfort'

b. -3>0: yo' + akasi → yo-a'kasi > yo-akasi
'night + spending; staying awake the whole night'

c. -3>-1: ro + hiraki$_{acc}$ → ro-bi'raki > ro-biraki'
'fireplace + opening; starting to use a fireplace in winter'

2.3.6. 2μ+3μ

This section shows the results for cases where the first element has two morae and the second element has three morae. (82)-(a) is based on token frequency, while (82)-(b) is based on type frequency.

(82) Percentages of [±accented] and [+rendaku] (Type I [accusative], 2μ+3μ)

a. Token frequency

Rendaku \ Accentuation		[-accented] 0	[+accented] -3	Sum	Percentage of [+rendaku]
Possible	[-rendaku]	**4 (12%)**	**30 (88%)**	**34 (100%)**	**48/82 ≒ 59%**
	[+rendaku]	**3 (6%)**	**45 (94%)**	**48 (100%)**	
	[±rendaku]	**0 (0%)**	**1 (100%)**	**1 (100%)**	
Impossible		**6 (6%)**	**102 (94%)**	**108 (100%)**	
Sum		**13 (7%)**	**178 (93%)**	**191 (100%)**	

b. Type frequency

Rendaku \ Accentuation		[-accented] 0	[+accented] -3	Sum	Percentage of [+rendaku]
Possible	[-rendaku]	**4 (27%)**	**11 (73%)**	**15 (100%)**	**20/35 ≒ 57%**
	[+rendaku]	**3 (15%)**	**17 (85%)**	**20 (100%)**	
	[±rendaku]	**0 (0%)**	**1 (100%)**	**1 (100%)**	
Impossible		**6 (10%)**	**55 (90%)**	**61 (100%)**	
Sum		**13 (13%)**	**84 (87%)**	**97 (100%)**	

Here, about 90% of the compounds are accented and about 60% of the compounds undergo *rendaku*. Most of the compounds where *rendaku* is possible are [+accented, -rendaku] or [+accented, +rendaku], so the tendency toward complementary distribution of accent and *rendaku* is not evident in these cases. The location of the accent is antepenultimate in every case, and some examples are shown in (83).

(83) a. [+accented, -rendaku]

ka'ta + tataki$_{acc}$ → kata-ta'taki 'shoulders + hitting; rapping over the shoulders'
tu'mi + tukuri$_{acc}$ → tumi-tu'kuri 'crime + making; cruel'
kuri' + hiroi → kuri-hi'roi 'chestnut + gathering; chestnut-gathering'

b. [+accented, +rendaku]

u'sa + harasi$_{acc}$ → usa-ba'rasi 'gloom + dispelling; diversion'
hito + tasuke$_{acc}$ → hito-da'suke 'human + helping; kindness'
hito+ kirai → hito-gi'rai 'human + disliking; misanthropy'

Some of the compounds show variation in accentuation, as illustrated in (84). Although the final-accented pattern is not found in (82), it is allowed as a variant, which is the same as in the cases in 2.3.3 and 2.3.5.

(84) Variation in accentuation

a. 0>-3: kao + awase$_{acc}$ → kao-awase > kao-a'wase 'face + putting together; meeting'
b. -3>0: kane + mooke$_{acc}$ → kane-mo'oke > kane-mooke
'money + making a profit; making money'
c. -3>-1: hai + tataki$_{acc}$ → hai-ta'taki > hai-tataki' 'fly +hitting ; fly swatter'

2.3.7. 3μ+3μ

The two tables in (85) show the result for the cases where the first and second elements both have three morae. (85)-(a) is based on token frequency, while (85)-(b) is based on type frequency.

(85) Percentages of [±accented] and [+rendaku] (Type I [accusative], 3μ+3μ)

a. Token frequency

Rendaku \ Accentuation		[-accented] 0	[+accented] -3	Sum	Percentage of [+rendaku]
Possible	[-rendaku]	**0 (0%)**	**8 (100%)**	**8 (100%)**	**21/29 ≒ 72%**
	[+rendaku]	**0 (0%)**	**21 (100%)**	**21 (100%)**	
Impossible		**0 (0%)**	**38 (100%)**	**38 (100%)**	
Sum		**0 (0%)**	**67 (100%)**	**67 (100%)**	

b. Type frequency

Rendaku \ Accentuation		[-accented] 0	[+accented] -3	Sum	Percentage of [+rendaku]
Possible	[-rendaku]	**0 (0%)**	**6 (100%)**	**6 (100%)**	**13/19 ≒ 69%**
	[+rendaku]	**0 (0%)**	**13 (100%)**	**13 (100%)**	
Impossible		**0 (0%)**	**22 (100%)**	**22 (100%)**	
Sum		**0 (0%)**	**41 (100%)**	**41 (100%)**	

The results in the two tables are consistent: all of the compounds are accented and about 70% of the compounds undergo *rendaku*. That is, all of the compounds where *rendaku* is possible are [+accented, -rendaku] or [+accented, +rendaku], so the distribution of accent and *rendaku* is not complementary. The location of the accent is antepenultimate in all cases. Some examples are shown below.

(86) a. [+accented, -rendaku]

o'tibo + hiroi → otibo-hi'roi ‘fallen grains of rice + picking up; gleaning/gleaner’

mahoo + tukai → mahoo-tu'kai ‘magic + using; magician’

dozyoo + sukui → dozyoo-su'kui ‘loach + scooping; scooping loaches’

b. [+accented, +rendaku]

i'noti + hiroi → inoti-bi'roi 'life + picking up; having a narrow escape'

tikara' + tamesi$_{\text{acc}}$ → tikara-da'mesi 'strength + trying; trial of strength'

nemuke + samasi$_{\text{acc}}$ → nemuke-za'masi

'sleepness + shaking off; shaking off sleepness'

The only pattern of variation in accentuation is '-3>-2'. For example, *mahoo-tu'kai* 'magician' and *dozyoo-su'kui* 'scooping loaches' in (86)-(a) have the variants *mahoo-tuka'i* 'magician' and *dozyoo-suku'i* respectively. This accent shift to the penultimate syllable is due to the devoicing of the high vowel /u/ in the antepenultimate syllable. Unlike 1μ+3μ and 2μ+3μ, the unaccented pattern is not allowed even as a variant in 3μ+3μ.

2.3.8. 4μ+3μ

This section shows the results for cases where the first element has four morae and the second element has three morae. (87)-(a) is based on token frequency, while (87)-(b) is based on type frequency.

(87) Percentages of [±accented] and [+rendaku] (Type I [accusative], 4μ+3μ)

a. Token frequency

Accentuation / *Rendaku*		[-accented] 0	[+accented] -3	Sum	Percentage of [+rendaku]
Possible	[-rendaku]	**0 (0%)**	**5 (100%)**	**5 (100%)**	**3/8 ≒ 38%**
	[+rendaku]	**0 (0%)**	**3 (100%)**	**3 (100%)**	
	[±rendaku]	**0 (0%)**	**1 (100%)**	**1 (100%)**	
Impossible		**0 (0%)**	**12 (100%)**	**12 (100%)**	
Sum		**0 (0%)**	**21 (100%)**	**21 (100%)**	

b. Type frequency

Rendaku \ Accentuation		[-accented] 0	[+accented] -3	Sum	Percentage of [+rendaku]
Possible	[-rendaku]	**0 (0%)**	**3 (100%)**	**3 (100%)**	**3/6 ≒ 50%**
	[+rendaku]	**0 (0%)**	**3 (100%)**	**3 (100%)**	
	[±rendaku]	**0 (0%)**	**1 (100%)**	**1 (100%)**	
Impossible		**0 (0%)**	**12 (100%)**	**12 (100%)**	
Sum		**0 (0%)**	**19 (100%)**	**19 (100%)**	

The percentage of [+accented] is 100% both in (87)-(a) and in (87)-(b), which is the same as the $3\mu+3\mu$ cases. The location of the accent is antepenultimate in all cases. The percentage of [+rendaku] is 38% in terms of token frequency and 50% in terms of type frequency. Some examples are shown below.

(88) a. [+accented, -rendaku]
ningyoo + tukai → ningyoo-tu'kai 'puppet + manipulating; puppeteer'
kamiku'zu + hiroi → kamikuzu-hi'roi
'wastepaper + picking up; gathering up wastepaper'
b. [+accented, +rendaku]
uppun + harasi$_{acc}$ → uppun-ba'rasi 'anger + relieving; letting off steam'
ya'kkai + harai$_{acc}$ → yakkai-ba'rai 'trouble + sweeping; getting rid of a nuisance'

There is only one compound which shows variation in accentuation: *ningyoo-tu'kai* 'puppeteer' in (88)-(a) also allows *ningyoo-tuka'i*. This variation is due to high vowel devoicing, as in the $3\mu+3\mu$ cases.

2.3.9. Summary

This section summarizes the results for Type I, considering them from various viewpoints. First, the table in (89) gives an overview of the results, listing the number of items and the percentages of [+accented] and [+rendaku] for each combination of the lengths of the two elements. The numbers and the percentages are shown both in terms of token frequency and in terms of type frequency. There is no great discrepancy between the results for the two kinds of frequency.

(89) Overview of the results (Type I: Internal argument, accusative)

Length	Number of items		Percentage of [+accented]		Percentage of [+rendaku]	
	Token	Type	Token	Type	Token	Type
1μ+2μ	73	57	37%	39%	53%	55%
2μ+2μ	347	159	43%	52%	31%	27%
3μ+2μ	95	50	44%	40%	58%	59%
4μ+2μ	53	29	60%	55%	41%	50%
1μ+3μ	46	40	91%	90%	88%	87%
2μ+3μ	191	97	93%	87%	59%	57%
3μ+3μ	67	41	100%	100%	72%	69%
4μ+3μ	21	19	100%	100%	38%	50%

Second, the table in (90) shows the average percentages, comparing the compounds where the second element has two morae and those where the second element has three morae. The percentage of [+accented] is 44% (token frequency) and 47% (type frequency) when the second element has two morae. That is, both accented compounds and unaccented compounds are observed as well-established patterns. On the other hand, the percentage of [+accented] is 95% (token frequency) and 91% (type frequency) when the second element has three morae. In other words, most of the compounds are accented, while unaccented compounds are uncommon. The percentage of [+rendaku] is 40% (token frequency) and 39% (type frequency) when the second element has two morae, while it is 64% (token frequency) and 65% (type frequency) when the second element has three morae. That is, both [+rendaku] and [-rendaku] are possible as well-established patterns regardless of the length of the second element although the percentage of [+rendaku] increases when the second element is long.

(90) Average percentages (Type I: Internal argument, accusative)

a. Accentuation

Length	Token frequency			Type frequency		
	[+accented]	Total	Percentage	[+accented]	Total	Percentage
{1-4}μ+2μ	249	568	44%	140	295	47%
{1-4}μ+3μ	308	325	95%	180	197	91%

b. *Rendaku*

Length	Token frequency			Type frequency		
	[+rendaku]	Total	Percentage	[+rendaku]	Total	Percentage
{1-4}μ+2μ	127	321	40%	68	173	39%
{1-4}μ+3μ	86	135	64%	49	75	65%

The tables in (89) and (90) include both the cases where *rendaku* is possible and those where *rendaku* is impossible. The following discussion deals with the two kinds of cases separately for two reasons. First, focusing on the cases where *rendaku* is possible reveals the relationship between accentuation and *rendaku*. Secondly, focusing on the cases where *rendaku* is impossible makes it possible to extract pure patterns of accentuation by setting aside the effect of *rendaku*.

The two tables in (91) classify the compounds where *rendaku* is possible into four groups: [-accented, -rendaku], [+accented, -rendaku], [-accented, +rendaku], and [+accented, +rendaku]. (91)-(a) is based on token frequency, while (91)-(b) is based on type frequency. For example, the number of 1μ+2μ compounds where *rendaku* is possible is 32 from the viewpoint of token frequency. Fourteen of them are [-accented, +rendaku], accounting for 44%. Nine of them are [+accented, -rendaku], accounting for 28 %.

(91) The combinations of [±accented]([±acc]) and [±rendaku]([±r]) when *rendaku* is possible (Type I: Internal argument, accusative)

a. Token frequency

Length	[-acc, -r]	[+acc, -r]	[-acc, +r]	[+acc, +r]	Sum
1μ+2μ	6 (19%)	9 (28%)	14 (44%)	3 (9%)	32 (100%)
2μ+2μ	42 (21%)	94 (47%)	56 (28%)	6 (3%)	198 (100%)
3μ+2μ	0 (0%)	26 (42%)	35 (56%)	1 (2%)	62 (100%)
4μ+2μ	0 (0%)	17 (59%)	10 (34%)	2 (7%)	29 (100%)
{1-4}μ+2μ	48 (15%)	**146 (45%)**	**115 (36%)**	12 (4%)	321 (100%)
1μ+3μ	0 (0%)	2 (13%)	2 (13%)	12 (75%)	16 (100%)
2μ+3μ	4 (5%)	30 (37%)	3 (4%)	45 (55%)	82 (100%)
3μ+3μ	0 (0%)	8 (28%)	0 (0%)	21 (72%)	29 (100%)
4μ+3μ	0 (0%)	5 (63%)	0 (0%)	3 (38%)	8 (100%)
{1-4}μ+3μ	4 (3%)	**45 (33%)**	5 (4%)	**81 (60%)**	135 (100%)

b. Type frequency

Length	[-acc, -r]	[+acc, -r]	[-acc, +r]	[+acc, +r]	Sum
1μ+2μ	5 (17%)	8 (28%)	13 (45%)	3 (10%)	29 (100%)
2μ+2μ	22 (23%)	49 (51%)	20 (21%)	6 (6%)	97 (100%)
3μ+2μ	0 (0%)	12 (41%)	16 (55%)	1 (3%)	29 (100%)
4μ+2μ	0 (0%)	9 (50%)	8 (44%)	1 (6%)	18 (100%)
{1-4}μ+2μ	27 (16%)	**78 (45%)**	**57 (33%)**	11 (6%)	173 (100%)
1μ+3μ	0 (0%)	2 (13%)	2 (13%)	11 (73%)	15 (100%)
2μ+3μ	4 (11%)	11 (31%)	3 (9%)	17 (49%)	35 (100%)
3μ+3μ	0 (0%)	6 (32%)	0 (0%)	13 (68%)	19 (100%)
4μ+3μ	0 (0%)	3 (50%)	0 (0%)	3 (50%)	6 (100%)
{1-4}μ+3μ	4 (5%)	**22 (29%)**	5 (7%)	**44 (59%)**	75 (100%)

As shown in the two tables, [+accented, -rendaku] and [-accented, +rendaku] are the two dominant patterns when the second element has two morae. That is, there is a tendency toward complementary distribution of accent and *rendaku*. However, this tendency disappears when the second element has three morae. When the second element is long, [+accented, +rendaku] and [+accented, -rendaku] are the two dominant patterns.

The table in (92) shows the percentages of [±accented] in the cases where *rendaku* is impossible. When the second element has two morae, the percentage is about 40%: that is, both [+accented] and [-accented] are dominant to a certain extent. On the other hand, the percentage is over 90% when the second element has three morae: most of the compounds are [+accented]. These patterns of [±accented] are consistent with those where *rendaku* is possible.

(92) The percentages of [±accented] in the cases where *rendaku* is impossible
(Type I: Internal argument, accusative)

a. Token frequency

Length	[-accented]	[+accented]	Sum
1μ+2μ	26 (63%)	15 (37%)	41 (100%)
2μ+2μ	100 (68%)	48 (33%)	148 (100%)
3μ+2μ	18 (55%)	15 (45%)	33 (100%)
4μ+2μ	11 (46%)	13 (54%)	24 (100%)
{1-4}μ+2μ	**155 (63%)**	**91 (37%)**	246 (100%)
1μ+3μ	2 (7%)	28 (93%)	30 (100%)
2μ+3μ	6 (6%)	102 (94%)	108 (100%)
3μ+3μ	0 (0%)	38 (100%)	38 (100%)
4μ+3μ	0 (0%)	12 (100%)	12 (100%)
{1-4}μ+3μ	8 (4%)	**180 (96%)**	188 (100%)

b. Type frequency

Length	[-accented]	[+accented]	Sum
1μ+2μ	17 (61%)	11 (39%)	28 (100%)
2μ+2μ	34 (56%)	27 (44%)	61 (100%)
3μ+2μ	14 (67%)	7 (33%)	21 (100%)
4μ+2μ	5 (45%)	6 (55%)	11 (100%)
{1-4}μ+2μ	**70 (58%)**	**51 (42%)**	121 (100%)
1μ+3μ	2 (8%)	23 (92%)	25 (100%)
2μ+3μ	6 (10%)	55 (90%)	61 (100%)
3μ+3μ	0 (0%)	22 (100%)	22 (100%)
4μ+3μ	0 (0%)	12 (100%)	12 (100%)
{1-4}μ+3μ	8 (7%)	**112 (93%)**	120 (100%)

In conclusion, the patterns of [±accented] and [±rendaku] are summarized as follows. The percentages on both sides of the slash marks in the parentheses correspond to the percentages in terms of token frequency and type frequency in (91).

(93) Generalization (Type I: Internal argument, accusative)

a. {1-4}μ+2μ: [+accented, -rendaku] (45%/45%), [-accented, +rendaku] (36%/33%) (complementary distribution)

b. {1-4}μ+3μ: [+accented, +rendaku] (60%/59%), [+accented, -rendaku] (33%/29%)

Although previous studies have pointed out that compounds whose first element is the object of the verb are accented and resist *rendaku* in general when the second element has two morae, the results of this survey show that not only [+accented, -rendaku] but also [-accented, +rendaku] are possible. The results also show that accentuation and *rendaku* distribute complementarily when the second element has two morae. When the second element has three morae, both [+accented, +rendaku] and [+accented, -rendaku] are observed, although the former is more dominant. Although previous studies have focused on [+accented, +rendaku], this study shows that [+accented, -rendaku] is also an important pattern in Type I compounds whose second element has three morae. In conclusion, the survey in this study not only verifies the patterns of [±accented] and [±rendaku] pointed out in previous studies, but also shows that other patterns are also possible: [-accented, +rendaku] in {1-4}μ+2μ and [+accented, -rendaku] in {1-4}μ+3μ.

2.4. Results for Type IV (Adjunct)

This section shows the results for Type IV deverbal compounds, where the first element modifies the verb stem in the second element. Like Type I in 2.3, the compounds are classified into eight groups based on the length of each element: 1μ+2μ, 2μ+2μ, 3μ+2μ, 4μ+2μ, 1μ+3μ, 2μ+3μ, 3μ+3μ, and 4μ+3μ.

2.4.1. 1μ+2μ

The tables in (94) show the results for the cases where the first element has one mora and the second element has two morae.

(94) Percentages of [±accented] and [+rendaku] (Type IV [adjunct], 1μ+2μ)

a. Token frequency

Accentuation / *Rendaku*		[-accented] 0	[+accented]		Sum	Percentage of [+rendaku]
			-1	-3		
Possible	[-rendaku]	**2 (100%)**	**0 (0%)** 0	0	**2 (100%)**	**41/43 ≒95%**
	[+rendaku]	**32 (78%)**	**9 (22%)** 8	1	**41 (100%)**	
Impossible		**26 (76%)**	**8 (24%)** 8	0	**34 (100%)**	
Sum		**60 (78%)**	**17 (22%)** 16	1	**77 (100%)**	

b. Type frequency

Accentuation / *Rendaku*		[-accented] 0	[+accented]		Sum	Percentage of [+rendaku]
			-1	-3		
Possible	[-rendaku]	**2 (100%)**	**0 (0%)** 0	0	**2 (100%)**	**28/30 ≒93%**
	[+rendaku]	**20 (71%)**	**8 (29%)** 7	1	**28 (100%)**	
Impossible		**22 (79%)**	**6 (21%)** 6	0	**28 (100%)**	
Sum		**44 (76%)**	**14 (24%)** 13	1	**58 (100%)**	

The results in the two tables are consistent: about 20% of the compounds are accented and over 90% of the compounds undergo *rendaku*. Some examples are shown in (95).

(95) te' + kai$_{acc}$ → te-gai ‘hand + raising; hand-reared’
te' + kaki$_{acc}$ → te-gaki ‘hand + writing; handwritten’
ne + hie$_{acc}$ → ne-bie ‘sleeping + getting cold; getting chilled while asleep’
syu + nuri → syu-nuri ‘vermilion + lacquering; vermilion-lacquered’
su' + yaki → su-yaki ‘plain + firing; unglazed’

Some of the compounds show variation in accentuation. As illustrated in (96), variation between the unaccented and final-accented patterns is the major type of variation.

(96) Variation in accentuation
a. 0>-1: te' + ori$_{acc}$ → te-ori > te-ori' ‘hand + weaving; handwoven’
b. -1>0: wa' + kiri$_{acc}$ → wa-giri' > wa-giri ‘circle + cutting; cutting in round slices’

2.4.2. 2μ+2μ

The two tables in (97) show the results for the cases where each element has two morae. (97)-(a) is based on token frequency, while (97)-(b) is based on type frequency.

(97) Percentages of [±accented] and [+rendaku] (Type IV [adjunct], 2μ+2μ)
a. Token frequency

Accentuation / *Rendaku*		[-accented] 0	[+accented]	-1	-2	-3	Sum	Percentage of [+rendaku]
Possible	[-rendaku]	**3 (75%)**	**1 (25%)**	0	0	1	**4 (100%)**	**213/217 ≒ 98%**
	[+rendaku]	**211 (99%)**	**2 (1%)**	2	0	0	**213 (100%)**	
	[±rendaku]	**1 (100%)**	**0 (0%)**	0	0	0	**1 (100%)**	
Impossible		**226 (97%)**	**8 (3%)**	0	3	5	**234 (100%)**	
Sum		**441 (98%)**	**11 (2%)**	2	3	6	**452 (100%)**	

b. Type frequency

Rendaku \ Accentuation		[-accented] 0	[+accented]	-1	-2	-3	Sum	Percentage of [+rendaku]
Possible	[-rendaku]	**3 (75%)**	**1 (25%)**	0	0	1	**4 (100%)**	**69/73 ≒ 95%**
	[+rendaku]	**67 (97%)**	**2 (3%)**	2	0	0	**69 (100%)**	
	[±rendaku]	**1 (100%)**	**0 (0%)**	0	0	0	**1 (100%)**	
Impossible		**64 (93%)**	**5 (7%)**	0	3	2	**69 (100%)**	
Sum		**135 (94%)**	**8 (6%)**	2	3	3	**143 (100%)**	

The results in the two tables are consistent: the percentage of [+accented] is less than 10%, while that of [+rendaku] is over 90%. In other words, almost all of the compounds are [-accented, +rendaku] (or [-accented] when *rendaku* is impossible). Some examples are shown in (98).

(98) maru + kari → maru-gari 'circle + cutting; close clipping'
ka'ge + $hosi_{acc}$ → kage-bosi 'shade + drying; drying a thing out of direct sunlight'
betu + $suri_{acc}$ → betu-zuri 'distinction + printing; printing on different paper'
ma'e + uri → mae-uri 'in advance + selling; advance sales'
hui + uti_{acc} → hui-uti 'sudden + hitting; surprise attack'

Some of the compounds in (97) show variation in accentuation, as illustrated in (99). Variation between the unaccented pattern and the final-accented pattern is the major type. Compared to Type I 2μ+2μ compounds, there are fewer types of variation in Type IV. In addition, Type IV has fewer compounds which allow variation than Type I.

(99) Variation in accentuation

a. 0>-1: se'n + $kiri_{acc}$ → sen-giri > sen-giri' 'thousand + cutting; cutting into fine strips'

b. 0>-2: zyun + $kuri_{acc}$ → zyun-guri > zyun-gu'ri 'order + turning over; successively'

c. -2>-1: $naga_{acc}$ + iki_{acc}→ naga-i'ki > naga-iki' 'long + living; long life'

d. -3>0: ko'bu + maki → kobu'-maki > kobu-maki

‘kelp + wrapping; fish rolled in kelp and simmered till soft’

2.4.3. 3μ+2μ

This section shows the results for cases where the first element has three morae and the second element has two morae. (100)-(a) is based on token frequency, while (100)-(b) is based on type frequency.

(100) Percentages of [±accented] and [+rendaku] (Type IV [adjunct], 3μ+2μ)

a. Token frequency

Accentuation / *Rendaku*		[-accented] 0	[+accented] -3	Sum	Percentage of [+rendaku]
Possible	[-rendaku]	**0 (0%)**	**1 (100%)**	**1 (100%)**	**71/72 ≒ 99%**
	[+rendaku]	**70 (99%)**	**1 (1%)**	**71 (100%)**	
Impossible		**59 (86%)**	**10 (14%)**	**69 (100%)**	
Sum		**129 (91%)**	**12 (9%)**	**141 (100%)**	

b. Type frequency

Accentuation / *Rendaku*		[-accented] 0	[+accented] -3	Sum	Percentage of [+rendaku]
Possible	[-rendaku]	**0 (0%)**	**1 (100%)**	**1 (100%)**	**32/33 ≒ 97%**
	[+rendaku]	**31 (97%)**	**1 (3%)**	**32 (100%)**	
Impossible		**20 (77%)**	**6 (23%)**	**26 (100%)**	
Sum		**51 (86%)**	**8 (14%)**	**59 (100%)**	

The results in the two tables are consistent: about 90% of the compounds are unaccented and nearly 100% of the compounds undergo *rendaku*. That is, almost all of the compounds are [-accented, +rendaku] (or [-accented] when *rendaku* is impossible), which is the same as in the 2μ+2μ cases. Some examples are given in (101).

(101) mimizu + hare → mimizu-bare ‘earthworm + swelling; welt’

nusumi$_{acc}$ + kiki → nusumi-giki ‘stealing + listening; listening secretly’

naguri$_{acc}$ + kaki$_{acc}$ → naguri-gaki ‘hitting + writing; writing hastily’

kika'i + ami$_{acc}$ → kikai-ami ‘machine + knitting; machine-knitted’

hiroi + yomi$_{acc}$ → hiroi-yomi ‘picking up + reading; skimming through’

Some of the compounds show variation in accentuation, as exemplified in (102).

(102) Variation in accentuation

a. 0>-1: hitori+ $sime_{acc}$ → hitori-zime > hitori-zime'
'one person + occupied; monopolizing'

b. 0>-3: $nusumi_{acc}$ + kui → nusumi-gui > nusumi'-gui
'stealing + eating; eating something on the sly'

c. -3>0: $tataki_{acc}$ + uri → tataki'-uri > tataki-uri
'hitting + selling; selling at discount prices'

2.4.4. 4μ+2μ

This section shows the results for cases where the first element has three morae and the second element has two morae. (103)-(a) is based on token frequency, while (103)-(b) is based on type frequency.

(103) Percentages of [±accented] and [+rendaku] (Type IV [adjunct], 4μ+2μ)

a. Token frequency

Accentuation / *Rendaku*		[-accented] 0	[+accented] -3	Sum	Percentage of [+rendaku]
Possible	[-rendaku]	**0**	**0**	**0**	**35/35 ≒100%**
	[+rendaku]	**35 (100%)**	**0 (0%)**	**35 (100%)**	
Impossible		**22 (85%)**	**4 (15%)**	**26 (100%)**	
Sum		**57 (93%)**	**4 (7%)**	**61 (100%)**	

b. Type frequency

Accentuation / *Rendaku*		[-accented] 0	[+accented] -3	Sum	Percentage of [+rendaku]
Possible	[-rendaku]	**0**	**0**	**0**	**15/15 ≒100%**
	[+rendaku]	**15 (100%)**	**0 (0%)**	**15 (100%)**	
Impossible		**13 (76%)**	**4 (24%)**	**17 (100%)**	
Sum		**28 (88%)**	**4 (13%)**	**32 (100%)**	

The results in the two tables are consistent: about 90% of the compounds are unaccented and 100% of the compounds undergo *rendaku*. Some examples are shown in (104).

(104) sinyoo + kasi → sinyoo-gasi ‘trust + lending; credit loan’

gyakuten + kati$_{acc}$ → gyakuten-gati ‘reversal + winning; come-from-behind win’

i'ppon + turi → ippon-duri ‘one + fishing; pole-and-line fishing’

gyakuten + make → gyakuten-make ‘reversal + losing; losing in a last-minute reversal’

omowaku + kai → omowaku-gai ‘speculation + buying; speculative buying’

There are only two compounds which show variation in accentuation: *issoku'-tobi* > *isso'ku-tobi* ‘at a bound’ and *syoozi'n-age* > *syoozin-age* ‘fried vegetables’. *Isso'ku-tobi* in the former is due to devoicing of the high vowel /u/ in the antepenultimate syllable.

2.4.5. 1μ+3μ

This section deals with the cases where the first element has one mora and the second element has three morae. (105)-(a) is based on token frequency, while (105)-(b) is based on type frequency.

(105) Percentages of [±accented] and [+rendaku] (Type IV [adjunct], 1μ+3μ)

a. Token frequency

Accentuation / *Rendaku*		[-accented] 0	[+accented] -3	Sum	Percentage of [+rendaku]
Possible	[-rendaku]	**0 (0%)**	**1 (100%)**	**1 (100%)**	**22/23 ≒ 96%**
	[+rendaku]	**6 (27%)**	**16 (73%)**	**22 (100%)**	
Impossible		**2 (13%)**	**13 (87%)**	**15 (100%)**	
Sum		**8 (21%)**	**30 (79%)**	**38 (100%)**	

b. Type frequency

Accentuation / *Rendaku*		[-accented] 0	[+accented] -3	Sum	Percentage of [+rendaku]
Possible	[-rendaku]	**0 (0%)**	**1 (100%)**	**1 (100%)**	**19/20 ≒ 95%**
	[+rendaku]	**6 (32%)**	**13 (68%)**	**19 (100%)**	
Impossible		**2 (14%)**	**12 (86%)**	**14 (100%)**	
Sum		**8 (24%)**	**26 (76%)**	**34 (100%)**	

The results in the two tables are consistent: about 80% of the compounds are accented and nearly 100% of the compounds undergo *rendaku*. Although accented compounds are dominant, there are quite a few unaccented compounds. Some examples are shown in (106).

(106) a. [+accented, +rendaku]

te' + $tukami_{acc}$ → te-du'kami 'hand + grasping; catching by hand'

no' + sarasi → no-za'rasi 'field + exposing; weather-beaten'

yu' + $tukare_{acc}$ → yu-du'kare 'hot bath + getting tired; exhausted after a long bath'

b. [-accented, +rendaku]

ki + $taore_{acc}$ → ki-daore 'putting on + falling down; extravagance in dress'

mi_{acc} + korosi → mi-gorosi 'looking at + killing; leaving a person to his fate'

hi' + $kaeri_{acc}$ → hi-gaeri 'day + going back; going and returning in one day'

There are some compounds which show variation in accentuation. The major pattern of variation is '0>-3', as in *su-doori* > *su-do'ori* 'passing through without stopping'.

2.4.6. 2μ+3μ

This section shows the results for cases where the first element has two morae and the second element has three morae. (107)-(a) is based on token frequency, while (107)-(b) is based on type frequency.

(107) Percentages of [±accented] and [+rendaku] (Type IV [adjunct], 2μ+3μ)

a. Token frequency

Rendaku \ Accentuation		[-accented]	[+accented]			Sum	Percentage of [+rendaku]
		0		-3	-4		
Possible	[-rendaku]	**2 (40%)**	**3 (60%)**	2	1	**5 (100%)**	**60/65 ≒92%**
	[+rendaku]	**25 (42%)**	**35 (58%)**	35	0	**60 (100%)**	
	[±rendaku]	**2 (100%)**	**0 (0%)**	0	0	**2 (100%)**	
Impossible		**27 (22%)**	**97 (78%)**	97	0	**124 (100%)**	
Sum		**56 (29%)**	**135 (71%)**	134	1	**191 (100%)**	

b. Type frequency

Accentuation / *Rendaku*		[-accented]	[+accented]			Sum	Percentage of [+rendaku]
		0		-3	-4		
Possible	[-rendaku]	**2 (40%)**	**3 (60%)**	2	1	**5 (100%)**	**31/36 ≒ 86%**
	[+rendaku]	**13 (42%)**	**18 (58%)**	18	0	**31 (100%)**	
	[±rendaku]	**2 (100%)**	**0 (0%)**	0	0	**2 (100%)**	
Impossible		**22 (32%)**	**46 (68%)**	46	0	**68 (100%)**	
Sum		**39 (37%)**	**67 (63%)**	66	1	**106 (100%)**	

The tendencies shown in the two tables are consistent. Although [+accented] is the dominant pattern, there are quite a few unaccented compounds: 29% in terms of token frequency and 37% in terms of type frequency. With regard to *rendaku*, most of the compounds undergo the process. In sum, most of the compounds where *rendaku* is possible are [+accented, +rendaku] or [-accented, +rendaku]. Some examples are shown below.

(108) a. [+accented, +rendaku]

tabi' + tukare$_{acc}$ → tabi-du'kare 'travel + getting tired; fatigue of travel'

ma'e + harai$_{acc}$ → mae-ba'rai 'in advance + paying; payment in advance'

maru + kakae → maru-ga'kae

'complete + holding; being completely financed by someone'

b. [-accented, +rendaku]

ha'n + kawaki$_{acc}$ → han-gawaki 'half + drying; not fully dried'

tomo + taore$_{acc}$ → tomo-daore 'together + falling down; falling together'

hiki + katari → hiki-gatari

'playing + reciting; singing a song accompanying oneself on the piano'

Some of the compounds show variation in accentuation, as exemplified in (109).

(109) Variation in accentuation

a. 0>-3: ara + kasegi$_{acc}$ → ara-kasegi > ara-ka'segi 'wild + making money; making quick money'

b. -3>0: ku'ro + hikari$_{acc}$ → kuro-bi'kari > kuro-bikari 'black + shining; shining black'

c. 0>-1: yoko + naguri$_{acc}$ → yoko-naguri > yoko-naguri' 'side + hitting; side blow'

2.4.7. 3μ+3μ

This section deals with the cases where each element has three morae. (110)-(a) is based on token frequency, while (110)-(b) is based on type frequency.

(110) Percentages of [±accented] and [+rendaku] (Type IV [adjunct], 3μ+3μ)

a. Token frequency

Accentuation / *Rendaku*		[-accented] 0	[+accented] -3	Sum	Percentage of [+rendaku]
Possible	[-rendaku]	**2 (100%)**	**0 (0%)**	**2 (100%)**	**25/27 ≒ 93%**
	[+rendaku]	**1 (4%)**	**24 (96%)**	**25 (100%)**	
Impossible		**2 (5%)**	**41 (95%)**	**43 (100%)**	
Sum		**5 (7%)**	**65 (93%)**	**70 (100%)**	

b. Type frequency

Accentuation / *Rendaku*		[-accented] 0	[+accented] -3	Sum	Percentage of [+rendaku]
Possible	[-rendaku]	**2 (100%)**	**0 (0%)**	**2 (100%)**	**12/14 ≒ 86%**
	[+rendaku]	**1 (8%)**	**11 (92%)**	**12 (100%)**	
Impossible		**1 (4%)**	**22 (96%)**	**23 (100%)**	
Sum		**4 (11%)**	**33 (89%)**	**37 (100%)**	

The tendencies shown in the two tables are consistent: most of the compounds are accented and undergo *rendaku*. The location of the accent is antepenultimate in all cases. Some examples are shown below.

(111) siboo + $hutori_{acc}$ → siboo-bu'tori 'fat + growing fat; podgy'

iti'ya + $tukuri_{acc}$ → itiya-du'kuri 'one night + making; hastily prepared'

iti'zi + $harai_{acc}$ → itizi-ba'rai 'once + paying; payment in a lump sum'

sonohi' + kurasi → sonohi-gu'rasi 'that day + living; living from hand to mouth'

aiso' + warai → aiso-wa'rai 'friendliness + smiling; putting on an ingratiating smile'

2.4.8. 4μ+3μ

This section shows the results for cases where the first element has four morae and the second element has three morae. (112)-(a) is based on token frequency, while (112)-(b) is based on type frequency.

(112) Percentages of [±accented] and [+rendaku] (Type IV [adjunct], 4μ+3μ)

a. Token frequency

Rendaku \ Accentuation		[-accented] 0	[+accented] -3	Sum	Percentage of [+rendaku]
Possible	[-rendaku]	**0**	**0**	**0**	**16/16 ≒ 100%**
	[+rendaku]	**0 (0%)**	**16 (100%)**	**16 (100%)**	
Impossible		**0 (0%)**	**9 (100%)**	**9 (100%)**	
Sum		**0 (0%)**	**25 (100%)**	**25 (100%)**	

b. Type frequency

Rendaku \ Accentuation		[-accented] 0	[+accented] -3	Sum	Percentage of [+rendaku]
Possible	[-rendaku]	**0**	**0**	**0**	**4/4 ≒ 100%**
	[+rendaku]	**0 (0%)**	**4 (100%)**	**4 (100%)**	
Impossible		**0 (0%)**	**7 (100%)**	**7 (100%)**	
Sum		**0 (0%)**	**11 (100%)**	**11 (100%)**	

The tendencies shown in the two tables are consistent: most of the compounds are accented and undergo *rendaku*. The location of the accent is antepenultimate in all cases. Some examples are shown in (113).

(113) ikkatu + $harai_{acc}$ → ikkatu-ba'rai 'making a lump-sum payment'

issa'n + $hasiri_{acc}$ → issan-ba'siri 'at full speed + running; running at full speed'

bo'ttyan + $sodati_{acc}$ → bottyan-so'dati 'greenhorn + growing up; coddled upbringing' otaiko + musubi → otaiko-mu'subi 'drum + tying; drum knot fastening of the *obi*'

kannon + $hiraki_{acc}$ → kannon-bi'raki

'the God of Mercy + opening; hinged double doors'

2.4.9. Summary

This section summarizes the results for Type IV and examines them from various viewpoints. First, the table in (114) gives an overview of the results, listing the number of items and the percentages of [+accented] and [+rendaku] for each combination of the length of each element. The numbers and the percentages are shown both in terms of token frequency and in terms of type frequency. There is no great discrepancy between the results for the two kinds of frequency.

(114) Overview of the results (Type IV: Adjunct)

Length	Number of items		Percentage of [+accented]		Percentage of [+rendaku]	
	Token	Type	Token	Type	Token	Type
1μ+2μ	77	58	22%	24%	95%	93%
2μ+2μ	452	143	2%	6%	98%	95%
3μ+2μ	141	59	9%	14%	99%	97%
4μ+2μ	61	32	7%	13%	100%	100%
1μ+3μ	38	34	79%	76%	96%	95%
2μ+3μ	191	106	71%	63%	92%	86%
3μ+3μ	70	37	93%	89%	93%	86%
4μ+3μ	25	11	100%	100%	100%	100%

Second, average percentages are shown in (115), which compares the compounds where the second element has two morae and those where the second element has three morae. The percentage of [+accented] is 5% (token frequency) and 12% (type frequency) when the second element has two morae. In other words, most compounds are unaccented. On the other hand, the percentage of [+accented] is 79% (token frequency) and 73% (type frequency) when the second element has three morae. Although accented compounds are dominant, unaccented compounds are not uncommon. The percentage of [+rendaku] is 98% (token frequency) and 95% (type frequency) when the second element has two morae, and it is 94% (token frequency) and 89% (type frequency) when the second element has three morae. That is, most compounds undergo *rendaku* regardless of the length of the second element.

(115) Average percentages (Type IV: Adjunct)

a. Accentuation

Length	Token frequency			Type frequency		
	[+accented]	Total	Percentage	[+accented]	Total	Percentage
{1-4}μ+2μ	39	731	5%	34	292	12%
{1-4}μ+3μ	255	324	79%	137	188	73%

b. *Rendaku*

Length	Token frequency			Type frequency		
	[+rendaku]	Total	Percentage	[+rendaku]	Total	Percentage
{1-4}μ+2μ	360	367	98%	144	151	95%
{1-4}μ+3μ	123	131	94%	66	74	89%

The two tables in (116) show the percentages of compounds in terms of the combinations of [±accented] and [±rendaku]. The results in (116)-(a) are based on token frequency, while those in (116)-(b) are based on type frequency. As shown in the tables, most compounds are [-accented, +rendaku] when the second element has two morae. That is, one of the types of complementary distribution of accent and *rendaku* (i.e. [-accented, +rendaku]) can be seen in these cases. However, it becomes less prominent when the second element has three morae because the percentage of [+accented] increases. When the second element is long, [+accented, +rendaku] is the dominant pattern although [-accented, +rendaku] is also observed, especially in 2μ+3μ.

(116) The combinations of [±accented] ([±acc]) and [±rendaku] ([±r])when *rendaku* is possible (Type IV: Adjunct)

a. Token frequency

Length	[-acc, -r]	[+acc, -r]	[-acc, +r]	[+acc, +r]	Sum
1μ+2μ	2 (5%)	0 (0%)	32 (74%)	9 (21%)	43 (100%)
2μ+2μ	3 (1%)	1 (0%)	211 (97%)	2 (1%)	217 (100%)
3μ+2μ	0 (0%)	1 (1%)	70 (97%)	1 (1%)	72 (100%)
4μ+2μ	0 (0%)	0 (0%)	35 (100%)	0 (0%)	35 (100%)
{1-4}μ+2μ	5 (1%)	2 (1%)	**348 (95%)**	12 (3%)	367 (100%)
1μ+3μ	0 (0%)	1 (4%)	6 (26%)	16 (70%)	23 (100%)
2μ+3μ	2 (3%)	3 (5%)	25 (38%)	35 (54%)	65 (100%)
3μ+3μ	2 (7%)	0 (0%)	1 (4%)	24 (89%)	27 (100%)
4μ+3μ	0 (0%)	0 (0%)	0 (0%)	16 (100%)	16 (100%)
{1-4}μ+3μ	4 (3%)	4 (3%)	**32 (24%)**	**91 (69%)**	131 (100%)

b. Type frequency

Length	[-acc, -r]	[+acc, -r]	[-acc, +r]	[+acc, +r]	Sum
1μ+2μ	2 (7%)	0 (0%)	20 (67%)	8 (27%)	30 (100%)
2μ+2μ	3 (4%)	1 (1%)	67 (92%)	2 (3%)	73 (100%)
3μ+2μ	0 (0%)	1 (3%)	31 (94%)	1 (3%)	33 (100%)
4μ+2μ	0 (0%)	0 (0%)	15 (100%)	0 (0%)	15 (100%)
{1-4}μ+2μ	5 (3%)	2 (1%)	**133 (88%)**	11 (7%)	151 (100%)
1μ+3μ	0 (0%)	1 (5%)	6 (30%)	13 (65%)	20 (100%)
2μ+3μ	2 (6%)	3 (8%)	13 (36%)	18 (50%)	36 (100%)
3μ+3μ	2 (14%)	0 (0%)	1 (7%)	11 (79%)	14 (100%)
4μ+3μ	0 (0%)	0 (0%)	0 (0%)	4 (100%)	4 (100%)
{1-4}μ+3μ	4 (5%)	4 (5%)	**20 (27%)**	**46 (62%)**	74 (100%)

The table in (117) shows the percentages of [±accented] in the cases where *rendaku* is impossible. When the second element has two morae, most compounds are unaccented. In contrast, the percentage of [+accented] is about 80% when the second element has three morae although [-accented] is also observed. These patterns of [±accented] are consistent with those where *rendaku* is possible.

(117) The percentage of [±accented] in the cases where *rendaku* is impossible

(Type IV: Adjunct)

a. Token frequency

Length	[-accented]	[+accented]	Sum
1μ+2μ	26 (76%)	8 (24%)	34 (100%)
2μ+2μ	226 (97%)	8 (3%)	234 (100%)
3μ+2μ	59 (86%)	10 (14%)	69 (100%)
4μ+2μ	22 (85%)	4 (15%)	26 (100%)
{1-4}μ+2μ	**333 (92%)**	30 (8%)	363 (100%)
1μ+3μ	2 (13%)	13 (87%)	15 (100%)
2μ+3μ	27 (22%)	97 (78%)	124 (100%)
3μ+3μ	2 (5%)	41 (95%)	43 (100%)
4μ+3μ	0 (0%)	9 (100%)	9 (100%)
{1-4}μ+3μ	**31 (16%)**	**160 (84%)**	191 (100%)

b. Type frequency

Length	[-accented]	[+accented]	Sum
1μ+2μ	22 (79%)	6 (21%)	28 (100%)
2μ+2μ	64 (93%)	5 (7%)	69 (100%)
3μ+2μ	20 (77%)	6 (23%)	26 (100%)
4μ+2μ	13 (76%)	4 (24%)	17 (100%)
{1-4}μ+2μ	**119 (85%)**	21 (15%)	140 (100%)
1μ+3μ	2 (14%)	12 (86%)	14 (100%)
2μ+3μ	22 (32%)	46 (68%)	68 (100%)
3μ+3μ	1 (4%)	22 (96%)	23 (100%)
4μ+3μ	0 (0%)	7 (100%)	7 (100%)
{1-4}μ+3μ	**25 (22%)**	**87 (78%)**	112 (100%)

Based on the results discussed above, the patterns of [±accented] and [±rendaku] in Type IV are summarized as follows. The percentages on either side of the slash marks in the parentheses correspond to the percentages in terms of token frequency and type frequency respectively in (116).

(118) Generalization (Type IV: Adjunct)

a. {1-4}μ+2μ: [-accented, +rendaku] (95%/88%)

b. {1-4}μ+3μ: [+accented, +rendaku] (69%/62%), [-accented, +rendaku] (24%/27%)

First, compounds whose second element has two morae are [-accented, +rendaku] in general, which is consistent with earlier observations in previous studies. Second, when the second element has three morae, both [+accented, +rendaku] and [-accented, +rendaku] are observed although the former is dominant. Although previous studies have focused on [+accented, +rendaku], the survey in this study shows that [-accented, +rendaku] is also an important pattern in Type IV compounds whose second element has three morae.

2.5. Comparison between Type I and Type IV

Type I and Type IV are the major two types which have been compared in many previous studies. The following table summarizes what has been pointed out in those studies.

(119) Tendencies pointed out in previous studies

Type / Length of the second element	Type I Internal argument [*o* (acc)]	Type IV Adjunct
2μ	**[+accented, -rendaku]** (e.g. hituzi'-kai)	**[-accented, +rendaku]** (e.g. nizyuu-dori)
3μ	**[+accented, +rendaku]** (e.g. umi-bi'raki)	**[+accented, +rendaku]** (e.g. tabi-du'kare)

Let us compare (119) with the results of the survey in 2.3 and 2.4. The table in (120) shows the patterns of [±accented] and [±rendaku] of the two types, including examples. The percentages in the parentheses are those calculated in (91) and (116).

(120) Results of the survey

Type / Length of the second element	Type I Internal argument [*o* (acc)]	Type IV Adjunct
2μ	**(i) [+accented, -rendaku]** (45%/45%) (e.g. hituzi'-kai) **(ii) [-accented, +rendaku]** (36%/33%) (e.g. itami-dome) complementary distribution	**[-accented, +rendaku]** (95%/88%) (e.g. nizyuu-dori)
3μ	**(i) [+accented, +rendaku]** (60%/59%) (e.g. umi-bi'raki) **(ii) [+accented, -rendaku]** (33%/29%) (e.g. netu-sa'masi)	**(i) [+accented, +rendaku]** (69%/62%) (e.g. tabi-du'kare) **(ii) [-accented, +rendaku]** (24%/27%) (e.g. han-gawaki)

There are three patterns in (120) which are not included in (119) although some previous studies refer to examples which show the patterns. The three patterns are encircled by broken lines. First, [-accented, +rendaku] can be seen in Type I when the second element has two morae. However, this result is not inconsistent with the generalization that Type I is more likely to be accented and resist *rendaku* compared to Type IV. Second, [+accented, -rendaku] is observed in Type I when the second element has three morae. Third, [-accented, +rendaku] can be seen in Type IV when the second element has three morae. These two results imply that the difference between Type I and Type IV still remains even if the second element is long. In summary, the corpus study in this chapter not only verifies what has been pointed out in previous studies but also reveals some new details. The patterns shown in (120) are analyzed within the framework of Optimality Theory in Chapters 3 and 4. Accentuation is focused on in Chapter 3, and Chapter 4 analyzes *rendaku*, including the relationship with accentuation.

The next subsections show the results for the other two types: Type II and Type III. These two types are compounds where the first element is an internal argument, but the case particle is different from Type I.

2.6. Results for Type II (Internal argument, [*ga* (nominative)])

This section shows the results for Type II, where the second element is an unaccusative intransitive verb and the first element is the subject of the verb. The compounds are classified into eight groups based on the length of each element, and the results are shown for each group.

2.6.1. 1μ+2μ

The tables in (121) show the results for the cases where the first element has one mora and the second element has two morae. (121)-(a) is based on token frequency, while (121)-(b) is based on type frequency.

(121) Percentages of [±accented] and [+rendaku] (Type II [nominative], 1μ+2μ)

a. Token frequency

<table>
<tr><th colspan="2" rowspan="2">Accentuation / *Rendaku*</th><th>[-accented]</th><th colspan="2">[+accented]</th><th rowspan="2">Sum</th><th rowspan="2">Percentage of [+rendaku]</th></tr>
<tr><th>0</th><th>-1</th><th>-3</th></tr>
<tr><td rowspan="4">Possible</td><td rowspan="2">[-rendaku]</td><td rowspan="2">**2 (33%)**</td><td colspan="2">**4 (67%)**</td><td rowspan="2">**6 (100%)**</td><td rowspan="4">**7/13 ≒54%**</td></tr>
<tr><td>4</td><td>0</td></tr>
<tr><td rowspan="2">[+rendaku]</td><td rowspan="2">**5 (71%)**</td><td colspan="2">**2 (29%)**</td><td rowspan="2">**7 (100%)**</td></tr>
<tr><td>2</td><td>0</td></tr>
<tr><td colspan="2" rowspan="2">Impossible</td><td rowspan="2">**15 (71%)**</td><td colspan="2">**6 (29%)**</td><td rowspan="2">**21 (100%)**</td><td rowspan="2"></td></tr>
<tr><td>5</td><td>1</td></tr>
<tr><td colspan="2" rowspan="2">Sum</td><td rowspan="2">**22 (65%)**</td><td colspan="2">**12 (35%)**</td><td rowspan="2">**34 (100%)**</td><td rowspan="2"></td></tr>
<tr><td>11</td><td>1</td></tr>
</table>

b. Type frequency

Rendaku \ Accentuation		[-accented]	[+accented]		Sum	Percentage of [+rendaku]
		0	-1	-3		
Possible	[-rendaku]	**1 (25%)**	**3 (75%)**		**4 (100%)**	**7/11 ≒ 64%**
			3	0		
	[+rendaku]	**5 (71%)**	**2 (29%)**		**7 (100%)**	
			2	0		
Impossible		**11 (69%)**	**5 (31%)**		**16 (100%)**	
			4	1		
Sum		**17 (63%)**	**10 (37%)**		**27 (100%)**	
			9	1		

As shown in the two tables, about 60% of the compounds are unaccented. The percentage of [+rendaku] is 54% (token frequency) and 64% (type frequency). Some examples are shown in (122).

(122) hi + kure → hi-gure ‘sun + getting dark; sunset’

yo' + huke$_{acc}$ → yo-huke' ‘night + getting late; middle of the night’

ki + oti$_{acc}$ → ki-oti ‘spirit + falling; discouragement’

Some of the compounds show variation in accentuation. As illustrated in (123), variation between the unaccented and final-accented patterns is the major type of variation.

(123) Variation in accentuation

a. 0>-1: hi + teri$_{acc}$ → hi-deri > hi-deri' ‘sun + shining; dry weather’

b. -1>0: me' + kiki → me-kiki' > me-kiki ‘eye + working; judgment’

2.6.2. 2μ+2μ

The two tables in (124) show the results for the cases where each element has two morae. (124)-(a) is based on token frequency, while (124)-(b) is based on type frequency.

(124) Percentages of [±accented] and [+rendaku] (Type II [nominative], 2μ+2μ)

a. Token frequency

Accentuation / *Rendaku*		[-accented] 0	[+accented]	-1	-2	-3	Sum	Percentage of [+rendaku]
Possible	[-rendaku]	**13 (65%)**	**7 (35%)**	2	1	4	**20 (100%)**	**16/36 ≒30%**
	[+rendaku]	**15 (94%)**	**1 (6%)**	1	0	0	**16 (100%)**	
Impossible		**32 (94%)**	**2 (6%)**	1	0	1	**34 (100%)**	
Sum		**60 (86%)**	**10 (14%)**	4	1	5	**70 (100%)**	

b. Type frequency

Accentuation / *Rendaku*		[-accented] 0	[+accented]	-1	-2	-3	Sum	Percentage of [+rendaku]
Possible	[-rendaku]	**6 (50%)**	**6 (50%)**	2	1	3	**12 (100%)**	**11/23 ≒48%**
	[+rendaku]	**10 (91%)**	**1 (9%)**	1	0	0	**11 (100%)**	
Impossible		**13 (87%)**	**2 (13%)**	1	0	1	**15 (100%)**	
Sum		**29 (76%)**	**9 (24%)**	4	1	4	**38 (100%)**	

As shown in the tables, most compounds are unaccented, especially when *rendaku* occurs or when *rendaku* is impossible. The percentage of [+rendaku] is 30% (token frequency) and 48% (type frequency). Some examples are shown in (125).

(125) mizu + hake$_{acc}$ → mizu-hake ‘water + draining; drainage’

ude' + kiki → ude-kiki' ‘arm + working; person of ability’

mizu + kare → mizu-gare ‘water + drying up; drying up’

sina + kire$_{acc}$ → sina-gire ‘item + running out; be out of stock’

ha'da + are → hada-are ‘skin + getting chapped; chapped skin’

ga'su + more$_{acc}$ → gasu-more ‘gas + leaking; gas leak’ ka'ta + $kori_{acc}$ → kata'-kori ‘shoulder + getting stiff; stiff shoulders’

a'me + $huri_{acc}$ → ame'-huri ‘rain + falling; rainfall’

Some of the compounds in (124) show variation in accentuation, as illustrated in (126). Variation between the unaccented pattern and the final-accented pattern is the major type.

(126) Variation in accentuation

a. 0>-1: yuki' + $toke_{acc}$ → yuki-doke > yuki-doke' ‘snow + thawing; thaw’

b. -1>0: siri + $kire_{acc}$ → siri-kire' > siri-kire ‘back + breaking; being left unfinished’

2.6.3. 3μ+2μ

This section shows the results for cases where the first element has three morae and the second element has two morae. (127)-(a) is based on token frequency, while (127)-(b) is based on type frequency.

(127) Percentages of [±accented] and [+rendaku] (Type II [nominative], 3μ+2μ)

a. Token frequency

Rendaku \ Accentuation		[-accented] 0	[+accented] -3	Sum	Percentage of [+rendaku]
Possible	[-rendaku]	**3 (75%)**	**1 (25%)**	**4 (100%)**	**6/10 ≒ 60%**
	[+rendaku]	**6 (100%)**	**0 (0%)**	**6 (100%)**	
Impossible		**4 (100%)**	**0 (0%)**	**4 (100%)**	
Sum		**13 (93%)**	**1 (7%)**	**14 (100%)**	

b. Type frequency

Rendaku \ Accentuation		[-accented] 0	[+accented] -3	Sum	Percentage of [+rendaku]
Possible	[-rendaku]	**1 (50%)**	**1 (5%)**	**2 (100%)**	**2/4 ≒ 50%**
	[+rendaku]	**2 (100%)**	**0 (0%)**	**2 (100%)**	
Impossible		**4 (100%)**	**0 (0%)**	**4 (100%)**	
Sum		**7 (88%)**	**1 (13%)**	**8 (100%)**	

As shown in the tables, most compounds are unaccented. The percentage of [+rendaku] is 60% (token frequency) and 50% (type frequency). Some examples are shown in (128).

(128) hosyoo + $tuki_{acc}$ → hosyoo-tuki ‘guarantee + having; with guarantee’
zikan + $kire_{acc}$ → zikan-gire ‘time + running out; Time has run out.’
nakama' + ware → nakama-ware ‘group + breaking; split among friends’
abura + $more_{acc}$ → abura-more ‘oil + leaking; oil leak’

There are two compounds which show variation in accentuation: *kiwame-tuki* > *kiwame'-tuki* ‘guaranteed’ and *iwaku-tuki* > *iwaku'-tuki* ‘with a strange history’.

2.6.4. 4μ+2μ

This section shows the results for cases where the first element has three morae and the second element has two morae. (129)-(a) is based on token frequency, while (129)-(b) is based on type frequency.

(129) Percentages of [±accented] and [+rendaku] (Type II [nominative], 4μ+2μ)

a. Token frequency

Accentuation / *Rendaku*		[-accented] 0	[+accented] -3	Sum	Percentage of [+rendaku]
Possible	[-rendaku]	**6 (100%)**	**0 (0%)**	**6 (100%)**	**3/9 ≒ 33%**
	[+rendaku]	**3 (100%)**	**0 (0%)**	**3 (100%)**	
Impossible		**4 (100%)**	**0 (0%)**	**4 (100%)**	
Sum		**13 (100%)**	**0 (0%)**	**13 (100%)**	

b. Type frequency

Accentuation / *Rendaku*		[-accented] 0	[+accented] -3	Sum	Percentage of [+rendaku]
Possible	[-rendaku]	**1 (100%)**	**0 (0%)**	**1 (100%)**	**1/2 ≒ 50%**
	[+rendaku]	**1 (100%)**	**0 (0%)**	**1 (100%)**	
Impossible		**4 (100%)**	**0 (0%)**	**4 (100%)**	
Sum		**6 (100%)**	**0 (0%)**	**6 (100%)**	

As shown in the tables, all compounds are unaccented. The percentage of [+rendaku] is 33% (token frequency) and 50% (type frequency). There are only two verb stems in these compounds where *rendaku* is possible: $tuki_{acc}$ ‘having’ and $sumi_{acc}$ ‘finishing’. As exemplified in (130), the former resists *rendaku*, and the latter undergoes *rendaku*.

(130) a. Deverbal compounds which involves *tuki*$_{acc}$ 'having'

zyooke'n + tuki$_{acc}$ → zyooken-tuki 'condition + having; conditional'

haitoo + tuki$_{acc}$ → haitoo-tuki 'dividend + having; cum dividend'

b. Deverbal compounds which involves *sumi*$_{acc}$ 'finishing'

kentee + sumi$_{acc}$ → kentee-zumi 'examination + finishing; authorized'

baiyaku + sumi$_{acc}$ → baiyaku-zumi 'contract for sale + finishing; sold'

Some of the compounds show variation in accentuation, as illustrated in (131).

(131) kinpaku + tuki$_{acc}$ → kinpaku-tuki > kinpaku'-tuki 'gold leaf + having; with gold leaf'

katagaki + tuki$_{acc}$ → katagaki-tuki > katagaki'-tuki 'status + having; having titles'

2.6.5. 1μ+3μ

This section deals with the cases where the first element has one mora and the second element has three morae. (132)-(a) is based on token frequency, while (132)-(b) is based on type frequency.

(132) Percentages of [±accented] and [+rendaku] (Type II [nominative], 1μ+3μ)

a. Token frequency

Accentuation / *Rendaku*		[-accented] 0	[+accented] -3	Sum	Percentage of [+rendaku]
Possible	[-rendaku]	**0**	**0**	**0**	**8/8 ≒ 100%**
	[+rendaku]	**2 (25%)**	**6 (75%)**	**8 (100%)**	
Impossible		**5 (20%)**	**20 (80%)**	**25 (100%)**	
Sum		**7 (21%)**	**26 (79%)**	**33 (100%)**	

b. Type frequency

Accentuation / *Rendaku*		[-accented] 0	[+accented] -3	Sum	Percentage of [+rendaku]
Possible	[-rendaku]	**0**	**0**	**0**	**7/7 ≒ 100%**
	[+rendaku]	**2 (29%)**	**5 (71%)**	**7 (100%)**	
Impossible		**5 (26%)**	**14 (74%)**	**19 (100%)**	
Sum		**7 (27%)**	**19 (73%)**	**26 (100%)**	

As shown in the two tables, the compounds tend to be accented and *rendaku* occurs in all cases. Some examples are shown below.

(133) ki + $tumari_{acc}$ → ki-du'mari 'spirit + being blocked; feeling ill at ease'
to + $simari_{acc}$ → to-zi'mari 'door + shutting; fastening a door'
zi' + $suberi_{acc}$ → zi-su'beri 'ground + sliding; landslide'
ha' + narabi → ha'-narabi 'tooth + forming a line; set of teeth'

Some of the compounds show variation in accentuation, as illustrated in (134).

(134) hi + tamari → hi-damari > hi-da'mari 'sun + gathering; sunny place'
ki + okure → ki-okure > ki-o'kure 'spirit + being late; nervousness'

2.6.6. 2μ+3μ

This section shows the results for cases where the first element has two morae and the second element has three morae. (135)-(a) is based on token frequency, while (135)-(b) is based on type frequency.

(135) Percentages of [±accented] and [+rendaku] (Type II [nominative], 2μ+3μ)

a. Token frequency

Accentuation / *Rendaku*		[-accented] 0	[+accented] -3	Sum	Percentage of [+rendaku]
Possible	[-rendaku]	**1 (100%)**	**0 (0%)**	**1 (100%)**	**24/25 ≒ 96%**
	[+rendaku]	**4 (17%)**	**20 (83%)**	**24 (100%)**	
Impossible		**4 (10%)**	**38 (90%)**	**42 (100%)**	
Sum		**9 (13%)**	**58 (87%)**	**67 (100%)**	

b. Type frequency

Accentuation / *Rendaku*		[-accented] 0	[+accented] -3	Sum	Percentage of [+rendaku]
Possible	[-rendaku]	**1 (100%)**	**0 (0%)**	**1 (100%)**	**10/11 ≒ 91%**
	[+rendaku]	**4 (40%)**	**6 (60%)**	**10 (100%)**	
Impossible		**4 (18%)**	**18 (82%)**	**22 (100%)**	
Sum		**9 (27%)**	**24 (73%)**	**33 (100%)**	

As shown in the two tables, the compounds tend to be accented and undergo *rendaku*. Some examples are shown below.

(136) ko'e + kawari → koe-ga'wari 'voice + changing; one's voice changes'
maku' + tamari → maku-da'mari
'curtain + accumulating; the place in a stage where curtains are drawn back'
kata' + $kuzure_{acc}$ → kata-ku'zure 'pattern + collapsing; losing shape'

Some of the compounds show variation in accentuation. Variation between a form with the accent in antepenultimate position and an unaccented form is the major type, as illustrated in (137).

(137) a. -3>0: kana + maziri → kana-ma'ziri > kana-maziri
'*kana* (Japanese syllabary) + being mixed; writing in *kana* and *kanji*'
b. 0>-3: hana + $tumari_{acc}$ → hana-dumari > hana-du'mari
'nose + being blocked; nasal congestion'

2.6.7. 3μ+3μ

This section deals with the cases where each element has three morae. (138)-(a) is based on token frequency, while (138)-(b) is based on type frequency.

(138) Percentages of [±accented] and [+rendaku] (Type II [nominative], 3μ+3μ)

a. Token frequency

Accentuation / *Rendaku*		[-accented] 0	[+accented] -3	Sum	Percentage of [+rendaku]
Possible	[-rendaku]	**0**	**0**	**0**	**5/5 ≒ 100%**
	[+rendaku]	**0 (0%)**	**5 (100%)**	**5 (100%)**	
Impossible		**0 (0%)**	**18 (100%)**	**18 (100%)**	
Sum		**0 (0%)**	**23 (100%)**	**23 (100%)**	

b. Type frequency

Rendaku \ Accentuation		[-accented] 0	[+accented] -3	Sum	Percentage of [+rendaku]
Possible	[-rendaku]	**0**	**0**	**0**	**4/4**
	[+rendaku]	**0 (0%)**	**4 (100%)**	**4 (100%)**	**≒100%**
Impossible		**0 (0%)**	**11 (100%)**	**11 (100%)**	
Sum		**0 (0%)**	**15 (100%)**	**15 (100%)**	

As shown in the two tables, the compounds are accented and undergo *rendaku* in all cases. The position of the accent is antepenultimate, and there are no compounds which allow variation. Some examples are shown below.

(139) koko'ro + kawari → kokoro-ga'wari 'heart + changing; change of heart'
okoe + $kakari_{acc}$ → okoe-ga'kari 'voice + hanging; on the recommendation of'
kitai + hazure → kitai-ha'zure 'expectation + failing; disappointment'

2.6.8. 4μ+3μ

This section shows the results for cases where the first element has four morae and the second element has three morae. (140)-(a) is based on token frequency, while (140)-(b) is based on type frequency.

(140) Percentages of [±accented] and [+rendaku] (Type II [nominative], 4μ+3μ)

a. Token frequency

Rendaku \ Accentuation		[-accented] 0	[+accented] -3	Sum	Percentage of [+rendaku]
Possible	[-rendaku]	**0**	**0**	**0**	
	[+rendaku]	**0**	**0**	**0**	
Impossible		**0 (0%)**	**7 (100%)**	**7 (100%)**	
Sum		**0 (0%)**	**7 (100%)**	**7 (100%)**	

b. Type frequency

Rendaku \ Accentuation		[-accented] 0	[+accented] -3	Sum	Percentage of [+rendaku]
Possible	[-rendaku]	**0**	**0**	**0**	
	[+rendaku]	**0**	**0**	**0**	
Impossible		**0 (0%)**	**3 (100%)**	**3 (100%)**	
Sum		**0 (0%)**	**3 (100%)**	**3 (100%)**	

There are only seven compounds in this group. As *rendaku* is impossible in all cases, the percentage of [+rendaku] cannot be calculated. The percentage of [+accented] is 100%, and there are no compounds which allow variation. Some examples are shown below.

(141) tyuumon + nagare$_{acc}$ → tyuumon-na'gare 'order + flowing; order cancellation'
hanauta + maziri$_{acc}$ → hanauta-ma'ziri
'humming + being mixed; doing something humming a tune'

2.6.9. Summary

This section summarizes the results for Type II. The table in (142) gives an overview of the results, listing the number of items and the percentages of [+accented] and [+rendaku] for each combination of the length of each element. The numbers and the percentages are shown both in terms of token frequency and in terms of type frequency. There is no great discrepancy between the results for the two kinds of frequency.

(142) Overview of the results (Type II: Internal argument, nominative)

Length	Number of items		Percentage of [+accented]		Percentage of [+rendaku]	
	Token	Type	Token	Type	Token	Type
1μ+2μ	34	27	35%	37%	54%	64%
2μ+2μ	70	38	14%	24%	30%	48%
3μ+2μ	14	8	7%	13%	60%	50%
4μ+2μ	13	6	0%	0%	33%	50%
1μ+3μ	33	26	79%	73%	100%	100%
2μ+3μ	67	33	87%	73%	96%	91%
3μ+3μ	23	15	100%	100%	100%	100%
4μ+3μ	7	3	100%	100%	—	—

Second, average percentages are shown in (143), which compares the compounds where the second element has two morae and those where the second element has three morae. The percentage of [+accented] is 18% (token frequency) and 25% (type frequency) when the second element has two morae. On the other hand, the percentage of [+accented] is 88% (token frequency) and 79% (type frequency) when the second element has three morae. That is, the percentage increases when the second element is long. The percentage of [+rendaku] is 47% (token frequency) and 53% (type frequency) when the second element has two morae, and it is 97% (token frequency) and 95% (type frequency) when the second element has three morae.

(143) Average percentages (Type II: Internal argument, nominative)

a. Accentuation

Length	Token frequency			Type frequency		
	[+accented]	Total	Percentage	[+accented]	Total	Percentage
{1-4}μ+2μ	23	131	18%	20	79	25%
{1-4}μ+3μ	114	130	88%	61	77	79%

b. *Rendaku*

Length	Token frequency			Type frequency		
	[+rendaku]	Total	Percentage	[+rendaku]	Total	Percentage
{1-4}μ+2μ	32	68	47%	21	40	53%
{1-4}μ+3μ	37	38	97%	21	22	95%

The two tables in (144) show the percentages of compounds in terms of the combinations of [±accented] and [±rendaku]. The result in (144)-(a) is based on token frequency, while that in (144)-(b) is based on type frequency. As shown in the tables, the three combinations other than [+accented, +rendaku] are the major types when the second element has two morae. On the other hand, [+accented, +rendaku] is dominant when the second element has three morae. [-accented, +rendaku] is also observed in these cases.

(144) The combinations of [±accented] ([±acc]) and [±rendaku] ([±r]) when *rendaku* is possible (Type II: Internal argument, nominative)

a. Token frequency

Length	[-acc, -r]	[+acc, -r]	[-acc, +r]	[+acc, +r]	Sum
1μ+2μ	2 (15%)	4 (31%)	5 (38%)	2 (15%)	13 (100%)
2μ+2μ	13 (36%)	7 (19%)	15 (42%)	1 (3%)	36 (100%)
3μ+2μ	3 (30%)	1 (10%)	6 (60%)	0 (0%)	10 (100%)
4μ+2μ	6 (67%)	0 (0%)	3 (33%)	0 (0%)	9 (100%)
{1-4}μ+2μ	**24 (35%)**	**12 (18%)**	**29 (43%)**	3 (4%)	68 (100%)
1μ+3μ	0 (0%)	0 (0%)	2 (25%)	6 (75%)	8 (100%)
2μ+3μ	1 (4%)	0 (0%)	4 (16%)	20 (80%)	25 (100%)
3μ+3μ	0 (0%)	0 (0%)	0 (0%)	5 (100%)	5 (100%)
4μ+3μ	0	0	0	0	0
{1-4}μ+3μ	1 (3%)	0 (0%)	**6 (16%)**	**31 (82%)**	38 (100%)

b. Type frequency

Length	[-acc, -r]	[+acc, -r]	[-acc, +r]	[+acc, +r]	Sum
1μ+2μ	1 (9%)	3 (27%)	5 (45%)	2 (18%)	11 (100%)
2μ+2μ	6 (26%)	6 (26%)	10 (43%)	1 (4%)	23 (100%)
3μ+2μ	1 (25%)	1 (25%)	2 (50%)	0 (0%)	4 (100%)
4μ+2μ	1 (50%)	0 (0%)	1 (50%)	0 (0%)	2 (100%)
{1-4}μ+2μ	**9 (23%)**	**10 (25%)**	**18 (45%)**	3 (8%)	40 (100%)
1μ+3μ	0 (0%)	0 (0%)	2 (29%)	5 (71%)	7 (100%)
2μ+3μ	1 (9%)	0 (0%)	4 (36%)	6 (55%)	11 (100%)
3μ+3μ	0 (0%)	0 (0%)	0 (0%)	4 (100%)	4 (100%)
4μ+3μ	0	0	0	0	0
{1-4}μ+3μ	1 (5%)	0 (0%)	**6 (27%)**	**15 (68%)**	22 (100%)

The table in (145) shows the percentages of [±accented] in the cases where *rendaku* is impossible. When the second element has two morae, [-accented] is dominant; in contrast, [+accented] is dominant when the second element has three morae.

(145) The percentages of [+accented] in the cases where *rendaku* is impossible

(Type II: Internal argument, nominative)

a. Token frequency

Length	[-accented]	[+accented]	Sum
1μ+2μ	15 (71%)	6 (29%)	21 (100%)
2μ+2μ	32 (94%)	2 (6%)	34 (100%)
3μ+2μ	4 (100%)	0 (0%)	4 (100%)
4μ+2μ	4 (100%)	0 (0%)	4 (100%)
{1-4}μ+2μ	**55 (87%)**	8 (13%)	63 (100%)
1μ+3μ	5 (20%)	20 (80%)	25 (100%)
2μ+3μ	4 (10%)	38 (90%)	42 (100%)
3μ+3μ	0 (0%)	18 (100%)	18 (100%)
4μ+3μ	0 (0%)	7 (100%)	7 (100%)
{1-4}μ+3μ	9 (10%)	**83 (90%)**	92 (100%)

b. Type frequency

Length	[-accented]	[+accented]	Sum
1μ+2μ	11 (69%)	5 (31%)	16 (100%)
2μ+2μ	13 (87%)	2 (13%)	15 (100%)
3μ+2μ	4 (100%)	0 (0%)	4 (100%)
4μ+2μ	4 (100%)	0 (0%)	4 (100%)
{1-4}μ+2μ	**32 (82%)**	7 (18%)	39 (100%)
1μ+3μ	5 (26%)	14 (74%)	19 (100%)
2μ+3μ	4 (18%)	18 (82%)	22 (100%)
3μ+3μ	0 (0%)	11 (100%)	11 (100%)
4μ+3μ	0 (0%)	3 (100%)	3 (100%)
{1-4}μ+3μ	9 (16%)	**46 (84%)**	55 (100%)

2.7. Results for Type III (Internal argument, [*ni* (dative)])

This section shows the results for Type III, where the first element is an internal argument whose case particle is *ni* (dative). Both intransitive verbs and transitive verbs are possible as the second element. The compounds are classified into eight groups based on the length of each element: 1μ+2μ, 2μ+2μ, 3μ+2μ, 4μ+2μ, 1μ+3μ, 2μ+3μ, 3μ+3μ, and 4μ+3μ. As there are only two compounds whose length is 4μ+3μ, for the sake of convenience they are referred to in 2.7.7, which deals with 3μ+3μ.

2.7.1. 1μ+2μ

The tables in (146) show the results for the cases where the first element has one mora and the second element has two morae. (146)-(a) is based on token frequency, while (146)-(b) is based on type frequency.

(146) Percentages of [±accented] and [+rendaku] (Type III [dative], 1μ+2μ)

a. Token frequency

Accentuation / *Rendaku*		[-accented] 0	[+accented] -1	Sum	Percentage of [+rendaku]
Possible	[-rendaku]	**2 (67%)**	**1 (33%)**	**3 (100%)**	**6/9 ≒ 67%**
	[+rendaku]	**4 (67%)**	**2 (33%)**	**6 (100%)**	
Impossible		**1 (33%)**	**2 (67%)**	**3 (100%)**	
Sum		**7 (58%)**	**5 (42%)**	**12 (100%)**	

b. Type frequency

Accentuation / *Rendaku*		[-accented] 0	[+accented] -1	Sum	Percentage of [+rendaku]
Possible	[-rendaku]	**1 (50%)**	**1 (50%)**	**2 (100%)**	**5/7 ≒ 71%**
	[+rendaku]	**3 (60%)**	**2 (40%)**	**5 (100%)**	
Impossible		**1 (33%)**	**2 (67%)**	**3 (100%)**	
Sum		**5 (50%)**	**5 (50%)**	**10 (100%)**	

As shown in the two tables, the percentage of [+accented] is 42% (token frequency) and 50% (type frequency), and about 70% of the compounds undergo *rendaku*. Some examples are shown in (147).

(147) no' + tumi → no-dumi ‘field + piling; open-air storage’

ba + $nare_{acc}$ → ba-nare ‘place + getting used to; experienced’

ta' + ue → ta-ue' ‘rice field + planting; rice-planting’

Some of the compounds show variation in accentuation. As illustrated in (148), variation between the unaccented and final-accented patterns is the major type of variation.

(148) Variation in accentuation

a. 0>-1: za + $tuki_{acc}$ → za-tuki > za-tuki' ‘seat + being attached; attached to a theater’

b. -1>0: su' + tuke → su-duke' > su-duke ‘vinegar + soaking; pickles’

2.7.2. 2μ+2μ

The two tables in (149) show the results for the cases where each element has two morae. (149)-(a) is based on token frequency, while (149)-(b) is based on type frequency.

(149) Percentages of [±accented] and [+rendaku] (Type III [dative], 2μ+2μ)

a. Token frequency

<table>
<tr><td colspan="2" rowspan="2">Accentuation / *Rendaku*</td><td>[-accented]</td><td colspan="3">[+accented]</td><td rowspan="2">Sum</td><td rowspan="2">Percentage of [+rendaku]</td></tr>
<tr><td>0</td><td>-1</td><td>-2</td><td>-3</td></tr>
<tr><td rowspan="4">Possible</td><td rowspan="2">[-rendaku]</td><td rowspan="2">**2 (33%)**</td><td colspan="3">**4 (67%)**</td><td rowspan="2">**6 (100%)**</td><td rowspan="4">**22/28 ≒79%**</td></tr>
<tr><td>1</td><td>1</td><td>2</td></tr>
<tr><td rowspan="2">[+rendaku]</td><td rowspan="2">**21 (95%)**</td><td colspan="3">**1 (5%)**</td><td rowspan="2">**22 (100%)**</td></tr>
<tr><td>0</td><td>1</td><td>0</td></tr>
<tr><td colspan="2" rowspan="2">Impossible</td><td rowspan="2">**31 (78%)**</td><td colspan="3">**9 (23%)**</td><td rowspan="2">**40 (100%)**</td><td rowspan="2"></td></tr>
<tr><td>1</td><td>3</td><td>5</td></tr>
<tr><td colspan="2" rowspan="2">Sum</td><td rowspan="2">**54 (79%)**</td><td colspan="3">**14 (21%)**</td><td rowspan="2">**68 (100%)**</td><td rowspan="2"></td></tr>
<tr><td>2</td><td>5</td><td>7</td></tr>
</table>

b. Type frequency

<table>
<tr><td colspan="2" rowspan="2">Accentuation / *Rendaku*</td><td>[-accented]</td><td colspan="3">[+accented]</td><td rowspan="2">Sum</td><td rowspan="2">Percentage of [+rendaku]</td></tr>
<tr><td>0</td><td>-1</td><td>-2</td><td>-3</td></tr>
<tr><td rowspan="4">Possible</td><td rowspan="2">[-rendaku]</td><td rowspan="2">**2 (40%)**</td><td colspan="3">**3 (60%)**</td><td rowspan="2">**5 (100%)**</td><td rowspan="4">**10/15 ≒67%**</td></tr>
<tr><td>1</td><td>1</td><td>1</td></tr>
<tr><td rowspan="2">[+rendaku]</td><td rowspan="2">**9 (90%)**</td><td colspan="3">**1 (10%)**</td><td rowspan="2">**10 (100%)**</td></tr>
<tr><td>0</td><td>1</td><td>0</td></tr>
<tr><td colspan="2" rowspan="2">Impossible</td><td rowspan="2">**12 (67%)**</td><td colspan="3">**6 (33%)**</td><td rowspan="2">**18 (100%)**</td><td rowspan="2"></td></tr>
<tr><td>1</td><td>2</td><td>3</td></tr>
<tr><td colspan="2" rowspan="2">Sum</td><td rowspan="2">**23 (70%)**</td><td colspan="3">**10 (30%)**</td><td rowspan="2">**33 (100%)**</td><td rowspan="2"></td></tr>
<tr><td>2</td><td>4</td><td>4</td></tr>
</table>

As shown in the two tables, a majority of the compounds are unaccented and undergo *rendaku*. Some examples are shown in (150).

(150) hako + $tume_{acc}$ → hako-dume 'box + packing; packed in a box'

hu'ne + tumi → huna-dumi 'ship + loading; loading a ship'

mi'so + tuke → miso-duke 'miso + soaking; miso pickles'

Some of the compounds in (149) show variation in accentuation, as illustrated in (151).

(151) Variation in accentuation

a. 0>-1: sio' + tuke → sio-duke > sio-duke' 'salt + soaking; salting down'

b. -2>-1: kabe + $kake_{acc}$ → kabe-ka'ke > kabe-kake' 'wall + hanging; wall-hanging'

2.7.3. 3μ+2μ

This section shows the results for cases where the first element has three morae and the second element has two morae. (152)-(a) is based on token frequency, while (152)-(b) is based on type frequency.

(152) Percentages of [±accented] and [+rendaku] (Type III [dative], 3μ+2μ)

a. Token frequency

Rendaku \ Accentuation		[-accented] 0	[+accented] -3	Sum	Percentage of [+rendaku]
Possible	[-rendaku]	**0 (0%)**	**1 (100%)**	**1 (100%)**	**8/9 ≒ 89%**
	[+rendaku]	**8 (100%)**	**0 (0%)**	**8 (100%)**	
Impossible		**9 (82%)**	**2 (18%)**	**11 (100%)**	
Sum		**17 (85%)**	**3 (15%)**	**20 (100%)**	

b. Type frequency

Rendaku \ Accentuation		[-accented] 0	[+accented] -3	Sum	Percentage of [+rendaku]
Possible	[-rendaku]	**0 (0%)**	**1 (100%)**	**1 (100%)**	**4/5 ≒ 80%**
	[+rendaku]	**4 (100%)**	**0 (0%)**	**4 (100%)**	
Impossible		**3 (60%)**	**2 (40%)**	**5 (100%)**	
Sum		**7 (70%)**	**3 (30%)**	**10 (100%)**	

As shown in the two tables, a majority of the compounds are unaccented and undergo *rendaku*. Some examples are given in (153).

(153) sato'o + tuke → satoo-duke ‘sugar + soaking; preserved in sugar’

hukuro' + $tume_{acc}$ → hukuro-dume ‘bag + packing; packed in a bag’

nakama' + iri → nakama-iri ‘group + entering; joining a group’

There is only one compound which shows variation in accentuation: *hasigo'-nori* ‘acrobatic performances/performer on a ladder’ also allows *hasigo-nori*.

2.7.4. 4μ+2μ

This section shows the results for cases where the first element has three morae and the second element has two morae. (154)-(a) is based on token frequency, while (154)-(b) is based on type frequency.

(154) Percentages of [±accented] and [+rendaku] (Type III [dative], 4μ+2μ)

a. Token frequency

Accentuation / *Rendaku*		[-accented] 0	[+accented] -3	Sum	Percentage of [+rendaku]
Possible	[-rendaku]	**0 (0%)**	**1 (100%)**	**1 (100%)**	**2/3 ≒ 67%**
	[+rendaku]	**2 (100%)**	**0 (0%)**	**2 (100%)**	
Impossible		**6 (100%)**	**0 (0%)**	**6 (100%)**	
Sum		**8 (89%)**	**1 (11%)**	**9 (100%)**	

b. Type frequency

Accentuation / *Rendaku*		[-accented] 0	[+accented] -3	Sum	Percentage of [+rendaku]
Possible	[-rendaku]	**0 (0%)**	**1 (100%)**	**1 (100%)**	**2/3 ≒ 67%**
	[+rendaku]	**2 (100%)**	**0 (0%)**	**2 (100%)**	
Impossible		**3 (100%)**	**0 (0%)**	**3 (100%)**	
Sum		**5 (83%)**	**1 (17%)**	**6 (100%)**	

Although there are only a few compounds in this category, the percentage of [+accented] is low and that of [+rendaku] is high. There are no compounds which show variation in accentuation. Some examples are given in (155).

(155) kaigan + soi → kaigan-zoi ‘seashore + along; along the coast’

kamiso'ri + make → kamisori-make ‘razor + losing; razor rash’

nukamiso + tuke → nukamiso-duke

‘salted rice-bran paste for pickling + soaking; vegetables pickled in rice-bran paste’

2.7.5. 1μ+3μ

This section deals with the cases where the first element has one mora and the second element has three morae. (156)-(a) is based on token frequency, while (156)-(b) is based on type frequency.

(156) Percentages of [±accented] and [+rendaku] (Type III [dative], 1μ+3μ)

a. Token frequency

Accentuation / *Rendaku*		[-accented] 0	[+accented] -3	Sum	Percentage of [+rendaku]
Possible	[-rendaku]	**0**	**0**	**0**	**5/5**
	[+rendaku]	**0 (0%)**	**5 (100%)**	**5 (100%)**	≒ **100%**
Impossible		**2 (50%)**	**2 (50%)**	**4 (100%)**	
Sum		**2 (22%)**	**7 (78%)**	**9 (100%)**	

b. Type frequency

Accentuation / *Rendaku*		[-accented] 0	[+accented] -3	Sum	Percentage of [+rendaku]
Possible	[-rendaku]	**0**	**0**	**0**	**4/4**
	[+rendaku]	**0 (0%)**	**4 (0%)**	**4 (100%)**	≒ **100%**
Impossible		**2 (50%)**	**2 (50%)**	**4 (100%)**	
Sum		**2 (25%)**	**6 (75%)**	**8 (100%)**	

As shown in the tables, a majority of the compounds are accented and *rendaku* occurs in all cases. Some examples are given in (157).

(157) me' + sawari → me-za'wari ‘eye + interfering with; obstruction’

yu' + $toosi_{acc}$ → yu-do'osi ‘hot water + letting a thing through; steaming’

ki' + nobori → ki-no'bori ‘tree + climbing; tree-climbing’

There are two compounds which are unaccented but also allow [+accented], as shown in (158).

(158) ti + $mamire_{acc}$ → ti-mamire > ti-ma'mire 'blood + being covered with; bloodstained'

ki + $makase_{acc}$ → ki-makase > ki-ma'kase 'spirit + leaving a thing to a person; at will'

2.7.6. 2μ+3μ

This section shows the results for cases where the first element has two morae and the second element has three morae. (159)-(a) is based on token frequency, while (159)-(b) is based on type frequency.

(159) Percentages of [±accented] and [+rendaku] (Type III [dative], 2μ+3μ)

a. Token frequency

Accentuation / *Rendaku*		[-accented] 0	[+accented] -3	Sum	Percentage of [+rendaku]
Possible	[-rendaku]	**0**	**0**	**0**	**15/15 ≒ 100%**
	[+rendaku]	**1 (7%)**	**14 (93%)**	**15 (100%)**	
Impossible		**0 (0%)**	**19 (100%)**	**19 (100%)**	
Sum		**1 (3%)**	**33 (97%)**	**34 (100%)**	

b. Type frequency

Accentuation / *Rendaku*		[-accented] 0	[+accented] -3	Sum	Percentage of [+rendaku]
Possible	[-rendaku]	**0**	**0**	**0**	**10/10 ≒ 100%**
	[+rendaku]	**1 (10%)**	**9 (90%)**	**10 (100%)**	
Impossible		**0 (0%)**	**8 (100%)**	**8 (100%)**	
Sum		**1 (6%)**	**17 (94%)**	**18 (100%)**	

As shown in the tables, most of the compounds are accented and *rendaku* occurs in all cases. Some examples are given in (160).

(160) ha'da + sawari → hada-za'wari 'skin + touching; texture'

yama' + $komori_{acc}$ → yama-go'mori

'mountain + staying inside; hiding oneself away in the mountains'

hito + $makase_{acc}$ → hito-ma'kase

'person + leaving a thing to a person; leaving a thing for others to do'

Some of the compounds show variation in accentuation. As illustrated in (161), they allow both an unaccented form and a form with accent in the antepenultimate position.

(161) a. -3>0: mizu + hitasi → mizu-bi'tasi > mizu-bitasi

‘water + submerging; water-soaked’

b. 0>-3: sake + hitari → sake-bitari > sake-bi'tari

‘liquor + being submerged in; being steeped in liquor’

2.7.7. 3μ+3μ

This section deals with the cases where each element has three morae. (162)-(a) is based on token frequency, while (162)-(b) is based on type frequency.

(162) Percentages of [±accented] and [+rendaku] (Type III [dative], 3μ+3μ)

a. Token frequency

Accentuation / *Rendaku*		[-accented] 0	[+accented] -3	Sum	Percentage of [+rendaku]
Possible	[-rendaku]	**0**	**0**	**0**	**6/6 ≒ 100%**
	[+rendaku]	**0 (0%)**	**6 (100%)**	**6 (100%)**	
Impossible		**0 (0%)**	**13 (100%)**	**13 (100%)**	
Sum		**0 (0%)**	**19 (100%)**	**19 (100%)**	

b. Type frequency

Accentuation / *Rendaku*		[-accented] 0	[+accented] -3	Sum	Percentage of [+rendaku]
Possible	[-rendaku]	**0**	**0**	**0**	**4/4 ≒ 100%**
	[+rendaku]	**0 (0%)**	**4 (100%)**	**4 (100%)**	
Impossible		**0 (0%)**	**11 (100%)**	**11 (100%)**	
Sum		**0 (0%)**	**15 (100%)**	**15 (100%)**	

As shown in the two tables, the compounds are accented and undergo *rendaku* in all cases. The position of the accent is antepenultimate, and there are no compounds which allow variation. Some examples are given in (163).

(163) ko'noma + kakure$_{\text{acc}}$ → konoma-ga'kure

‘between the trees + hiding; seeing a thing through the trees’

yasiki' + tutome$_{\text{acc}}$ → yasiki-du'tome

‘samurai residence + working; being employed at samurai residence’

a'tusa + atari → atusa-a'tari ‘heat + being affected by; heatstroke’

Before closing this section, let me refer to the 4μ+3μ group. There are only two compounds in this group: *ryuukoo-o'kure* 'out of fashion' and *dosakusa-ma'gire* 'in the confusion'. These two compounds are accented and *rendaku* is impossible in both cases.

2.7.8. Summary

This section summarizes the results for Type III. The table in (164) gives an overview of the results, listing the number of items and the percentages of [+accented] and [+rendaku] for each combination of the length of each element. The numbers and the percentages are shown both in terms of token frequency and in terms of type frequency. There is no great discrepancy between the results for the two kinds of frequency.

(164) Overview of the results (Type III: Internal argument, dative)

Length	Number of items		Percentage of [+accented]		Percentage of [+rendaku]	
	Token	Type	Token	Type	Token	Type
1μ+2μ	12	10	42%	50%	67%	71%
2μ+2μ	68	33	21%	30%	79%	67%
3μ+2μ	20	10	15%	30%	89%	80%
4μ+2μ	9	6	11%	17%	67%	67%
1μ+3μ	9	8	78%	75%	100%	100%
2μ+3μ	34	18	97%	94%	100%	100%
3μ+3μ	19	15	100%	100%	100%	100%
4μ+3μ	2	2	100%	100%	—	—

The tables in (165) show average percentages, comparing the compounds where the second element has two morae and those where the second element has three morae. The percentage of [+accented] is 21% (token frequency) and 32% (type frequency) when the second element has two morae. On the other hand, the percentage of [+accented] is 95% (token frequency) and 93% (type frequency) when the second element has three morae. In other words, the percentage increases when the second element is long. The percentage of [+rendaku] is 78% (token frequency) and 70% (type frequency) when the second element has two morae, and it is 100% in terms of both token frequency and type frequency when the second element has three morae.

(165) Average percentages (Type III: Internal argument, dative)

a. Accentuation

Length	Token frequency			Type frequency		
	[+accented]	Total	Percentage	[+accented]	Total	Percentage
{1-4}μ+2μ	23	109	21%	19	59	32%
{1-4}μ+3μ	61	64	95%	40	43	93%

b. *Rendaku*

Length	Token frequency			Type frequency		
	[+rendaku]	Total	Percentage	[+rendaku]	Total	Percentage
{1-4}μ+2μ	38	49	78%	21	30	70%
{1-4}μ+3μ	26	26	100%	18	18	100%

The two tables in (166) show the percentages of compounds in terms of the combinations of [±accented] and [±rendaku]. The results in (166)-(a) are based on token frequency, while those in (166)-(b) are based on type frequency. As shown in the tables, [-accented, +rendaku] is the major type when the second element has two morae. In addition, some compounds are [+accented, -rendaku]. On the other hand, most of the compounds are [+accented, +rendaku] when the second element has three morae.

(166) The combinations of [±accented] ([±acc]) and [±rendaku] ([±r]) when *rendaku* is possible (Type III: Internal argument, dative)

a. Token frequency

Length	[-acc, -r]	[+acc, -r]	[-acc, +r]	[+acc, +r]	Sum
1μ+2μ	2 (22%)	1 (11%)	4 (44%)	2 (22%)	9 (100%)
2μ+2μ	2 (7%)	4 (14%)	21 (75%)	1 (4%)	28 (100%)
3μ+2μ	0 (0%)	1 (11%)	8 (89%)	0 (0%)	9 (100%)
4μ+2μ	0 (0%)	1 (33%)	2 (67%)	0 (0%)	3 (100%)
{1-4}μ+2μ	4 (8%)	**7 (14%)**	**35 (71%)**	3 (6%)	49 (100%)
1μ+3μ	0 (0%)	0 (0%)	0 (0%)	5 (100%)	5 (100%)
2μ+3μ	0 (0%)	0 (0%)	1 (7%)	14 (93%)	15 (100%)
3μ+3μ	0 (0%)	0 (0%)	0 (0%)	6 (100%)	6 (100%)
4μ+3μ	0 (0%)	0 (0%)	0 (0%)	0 (0%)	0 (100%)
{1-4}μ+3μ	0 (0%)	0 (0%)	1 (4%)	**25 (96%)**	26 (100%)

b. Type frequency

Length	[-acc, -r]	[+acc, -r]	[-acc, +r]	[+acc, +r]	Sum
1μ+2μ	1 (14%)	1 (14%)	3 (43%)	2 (12%)	7 (100%)
2μ+2μ	2 (13%)	3 (20%)	9 (60%)	1 (7%)	15 (100%)
3μ+2μ	0 (0%)	1 (20%)	4 (50%)	0 (0%)	5 (100%)
4μ+2μ	0 (0%)	1 (33%)	2 (67%)	0 (0%)	3 (100%)
{1-4}μ+2μ	3 (10%)	**6 (20%)**	**18 (60%)**	3 (10%)	30 (100%)
1μ+3μ	0 (0%)	0 (0%)	0 (0%)	4 (100%)	4 (100%)
2μ+3μ	0 (0%)	0 (0%)	1 (10%)	9 (90%)	10 (100%)
3μ+3μ	0 (0%)	0 (0%)	0 (0%)	4 (100%)	4 (100%)
4μ+3μ	0 (0%)	0 (0%)	0 (0%)	0 (0%)	0 (100%)
{1-4}μ+3μ	0 (0%)	0 (0%)	1 (6%)	**17 (94%)**	18 (100%)

The table in (167) shows the percentages of [±accented] in the cases where *rendaku* is impossible. When the second element has two morae, [-accented] is dominant, but a certain number of compounds are [+accented]. On the other hand, [+accented] is dominant when the second element has three morae.

(167) The percentages of [±accented] in the cases where *rendaku* is impossible
(Type III: Internal argument, dative)

a. Token frequency

Length	[-accented]	[+accented]	Sum
1μ+2μ	1 (33%)	2 (67%)	3 (100%)
2μ+2μ	31 (78%)	9 (23%)	40 (100%)
3μ+2μ	9 (82%)	2 (18%)	11 (100%)
4μ+2μ	6 (100%)	0 (0%)	6 (100%)
{1-4}μ+2μ	**47 (78%)**	**13 (22%)**	60 (100%)
1μ+3μ	2 (50%)	2 (50%)	4 (100%)
2μ+3μ	0 (0%)	19 (100%)	19 (100%)
3μ+3μ	0 (0%)	13 (100%)	13 (100%)
4μ+3μ	0 (0%)	2 (100%)	2 (100%)
{1-4}μ+3μ	2 (5%)	**36 (95%)**	38 (100%)

b. Type frequency

Length	[-accented]	[+accented]	Sum
1μ+2μ	1 (50%)	1 (50%)	2 (100%)
2μ+2μ	12 (67%)	6 (33%)	18 (100%)
3μ+2μ	3 (60%)	2 (40%)	5 (100%)
4μ+2μ	3 (100%)	0 (0%)	3 (100%)
{1-4}μ+2μ	**19 (68%)**	**9 (32%)**	28 (100%)
1μ+3μ	2 (50%)	2 (50%)	4 (100%)
2μ+3μ	0 (0%)	8 (100%)	8 (100%)
3μ+3μ	0 (0%)	11 (100%)	11 (100%)
4μ+3μ	0 (0%)	2 (100%)	2 (100%)
{1-4}μ+3μ	2 (8%)	**23 (92%)**	25 (100%)

2.8. Comparison of the four types

This section compares the results for the four types which have been discussed. As discussed in 2.5, Type I and Type IV are different in accentuation and *rendaku*. This section focuses on the distinctions among Types I-III, where the first element is an internal argument of a verb, and argues that they also show different tendencies.

First, the tables in (168) compare the percentages of [+accented]. There are two kinds of percentages in the tables: '*Rendaku*--Possible/Impossible' and '*Rendaku*--Impossible'. '*Rendaku*--Possible/Impossible' includes both the cases where *rendaku* is possible and cases where *rendaku* is impossible, while '*Rendaku*--Impossible' includes only the latter. As shown in the tables, the percentages are highest for Type I and lowest for Type IV. Type II and Type III are in between when the second element has two morae. When the second element has three morae, the percentages are high for each type compared to the cases where the second element has two morae, but the percentages for Type IV is a little lower than those for the other three types.

(168) The percentages of [+accented]

a. Token frequency

Length	Type	*Rendaku*	
		Possible / Impossible	Impossible
{1-4}μ+2μ	Type I	44%	37%
	Type II	18%	13%
	Type III	21%	22%
	Type IV	5%	8%
{1-4}μ+3μ	Type I	95%	96%
	Type II	88%	90%
	Type III	95%	95%
	Type IV	79%	85%

b. Type frequency

Length	Type	*Rendaku*	
		Possible / Impossible	Impossible
{1-4}μ+2μ	Type I	47%	42%
	Type II	25%	18%
	Type III	32%	32%
	Type IV	12%	15%
{1-4}μ+3μ	Type I	91%	93%
	Type II	79%	84%
	Type III	93%	92%
	Type IV	73%	78%

Second, the tables in (169) compare the percentages of [+rendaku]. When the second element has two morae, the percentage is lowest for Type I and highest for Type IV, and Type II and Type III are in between. When the second element has three morae, the percentage is the lowest for Type I, although it is higher than the percentage where the second element has two morae. On the other hand, the percentage is above 90% for Types II, III, and IV.

(169) The percentage of [+rendaku]

a. Token frequency

Length	Type	The percentage of [+rendaku]
{1-4}μ+2μ	Type I	40%
	Type II	47%
	Type III	78%
	Type IV	98%
{1-4}μ+3μ	Type I	64%
	Type II	97%
	Type III	100%
	Type IV	94%

b. Type frequency

Length	Type	The percentage of [+rendaku]
{1-4}μ+2μ	Type I	39%
	Type II	53%
	Type III	70%
	Type IV	95%
{1-4}μ+3μ	Type I	65%
	Type II	95%
	Type III	100%
	Type IV	89%

Third, the tables in (170) summarize the results in terms of the combinations of [±accented] and [±rendaku]. As shown in the tables, the percentages of [+accented, -rendaku] for Type I are higher those that for Type II and Type III, especially when the second element has three morae.

(170) The combinations of [±accented] ([±acc]) and [±rendaku] ([±r]) when *rendaku* is possible

a. Token frequency

Length	Type	[-acc, -r]	[+acc, -r]	[-acc, +r]	[+acc, +r]	Sum
{1-4}μ+2μ	Type I	48 (15%)	146 (45%)	115 (36%)	12 (4%)	321 (100%)
	Type II	24 (35%)	12 (18%)	29 (43%)	3 (4%)	68 (100%)
	Type III	4 (8%)	7 (14%)	35 (71%)	3 (6%)	49 (100%)
	Type IV	5 (1%)	2 (1%)	348 (95%)	12 (3%)	367 (100%)
{1-4}μ+3μ	Type I	4 (3%)	45 (33%)	5 (4%)	81 (60%)	135 (100%)
	Type II	1 (3%)	0 (0%)	6 (16%)	31 (82%)	38 (100%)
	Type III	0 (0%)	0 (0%)	1 (4%)	25 (96%)	26 (100%)
	Type IV	4 (3%)	4 (3%)	32 (24%)	91 (69%)	131 (100%)

b. Type frequency

Length	Type	[-acc, -r]	[+acc, -r]	[-acc, +r]	[+acc, +r]	Sum
{1-4}μ+2μ	Type I	27 (16%)	78 (45%)	57 (33%)	11 (6%)	173 (100%)
	Type II	9 (23%)	10 (25%)	18 (45%)	3 (8%)	40 (100%)
	Type III	3 (10%)	6 (20%)	18 (60%)	3 (10%)	30 (100%)
	Type IV	5 (3%)	2 (1%)	133 (88%)	11 (7%)	151 (100%)
{1-4}μ+3μ	Type I	4 (5%)	22 (29%)	5 (7%)	44 (59%)	75 (100%)
	Type II	1 (5%)	0 (0%)	6 (27%)	15 (68%)	22 (100%)
	Type III	0 (0%)	0 (0%)	1 (6%)	17 (94%)	18 (100%)
	Type IV	4 (5%)	4 (5%)	20 (27%)	46 (62%)	74 (100%)

In conclusion, the results of the survey imply that the distinction among Types I, II and III is necessary in addition to the distinction between Type I and Type IV.

2.9. Summary

In summary, the survey in this study showed the percentages of [+accented] and [+rendaku] for each type of deverbal compounds. It verified the difference and the similarity between Type I and Type IV which have been pointed out in previous studies. That is, when the second element is short, Type I tends to be accented and to resist *rendaku*, while Type IV tends to be unaccented and to undergo *rendaku*. On the other hand, both types tend to be accented and to undergo *rendaku* when the second element is long.

The survey of the corpus also revealed some new details, as summarized below. (171)-(b, c) imply that the difference between Type I and Type IV still subsists, even if the second element is long.

(171) a. [-accented, +rendaku] is also observed in Type I when the second element is short.

b. [+accented, -rendaku] is also observed in Type I when the second element is long.

c. [-accented, +rendaku] is also observed in Type IV when the second element is long.

The patterns of Type I and Type IV shown in this chapter are analyzed theoretically in the next two chapters.

In addition, the survey also deals with Type II and Type III, which are the same as Type I in that the first element is an internal argument of a verb. It was shown that the accentuation and *rendaku* of Types I, II, and III are not uniform. That is, it is necessary to deal with the three types separately.

3. Analysis of accentuation

This chapter analyzes the accentuation of Type I deverbal compounds and Type IV deverbal compounds within the framework of Optimality Theory, comparing them with noun compounds. First, 3.1 shows the differences and similarities between noun compounds and the two types of deverbal compounds, focusing on accent location and unaccentedness. Then, 3.2 analyzes the differences and similarities in terms of constraint ranking. Finally, 3.3 shows that the ranking is motivated by the 'lexical category' of compounds.

The scope of discussion in this chapter is more limited than that in Chapter 2 in terms of the length of compounds. As pointed out in Kubozono and Fujiura (2004), most previous studies have focused on 'long compounds' (i.e. compound nouns whose first and/or second member is longer than two morae). This chapter compares the accentuation of 'long' noun compounds and that of 'long' deverbal compounds, based on analyses of previous researches.

3.1. Generalization

3.1.1. Noun compounds

There is a considerable literature on the accentuation of noun compounds, on both descriptive and theoretical aspects (McCawley 1968, 1977, Sato 1989, Poser 1990, Kubozono 1995, 1997, NHK 1998, Akinaga 2001, Tanaka 2001, 2005a). As these studies have shown, the accentuation of a compound is determined by that of the second element (N2) in principle, as summarized in (172).[20]

[20] If both of the first and second elements are less than three morae, the accentuation of a compound tends to depend on that of both elements (Akinaga 2001, Kubozono and Fujiura 2004).

(172) Accentuation of noun compounds

	Second element (N2)	Compound	Examples	
			N2	Compound
a.	Antepenultimate	Antepenultimate	ka'buto	tetu-ka'buto
b.	Penultimate	(i) Penultimate (ii) Antepenultimate	(i) hu'ne uti'wa (ii) hi'me koko'ro	(i) watasi-bu'ne sibu-uti'wa (ii) ningyo'-hime[21] oya-go'koro
c.	Final	(i) Antepenultimate (ii) Unaccented [deaccenting morpheme]	(i) uma' otoko' (ii) iro'	(i) abare'-uma yama-o'toko (ii) midori-iro
d.	Unaccented	Antepenultimate	tori kusuri	miyako'-dori kona-gu'suri

First, antepenultimate accent on the second element is preserved in compounds, as illustrated in (173).

(173) a. tetu + ka'buto → tetu-ka'buto 'iron + helmet; steel helmet'
b. so'ra + na'mida → sora-na'mida 'false + tear; false tears'
c. suna + a'rasi → suna-a'rasi 'sand + storm; sandstorm'

Second, penultimate accent is preserved in some cases. Some examples are shown below.

(174) a. watasi + hu'ne → watasi-bu'ne 'carrying across + ship; ferryboat'
b. ma'tuba + tu'e → matuba-du'e 'pine needle + cane; crutch'
c. kumori' + so'ra → kumori-zo'ra 'cloudiness + sky; cloudy sky'
d. sibu' + uti'wa → sibu-uti'wa 'persimmon tannin + Japanese fan; Japanese fan painted with persimmon tannin'

In other cases, penultimate accent is not preserved and is shifted to the antepenultimate position, as illustrated in (175). This pattern is exceptional in that non-final N2 accent cannot be preserved; it is called 'Little-Mermaid pattern' (Kubozono 1997).

[21] The accentuation of *ningyo'-hime* is judged based on Akinaga (2001).

(175) a. ni'ngyo + hi'me → ningyo'-hime 'mermaid + young lady of gentle birth; Little mermaid'

b. ka'rasu + u'ri → karasu'-uri 'crow + cucurbit; snake gourd'

c. oya' + koko'ro → oya-go'koro 'parent + heart; parent's love'

Some of the nouns which have penultimate accent show both of the patterns in (174) and (175) (Kubozono 1997, Tanaka 2001), as illustrated below.

(176) Variation between the two patterns in (174) and (175)

a. situke + i'to →situke-i'to / situke'-ito 'tacking thread'

b. ka'rasu + mu'gi →karasu-mu'gi / karasu'-mugi 'crow + barley; oat'

c. mata + ito'ko → mata-ito'ko / mata-i'toko 'again + cousin; second cousin'

Third, when the accent of the second element is located on the last syllable, it cannot be preserved in compounds. In most cases, the accent of a compound is located on the syllable which contains the antepenultimate mora, as shown in (177).

(177) a. abare + uma' → abare'-uma 'acting violently + horse; unruly horse'

b. komo'ri + uta' → komori'-uta 'nurse + song; lullaby'

c. yama' + otoko' → yama-o'toko 'mountain + man; hillman'

However, some final-accented nouns trigger deaccentuation. These nouns are called 'deaccenting morphemes' and are considered to be exceptional (Kubozono 1997). Some examples of deaccenting morphemes are shown below.

(178) Examples of deaccenting morphemes

a. /kata'/ 'shape' (e.g. oogi' + kata' → oogi-gata 'fan + shape; fan-shaped')

b. /iro'/ 'color' (e.g. mi'dori + iro' → midori-iro 'green + color; green')

c. /kawa'/ 'side' (e.g. hidari + kawa' → hidari-gawa 'left + side; the left side')

d. /kiwa'/ 'edge' (e.g. $\text{namiuti}_{\text{acc}}$ + kiwa' → namiuti-giwa 'billowing + edge; water's edge')

e. /heri'/ 'edge' (e.g. tatami + heri → tatami-beri '*tatami* + edge; edge of *tatami*")

f. /yama'/ 'mountain' (e.g. hakone + yama' → hakone-yama '*Hakone* + mountain; mountain of *Hakone*')

g. /heya'/ 'room' (e.g. kodomo + heya' → kodomo-beya 'children + room; children's room')

h. /mura'/ ‘village’ (e,g. tonari + mura' → tonari-mura ‘neighboring + village; the neighboring village’)
i. /tera'/ ‘temple’ (e.g. kiyo'mizu + tera' → kiyomizu-dera ‘*Kiyomizu* + temple; temple of *Kiyomizu*’)
j. /husi'/ ‘joint’ (e.g. katuo + husi → katuo-busi ‘bonito + joint; dried bonito’)
k. /tura'/ ‘face’ (e.g. $neboke_{acc}$ + tura → neboke-dura ‘being half asleep + face; sleepy face’)
l. /tama'/ ‘ball’ (e.g. syabon + tama' → syabon-dama ‘soap + ball; soap bubble’)
m. /sima'/ ‘stripe’ (e.g. koosi + sima' → koosi-zima ‘lattice + stripe; cross stripes’)

The nouns in (178) share two properties: (i) they are final-accented and (ii) the length is two morae.[22] This skewed distribution of deaccenting morphemes implies that they are not mere exceptions.

Lastly, if the second element is unaccented, the syllable which contains the antepenultimate mora is accented in compounds, as shown in (179).

(179) a. miyako + tori → miyako'-dori ‘capital + bird; black-headed gull’
b. ka'buto + musi → kabuto'-musi ‘helmet + insect; beetle’
c. kona' + kusuri → kona-gu'suri ‘powder + medicine; powdered medicine’

In summary, the accentuation of noun compounds is predictable for the most part based on that of the second elements. If the second element has penultimate accent, the accent of a compound is penultimate or antepenultimate, whether the second element has two morae or three morae. In the other cases, the accent of compounds is antepenultimate in general regardless of the length of the second element. The accentuation of the second element is also related to a condition on deaccenting morphemes: they are limited to final-accented nouns. Length is another condition on second elements that are deaccenting morphemes: they are limited to nouns which have two morae.

3.1.2. Deverbal compounds

The length of the second element has a stronger effect on accentuation in deverbal compounds than in noun compounds. The table in (180) summarizes the accentuation patterns of Type I deverbal compounds based on the survey in Chapter 2.

[22] Not all of the deaccenting morphemes meet these conditions. For example, /saki/ ‘point’, which is unaccented, triggers deaccentuation (e.g. tori'hiki + saki → torihiki-saki ‘business + point; customer’).

(180) Accentuation of Type I deverbal compounds

	Second element	Compound	Examples	
			Second element	Compound
a.	2μ	(i) Antepenultimate (ii) Unaccented	(i) uti_{acc} uri (ii) $mati_{acc}$ yose	(i) kataki'-uti kusuri'-uri (ii) kyanseru-mati kuruma-yose
b.	3μ	Antepenultimate	$yaburi_{acc}$ sagasi	kata-ya'buri ara-sa'gasi

If the second element has two morae, compounds have the antepenultimate accent or are unaccented, whether the second element is accented or unaccented. Some examples are shown below.

(181) a. Antepenultimate

kataki' + uti_{acc} → kataki'-uti 'enemy + attacking; revenge'
tikara' + $moti_{acc}$ → tikara'-moti 'power + having; powerful person'
boosi + $kake_{acc}$ → boosi'-kake 'hat + hanging; hat-rack'
abura + sasi $_{acc}$ → abura'-sasi 'oil + pouring; oilcan'
kusuri + uri → kusuri'-uri 'medicine + selling; seller of medicine'
meesi + ire → meesi'-ire 'visiting card + putting in; card case'
kuruma + hiki → kuruma'-hiki 'car + pulling; carter'
goyo'o + kiki → goyo'o-kiki 'order + listening (asking); order taker'

b. Unaccented

kya'nseru + $mati_{acc}$ → kyanseru-mati 'cancel + waiting; being on the waiting list'
kemuri + $dasi_{acc}$ → kemuri-dasi 'smoke + giving out; ventilator'
kurai + $tori_{acc}$ → kurai-dori 'numerical position + taking; putting a decimal point'
zookin + $kake_{acc}$ → zookin'-gake 'floorcloth + administering; wiping with a cloth'
kuruma + yose → kuruma-yose 'car + pulling a thing near; carriage porch'
kagami' + wari → kagami-wari
'mirror + dividing; the cutting of New Year's round rice-cakes'
hiyake + tome → hiyake-dome 'sunburn + stopping; sunscreen'
koromo + kae → koromo-gae 'clothes + changing; seasonal change of clothing'

If the second element has three morae, compounds have the antepenultimate accent regardless of the accentuation of the second element.

(182) kata' + $yaburi_{acc}$ → kata-ya'buri ‘pattern + breaking; unconventionality’
oya' + $omoi_{acc}$ → oya-o'moi ‘parent + thinking; being considerate to one’s parents’
ka'ta + $tataki_{acc}$ → kata-ta'taki ‘shoulders + hitting; rapping over the shoulders’
u'sa + $harasi_{acc}$ → usa-ba'rasi ‘gloom + dispelling; diversion’
ara' + sagasi → ara-sa'gasi ‘fault + finding; faultfinding’
kusa' + musiri → kusa-mu'siri ‘grass + plucking; weeding’
hito+ kirai → hito-gi'rai ‘human + disliking; misanthropy’
kuri' + hiroi → kuri-hi'roi ‘chestnut + gathering; chestnut-gathering’

Type IV deverbal compounds are also affected by the length of the second element, as shown in (183).

(183) Accentuation of Type IV deverbal compounds

	Second element	Compound	Examples	
			Second element	Compound
a.	2μ	Unaccented	$yomi_{acc}$ naki	naname-yomi uresi-naki
b.	3μ	(i) Antepenultimate (ii) Unaccented	(i) $aruki_{acc}$ arai (ii) $urami_{acc}$ kezuri	(i) yoko-a'ruki mizu-a'rai (ii) saka-urami ara-kezuri

If the second element has two morae, compounds are unaccented whether the second element is accented or unaccented. Some examples are given in (184).

(184) naname + $yomi_{acc}$ → naname-yomi 'obliquely + reading; skipping through the book'

rappa + $nomi_{acc}$ → rappa-nomi 'trumpet + drinking; drinking from the bottle'

gyakuten + $kati_{acc}$ → gyakuten-gati 'reversal + winning; come-from-behind win'

nizyuu + $tori_{acc}$ → nizyuu-dori 'double + taking; receiving double payment'

$uresi_{acc}$ + naki → uresi-naki 'joyful + crying; crying for joy'

gyakuten + make → gyakuten-make

'reversal + losing; losing in a last-minute reversal'

mimizu + hare → mimizu-bare 'earthworm + swelling; welt'

sinyoo + kasi → sinyoo-gasi 'trust + lending; credit loan'

If the second element has three morae, compounds have the antepenultimate accent or are unaccented regardless of the accentuation of the second element.

(185) a. Antepenultimate

yoko + $aruki_{acc}$ → yoko-a'ruki 'sideways + walking; walking sideways'

maru + $utusi_{acc}$ → maru-u'tusi 'complete + copying; copying word for word'

tabi + $tukare_{acc}$ → tabi-du'kare 'travel + getting tired; fatigue of travel'

mae + $harai_{acc}$ → mae-ba'rai 'in advance + paying; payment in advance'

mizu + arai → mizu-a'rai 'water + washing; washing a thing without using soap'

$taka_{acc}$ + warai → taka-wa'rai 'loud + laughing; loud laugh'

$yasu_{acc}$ + agari → yasu-aga'ri 'cheap + going up; economical'

maru + kakae → maru-ga'kae

'complete + holding; being completely financed by someone'

b. Unaccented

saka + $urami_{acc}$ → saka-urami

'upside-down + having a grudge; resent someone's kindness'

saki + $nobasi_{acc}$ → saki-nobasi 'future + putting off; postponing'

han + $kawaki_{acc}$ → han-gawaki 'half + drying; not fully dried'

kui_{acc} + $taore_{acc}$ → kui-daore

'eating + falling; ruining oneself financially by one's extravagance in food'

ara + kezuri → ara-kezuri 'rough + planing; rough-planed'

saki + okuri → saki-okuri 'future + sending; postponing' hiki + katari → hiki-gatari

'playing + talking; singing a song accompanying oneself on the piano'

mizu + hukure → mizu-bukure 'water + swelling; water blister'

In sum, deverbal compounds are affected by the length of the second element: they tend to be accented when the second element has three morae, which holds true for both Type I and Type IV. The next section compares the accentuation patterns of noun compounds and those of deverbal compounds.

3.1.3. Differences and similarities between noun compounds and deverbal compounds

Accentuation patterns of deverbal compounds and noun compounds have some differences and similarities. First, penultimate patterns are allowed in noun compounds as well as antepenultimate patterns. On the other hand, the position of the accent is antepenultimate in accented deverbal compounds. Second, unaccented patterns are not uncommon in deverbal compounds. In contrast, noun compounds are accented except for compounds where the second element is a deaccenting morpheme. Third, the length of the second element has some effect on both deverbal compounds and noun compounds, but the degree of the influence is greater in the former. Deverbal compounds tend to be unaccented when the length of the second element is two morae. On the other hand, noun compounds are not affected by the length of the second element except in the case of deaccenting morphemes. That is, deaccenting morphemes are limited to nouns which have two morae. These differences and similarities are summarized in (186).

(186) Differences and similarities between noun compounds and deverbal compounds

		Noun compounds	Deverbal compounds (Type I)	Deverbal compounds (Type IV)
Position of accent in accented compounds		Penultimate/ Antepenultimate	Antepenultimate	Antepenultimate
Presence of accent	2μ	Accented/ Unaccented (only in deaccenting morphemes)	Accented/ Unaccented	Unaccented
	3μ	Accented	Accented	Accented/ Unaccented

3.2. Theoretical analysis

This section presents a theoretical analysis of the differences and similarities between noun compounds and deverbal compounds. First, 3.2.1 reviews the OT analysis of noun compounds in Kubozono (1997), and 3.2.2 offers a reanalysis by examining faithfulness constraints. Second, 3.2.3 points out that simplex nouns and noun compounds have different systems, and 3.2.5 also argues that the same holds true for verb stems and deverbal compounds, based on the analysis of verb stems in 3.2.4. Third, 3.2.6 conducts an analysis within the framework of OT, comparing the following four types of compounds: Type I deverbal compounds, Type IV deverbal compounds, noun compounds, and noun compounds which include a deaccenting morpheme.

3.2.1. OT analysis of noun compounds in Kubozono (1997)

This section reviews Kubozono (1997), which analyzes accentuation of noun compounds within the framework of Optimality Theory and shows that a nonderivational analysis can give a better explanation than a derivational analysis. The following constraints are employed in Kubozono (1997).

(187) Relevant constraints (Kubozono 1997: 277-278)

a. OCP: No more than one prominence peak (i.e. word accent) is allowed in a single PrWd.
b. PARSE-ACCENT: Parse the lexical accent of N2 in compound nouns.
c. NON-FINALITY (μ): The head mora, i.e. the accented mora, is not final in [a] PrWd.
d. NON-FINALITY (σ): The head syllable, i.e. the accented syllable, is not final in [a] PrWd.
e. NON-FINALITY (Ft): The head foot, i.e. the accented foot, is not final in [a] PrWd.
f. EDGEMOSTNESS/RIGHTMOSTNESS: A peak of prominence lies at the right edge of the Word.

First, OCP requires that only one accent should be allowed in a compound. The lexical accent of the first element is deleted due to this markedness constraint (e.g. ma'tuba + tu'e → matuba-du'e 'pine needle + cane; crutch'). The lexical accent of the second element (N2) is not deleted because N2 is the head of a compound. Second, PARSE-ACCENT is a faithfulness constraint which requires that the position of N2 lexical accent should be preserved in a compound. Third, the three constraints in (187)-(c-e) are markedness constraints. NON-FINALITY (μ) prohibits the head mora (i.e. the accented mora) from being final in a prosodic word. Similarly, NON-FINALITY (σ) and NON-FINALITY (FT) penalize a head syllable and a head foot which are final in a prosodic word, respectively. Lastly, EDGEMOSTNESS/RIGHTMOSTNESS is a kind of alignment constraint which requires that the accent and the prosodic word should be aligned at the right edge.

Among these constraints, OCP and NON-FINALITY (μ) are undominated, while EDGEMOSTNESS/RIGHTMOSTNESS is low-ranked. The other constraints are ranked as in (188).

(188) Constraint ranking: NON-FINALITY (σ) >> PARSE-ACCENT, NON-FINALITY (Ft)[23]

The tableaux in (189)-(192) illustrate how these constraints work.[24] Although Kubozono (1997) presents the tableaux where the second element has two morae, he points

[23] In this ranking, PARSE-ACCENT and NON-FINALITY (Ft) are freely ranked. Kubozono (1997) posits the ranking NON-FINALITY (σ) >> PARSE-ACCENT >> NON-FINALITY (Ft) in principle and explains exceptional patterns such as *ni'ngyo* + *hi'me* → *ningyo'-hime* 'mermaid + young lady of gentle birth; Little mermaid' with the ranking NON-FINALITY (σ) >> NON-FINALITY (Ft) >> PARSE-ACCENT. (188) brings together these two rankings to simplify the discussion. What is important is that reranking of PARSE-ACCENT and NON-FINALITY (Ft) has influence on the selection of the output only in the cases where N2 has penultimate accent. In the other cases, the output is the candidate which has antepenultimate accent irrespective of the ranking of the two constraints.

out that compounds where the second element has more than two morae can be analyzed based on the same system. Therefore, the tableaux in (189)-(192) include both cases. First, the tableau in (189) shows the cases where three-mora N2 has antepenultimate accent. Candidates (b) and (c) violate PARSE-ACCENT because the accent of N2 is not preserved. Candidate (b) also violates NON-FINALITY (Ft) because the accented foot is final in the prosodic word. Candidate (c) violates both NON-FINALITY (σ) and NON-FINALITY (Ft) because the accented syllable and the accented foot are final in the prosodic word. Therefore, candidate (a), which satisfies all of the three constraints, is selected as the winner.

(189) N2: Antepenultimate, three morae (e.g. tetu-ka'buto)[25]

/μμ-μ'μμ/	NON-FIN (σ)	PARSE-ACCENT	NON-FIN (Ft)
☞a. μμ-(μ'μ)μ			
b. μμ-μ(μ'μ)		*!	*!
c. μμ-μ(μμ')	*!	*	*

Second, the tableaux in (190) show the cases where N2 has penultimate accent. Candidate (c) is excluded because of the violation of NON-FINALITY (σ), which is ranked high in both (190)-(a) and (190)-(b). Candidate (b) is selected if PARSE-ACCENT dominates NON-FINALITY (Ft). That is, the penultimate accent is preserved if the faithfulness constraint PARSE-ACCENT is ranked high. On the other hand, candidate (a) is selected if the ranking is the opposite, that is, the penultimate accent is not preserved due to the dominance of NON-FINALITY (Ft). Some compounds allow both patterns in candidates (a) and (b) (e.g. ni'waka + a'me → niwaka'-ame / niwaka-a'me 'sudden + rain; sudden shower'), while others show only one pattern.

(190) N2: Penultimate

a. Two morae (e.g. watasi-bu'ne, ningyo'-hime)

/μμμ-μ'μ/	NON-FIN (σ)	PARSE-ACCENT	NON-FIN (Ft)
☞a. μ(μμ')-μμ		*	
☞b. μμμ-(μ'μ)			*
c. μμμ-(μμ')	*!	*	*

[24] The candidates in (189)-(192) are represented with morae (μ), instead of syllables (σ). If a heavy syllable is involved, the foot structures of candidates are not the same as those in the cases where there is no heavy syllable. For example, the foot structure (CVV') is impossible because the second vowel in CVV is a non-head mora. These tableaux deal with cases where there is no heavy syllable to simplify the discussion.

[25] The dotted line between PARSE-ACCENT and NON-FINALITY (Ft) means that they are freely ranked.

b. Three morae (e.g. sibu-uti'wa, oya-go'koro)

/μμ-μμ'μ/	NON-FIN (σ)	PARSE-ACCENT	NON-FIN (Ft)
☞a. μμ-(μ'μ)μ		*	
☞b. μμ-μ(μ'μ)			*
c. μμ-μ(μμ')	*!	*	*

Third, the tableaux in (191) show the cases where N2 has final accent. Candidate (c), which preserves the accent of N2, is excluded due to the violation of NON-FINALITY (σ). On the other hand, candidates (a) and (b) violate PARSE-ACCENT. As candidate (b) also violates NON-FINALITY (Ft), candidate (a) is selected as the winner irrespective of the ranking of PARSE-ACCENT and NON-FINALITY (Ft).

(191) N2: Final

a. Two morae (e.g. abare'-uma)

/μμμ-μμ'/	NON-FIN (σ)	PARSE-ACCENT	NON-FIN (Ft)
☞a. μ(μμ')-μμ		*	
b. μμμ-(μ'μ)		*	*!
c. μμμ-(μμ')	*!		*

b. Three morae (e.g. yama-o'toko)

/μμ-μμμ'/	NON-FIN (σ)	PARSE-ACCENT	NON-FIN (Ft)
☞a. μμ-(μ'μ)μ		*	
b. μμ-μ(μ'μ)		*	*!
c. μμ-μ(μμ')	*!		*

Lastly, the tableaux in (192) show the cases where N2 is unaccented. In other words, there is no accent to parse, which is the reason why all of the candidates satisfy PARSE-ACCENT. Candidate (a) also satisfies the other two constraints, so it is selected as the winner.

(192) N2: Unaccented

a. Two morae (e.g. miyako'-dori)

/μμμ-μμ/	NON-FIN (σ)	PARSE-ACCENT	NON-FIN (Ft)
☞a. μ(μμ')-μμ			
b. μμμ-(μ'μ)			*!
c. μμμ-(μμ')	*!		*

b. Three morae (e.g. kona-gu'suri)

/μμ-μμμ/	NON-FIN (σ)	PARSE-ACCENT	NON-FIN (Ft)
☞a. μμ-(μ'μ)μ			
b. μμ-μ(μ'μ)			*!
c. μμ-μ(μμ')	*!		*

3.2.2. Examining faithfulness constraints

In the tableaux (189)-(192), PARSE-ACCENT prohibits accent shift and does not penalize accent insertion; in addition, it is unclear whether PARSE-ACCENT prohibits accent deletion because unaccented candidates are not included in the tableaux. What kind of constraint penalizes accent insertion? How is accent deletion evaluated? Alderete (1999) gives answers to these questions, differentiating among the following three kinds of prosodic faithfulness constraints.

(193) Prosodic faithfulness constraints (Alderete 1999)

a. MAX-PROMINENCE: Every prominence in the input must have a correspondent in the output. (No deletion)

b. DEP-PROMINENCE: Every prominence in the output must have a correspondent in the input. (No insertion)

c. NO-FLOP-PROMINENCE: Corresponding prominences have corresponding sponsors and links. (No shift)

First, MAX-PROMINENCE prohibits accent deletion. That is, if N2 has a lexical accent and the compound is unaccented, this constraint is violated. Second, DEP-PROMINENCE prohibits accent insertion. As shown in (195), it can be violated in noun compounds to avoid the violation of CULMINATIVITY, which is defined in (194).

(194) CULMINATIVITY: Every prosodic constituent has exactly one head. (Alderete 1999)

(195) CULMINATIVITY and DEP-PROMINENCE (e.g. kona-gu'suri)

/μμ-μμμ/	CULMINATIVITY	DEP-PROMINENCE
☞a. μμ-(μ'μ)μ		*
b. μμ-μμμ	*!	

Third, NO-FLOP-PROMINENCE penalizes accent shift. As shown in (196), it can be violated in noun compounds to avoid the violation of NON-FINALITY (σ). That is, NON-FINALITY (σ) dominates NO-FLOP-PROMINENCE.

(196) NON-FINALITY (σ) and NO-FLOP-PROMINENCE (e.g. yama-o'toko)

/μμ-μμμ'/	NON-FINALITY(σ)	NO-FLOP-PROMINENCE
☞a. μμ-(μ'μ)μ		*
b. μμ-μ(μμ')	*!	

On the other hand, NON-FINALITY (Ft) and NO-FLOP-PROMINENCE can be ranked freely. As illustrated in (197), candidate (a) is the winner if NON-FINALITY (Ft) dominates NO-FLOP-PROMINENCE, and candidate (b) is the winner in the opposite ranking.

(197) NON-FINALITY (Ft) and NO-FLOP-PROMINENCE (e.g. sibu-uti'wa, oya-go'koro)

/μμ-μμ'μ/	NO-FLOP-PROMINENCE	NON-FINALITY(Ft)
☞a. μμ-(μ'μ)μ	*	
☞b. μμ-μ(μ'μ)		*

Lastly, let us consider the ranking of NO-FLOP-PROMINENCE, MAX-PROMINENCE, and CULMINATIVITY, taking an unaccented candidate into account. As shown in the combination tableau (198), the unaccented candidate is correctly excluded if one of the two rankings in (199) is satisfied.[26] We cannot know which of the two rankings is valid. Also, the ranking of MAX-PROMINENCE and CULMINATIVITY is not clear.

(198) NO-FLOP-PROMINENCE, MAX-PROMINENCE, and CULMINATIVITY (e.g. yama-o'toko)

/μμ-μμμ'/	CULMINATIVITY	MAX-PROMINENCE	NO-FLOP-PROMINENCE
☞a. μμ-(μ'μ)μ			*L
b. μμ-μμμ	*W	*W	

[26] Although it is difficult to represent the situation in (199) correctly in a tableau, a solid line is drawn for clarity.

(199) Constraint rankings which choose the correct output in (198)

a. CULMINATIVITY >> NO-FLOP-PROMINENCE

b. MAX-PROMINENCE >> NO-FLOP-PROMINENCE

In summary, the constraint ranking in (188) is reanalyzed as in (200) by examining prosodic faithfulness constraints.

(200) Reanalysis of (188)

a. NON-FINALITY (σ) >> NO-FLOP-PROMINENCE, NON-FINALITY (Ft)

b. CULMINATIVITY >> DEP-PROMINENCE

c. CULMINATIVITY >> NO-FLOP-PROMINENCE
or MAX-PROMINENCE >> NO-FLOP-PROMINENCE

3.2.3. Difference between simplex words and compounds

This section points out that simplex words and compounds differ in their accentuation systems, which requires different correspondence relationships. It is argued that simplex words are based on I-O correspondence and that compounds are based on O-O correspondence.

First, let us compare noun compounds and simplex nouns. As discussed in previous sections, the ranking in (200) explains the accentuation of noun compounds. However, it does not apply to simplex nouns. Unlike noun compounds, simplex nouns allow accent on the final syllable, accent on the final foot, and the unaccented pattern, as illustrated in (201).

(201) Simplex nouns

a. Final accent: asi' ‘foot’, uta' ‘song’, iro' ‘color’, otoko' ‘man’, atama' ‘head’

b. Penultimate accent: a'me ‘rain’, ka'sa ‘umbrella’, ma'do ‘window’
uti'wa ‘Japanese fan’, koko'ro ‘heart’

c. Unaccented: usi ‘cow’, kane ‘money’, azi ‘taste’, sirusi ‘sign’, sakura ‘cherry tree’

These examples show that the presence/absence of accent and the accent location at the input level is preserved at the output level in simplex nouns. This implies that NON-FINALITY (σ), NON-FINALITY (Ft), and CULMINATIVITY are dominated by faithfulness constraints in simplex nouns, as shown in (202).

(202) Constraint interaction in simplex nouns

a. Final accent

/μμμ'/	NO-FLOP-PROMINENCE	NON-FINALITY (σ)
☞a. μ(μμ')		*
b. (μ'μ)μ	*!	

b. Penultimate accent

/μμ'μ/	NO-FLOP-PROMINENCE	NON-FINALITY (Ft)
☞a. μ(μ'μ)		*
b. (μ'μ)μ	*!	

c. Unaccented pattern

/μμμ/	DEP-PROMINENCE	CULMINATIVITY
☞a. μμμ		*
b. (μ'μ)μ	*!	

First, final accent is preserved at the output level because NO-FLOP-PROMINENCE dominates NON-FINALITY (σ) (i.e. (202)-(a)). Likewise, penultimate accent is preserved due to the ranking in which NO-FLOP-PROMINENCE dominates NON-FINALITY (Ft) (i.e. (202)-(b)). Third, accent is not inserted for an unaccented input because DEP-PROMINENCE dominates CULMINATIVITY (i.e. (202)-(c)).

In contrast, NON-FINALITY (σ) and CULMINATIVITY, which are markedness constraints, dominate faithfulness constraints in noun compounds (i.e. NO-FLOP-PROMINENCE and DEP-PROMINENCE, respectively); therefore, the final-accented and unaccented patterns are avoided. Another markedness constraint, NON-FINALITY (Ft), and NO-FLOP-PROMINENCE are ranked freely, so an accent on the final foot is avoided in some cases.

These differences in constraint ranking between simplex nouns and noun compounds are summarized as below: compared to simplex nouns, markedness constraints are ranked higher for noun compounds.

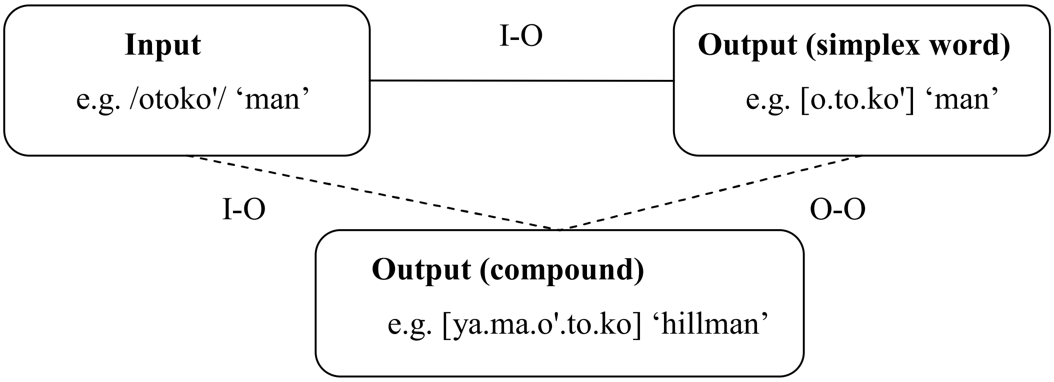
(203) The difference between simplex nouns and noun compounds

a. Simplex nouns	b. Noun compounds
NO-FLOP >> NON-FINALITY (σ)	NON-FINALITY (σ) >> NO-FLOP
NO-FLOP >> NON-FINALITY (Ft)	NO-FLOP, NON-FINALITY (Ft)
DEP-PROMINENCE >> CULMINATIVITY	CULMINATIVITY >> DEP-PROMINENCE

This difference is related to ‘correspondence’ in the framework of Optimality Theory. As mentioned in 1.5.2, ‘correspondence’ is found not only in the Input-Output (I-O) relationship but also in the Output-Output (O-O) relationship (Benua 1995). Most studies on O-O correspondence have been focused on morphological truncation (i.e. Base-Truncated forms [B-T]) and stem-based affixation (i.e. Stem-Affixed stems [B-A]). That being so, how is compounding analyzed in terms of ‘correspondence’?

As shown in (204), the pattern for simplex words is based on I-O correspondence. The position of accent and the presence/absence of accent at the input level are preserved at the output level. In contrast, as shown in (205), there are three theoretical possibilities with regard to the pattern for compounds.

(204) Correspondence in simplex words and compounds



(205) Possibilities for correspondence in compounds

a. Only I-O correspondence
b. Only O-O correspondence
c. Both I-O correspondence and O-O correspondence

(205)-(a) would predict that the system for simplex words and that for compounds are the same, which is contradictory to (203). In contrast, (205)-(b) explains the difference of the two systems, as shown in the following tableaux.

(206) a. Simplex nouns (e.g. otoko' ‘man’)

Input: /otoko'/	No-Flop-IO	Non-finality (σ)	No-Flop -OO
☞a. o(toko')		*	
b. (o'to)ko	*!		

b. Compounds (e.g. yama-o'toko 'mountain + man; hillman')

Input: /otoko'/ Base: [otoko']	NO-FLOP-IO	NON-FINALITY (σ)	NO-FLOP -OO
a. yama-o(toko')		*!	
☞b. yama-(o'to)ko			*

In simplex nouns, the final accent is preserved because NO-FLOP-PROMINENCE-IO dominates NON-FINALITY (σ). However, final accent cannot be preserved in compounds because NO-FLOP-PROMINENCE-OO is dominated by NON-FINALITY (σ), as shown in (206)-(b). The crucial point is that NO-FLOP-PROMINENCE-IO is irrelevant in this case.

The other possibility, in (205)-(c), makes an incorrect prediction, as shown in (207). If both I-O correspondence and O-O correspondence were relevant, final accent would be preserved in compounds.

(207) Incorrect prediction for compounds

Input: /otoko'/ Base: [otoko']	NO-FLOP -IO	NON-FINALITY (σ)	NO-FLOP -OO
×a. yama-o(toko')		*	
☜b. yama-(o'to)ko	*!		*

(×: wrongly selected, ☜: desired)

Consequently, we need to posit only O-O correspondence between simplex words and compounds.

Benua (1995) develops a similar argument with regard to the truncation of names in Japanese. As illustrated in the examples in (208), which are cited from Benua (1995: 117-118), base names are reduced to a bimoraic foot (Poser 1990, Mester 1990, Ito 1990), which is an unmarked prosodic structure.

(208) Truncation of names in Japanese

a. Hypocoristics
Midori → Mido-tyan, Mii-tyan
Yooko → Yoko-tyan, Yoo-tyan

b. Geisya House Discretionary Client Names
Honda → o-Hoo-san, o-Hon-san
Saiki → o-Saa-san, o-Sai-san

c. Rustic Girl's Name

Midori → o-Mido

Hanako → o-Hana

Benua (1995) analyzes truncation to a bimoraic foot as 'the emergence of the unmarked.' As shown in (209), the markedness constraints FtBin (i.e. 'Feet are binary on a syllabic or moraic analysis.') and Parse-Syll (i.e. 'All syllables are parsed into feet.') dominate a faithfulness constraint Max-BT, which prohibits the deletion of a segment in truncated forms.[27] As a result, the unmarked bimoraic foot (mi.do) is selected as the winner.

(209) The emergence of the unmarked in O-O correspondence

Base: (mi.do){ri}	FtBin	Parse-Syll	Max-BT
a. (mi.do)(ri)	*!		
b. (mi.do){ri}		*!	
☞c. (mi.do)			*

However, deletion does not occur in I-O correspondence, which indicates that Max-IO is ranked higher.

(210) No deletion in I-O correspondence

Input: /midori/	Max-IO	FtBin	Parse-Syll
a. (mi.do)(ri)		*!	
☞b. (mi.do){ri}			*
c. (mi.do)	*!		

In this tableau, *(mi.do) and *(mi.do)(ri) are excluded because of Max-IO and FtBin, respectively. As a result, the winner is (mi.do){ri}, which violates lower-ranked Parse-Syll.

Based on the analysis of truncation in Japanese, Benua (1995) presents the model in (211), arguing as in (212).

(211)

BT-Identity

[mi.do.ri] ⟷ [mi.do]

IO-Faith ↕

/midori/

[27] The tableau in (209) is adapted from the original analysis of Benua (1995) for the simplification of discussion.

(212) The truncated output [mi.do] is linked only to its base [mi.do.ri]; there is no correspondence relation between the truncated output and the input string /midori/. Because the truncated output is not in an IO-correspondence relation, it is not subject to IO-faithfulness constraints. […] If the truncated forms were subject to the high-ranking IO-Faith constraints that govern non-truncated words of Japanese, truncated words would be expected to have the same phonology. […] (Benua 1995: 121-122)

Returning to the difference between simplex nouns and noun compounds, it too is a kind of 'emergence of the unmarked', because unmarked patterns appear only in the latter, such as avoidance of the final-accented and unaccented patterns. Consequently, the correspondence relation between simplex nouns and noun compounds is schematized as follows. Note that there is no correspondence between the input and the compound output.

(213)

OO-Faith

[o.to.ko'] ⟷ [ya.ma.o'.to.ko]

IO-Faith ↕

/otoko'/

3.2.4. Accentuation of verb stems

In order to compare the accentuation of verb stems and that of deverbal compounds, let us examine the former in this section. As pointed out in Sugioka (1996, 2002) and Ito and Sugioka (2002), verb stems have two functions, and each function shows different patterns of accentuation. With regard to accented roots, the verb infinitive has an accent on the penultimate syllable, while the deverbal nominal is final-accented, as exemplified in (214).

(214) Verb stems of accented roots (e.g yom$_{acc}$ 'read') [=(18)]

a. Verb infinitive: yo'mi ni iku 'go to read'

b. Deverbal nominal: yomi' ga asai 'reading is shallow'

In contrast, the difference between the two functions is not found for unaccented roots.

(215) Verb stems of unaccented root (e.g. kas 'lend')

a. Verb infinitive: kasi ni iku 'go to lend'

b. Deverbal nominal: kasi ga a'ru 'be indebted to someone'

However, verb infinitives of unaccented roots are final-accented in some environments, as illustrated in (216).

(216) Final-accented verb infinitives of unaccented roots (e.g. nak ‘cry’)

a. naki' wa sinai ‘do not cry’

b. naki' ni naku ‘cries and cries’[28]

On the other hand, the verb infinitive of an accented root has an accent on the penultimate syllable in the environments in (216), which is the same pattern as (214)-(a).

(217) Penultimate-accented verb infinitives of accented roots (e.g. yom$_{acc}$‘read’)

a. yo'mi wa sinai ‘do not read’

b. yo'mi ni yo'mu ‘reads and reads’

The following table summarizes these patterns in verb stems.

(218) Accentuation of verb stems

	Accented root (e.g. yom$_{acc}$ ‘read’)	Unaccented root (e.g. kas ‘lend’)
A) verb infinitive	accented [penultimate] (e.g. yo'mi)	i) unaccented (e.g. kasi)
		ii) accented [final] (e.g. kasi')
B) deverbal nominal	accented [final] (e.g. yomi')	unaccented (e.g. kasi)

As shown in (218), the position of the accent in verb stems is penultimate or final, if any. In contrast, the position of the accent in accented deverbal compounds is antepenultimate, which implies that verb stems and deverbal compounds have different systems.

In order to discuss the difference between the two systems, let us examine the accentuation of verb infinitives.[29] As pointed out in previous studies (Haraguchi 1991, Kubozono 2008), the accent of conjugated forms of verbs is located at a morpheme boundary (e.g. /atumar$_{acc}$+u/→[a.tu.ma'.ru] ‘gather (non-past)’, /atumar$_{acc}$+i/→[a.tu.ma'.ri] ‘gathering (infinitive)’, /atumar$_{acc}$+e/→[a.tu.ma'.re] ‘gather (imperative)’).[30] This is explained by ALIGN-R (accent, root), which is defined in (219).

(219) ALIGN-R (accent, root): Assign one violation mark for every mora which stands between μ_h-σ' and the right edge of the root. (Yamaguchi 2010b)

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[28] This example is taken from Martin (1975).

[29] The analysis in Yamaguchi (2010b), which explains the difference in accentuation between non-past tense and past tense (e.g. [ta.be'.ru] ‘eat’ vs. [ta'.be.ta] ‘ate’) by ALIGN-R (accent, root) (i.e. (219)) and UNIFORM EXPONENCE (UE) -AFFIX (i.e. (228)), is applied in the following discussion on the accentuation of verb stems.

[30] This sentence is based on a sentence in Yamaguchi (2010b) with some modification.

As shown in (220), candidates (a) and (b) (i.e. [a'.tu.ma.ri] and [a.tu'.ma.ri]) violate ALIGN-R (accent, root). In contrast, candidate (c) (i.e. [a.tu.ma'.ri]) satisfies the constraint. Candidates (d) and (e) (i.e. [a.tu.ma.ri'] and [a.tu.ma.ri]) are excluded due to the violation of the positional faithfulness constraint IDENT$_{root}$, which penalizes deleting or inserting the accent in a root.

(220)

Input: /atumar$_{acc}$ + i/	IDENT$_{root}$	ALIGN-R (accent, root)
a. a'tumar-i		**!
b. atu'mar-i		*!
☞c. atuma'r-i		
d. atumar-i'	*!	
e. atumar-i	*!	

So far, the accent location has been tentatively transcribed with underspecification, as in /atumar$_{acc}$/ ‘gather’. However, /a'tumar/, /atu'mar/, and /atuma'r/ are possible options based on Richness of the Base. Even if these inputs are assumed, the output shows only one pattern: [atuma'ri]. In other words, the accent location is neutralized in verbs, as shown below.

(221) Neutralization of accent location

Input		**Output**
/a'tumar+i/	→	[atuma'ri]
/atu'mar+i/	→	[atuma'ri]
/atuma'r+i/	→	[atuma'ri]

The occurrence of neutralization implies that ALIGN-R (accent, root) dominates NO-FLOP-PROMINENCE. As shown in (222), accent shift can occur because ALIGN-R (accent, root) requires that the accent be located at the right edge of the root.

(222) a. /a'tumar+i/

Input: /a'tumar+i/	IDENT$_{root}$	ALIGN-R (accent, root)	NO-FLOP-PROMINENCE
a. a'tumar-i		**!	
b. atu'mar-i		*!	*
☞c. atuma'r-i			*
d. atumar-i'	*!		*
e. atumar-i	*!		

b. /atu'mar+i/

Input: /atu'mar+i/	IDENT$_{root}$	ALIGN-R (accent, root)	NO-FLOP-PROMINENCE
a. a'tumar-i		**!	*
b. atu'mar-i		*!	
☞c. atuma'r-i			*
d. atumar-i'	*!		*
e. atumar-i	*!		

c. /atuma'r+i/

Input: /atuma'r+i/	IDENT$_{root}$	ALIGN-R (accent, root)	NO-FLOP-PROMINENCE
a. a'tumar-i		**!	*
b. atu'mar-i		*!	*
☞c. atuma'r-i			
d. atumar-i'	*!		*
e. atumar-i	*!		

This ranking is also consistent with underspecification. Since the location of the accent in the root is not specified at the input level, candidates (a)-(c) do not violate NO-FLOP-PROMINENCE.

(223) Underspecification in the root

Input: /atumar$_{acc}$ + i/	IDENT$_{root}$	ALIGN-R (accent, root)	NO-FLOP-PROMINENCE
a. a'tumar-i		**!	
b. atu'mar-i		*!	
☞c. atuma'r-i			
d. atumar-i'	*!		*
e. atumar-i	*!		

To summarize, Richness of the Base requires that any type of input is allowed, which implies the ranking where ALIGN-R (accent, root) dominates NO-FLOP-PROMINENCE.

ALIGN-R (accent, root) also dominates NON-FINALITY (Ft) since verb infinitives allow the penultimate pattern, as illustrated in (224).

(224)

Input: /a'tumar+i/	IDENT$_{root}$	ALIGN-R (accent, root)	NON-FINALITY (Ft)	NO-FLOP-PROMINENCE
a. a'tumar-i		**W	L	L
b. atu'mar-i		*W	L	*
☞c. atuma'r-i			*	*
d. atumar-i'	*W		*	*
e. atumar-i	*W		L	L

The ranking in (224) explains the pattern in C-final roots. However, it is not sufficient for V-final roots. As shown in (225), the wrong winner *[ta.zu.ne'] is selected by the ranking ALIGN-R (accent, root) >> NO-FLOP-PROMINENCE.

(225) Wrong prediction regarding V-final roots (e.g. /ta'zune/ 'ask')

Input: /ta'zune + φ/	IDENT$_{root}$	ALIGN-R (accent, root)	NON-FINALITY (Ft)	NO-FLOP-PROMINENCE
a. ta'zune		**!		
☜b. tazu'ne		*!	*	*
×c. tazune'			*	*

(×: wrongly selected, ☜: desired)

This problem is solved by taking C-final roots into account: [ta.zu'.ne], which violates ALIGN-R (accent, root), can be accounted for if we consider the fact that the position of μ_h-σ' in [ta.zu'.ne] and that in [a.tu.ma'.ri] should be identical (i.e. penultimate). That is, the position of μ_h-σ' should be invariant whether the root is V-final or C-final.[31] In this study, this invariance is called 'Accent Identity', and this is defined in (226).

(226) Accent Identity: In the pair {V-final root + suffix α, C-final root + suffix α}, the two forms have the head mora of the accented syllable (μ_h-σ') in the same position. (Yamaguchi 2010b)

This notion can be explained as one instance of Uniform Exponence (Kenstowicz 1996, 1998), which is shown in (227) (Yamaguchi 2010b).

(227) Uniform Exponence (UE): a lexical item (root, affix, word) has the same realization for property P in its various contexts of occurrence.

In order to explain the pattern of V-final roots within the framework of OT, Accent Identity is formalized as UNIFORM EXPONENCE (UE) -AFFIX, which is defined in (228).

(228) UNIFORM EXPONENCE (UE) -AFFIX: Assign one violation mark for every pair {V-final root + suffix α, C-final root + suffix α} where the two forms have the head mora of the accented syllables (μ_h-σ') in different positions. (Suffix α may or may not have allomorphs.) (Yamaguchi 2010b)

In the following tableau, candidates are represented as pairs of the form {V-final root + φ, C-final root + i}. The representation <-n_1,-n_2> in each candidate shows the position of μ_h-σ' in the pair. If $n_1 = n_2$, the candidate satisfies UE- AFFIX.

[31] This sentence and the next one are based on sentences in Yamaguchi (2010b) with some modifications.

(229) Verb infinitives of accented roots

/ta'zune-φ /, /a'tumar-i/	IDENT$_{root}$	UE-AFFIX	ALIGN-R (accent, root)	NON-FIN (Ft)	NO-FLOP
a. {ta'.zu.ne, a'.tu.ma.r-i} <-3, -4>		*!	****		
b. {ta'.zu.ne, a.tu'.ma.r-i} <-3, -3>			***!		*
☞c. {ta.zu'.ne, a.tu.ma'.r-i} <-2, -2>			*	**	**
d. {ta.zu.ne', a.tu.ma'.r-i} <-1, -2>		*!		**	**
e. {ta.zu.ne', a.tu.ma.r-i'} <-1, -1>	*!			**	**

As candidates (a) and (d) violate UE-AFFIX, they are not selected as the winner. Candidate (e) is excluded due to the violation of IDENT$_{root}$. Although both candidate (b) and candidate (c) satisfy UE-AFFIX, the former has three violation marks for ALIGN-R (accent, root), while the latter has only one violation mark. Therefore, candidate (c) (i.e. {ta.zu'.ne, a.tu.ma'.r-i}) is selected as the winner.

In sum, UE-AFFIX and ALIGN-R (accent, root) play an important role in accentuation of verb infinitives. As NO-FLOP-PROMINENCE is dominated by the two constraints, the difference at the input level is neutralized at the output level.

Now that we have looked at verb infinitives of accented roots, it is time to move on to unaccented roots. As summarized in (218), verb infinitives of unaccented roots show two patterns: final-accented and unaccented. This variation is explained by the reranking of IDENT$_{root}$ and CULMINATIVITY. As shown in (230), the final-accented pattern is selected as the winner if CULMINATIVITY dominates IDENT$_{root}$, while the opposite ranking favors the unaccented pattern.

(230) Verb infinitives of unaccented roots

a. Final-accented: CULMINATIVITY >> IDENT$_{root}$

/ake-φ /, /nozom-i/ (verb infinitive)	UE-AFFIX	CUL	IDENT$_{root}$	ALIGN-R (accent, root)
a. {a'.ke, no.zo'.m-i} <-2, -2>			**!	*
☞b. {a.ke', no.zo.m-i'} <-1, -1>			*	
c. {a.ke, no.zo.m-i} <0, 0>		**!		
d. {a.ke, no.zo.m-i'} <0, -1>	*!	*		

b. Unaccented: IDENT$_{root}$ >> CULMINATIVITY

/ake-φ /, /nozom-i/ (verb infinitive)	UE-AFFIX	IDENT$_{root}$	CUL	ALIGN-R (accent, root)
a. {a'.ke, no.zo'.m-i} <-2, -2>		**!		*
b. {a.ke', no.zo.m-i'} <-1, -1>		*!		
☞c. {a.ke, no.zo.m-i} <0, 0>			**	
d. {a.ke, no.zo.m-i'} <0, -1>	*!		*	

With regard to accented roots, the correct output is selected regardless of the ranking of CULMINATIVITY and IDENT$_{root}$, as shown in (231).

(231) Verb infinitives of accented roots

/tabe$_{acc}$-φ/, /tukur$_{acc}$-i/ (verb infinitive)	UE-AFFIX	CUL	IDENT$_{root}$	ALIGN-R (accent, root)
☞a. {ta'.be, tu.ku'.r-i} <-2, -2>				*
b. {ta.be', tu.ku.r-i'} <-1, -1>			*!	
c. {ta.be, tu.ku.r-i} <0, 0>		**!	**!	
d. {ta.be', tu.ku'.r-i} <-1, -2>	*!			

The accentuation of deverbal nominals is different from that of verb infinitives, as summarized in (218). This difference is also explained by the difference in constraint ranking. As ALIGN-R (accent, root) dominates IDENT$_{root}$, {ta.be', tu.ku.r-i'} is favored over {ta'.be, tu.ku'.r-i}, as shown in (232)-(a). With regard to unaccented roots, {a.ke, no.zo.m-i} is favored over {a.ke', no.zo.m-i'} due to the ranking of IDENT$_{root}$ >> CULMINATIVITY.

(232) Deverbal nominals

a. Accented roots

/tabe$_{acc}$-φ/, /tukur$_{acc}$-i/ (deverbal nominal)	UE-AFFIX	ALIGN-R (accent, root)	IDENT$_{root}$	CUL
a. {ta'.be, tu.ku'.r-i} <-2, -2>		*!		
b. {ta'.be, tu.ku.r-i'} <-2, -1>	*!	*	*	
c. {ta.be', tu.ku'.r-i} <-1, -2>	*!			
☞d. {ta.be', tu.ku.r-i'} <-1, -1>			*	
e. {ta.be, tu.ku.r-i} <0, 0>			**!	**

b. Unaccented roots

/ake-φ/, /nozom-i/ (deverbal nominal)	UE-AFFIX	ALIGN-R (accent, root)	IDENT$_{root}$	CUL
a. {a'.ke, no.zo'.m-i} <-2, -2>		*!	**	
b. {a'.ke, no.zo.m-i'} <-2, -1>	*!	*	*	
c. {a.ke', no.zo'.m-i} <-1, -2>	*!		**	
d. {a.ke', no.zo.m-i'} <-1, -1>			*!	
☞e. {a.ke, no.zo.m-i} <0, 0>				**

In summary, the difference between verb infinitives and deverbal nominals and the variation between two patterns in verb infinitives are explained by difference in constraint ranking, as summarized in (233).

(233) Constraint ranking and accentuation of verb stems

	Constraint ranking	Accented root	Unaccented root
A) verb infinitive	IDENT$_{root}$ >> CUL >> ALIGN-R	accented [penultimate]	i) unaccented
	CUL >> IDENT$_{root}$ >> ALIGN-R		ii) accented [final]
B) deverbal nominal	ALIGN-R >> IDENT$_{root}$ >> CUL	accented [final]	unaccented

3.2.5. Comparison of verb stems and deverbal compounds

Let us move on to a comparison of verb stems and deverbal compounds. One of the differences between the two is that only the former allow penultimate accent. As shown in

(229), IDENT$_{root}$-IO dominates ALIGN-R (accent, root) and ALIGN-R (accent, root) dominates NON-FINALITY (Ft). Thus, IDENT$_{root}$-IO dominates NON-FINALITY (Ft). If the correspondence between verb stems and deverbal compounds were only an I-O relationship, the difference could not be explained, as shown in (234).

(234) Incorrect prediction about Type I

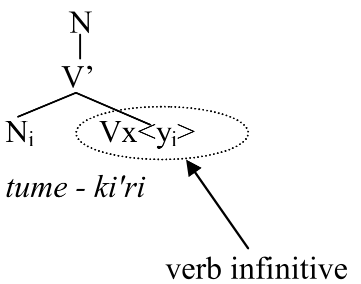
(e.g. tikara' + moti$_{acc}$ → tikara'-moti 'power + having; powerful person')

Input: /tikara+moti$_{acc}$/	IDENT$_{root}$-IO	NON-FINALITY (Ft)
☜a. tikara'-moti	*!	
×b. tikara-mo'ti		*

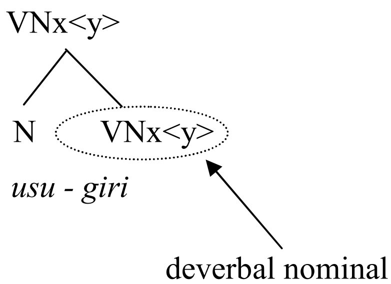
(×: wrongly selected, ☜: desired)

This implies that O-O correspondence must be taken into account. That is, it is necessary to consider the accentuation of a verb stem which constitutes a deverbal compound. To the best of my knowledge, only Sugioka (1996, 2002) and Ito and Sugioka (2002) deal with the accentuation of verb stems in deverbal compounds. They argue that the two types of deverbal compounds have different internal structures and that the second elements of the compounds have different accentual properties. The examples in (235) are the pair *tume* + *kiri$_{acc}$* → *tume-ki'ri* 'nail + cutting; nail clippers' and *usu* + *kiri$_{acc}$* → *usu-giri* 'thin + cutting; thinly sliced'.

(235) a. Internal argument (Type I)



b. Adjunct (Type IV)



Ito and Sugioka argue that the second element is a verb in (235)-(a), while it is a verbal noun in (235)-(b). That is, the verb stems in the two structures are morphologically different: verb infinitive in (235)-(a) and deverbal nominal in (235)-(b).

Based on this argument, let us examine the correspondence between the accentuation of verb stems and deverbal compounds. The tableaux in (236) and (237) illustrate accented Type I deverbal compounds where the second element is based on an accented root. As the second element is a verb infinitive in Type I, the accent location of the second element is penultimate.

The tableau in (236) hypothesizes that both I-O correspondence and O-O correspondence are relevant. However, the penultimate accent in the base would be preserved if IDENT$_{root}$-IO were relevant in deverbal compounds.

(236) Incorrect prediction about Type I

(e.g. tikara' + moti$_{acc}$ → tikara'-moti 'power + having; powerful person')

Input: /mot$_{acc}$+i/ Base: [mo'ti]	IDENT$_{root}$-IO	NON-FINALITY (Ft)	IDENT$_{root}$-OO
☜a. tikara'-moti	*!		*
×b. tikara-mo'ti		*	

(×: wrongly selected, ☜: desired)

Therefore, it is necessary to posit only O-O correspondence in Type I deverbal compounds. As illustrated in (237), *tikara'-moti* is selected as the winner because it is not penalized by IDENT$_{root}$-IO.

(237) Irrelevance of I-O correspondence in Type I

Input: /mot$_{acc}$+i/ Base: [mo'ti]	IDENT$_{root}$-IO	NON-FINALITY (Ft)	IDENT$_{root}$-OO
☞a. tikara'-moti			*
b. tikara-mo'ti		*!	

(238) and (239) illustrate accented Type IV deverbal compounds where the second element is based on an unaccented root. As the second element is a deverbal nominal in Type IV, the second element is unaccented. As shown in (232), IDENT$_{root}$-IO dominates CULMINATIVITY. However, if IDENT$_{root}$-IO were relevant in deverbal compounds, the winner would be unaccented, as shown in (238).

(238) Incorrect prediction about Type IV

Input: /musub+i/ Base: [musubi]	IDENT$_{root}$-IO	CULMINATIVITY	IDENT$_{root}$-OO
×a. tyoo-musubi		*	
☜b. tyoo-mu'subi	*!		*

(×: wrongly selected, ☜: desired)

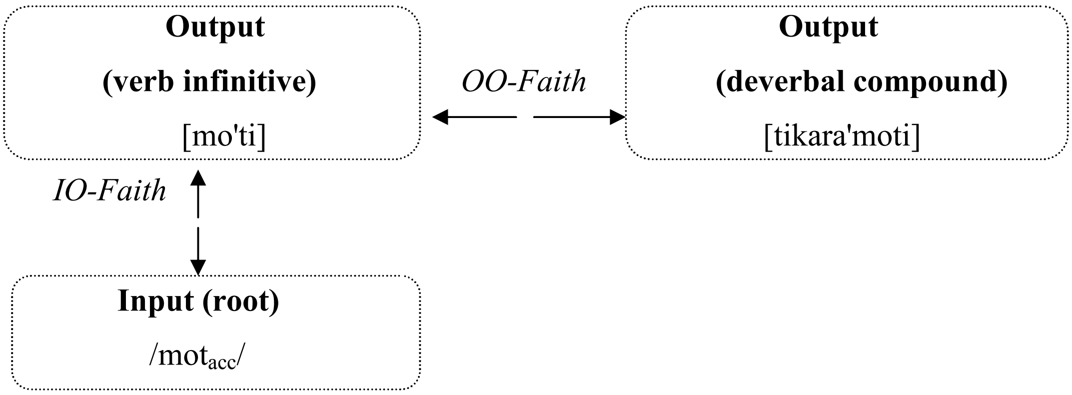
Consequently, only O-O correspondence is posited in Type IV deverbal compounds, too. As shown in (239), *tyoo-mu'subi* is selected as the winner because it is not penalized by IDENT$_{root}$-IO.

(239) Irrelevance of I-O correspondence in Type IV

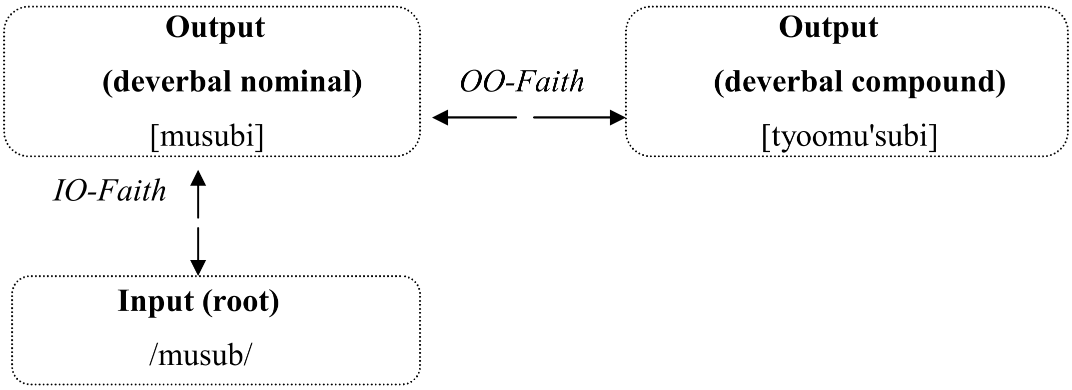
Input: /musub+i/ Base: [musubi]	IDENT$_{root}$-IO	CULMINATIVITY	IDENT$_{root}$-OO
a. tyoo-musubi		*!	
☞b. tyoo-mu'subi			*

In summary, only O-O correspondence is relevant in both types of deverbal compounds, as shown in (240), which is the same as in the case of noun compounds. In addition, the relationship in (240) implies that it is not necessary to assume underspecification of verb stems in deverbal compounds.

(240) a. Type I



b. Type IV



3.2.6. Analysis of deverbal compounds: Comparison with noun compounds

This section analyzes the difference in accentuation between Type I and Type IV, comparing them with noun compounds.

3.2.6.1. Previous studies

To my knowledge, the only theoretical analyses of accentuation in deverbal compounds are those proposed by Sugioka (1996, 2002) and Ito and Sugioka (2002). They analyze the difference between the two kinds of deverbal compounds based on the difference in their internal structures, which are illustrated in (235). As shown in 3.2.5, the second element is a verb infinitive in Type I, so the location of the accent is penultimate, if the verb root is accented (e.g. ki'ri). In contrast, the second element is final-accented in Type IV because it is a deverbal nominal (e.g. kiri'). According to the analysis of Sugioka (1996, 2002) and Ito and Sugioka (2002), the penultimate accent in Type I is preserved based on the independently motivated rule in (241)-(a). In contrast, they argue that compounds where the first element is an adjunct are unaccented because the final accent cannot be preserved due to the independently motivated rule in (241)-(c). These processes are shown in (242).

(241) Generalization regarding noun compounds in McCawley (1977: 272)

a. In a noun compound X#Y, the accent of Y predominates.
b. If Y is long and final-accented or unaccented, put accent on the first syllable of Y.
c. If Y is short and final-accented, deaccent the whole compound.

(242) a. tume + ki'ri ----- (241)-(a) ---→ tume-ki'ri
b. usu + kiri' ----- (241)-(c) ---→ usu-giri

The examples in (242) are cases where the verb root is accented. How are the cases involving unaccented roots explained? With regard to Type IV, the second element is unaccented as it is a deverbal nominal (e.g. kasi). In contrast, the accentuation of the second element in Type I is controversial. As discussed in 3.2.4, a verb infinitive based on an unaccented root shows two patterns: unaccented and final-accented (e.g. kasi/kasi'). It is difficult to decide which pattern is valid because there seems to be no evidence. Therefore, I consider both possibilities in the following discussion.

If the second element is unaccented in Type I, the analysis of Sugioka (1996, 2002) and Ito and Sugioka (2002) predicts that the same pattern of accentuation is produced in both types of deverbal compounds, since the accentuation of the second element is the same. Ito and Sugioka (2002) provide examples which are consistent with this prediction: *hito* + *kai* → *hito-kai* ‘person + buying; man buyer (slave merchant)’ vs. *matome* + *kai* → *matome-gai* ‘collect + buying; buying in bulk’. However, the data presented in Chapter 2 show that there is a difference between Type I and Type IV even if the second element is based on an unaccented root, as shown in (243).

(243) Accentuation of compounds when the second element is derived from an unaccented root

a. Type I: Internal argument, accusative

Length	[-accented]	[+accented]	Sum
1μ+2μ	29 (76%)	9 (24%)	38 (100%)
2μ+2μ	109 (66%)	55 (34%)	164 (100%)
3μ+2μ	30 (70%)	13 (30%)	43 (100%)
4μ+2μ	7 (44%)	9 (56%)	16 (100%)
{1-4}μ+2μ	175 (67%)	86 (33%)	261 (100%)
1μ+3μ	0 (0%)	12 (100%)	12 (100%)
2μ+3μ	8 (10%)	69 (90%)	77 (100%)
3μ+3μ	0 (0%)	24 (100%)	24 (100%)
4μ+3μ	0 (0%)	9 (100%)	9 (100%)
{1-4}μ+3μ	8 (7%)	114 (93%)	122 (100%)

b. Type IV: Adjunct

Length	[-accented]	[+accented]	Sum
1μ+2μ	22 (79%)	6 (21%)	28 (100%)
2μ+2μ	247 (98%)	5 (2%)	252 (100%)
3μ+2μ	48 (87%)	7 (13%)	55 (100%)
4μ+2μ	32 (89%)	4 (11%)	36 (100%)
{1-4}μ+2μ	349 (94%)	22 (6%)	371 (100%)
1μ+3μ	2 (12%)	15 (88%)	17 (100%)
2μ+3μ	20 (25%)	59 (75%)	79 (100%)
3μ+3μ	1 (4%)	25 (96%)	26 (100%)
4μ+3μ	0 (0%)	3 (100%)	3 (100%)
{1-4}μ+3μ	23 (18%)	102 (82%)	125 (100%)

As shown in (243), when the second element has two morae, the percentage of [+accented] is 33% in Type I, while it is 6 % in Type IV. Similarly, when the second element has three morae, the percentage of [+accented] is higher in Type I although the difference is less prominent (i.e. 93% in Type I, 82% in Type IV). In sum, Type I is more likely to be accented than Type IV even if the second element is derived from an unaccented verb. Examples which illustrate this difference are given in (244) and (245).

(244) Type I (Internal argument, accusative): unaccented verb roots

a. hana' + uri → hana-uri' ‘flower + selling; flower vendor’
b. ya'ne + huki → yane'-huki ‘roof + thatching; roofing’
c. kusuri + uri → kusuri'-uri ‘medicine + selling; medicine seller’
d. sakana + turi → sakana'-turi ‘fish + fishing; fishing’
e. goyo'o + kiki → goyo'o-kiki ‘order + listening (asking); order taker’
f. yasumono + kai → yasumono'-kai ‘cheap article + buying; buying a cheap article’
g. mono' + oki → mono-o'ki ‘thing + putting; closet’
h. meesi + ire → meesi'-ire ‘visiting card + putting in; card case’
i. go'han + taki → goha'n-taki ‘rice + boiling; boiling rice’
j. kuruma + hiki → kuruma'-hiki ‘car + pulling; hauler’
k. inku + kesi → inku'-kesi ‘ink + erasing; ink eraser’
l. kokuban + huki → kokuban-huki ‘blackboard + wiping; board eraser’
m. syamisen + hiki → syamise'n-hiki ‘*shamisen* + playing; *shamisen* player’
n. koozyoo + ii → koozyo'o-ii ‘prologue + saying; person who narrates a prologue’

In the examples in (244), the second element is an unaccented verb and the whole compound is accented.

In contrast, all of the examples in (245) are unaccented. The second elements are the same as those in (244) in (a)-(f).

(245) Type IV (Adjunct): unaccented verb roots

a. kara' + uri → kara-uri ‘empty + selling; selling short’
b. wa'ra + huki → wara-buki ‘straw + thatching; thatching’
c. $orosi_{acc}$ + uri → orosi-uri ‘wholesale + selling; wholesale’
d. i'ppon + turi → ippon-duri ‘one + fishing; pole-and-line fishing’
e. $nusumi_{acc}$ + kiki → nusumi-giki ‘stealing + listening; listening secretly’
f. saisan + kai → saisan-gai ‘profitable + buying; buying on a yield basis’

g. yuki' + yake → yuki-yake 'snow + burning; snow-tanned'

h. okure + saki → okure-zaki 'late + blooming; late blossoms'

i. mimizu + hare → mimizu-bare 'earthworm + swelling; welt'

j. kawara + huki → kawara-buki 'tile + roofing; tile-roofed'

k. hito'ri + kime → hitori-gime 'one person + deciding; deciding by oneself'

l. $uresi_{acc}$ + naki → uresi-naki 'joyful + crying; crying for joy'32

m. sinyoo + kasi → sinyoo-gasi 'trust + lending; credit loan'

n. suityoku + tobi → suityoku-tobi 'perpendicularly + jumping; vertical jump'

Let us move on to the other possibility. If a second element based on an unaccented root is final-accented in Type I, the analysis of Sugioka (1996, 2002) and Ito and Sugioka (2002) predicts that the compound is unaccented due to the rule in (241)-(c). However, 33% of Type I compounds where the second element is derived from an unaccented root are accented when the second element is short, as shown in (243).

In summary, the difference in accentuation between the two types of compounds does not result from the difference in accentuation between the two functions of verb stems, regardless of whether a verb infinitive based on an unaccented root is unaccented or final-accented. This implies that Type I and Type IV have different systems which give rise to the accentuation of compounds. The following sections examine these differences in terms of differences in constraint ranking, taking into account comparison with nominal compounds.

3.2.6.2. Unaccentedness

Unlike the situation with noun compounds, unaccentedness is not uncommon in deverbal compounds. This section discusses unaccentedness in deverbal compounds in two respects: length of the second element and the type of compound. First, both Type I and Type IV tend to be unaccented if the second element has two morae, as was shown in Chapter 2. This relationship between unaccentedness and length is summarized in (246).

[32] *$Uresi_{acc}$* is a stem of an adjective. Adjectives are either accented or unaccented and the location of the accent is predictable based on the inflectional form, just as in verb forms.

(246) The effect of the length of the second element

	2μ	3μ
Type I	Accented / Unaccented (e.g. kusuri'-uri 'medicine seller') / kemuri-dasi 'ventilator')	Accented (e.g. ara-sa'gasi 'faultfinding')
Type IV	Unaccented (e.g. uresi-naki 'crying for joy')	Accented / Unaccented (e.g. yasu-a'gari 'economical' /saki-okuri 'postponing')

What motivates the effect of length on unaccentedness? This effect can be accounted for if we consider that [μμ-(μ'μ)μ] is favored because it satisfies ALIGN-L (σ', root), which is defined in (247). When the length of the second element is two morae, an accented candidate *[μ(μμ')-μμ] violates ALIGN-L (σ', root).

(247) ALIGN-L (σ', root): The left edge of any accented syllable is aligned with the left edge of a head root. (Tanaka 2001)

In other words, unaccentedness in compounds where the second element has two morae is a strategy to avoid the violation of ALIGN-L (σ', root) (Yamaguchi 2010a).

The difference between Type I and Type IV is accounted for by the difference in the relationship between ALIGN-L (σ', root) and the following two kinds of constraints: constraints which favor the accented candidate and constraints which favor the unaccented candidate. CULMINATIVITY is a typical constraint of the former type. MAX-PROMINENCE also favors the accented candidate if the second element is accented. On the other hand, NON-FINALITY (PrWd') is a typical constraint which favors the unaccented candidate, as defined in (248).

(248) NON-FINALITY (PrWd'): The accented prosodic word must not be final in PrWd (Accent must not be present in PrWd). (Tanaka 2001)

In addition, DEP-PROMINENCE also favors the unaccented candidate if the second element is unaccented. NO-FLOP-PROMINENCE also favors the unaccented candidate if the accent location in the second element is not preserved in the accented candidate.

The remainder of this section seeks to explain the difference between Type I and Type IV, comparing them with noun compounds. First, tableaux in (249) show the interaction of constraints in Type I: ALIGN-L (σ', root) and a constraint which favors the accented candidate are freely ranked, dominating every constraint which favors the unaccented candidate.

(249) Type I deverbal compounds

a. Second element: 2μ (e.g. kusuri'-uri, kemuri-dasi)

	ALIGN-L (σ', root)	CONSTRAINT WHICH FAVORS [+ACC]	CONSTRAINT WHICH FAVORS [-ACC]
☞a. μ(μμ')-μμ	*		*
☞b. μμμ-μμ		*	

b. Second element: 3μ (e.g. ara-sa'gasi)

	ALIGN-L (σ', root)	CONSTRAINT WHICH FAVORS [+ACC]	CONSTRAINT WHICH FAVORS [-ACC]
☞a. μμ-(μ'μ)μ			*
b. μμ-μμμ		*!	

In the cases where the second element has two morae, the accented candidate violates ALIGN-L (σ', root). If ALIGN-L (σ', root) dominates a constraint which favors the accented candidate, the unaccented candidate is selected as the winner. In contrast, the accented candidate is favored under the opposite ranking. If the second element has three morae, the accented candidate is selected as the winner regardless of the ranking of ALIGN-L (σ', root) and a constraint which favors the accented candidate because it satisfies ALIGN-L (σ', root).

Second, (250) shows constraint interaction in Type IV deverbal compounds. A constraint which favors the accented candidate and a constraint which favors the unaccented candidate are freely ranked and they are dominated by ALIGN-L (σ', root).

(250) Type IV deverbal compounds

a. Second element: 2μ (e.g. uresi-naki)

	ALIGN-L (σ', root)	CONSTRAINT WHICH FAVORS [+ACC]	CONSTRAINT WHICH FAVORS [-ACC]
a. μ(μμ')-μμ	*!		*
☞b. μμμ-μμ		*	

b. Second element: 3μ (e.g. yasu-a'gari, saki-okuri)

	ALIGN-L (σ', root)	CONSTRAINT WHICH FAVORS [+ACC]	CONSTRAINT WHICH FAVORS [-ACC]
☞a. μμ-(μ'μ)μ			*
☞b. μμ-μμμ		*	

If the second element has two morae, the unaccented candidate is selected as the winner because it satisfies ALIGN-L (σ', root), which is highly ranked. In contrast, both candidates can be the output in cases where the second element has three morae.

Third, let us compare deverbal compounds with noun compounds, which are mostly accented. As shown in (251), a constraint which favors the accented candidate dominates ALIGN-L (σ', root) and every constraint which favors the unaccented candidate in noun compounds, so the accented candidate is selected as the winner whether the second element is two morae or three morae.[33]

(251) Noun compounds [common cases]

a. Second element: 2μ (e.g. miyako'-dori)

	CONSTRAINT WHICH FAVORS [+ACC]	ALIGN-L (σ', root)	CONSTRAINT WHICH FAVORS [-ACC]
☞a. μ(μμ')-μμ		*	*
b. μμμ-μμ	*!		

b. Second element: 3μ (e.g. kona-gu'suri)

	CONSTRAINT WHICH FAVORS [+ACC]	ALIGN-L (σ', root)	CONSTRAINT WHICH FAVORS [-ACC]
☞a. μμ-(μ'μ)μ			*
b. μμ-μμμ	*!		

The tableaux in (251) show the common cases in noun compounds. However, some noun compounds are unaccented due to deaccenting morphemes. As mentioned in 3.1.1, deaccenting morphemes share two properties: (i) they are final-accented and (ii) their length is two morae. First, (i) is related to NO-FLOP-PROMINENCE; that is, the final accent cannot be preserved in compounds due to NON-FINALITY (σ), so deaccentuation occurs to avoid the violation of NO-FLOP-PROMINENCE and NON-FINALITY (σ) (Takano 2008, Yamaguchi 2010a).

33 (251) does not include the penultimate pattern as a candidate in order to simplify the discussion.

Second, (ii) is accounted for by ALIGN-L (σ', root) as the unaccented candidate satisfies the constraint. The fact that deaccenting morphemes are limited to nouns which have the two properties noted implies that deaccentuation occurs when the accented candidate violates both NO-FLOP-PROMINENCE and ALIGN-L (σ', root). Consequently, we need to posit a conjoined constraint [NO-FLOP-PROMINENCE & ALIGN-L (σ', root)]$_{PrWd}$. The tableau in (252) shows the system where the unaccented candidate is selected as the winner only in nouns which satisfy both (i) and (ii). On the other hand, if the second element is unaccented, the accented candidate satisfies [NO-FLOP-PROMINENCE & ALIGN-L (σ', root)]$_{PrWd}$ because it does not violate NO-FLOP-PROMINENCE, as shown in (253)-(a). Similarly, if the second element has three morae, the conjoined constraint is satisfied by the accented candidate because ALIGN-L (σ', root) is not violated, as shown in (253)-(b).

(252) Noun compounds [deaccenting morphemes]

Second element: 2μ, final-accented (e.g. midori-iro)

/μμμ-μμ'/	NO-FLOP & ALIGN	CONSTRAINT WHICH FAVORS [+ACC]	ALIGN-L (σ', root)	CONSTRAINT WHICH FAVORS [-ACC]
a. μ(μμ')-μμ	*!		*	*
☞b. μμμ-μμ		*		

(253) Nonoccurrence of deaccentuation

a. Second element: 2μ, unaccented

/μμμ-μμ/	NO-FLOP & ALIGN	CONSTRAINT WHICH FAVORS [+ACC]	ALIGN-L (σ', root)	CONSTRAINT WHICH FAVORS [-ACC]
☞a. μ(μμ')-μμ			*	*
b. μμμ-μμ		*!		

b. Second element: 3μ, final-accented

/μμ-μμμ'/	NO-FLOP & ALIGN	CONSTRAINT WHICH FAVORS [+ACC]	ALIGN-L (σ', root)	CONSTRAINT WHICH FAVORS [-ACC]
☞a. μμ-(μ'μ)μ				*
b. μμ-μμμ		*!		

In summary, different types of compounds show different degrees of unaccentedness, and the difference is accounted for by differences in constraint ranking, as summarized in (254), where C [+ACC] and C [-ACC] stand for a constraint which favors the accented candidate and a constraint which favors the unaccented candidate, respectively. Focusing on the relationship between C [+ACC] and ALIGN-L (σ', root) brings the difference into sharp relief. They are freely ranked in Type I, while ALIGN-L (σ', root) dominates C [+ACC] in Type IV. On the other hand, C [+ACC] dominates ALIGN-L (σ', root) in noun compounds, although ALIGN-L (σ', root) has some effect as part of a conjoined constraint in deaccenting morphemes. Constraint rankings for each type of compound will be examined in detail in 3.2.6.4.

(254) Summary

Type of compounds	Constraint ranking
Deverbal compound (Type I)	ALIGN-L (σ', root), C[+ACC] >> C[-ACC]
Deverbal compound (Type IV)	ALIGN-L (σ', root) >> C[+ACC], C[-ACC]
Noun compound [common cases]	C[+ACC] >> ALIGN-L (σ', root) , C[-ACC]
Noun compound [deaccenting morphemes]	[NO-FLOP & ALIGN-L (σ', root)]$_{PrWd}$ >> C[+ACC] >> ALIGN-L (σ', root) , C[-ACC]

3.2.6.3. Preservation of penultimate accent

This section deals with the location of accent, comparing noun compounds and Type I deverbal compounds. As shown in (172), both penultimate accent and antepenultimate accent are possible in noun compounds where the second element has penultimate accent. This variation is explained by free ranking of NON-FINALITY (Ft) and NO-FLOP-PROMINENCE, as shown in (255).

(255) Noun compound [N2: penultimate] (e.g. mata-ito'ko / mata-i'toko)

/μμ-μμ'μ/	NON-FINALITY (Ft)	NO-FLOP-PROMINENCE
☞a. μμ-(μ'μ)μ		*
☞b. μμ-μ(μ'μ)	*	

On the other hand, penultimate accent in the second element cannot be preserved in Type I deverbal compounds because NON-FINALITY (Ft) dominates NO-FLOP-PROMINENCE, as shown in (256).

(256) Type I deverbal compound (e.g. ude-da'mesi)

/μμ-μμ'μ/	NON-FINALITY (Ft)	NO-FLOP-PROMINENCE
☞a. μμ-(μ'μ)μ		*
b. μμ-μ(μ'μ)	*!	

With regard to Type IV deverbal compounds, the stem is final-accented if it is based on an accented root. Therefore, the relationship between NON-FINALITY (Ft) and NO-FLOP-PROMINENCE is unknown, as shown below.

(257) Type IV deverbal compound (e.g. tabi-du'kare)

/μμ-μμμ'/	NON-FINALITY (Ft)	NO-FLOP-PROMINENCE
☞a. μμ-(μ'μ)μ		*
b. μμ-μ(μ'μ)	*!	*

3.2.6.4. Details of constraint ranking

3.2.6.4.1. Type I

The previous two sections outline the differences among different types of compounds, focusing on some specific constraints and candidates. This section examines the differences more closely by taking account of other relevant constraints and candidates.

The tableaux in (258) and (259) illustrate Type I deverbal compounds where the second element is based on an accented root.[34] On the one hand, (258) deals with compounds where the stem has two morae, and there are two cases: accented compounds and unaccented compounds. On the other hand, (259) shows cases where the stem has three morae. As mentioned in 3.2.5, the accent location of the stem is penultimate.

[34] The ranking in (258)and (259) is not the only one that produces the correct outputs. It is one of the rankings which meet the conditions in (260).

(258) Type I, Accented root, 2μ stem

a. Accented compound (e.g. kataki'-uti)

/μμμ-μ'μ/	NON-F (σ)	NON-F (Ft)	CUL	ALIGN -L	NON-F (PrWd')	MAX	DEP	NO-FLOP
☞a. μ(μμ')-μμ				*	*			*
b. μμμ-(μ'μ)		*W		L	*			L
c. μμμ-(μμ')	*W	*W		*	*			*
d. μμμ-μμ			*W	L	L	*W		L

b. Unaccented compound (e.g. atusa-yoke)

/μμμ-μ'μ/	NON-F (σ)	NON-F (Ft)	ALIGN -L	CUL	NON-F (PrWd')	MAX	DEP	NO-FLOP
a. μ(μμ')-μμ			*W	L	*W	L		*W
b. μμμ-(μ'μ)		*W		L	*W	L		
c. μμμ-(μμ')	*W	*W	*W	L	*W	L		*W
☞d. μμμ-μμ				*		*		

(259) Type I, Accented root, 3μ stem (e.g. kata-ya'buri)

/μμ-μμ'μ/	NON-F (σ)	NON-F (Ft)	CUL	ALIGN -L	NON-F (PrWd')	MAX	DEP	NO-FLOP
☞a. μμ-(μ'μ)μ					*			*
b. μμ-μ(μ'μ)		*W		*W	*			L
c. μμ-μ(μμ')	*W	*W		*W	*			*
d. μμ-μμμ			*W		L	*W		L

In order to examine the ranking of constraints, let us compare the winner and each loser in (258) and (259). The table in (260) shows the constraint ranking which is required in each comparison.

(260) Constraint ranking: Type I, Accented root

Stem	Compound	Comparison of candidates	Constraint ranking
2μ	[+acc]	(a) vs. (b)	(A) Non-f (Ft) >> Align-L, No-Flop
		(a) vs. (c)	[Candidate (c) is harmonically bounded by candidate (a).][35]
		(a) vs. (d)	(B) Cul or Max >> Align-L Cul or Max >> Non-f (PrWd') Cul or Max >> No-Flop
2μ	[-acc]	(d) vs. (a)	(C) Align-L or Non-f (PrWd') or No-Flop >> Cul Align-L or Non-f (PrWd') or No-Flop >> Max
		(d) vs. (b)	(D) Non-f (Ft) or Non-f (PrWd') >> Cul Non-f (Ft) or Non-f (PrWd') >> Max
		(d) vs. (c)	[Candidate (c) is harmonically bounded by candidate (a).]
3μ	[+acc]	(a) vs. (b)	(E) Non-f (Ft) or Align-L >> No-Flop
		(a) vs. (c)	[Candidate (c) is harmonically bounded by candidate (a).]
		(a) vs. (d)	(F) Cul or Max >> Non-f (PrWd') Cul or Max >> No-Flop

First, let us focus on the comparison between the candidate which has an antepenultimate accent (i.e. candidate (a)) and the unaccented candidate (i.e. candidate (d)) in the three tableaux: (258)-(a), (258)-(b) and (259). The comparison in (258)-(a) indicates that each of the constraints which favor candidate (d) (i.e. Align-L (σ’, root), Non-finality (PrWd') and No-Flop-Prominence), which are referred to as C [-Acc] in 3.2.6.2, is dominated by at least one constraint which favors candidate (a) (i.e. Culminativity or Max-Prominence), which are called C [+Acc] in 3.2.6.2 [= (B) in (260)]. The comparison between the two candidates in (258)-(b) indicates that each of C [+Acc] is dominated by at least one of the following three constraints: Align-L (σ’, root), Non-finality (PrWd') and No-Flop-Prominence [= (C) in

[35] If the violation marks of candidate A are a subset of those of candidate B, candidate B cannot defeat candidate A irrespective of the ranking of constraints. This situation is described as follows: ‘candidate B is harmonically bounded by candidate A.’

(260)]. Third, comparison between candidate (a) and candidate (d) in (259) requires that each of C [-ACC] (i.e. NON-FINALITY (PrWd') and NO-FLOP-PROMINENCE) is dominated by at least one constraint which favors candidate (a) (i.e. CULMINATIVITY or MAX-PROMINENCE) [= (F) in (260)].

As shown in (260), the difference in the winner between (258)-(a) and (258)-(b) results from different constraint rankings (i.e. (B) vs. (C)). On the other hand, there is no variation in the winner when the stem has three morae. That is, the winner is the accented compound whether the ranking is (B) or (C). This implies that (C) and (F) are compatible as well as (B) and (F). Based on the compatibility between (C) and (F), let us examine the relationship among ALIGN-L (σ', root), CULMINATIVITY and MAX-PROMINENCE in (C) in order to compare (C) with (B). As shown in (261), there are nine different combinations with regard to the constraints which dominate CULMINATIVITY or MAX-PROMINENCE, but four of them lead to contradiction: (e), (f), (h), and (i). There are two cases of contradiction: {(e), (i)} and {(f), (h)}. First, the contradiction in (e) and (i) results from the incompatibility with (F). For example, NON-FINALITY (PrWd') dominates both CULMINATIVITY and MAX-PROMINENCE in (e), which is inconsistent with the following ranking in (F): CULMINATIVITY or MAX-PROMINENCE >> NON-FINALITY (PrWd'). Second, the contradiction in (f) and (h) lies in the ranking paradox of CULMINATIVITY and MAX-PROMINENCE. For instance, as NON-FINALITY (PrWd') dominates CULMINATIVITY in (f), it is MAX-PROMINENCE that dominates NON-FINALITY (PrWd') in (F) (i.e. MAX-PROMINENCE >> NON-FINALITY (PrWd') >> CULMINATIVITY). Similarly, as NO-FLOP-PROMINENCE dominates MAX-PROMINENCE, it follows that CULMINATIVITY dominates NO-FLOP-PROMINENCE in (F) (i.e. CULMINATIVITY >> NO-FLOP-PROMINENCE >> MAX-PROMINENCE). That is, the relationship between CULMINATIVITY and MAX-PROMINENCE is inconsistent in (f).

(261) Relationship among ALIGN-L, CUL and MAX in (C)

	(C)	(C)	(F)	Relationship among ALIGN-L, CUL and MAX
(a)	ALIGN-L >> CUL	ALIGN-L >> MAX	CUL or MAX >> NON-F (PrWd') CUL or MAX >> NO-FLOP	**ALIGN-L** >> **CUL**, **MAX**
(b)	ALIGN-L >> CUL	NON-F (PrWd') >> MAX	CUL ~~or MAX~~ >> NON-F (PrWd') CUL or MAX >> NO-FLOP	**ALIGN-L** >> **CUL** >> NON-F (PrWd') >> **MAX**
(c)	ALIGN-L >> CUL	NO-FLOP >> MAX	CUL or MAX >> NON-F (PrWd') CUL ~~or MAX~~ >> NO-FLOP	**ALIGN-L** >> **CUL** >> NO-FLOP >> **MAX**
(d)	NON-F (PrWd') >> CUL	ALIGN-L >> MAX	~~CUL or~~ MAX >> NON-F (PrWd') CUL or MAX >> NO-FLOP	**ALIGN-L** >> **MAX** >> NON-F (PrWd') >> **CUL**
(e)	NON-F (PrWd') >> CUL	NON-F (PrWd') >> MAX	~~CUL or MAX~~ >> NON-F (PrWd') CUL or MAX >> NO-FLOP	[contradiction] NON-F (PrWd') >> CUL, MAX CUL or MAX >> NON-F (PrWd')
(f)	NON-F (PrWd') >> CUL	NO-FLOP >> MAX	~~CUL or~~ MAX >> NON-F (PrWd') CUL ~~or MAX~~ >> NO-FLOP	[contradiction] MAX >> NON-F (PRWD') >> CUL CUL >> NO-FLOP >> MAX
(g)	NO-FLOP >> CUL	ALIGN-L >> MAX	CUL or MAX >> NON-F (PrWd') ~~CUL or~~ MAX >> NO-FLOP	**ALIGN-L** >>**MAX** >> NO-FLOP >> **CUL**
(h)	NO-FLOP >> CUL	NON-F (PrWd') >> MAX	CUL ~~or MAX~~ >> NON-F (PrWd') ~~CUL or~~ MAX >> NO-FLOP	[contradiction] CUL >> NON-F (PrWd') >> MAX MAX >> NO-FLOP >> CUL
(i)	NO-FLOP >> CUL	NO-FLOP >> MAX	CUL or MAX >> NON-F (PrWd') ~~CUL or MAX~~ >> NO-FLOP	[contradiction] NO-FLOP >> CUL, MAX CUL or MAX >> NO-FLOP

On the other hand, the other five combinations imply the following ranking: ALIGN-L (σ', root) >> CULMINATIVITY, MAX-PROMINENCE. For example, as NON-FINALITY (PrWd') dominates MAX-PROMINENCE in (b), it is CULMINATIVITY that dominates NON-FINALITY (PrWd') in (F) (i.e. CULMINATIVITY >> NON-FINALITY (PrWd') >> MAX-PROMINENCE). As ALIGN-L (σ', root) dominates CULMINATIVITY, it follows that ALIGN-L (σ', root) also dominates MAX-PROMINENCE (i.e. ALIGN-L (σ', root) >> CULMINATIVITY >> NON-FINALITY (PrWd') >> MAX-PROMINENCE). In summary, ALIGN-L (σ', root) dominates both CULMINATIVITY and MAX-PROMINENCE in (C). Consequently, the difference between (B) and

(C) is reinterpreted as the reranking of the three constraints, as shown in (262). In the cases where the second element has two morae, the compound is accented if CULMINATIVITY or MAX-PROMINENCE dominates ALIGN-L (σ', root); in contrast, it is unaccented if ALIGN-L (σ', root) dominates both CULMINATIVITY and MAX-PROMINENCE.

(262) Variation between accented compounds and unaccented compounds in (258)

a. (B): CUL or MAX >> ALIGN-L → accented

b. (C): ALIGN-L >> CUL, MAX → unaccented

What has to be noticed is that the reranking does not affect the selection of the winner in (259) because both candidate (a) and candidate (d) satisfy ALIGN-L (σ', root).

Another important aspect of constraint ranking in (258) is that NON-FINALITY (Ft) dominates NO-FLOP-PROMINENCE, which is implied by comparison of candidate (a) and candidate (b) in (258)-(a) (i.e. (A) in (260)). Unlike nominal compounds, penultimate accent in the stem cannot be preserved.

I will now leave accented roots and turn to unaccented roots. As discussed before, we should consider two possibilities: unaccented stem and final-accented stem. (263) and (264) deal with the former possibility.

(263) Type I, Unaccented root [Unaccented stem], 2μ stem

a. Accented compound (e.g. kusuri'-uri)

/μμμ-μμ/	NON-F (σ)	NON-F (Ft)	CUL	ALIGN -L	NON-F (PrWd')	MAX	DEP	NO-FLOP
☞a. μ(μμ')-μμ				*	*		*	
b. μμμ-(μ'μ)		*W		L	*		*	
c. μμμ-(μμ')	*W	*W		*	*		*	
d. μμμ-μμ			*W	L	L		L	

b. Unaccented compound (e.g. koromo-gae)

/μμμ-μμ/	NON-F (σ)	NON-F (Ft)	ALIGN -L	CUL	NON-F (PrWd')	MAX	DEP	NO-FLOP
a. μ(μμ')-μμ			*W	L	*W		*W	
b. μμμ-(μ'μ)		*W		L	*W		*W	
c. μμμ-(μμ')	*W	*W	*W	L	*W		*W	
☞d. μμμ-μμ				*				

(264) Unaccented root [Unaccented stem], 3μ stem (e.g. ara-sa'gasi)

/μμ-μμμ/	NON-F (σ)	NON-F (Ft)	CUL	ALIGN -L	NON-F (PrWd')	MAX	DEP	NO-FLOP
☞a. μμ-(μ'μ)μ					*		*	
b. μμ-μ(μ'μ)		*W		*W	*		*	
c. μμ-μ(μμ')	*W	*W		*W	*		*	
d. μμ-μμμ			*W		L		L	

The table in (265) shows constraint rankings based on the comparison between the winner and the losers in (263) and (264). As MAX-PROMINENCE and NO-FLOP-PROMINENCE are irrelevant in this case, the relationship among constraints is simpler than that in (260).

(265) Constraint ranking: Type I, Unaccented root [Unaccented stem]

Stem	Compound	Comparison of candidates	Constraint ranking
2μ	[+acc]	(a) vs. (b)	(G) NON-F (Ft) >> ALIGN-L
		(a) vs. (c)	[Candidate (c) is harmonically bounded by candidate (a).]
		(a) vs. (d)	(H) CUL >> ALIGN-L, NON-F (PrWd'), DEP
2μ	[-acc]	(d) vs. (a)	(I) ALIGN-L or NON-F (PrWd') or DEP >> CUL
		(d) vs. (b)	(J) NON-F (Ft) or NON-F (PrWd') or DEP >> CUL
		(d) vs. (c)	[Candidate (c) is harmonically bounded by candidate (a).]
3μ	[+acc]	(a) vs. (b)	[Candidate (b) is harmonically bounded by candidate (a).]
		(a) vs. (c)	[Candidate (c) is harmonically bounded by candidate (a).]
		(a) vs. (d)	(K) CUL >> NON-F (PrWd'), DEP

As NON-FINALITY (PrWd') and DEP-PROMINENCE are dominated by CULMINATIVITY in (K), it is ALIGN-L (σ', root) that dominates CULMINATIVITY in (I). In short, the variation in accentedness in (263) is analyzed in terms of reranking of CULMINATIVITY and ALIGN-L (σ', root), as shown in (266). The reranking does not cause variation in (264) because ALIGN-L (σ', root) is satisfied in candidate (a) when the second element has three morae.

(266) Variation between accented compounds and unaccented compounds in (263)

a. (H) CUL >> ALIGN-L → accented

b. (I) ALIGN-L >> CUL → unaccented

Let us move on to the other possibility: the root is unaccented and the stem is final-accented. The tableaux in (267) deal with 2μ stems, while (268) deals with 3μ stems.

(267) Unaccented root [Final-accented stem], 2μ stem

a. Accented compound (e.g. kusuri'-uri)

/μμμ-μμ'/	NON-F (σ)	NON-F (Ft)	CUL	ALIGN -L	NON-F (PrWd')	MAX	DEP	NO-FLOP
☞a. μ(μμ')-μμ				*	*			*
b. μμμ-(μ'μ)		*W		L	*			*
c. μμμ-(μμ')	*W	*W		*	*			L
d. μμμ-μμ			*W	L	L	*W		L

b. Unaccented compound (e.g. koromo-gae)

/μμμ-μμ'/	NON-F (σ)	NON-F (Ft)	ALIGN -L	CUL	NON-F (PrWd')	MAX	DEP	NO-FLOP
a. μ(μμ')-μμ			*W	L	*W	L		*W
b. μμμ-(μ'μ)		*W		L	*W	L		*W
c. μμμ-(μμ')	*W	*W	*W	L	*W	L		
☞d. μμμ-μμ				*		*		

(268) Unaccented root [Final-accented stem], 3μ stem (e.g. ara-sa'gasi)

/μμ-μμμ'/	NON-F (σ)	NON-F (Ft)	CUL	ALIGN -L	NON-F (PrWd')	MAX	DEP	NO-FLOP
☞a. μμ-(μ'μ)μ					*			*
b. μμ-μ(μ'μ)		*W		*W	*			*
c. μμ-μ(μμ')	*W	*W		*W	*			L
d. μμ-μμμ			*W		L	*W		L

The table in (269) shows constraint rankings based on the comparison between the winner and the losers in (267) and (268).

(269) Constraint ranking: Type I, Unaccented root [Final-accented stem]

Stem	Compound	Comparison of candidates	Constraint ranking
2μ	[+acc]	(a) vs. (b)	(L) NON-F (Ft) >> ALIGN-L
		(a) vs. (c)	(M) NON-F (σ) or NON-F (Ft) >> NO-FLOP
		(a) vs. (d)	(N) CUL or MAX >> ALIGN-L CUL or MAX >> NON-F (PrWd') CUL or MAX >> NO-FLOP
2μ	[-acc]	(d) vs. (a)	(O) ALIGN-L or NON-F (PrWd') or NO-FLOP >> CUL ALIGN-L or NON-F (PrWd') or NO-FLOP >> MAX
		(d) vs. (b)	(P) NON-F (Ft) or NON-F (PrWd') or NO-FLOP >> CUL NON-F (Ft) or NON-F (PrWd') or NO-FLOP >> MAX
		(d) vs. (c)	(Q) NON-F (σ) or NON-F (Ft) or ALIGN-L or NON-F (PrWd') >> CUL NON-F (σ) or NON-F (Ft) or ALIGN-L or NON-F (PrWd') >> MAX
3μ	[+acc]	(a) vs. (b)	[Candidate (b) is harmonically bounded by candidate (a).]
		(a) vs. (c)	(R) NON-F (σ) or NON-F (Ft) or ALIGN-L >> NO-FLOP
		(a) vs. (d)	(S) CUL or MAX >> NON-F (PrWd') CUL or MAX >> NO-FLOP

As (N), (O) and (S) are the same as (B), (C), and (F) in (260) respectively, it follows that the variation in (267) is analyzed in the same way as (262), as shown below.

(270) Variation between accented compounds and unaccented compounds in (267)

a. (N): CUL or MAX >> ALIGN-L → accented

b. (O): ALIGN-L >> CUL, MAX → unaccented

However, the relationship between NON-FINALITY (Ft) and NO-FLOP-PROMINENCE is unknown in (269), while the former dominates the latter in (260).

In conclusion, 'accented/unaccented' variation in the cases where the stem has two morae is analyzed as the result of reranking of CULMINATIVITY, MAX-PROMINENCE and ALIGN-L (σ', root), although MAX-PROMINENCE is not relevant if the stem is unaccented. The absence of unaccentedness in the cases where the stem has three morae is explained by the dominance of the constraints which favor the accented candidate (i.e. CULMINATIVITY, MAX-PROMINENCE) over those which favor the unaccented candidate (i.e. NON-FINALITY (PrWd'), NO-FLOP-PROMINENCE and DEP-PROMINENCE). As for penultimate accent in the stem, it cannot be preserved due to the dominance of NON-FINALITY (Ft) over NO-FLOP-PROMINENCE.

3.2.6.4.2. Type IV

This section examines constraint ranking for Type IV deverbal compounds. Let us first focus on the cases where the second element is based on an unaccented root. As the stem is unaccented in such cases, the relationship among constraints is simple due to the irrelevance of MAX-PROMINENCE and NO-FLOP-PROMINENCE. The tableau in (271) deals with 2μ stems, while (272) deals with 3μ stems.

(271) Unaccented root, 2μ stem (e.g. nusumi-giki)

/μμμ-μμ/	NON-F (σ)	NON-F (Ft)	ALIGN -L	NON-F (PrWd')	CUL	MAX	DEP	NO-FLOP
a. μ(μμ')-μμ			*W	*W	L		*W	
b. μμμ-(μ'μ)		*W		*W	L		*W	
c. μμμ-(μμ')	*W	*W	*W	*W	L		*W	
☞d. μμμ-μμ					*			

(272) Unaccented root, 3μ stem

a. Accented compound (e.g. naga-tu'duki)

/μμ-μμμ/	NON-F (σ)	NON-F (Ft)	ALIGN -L	CUL	NON-F (PrWd')	MAX	DEP	NO-FLOP
☞a. μμ-(μ'μ)μ					*		*	
b. μμ-μ(μ'μ)		*W	*W		*		*	
c. μμ-μ(μμ')	*W	*W	*W		*		*	
d. μμ-μμμ				*W	L		L	

b. Unaccented compound (e.g. hiki-gatari)

/μμ-μμμ/	NON-F (σ)	NON-F (Ft)	ALIGN -L	NON-F (PrWd')	CUL	MAX	DEP	NO-FLOP
a. μμ-(μ'μ)μ				*W	L		*W	
b. μμ-μ(μ'μ)		*W	*W	*W	L		*W	
c. μμ-μ(μμ')	*W	*W	*W	*W	L		*W	
☞d. μμ-μμμ					*			

The table in (273) shows constraint rankings based on the comparison between the winner and the losers in (271) and (272).

(273) Constraint ranking: Type IV, Unaccented root

Stem	Compound	Comparison of candidates	Constraint ranking
2μ	[-acc]	(d) vs. (a)	(A) ALIGN-L or NON-F (PrWd') or DEP >> CUL
		(d) vs. (b)	(B) NON-F (Ft) or NON-F (PrWd') or DEP >> CUL
		(d) vs. (c)	(C) NON-F (σ) or NON-F (Ft) or ALIGN-L or NON-F (PrWd') or DEP >> CUL
3μ	[+acc]	(a) vs. (b)	[Candidate (b) is harmonically bounded by candidate (a).]
		(a) vs. (c)	[Candidate (c) is harmonically bounded by candidate (a).]
		(a) vs. (d)	(D) CUL >> NON-F (PrWd'), DEP
3μ	[-acc]	(d) vs. (a)	(E) NON-F (PrWd') or DEP >> CUL
		(d) vs. (b)	[Candidate (b) is harmonically bounded by candidate (a).]
		(d) vs. (c)	[Candidate (c) is harmonically bounded by candidate (a).]

As NON-FINALITY (PrWd') and DEP-PROMINENCE are dominated by CULMINATIVITY in (D), it is ALIGN-L (σ', root) that dominates CULMINATIVITY in (A). If NON-FINALITY (PrWd') or DEP-PROMINENCE dominated CUL in (A), the accented candidate could not be the winner in (272)-(a). Due to the rankings where ALIGN-L (σ', root) dominates CULMINATIVITY, Type IV compounds are always unaccented when the second element has two morae. On the other hand, there is variation in accentedness when the second element has three morae. This variation is analyzed in terms of reranking of CULMINATIVITY, NON-FINALITY (PrWd') and DEP-PROMINENCE, as shown below.

(274) Variation between accented compounds and unaccented compounds in (272)

a. (D) CUL >> NON-F (PrWd'), DEP → accented

b. (E) NON-F (PrWd') or DEP >> CUL → unaccented

(275) and (276) show the cases where the second element is based on an accented root. The former illustrates cases where the stem has two morae. The latter shows compounds where the stem has three morae, and there are two cases: accented compounds and unaccented compounds. As mentioned in 3.2.4, the stem is final-accented.

(275) Accented root, 2μ stem (e.g. naname-yomi)

/μμμ-μμ'/	NON-F (σ)	NON-F (Ft)	ALIGN -L	NON-F (PrWd')	CUL	MAX	DEP	NO-FLOP
a. μ(μμ')-μμ			*W	*W	L	L		*W
b. μμμ-(μ'μ)		*W		*W	L	L		*W
c. μμμ-(μμ')	*W	*W	*W	*W	L	L		
☞d. μμμ-μμ					*	*		

(276) Accented root, 3μ stem

a. Accented compound (e.g. tabi-du'kare)

/μμ-μμμ'/	NON-F (σ)	NON-F (Ft)	ALIGN -L	CUL	NON-F (PrWd')	MAX	DEP	NO-FLOP
☞a. μμ-(μ'μ)μ					*			*
b. μμ-μ(μ'μ)		*W	*W		*			*
c. μμ-μ(μμ')	*W	*W	*W		*			L
d. μμ-μμμ				*W	L	*W		L

b. Unaccented compound (tabe-aruki)

/μμ-μμμ'/	NON-F (σ)	NON-F (Ft)	ALIGN -L	NON-F (PrWd')	CUL	MAX	DEP	NO-FLOP
a. μμ-(μ'μ)μ				*W	L	L		*W
b. μμ-μ(μ'μ)		*W	*W	*W	L	L		*W
c. μμ-μ(μμ')	*W	*W	*W	*W	L	L		
☞d. μμ-μμμ					*	*		

The table in (277) shows constraint rankings based on the comparison between the winners and the losers in (275) and (276).

(277) Constraint ranking: Type IV, Accented root

Stem	Compound	Comparison of candidates	Constraint ranking
2μ	[-acc]	(d) vs. (a)	(A) ALIGN-L or NON-F (PrWd') or NO-FLOP >> CUL ALIGN-L or NON-F (PrWd') or NO-FLOP >> MAX
		(d) vs. (b)	(B) NON-F (Ft) or NON-F (PrWd') or NO-FLOP >> CUL NON-F (Ft) or NON-F (PrWd') or NO-FLOP >> MAX
		(d) vs. (c)	(C) NON-F (σ) or NON-F (Ft) or ALIGN-L or NON-F (PrWd') >> CUL NON-F (σ) or NON-F (Ft) or ALIGN-L or NON-F (PrWd') >> MAX
3μ	[+acc]	(a) vs. (b)	[Candidate (b) is harmonically bounded by candidate (a).]
		(a) vs. (c)	(D) NON-F (σ) or NON-F (Ft) or ALIGN-L >> NO-FLOP
		(a) vs. (d)	(E) CUL or MAX >> NON-F (PrWd') CUL or MAX >> NO-FLOP
3μ	[-acc]	(d) vs. (a)	(F) NON-F (PrWd') or NO-FLOP >> CUL NON-F (PrWd') or NO-FLOP >> MAX
		(d) vs. (b)	[Candidate (b) is harmonically bounded by candidate (a).]
		(d) vs. (c)	(G) NON-F (σ) or NON-F (Ft) or ALIGN-L or NON-F (PrWd') >> CUL NON-F (σ) or NON-F (Ft) or ALIGN-L or NON-F (PrWd') >> MAX

First, the variation between accented compounds and unaccented compounds in (276) is analyzed in terms of reranking of the following four constraints: CULMINATIVITY, NON-FINALITY (PrWd'), MAX-PROMINENCE, and NO-FLOP-PROMINENCE, as shown below.

(278) Variation between accented compounds and unaccented compounds in (276)

a. (E) Cul or Max >> Non-f (PrWd')

Cul or Max >> No-Flop → accented

b. (F) Non-f (PrWd') or No-Flop >> Cul

Non-f (PrWd') or No-Flop >> Max → unaccented

Second, based on the compatibility between (A) and (E), let us examine the relationship among Align-L (σ’, root), Culminativity and Max-Prominence. As discussed above, Align-L (σ’, root) dominates Culminativity, so there are three possibilities with regard to the constraints which dominate Max-Prominence. In any case, however, Max-Prominence is always dominated by Align-L (σ’, root), as shown in (279).

(279)

	(A)	(A)	(E)	Relationship among Align-L, Cul and Max
(a)	Align-L >> Cul	Align-L >> Max	Cul or Max >> Non-f (PrWd') Cul or Max >> No-Flop	**Align-L** >> **Cul**, **Max**
(b)	Align-L >> Cul	Non-f (PrWd') >> Max	Cul ~~or Max~~ >> Non-f (PrWd') Cul or Max >> No-Flop	**Align-L** >> **Cul** >> Non-f (PrWd') >> **Max**
(c)	Align-L >> Cul	No-Flop >> Max	Cul or Max >> Non-f (PrWd') Cul ~~or Max~~ >> No-Flop	**Align-L** >> **Cul** >> No-Flop >> **Max**

In summary, ‘accented/unaccented’ variation in the cases where the stem has three morae is analyzed as the result of reranking of some constraints. If every constraint which favors the unaccented candidate (i.e. Non-finality (PrWd'), No-Flop-Prominence and Dep-Prominence), which are referred to as C [-Acc] in 3.2.6.2, is dominated by some constraint which favors the accented candidate (i.e. C [+Acc]: Culminativity, Max-Prominence), the compound is accented. On the other hand, if every constraint which favors the accented candidate is dominated by some constraint which favors the unaccented candidate, the compound is unaccented. However, the effect of reranking does not appear in the cases where the stem has two morae: the compound is always unaccented because Align-L (σ’, root) is highly ranked in Type IV. Lastly, the relationship between Non-finality (Ft) and No-Flop-Prominence cannot be determined because an accented stem is final-accented in Type IV.

3.2.6.4.3. Noun compounds: Common cases

In order to compare deverbal compounds with noun compounds, this section examines constraint ranking in the latter. In particular, this section deals with the general patterns in noun compounds, setting aside deaccenting morphemes. The tableaux in (280)-(282) show the cases where the second element has two morae, while those in (283)-(286) deal with the cases where the second element has three morae.

(280) N2: 2μ, unaccented (e.g. miyako'-dori)

/μμμ-μμ/	NON-F (σ)	CUL	NO-FLOP	NON-F (Ft)	ALIGN -L	NON-F (PrWd')	MAX	DEP
☞a. μ(μμ')-μμ					*	*		*
b. μμμ-(μ'μ)				*W	L	*		*
c. μμμ-(μμ')	*W			*W	*	*		*
d. μμμ-μμ		*W			L	L		L

(281) N2: 2μ, final (abare'-uma)

/μμμ-μμ'/	NON-F (σ)	CUL	NO-FLOP	NON-F (Ft)	ALIGN -L	NON-F (PrWd')	MAX	DEP
☞a. μ(μμ')-μμ			*		*	*		
b. μμμ-(μ'μ)			*	*W	L	*		
c. μμμ-(μμ')	*W		L	*W	*	*		
d. μμμ-μμ		*W	L		L	L	*W	

(282) N2: 2μ, penultimate

a. Penultimate (e.g. watasi-bu'ne)

/μμμ-μ'μ/	NON-F (σ)	CUL	NO-FLOP	NON-F (Ft)	ALIGN -L	NON-F (PrWd')	MAX	DEP
a. μ(μμ')-μμ			*W	L	*W	*		
☞b. μμμ-(μ'μ)				*		*		
c. μμμ-(μμ')	*W		*W	*	*W	*		
d. μμμ-μμ		*W		L		L	*W	

b. Antepenultimate (e.g. ningyo'-hime)

/μμμ-μ'μ/	NON-F (σ)	CUL	NON-F (Ft)	NO-FLOP	ALIGN-L	NON-F (PrWd')	MAX	DEP
☞a. μ(μμ')-μμ				*	*	*		
b. μμμ-(μ'μ)			*W	L	L	*		
c. μμμ-(μμ')	*W		*W	*	*	*		
d. μμμ-μμ		*W		L	L	L	*W	

(283) N2: 3μ, unaccented (e.g. kona-gu'suri)

/μμ-μμμ/	NON-F (σ)	CUL	NO-FLOP	NON-F (Ft)	ALIGN-L	NON-F (PrWd')	MAX	DEP
☞a. μμ-(μ'μ)μ						*		*
b. μμ-μ(μ'μ)				*W	*W	*		*
c. μμ-μ(μμ')	*W			*W	*W	*		*
d. μμ-μμμ		*W				L		L

(284) N2: 3μ, final (e.g. yama-o'toko)

/μμ-μμμ'/	NON-F (σ)	CUL	NO-FLOP	NON-F (Ft)	ALIGN-L	NON-F (PrWd')	MAX	DEP
☞a. μμ-(μ'μ)μ			*			*		
b. μμ-μ(μ'μ)			*	*W	*W	*		
c. μμ-μ(μμ')	*W		L	*W	*W	*		
d. μμ-μμμ		*W	L			L	*W	

(285) N2: 3μ, penultimate

a. Penultimate (e.g. sibu-uti'wa)

/μμ-μμ'μ/	NON-F (σ)	CUL	NO-FLOP	NON-F (Ft)	ALIGN-L	NON-F (PrWd')	MAX	DEP
a. μμ-(μ'μ)μ			*W	L	L	*		
☞b. μμ-μ(μ'μ)				*	*	*		
c. μμ-μ(μμ')	*W		*W	*	*	*		
d. μμ-μμμ		*W		L	L	L	*W	

b. Antepenultimate (e.g. oya-go'koro)

/μμ-μμ'μ/	NON-F (σ)	CUL	NON-F (Ft)	NO-FLOP	ALIGN-L	NON-F (PrWd’)	MAX	DEP
☞a. μμ-(μ'μ)μ				*		*		
b. μμ-μ(μ'μ)			*W	L	*W	*		
c. μμ-μ(μμ')	*W		*W	*	*W	*		
d. μμ-μμμ		*W		L		L	*W	

(286) N2: 3μ, antepenultimate (e.g. tetu-ka'buto)

/μμ-μ'μμ/	NON-F (σ)	CUL	NO-FLOP	NON-F (Ft)	ALIGN-L	NON-F (PrWd’)	MAX	DEP
☞a. μμ-(μ'μ)μ						*		
b. μμ-μ(μ'μ)			*W	*W	*W	*		
c. μμ-μ(μμ')	*W		*W	*W	*W	*		
d. μμ-μμμ		*W				L	*W	

The table in (287) shows constraint rankings based on the comparison between the winners and losers in (280)-(286).

(287) Constraint ranking in noun compounds

a. 2μ stem

Stem	Compound	Comparison of candidates	Constraint ranking
0	-3	(a) vs. (b)	(A) NON-FIN (Ft) >> ALIGN-L
		(a) vs. (c)	[Candidate (c) is harmonically bounded by candidate (a).]
		(a) vs. (d)	(B) CUL >> ALIGN-L, NON-FIN (PrWd'), DEP
-1	-3	(a) vs. (b)	(C) NON-FIN (Ft) >> ALIGN-L
		(a) vs. (c)	(D) NON-FIN (σ) or NON-FIN (Ft) >> NO-FLOP
		(a) vs. (d)	(E) CUL or MAX >> NO-FLOP CUL or MAX >> ALIGN-L CUL or MAX >> NON-F (PrWd')
-2	-2	(b) vs. (a)	(F) NO-FLOP or ALIGN-L >> NON-FIN (Ft)
		(b) vs. (c)	[Candidate (c) is harmonically bounded by candidate (b).]
		(b) vs. (d)	(G) CUL or MAX >> NON-F (Ft) CUL or MAX >> NON-F (PrWd')
-2	-3	(a) vs. (b)	(H) NON-FIN (Ft) >> NO-FLOP, ALIGN-L
		(a) vs. (c)	[Candidate (c) is harmonically bounded by candidate (b).]
		(a) vs. (d)	(I) CUL or MAX >> NO-FLOP CUL or MAX >> ALIGN-L CUL or MAX >> NON-F (PrWd')

b. 3μ stem

Stem	Compound	Comparison of candidates	Constraint ranking
0	-3	(a) vs. (b)	[Candidate (b) is harmonically bounded by candidate (a).]
		(a) vs. (c)	[Candidate (c) is harmonically bounded by candidate (a).]
		(a) vs. (d)	(J) CUL >> NON-FIN (PrWd'), DEP
-1	-3	(a) vs. (b)	[Candidate (b) is harmonically bounded by candidate (a).]
		(a) vs. (c)	(K) NON-FIN (σ) or NON-FIN (Ft) or ALIGN-L >> NO-FLOP
		(a) vs. (d)	(L) CUL or MAX >> NO-FLOP CUL or MAX >> NON-F (PrWd')
-2	-2	(b) vs. (a)	(M) NO-FLOP >> NON-FIN (Ft), ALIGN-L
		(b) vs. (c)	[Candidate (c) is harmonically bounded by candidate (b).]
		(b) vs. (d)	(N) CUL or MAX >> NON-F (Ft) CUL or MAX >> ALIGN-L CUL or MAX >> NON-F (PrWd')
-2	-3	(a) vs. (b)	(O) NON-FIN (Ft) or ALIGN-L >> NO-FLOP
		(a) vs. (c)	[Candidate (c) is harmonically bounded by candidate (b).]
		(a) vs. (d)	(P) CUL or MAX >> NO-FLOP CUL or MAX >> NON-F (PrWd')
-3	-3	(a) vs. (b)	[Candidate (b) is harmonically bounded by candidate (a).]
		(a) vs. (c)	[Candidate (c) is harmonically bounded by candidate (a).]
		(a) vs. (d)	(Q) CUL or MAX >> NON-F (PrWd')

In each comparison which includes the unaccented candidate in (287), any constraint which favors the unaccented candidate (i.e. C [-ACC]) is dominated by some constraint which favors the accented candidate (i.e. C [+ACC]). Consequently, the winner is always accented. Since ALIGN-L (σ', root) is dominated by CULMINATIVITY as shown in (B), the unaccented candidate loses even if the second element has two morae. In contrast, the accented candidate can be the winner in deverbal compounds. The relationship between ALIGN-L (σ', root) and CULMINATIVITY is one of the characteristics which distinguish noun compounds from deverbal compounds.

Another characteristic of noun compounds is the relationship between NO-FLOP-PROMINENCE and NON-FINALITY (Ft). As shown in (F), NO-FLOP-PROMINENCE or ALIGN-L (σ', root) dominates NON-FINALITY (Ft) in the cases where the penultimate accent is preserved, but it can be restated based on (A). As NON-FINALITY (Ft) dominates ALIGN-L (σ', root) in (A), it is NO-FLOP-PROMINENCE that dominates NON-FINALITY (Ft). In contrast, NON-FINALITY (Ft) dominates NO-FLOP-PROMINENCE in the cases where the penultimate accent is not preserved, as shown in (H). That is, the variation in (282) and (285) is analyzed as the reranking of NON-FINALITY (Ft) and NO-FLOP-PROMINENCE. In contrast, NON-FINALITY (Ft) always dominates NO-FLOP-PROMINENCE in Type I deverbal compounds, so penultimate accent cannot be preserved. With regard to Type IV deverbal compounds, the relationship between the two constraints is unknown because an accented stem is final-accented.

3.2.6.4.4. Noun compounds: Special cases (deaccenting morphemes)

3.2.6.4.4.1. Analysis of two restrictions

Noun compounds whose second element is a deaccenting morpheme are similar to deverbal compounds in that the length of the second element affects accentuation. Specifically, deaccenting morphemes are found only in nouns whose second element has two morae. In addition, deaccenting morphemes share another property: they are final-accented. This section examines the constraint ranking which explains deaccenting morphemes, focusing on these two properties.

First, why are deaccenting morphemes limited to *final-accented* nouns? The answer lies in NON-FINALITY (σ). /μμμ-μμ'/ cannot preserve the original accent due to this constraint. If NO-FLOP-PROMINENCE is ranked high, deaccentuation is the only strategy for avoiding the violation of NON-FINALITY (σ). As shown in (288), candidates (a-c) violate NON-FINALITY (σ) or NO-FLOP-PROMINENCE, while candidate (d), where deaccentuation occurs, satisfies both.[36]

[36] The ranking in (288) and (289) is tentative; it needs elaboration, as discussed later.

(288) Occurrence of deaccentuation (N2: final-accented)

/μμμ-μμ'/	NON-FIN (σ)	NO-FLOP	CULMINATIVITY	NON-FIN (Ft)	DEP
a. μ(μμ')-μμ		*!			
b. μμμ-(μ'μ)		*!		*	
c. μμμ-(μμ')	*!			*	
☞d. μμμ-μμ			*		

On the other hand, /μμμ-μ'μ/ and /μμμ-μμ/ do not undergo deaccentuation even if NO-FLOP-PROMINENCE is ranked high, preserving the original accent or inserting a new accent (i.e. [μμμ-μ'μ] and [μμμ'-μμ], respectively).

(289) Non-occurrence of deaccentuation

a. N2: penultimate-accented

/μμμ-μ'μ/	NON-FIN (σ)	NO-FLOP	CULMINATIVITY	NON-FIN (Ft)	DEP
a. μ(μμ')-μμ		*!			
☞b. μμμ-(μ'μ)				*	
c. μμμ-(μμ')	*!	*!		*	
d. μμμ-μμ			*!		

b. N2: unaccented

/μμμ-μμ/	NON-FIN (σ)	NO-FLOP	CULMINATIVITY	NON-FIN (Ft)	DEP
☞a. μ(μμ')-μμ					*
b. μμμ-(μ'μ)				*!	*
c. μμμ-(μμ')	*!			*	*
d. μμμ-μμ			*!		

As shown in (289)-(a), candidate (b), which preserves the accent in the input, satisfies both NON-FINALITY (σ) and NO-FLOP-PROMINENCE. Although candidate (d) also satisfies the two constraints, it violates CULMINATIVITY. Therefore, candidate (b) is selected as the winner. Likewise, candidate (d) is excluded due to the violation of CULMINATIVITY in (289)-(b), and candidate (a) is selected as the winner. This explains why deaccenting morphemes are found only among final-accented N2s.

Let us move on to the second property of deaccenting morphemes. Why are they limited to nouns which have two morae? As discussed in 3.2.6.2, this correlation between the length and unaccentedness is also found in deverbal compounds. The correlation can be accounted for by ALIGN-L (σ', root), which requires that the left edge of any accented syllable should be aligned with the left edge of a head root. That is, deaccentuation is a strategy for avoiding the violation of ALIGN-L (σ', root), as shown below.[37]

(290) Occurrence of deaccentuation (N2: two morae)

/μμμ-μμ'/	ALIGN-L (σ', root)	CULMINATIVITY
a. μ(μμ')-μμ	*!	
☞b. μμμ-μμ		*

In contrast, deaccentuation does not occur if the second element has three morae, as shown in (291). This is because candidate (a) satisfies ALIGN-L (σ', root).

(291) Non-occurrence of deaccentuation (N2: three morae)

/μμ-μμμ'/	ALIGN-L (σ', root)	CULMINATIVITY
☞a. μμ-(μ'μ)μ		
b. μμ-μμμ		*!

To summarize, the two properties of deaccenting morphemes (i.e. final-accented, two morae) are accounted for by the ranking in (292), although some modification is necessary as discussed in the next section.

(292) Tentative ranking:

NON-FIN (σ), NO-FLOP, ALIGN-L (σ', root) >> CULMINATIVITY >> NON-FIN (Ft), DEP

3.2.6.4.4.2. Revision of constraint ranking

As discussed in the previous section, deaccentuation is a strategy for avoiding the violation of NON-FINALITY (σ), NO-FLOP-PROMINENCE, and ALIGN-L (σ', root). However, the ranking in (292) needs elaboration for two reasons. First, the ranking NO-FLOP-PROMINENCE >> CULMINATIVITY would predict that deaccentuation occurs when N2 is final-accented and has three morae. As shown in (293), candidate (a), which is the desired output, is wrongly excluded due to the violation of NO-FLOP-PROMINENCE.

[37] The ranking in (290) and (291) is tentative; it needs elaboration, as discussed later.

(293) N2: three morae, final-accented

/μμ-μμμ'/	NON-FIN (σ)	NO-FLOP	ALIGN-L	CUL	NON-FIN (Ft)	DEP
☜a. μμ-(μ'μ)μ		*!				
b. μμ-μ(μ'μ)		*!	*!		*	
c. μμ-μ(μμ')	*!		*!		*	
×d. μμ-μμμ				*		

(×: wrongly selected, ☜: desired)

In contrast, the ranking in (292) selects the correct winner when N2 is final-accented and has two morae. In (294), candidate (b) is correctly excluded due to the violation of NO-FLOP-PROMINENCE.

(294) N2: two morae, final-accented

/μμμ-μμ'/	NON-FIN (σ)	NO-FLOP	ALIGN-L	CUL	NON-FIN (Ft)	DEP
a. μ(μμ')-μμ		*!	*!			
b. μμμ-(μ'μ)		*!			*	
c. μμμ-(μμ')	*!		*!		*	
☞d. μμμ-μμ				*		

That is, the ranking NO-FLOP-PROMINENCE >> CULMINATIVITY wrongly excludes the mapping /μμ-μμμ'/ → [μμ-(μ'μ)μ] in (293), while it correctly blocks the mapping /μμμ-μμ'/ → *[μμμ-(μ'μ)] in (294). Although this may seems inexplicable, there is one difference between these two mappings: only the latter violates NON-FINALITY (Ft). This implies that the violation of NO-FLOP-PROMINENCE should be permitted when NON-FINALITY (Ft) is satisfied. Consequently, we need to posit a conjoined constraint [NO-FLOP-PROMINENCE & NON-FINALITY (Ft)]$_{PrWd}$, which is violated if both NO-FLOP-PROMINENCE and NON-FINALITY (Ft) are violated. As shown in (295), candidate (a) (i.e. /μμ-μμμ'/ → [μμ-(μ'μ)μ]) is correctly selected as the winner because it satisfies [NO-FLOP-PROMINENCE & NON-FINALITY (Ft)]$_{PrWd.}$

(295) N2: three morae, final-accented

/μμ-μμμ'/	NON-FIN (σ)	NO-FLOP & NON-FIN (Ft)	ALIGN-L	CUL	NO-FLOP	NON-FIN (Ft)	DEP
☞a. μμ-(μ'μ)μ					*		
b. μμ-μ(μ'μ)		*!	*!		*	*	
c. μμ-μ(μμ')	*!		*!			*	
d. μμ-μμμ				*			

The ranking in (295) also correctly excludes candidate (b) (i.e. /μμμ-μμ'/ → *[μμμ-(μ'μ)]), which violates [NO-FLOP-PROMINENCE & NON-FINALITY (Ft)]$_{PrWd}$, as shown in (296).

(296) N2: two morae, final-accented

/μμμ-μμ'/	NON-FIN (σ)	NO-FLOP & NON-FIN (Ft)	ALIGN-L	CUL	NO-FLOP	NON-FIN (Ft)	DEP
a. μ(μμ')-μμ			*!		*		
b. μμμ-(μ'μ)		*!			*	*	
c. μμμ-(μμ')	*!		*!			*	
☞d. μμμ-μμ				*			

The second reason for modifying the ranking in (292) is found in the cases where the second element is unaccented and has two morae. As shown in (297), ALIGN-L (σ', root) wrongly excludes candidate (a) (i.e. /μμμ-μμ/ → [μ(μμ')-μμ]), while it correctly excludes candidate (a) (i.e. /μμμ-μμ'/ → *[μ(μμ')-μμ]) in (296).

(297) N2: two morae, unaccented

/μμμ-μμ/	NON-FIN (σ)	NO-FLOP & NON-FIN (Ft)	ALIGN-L	CUL	NO-FLOP	NON-FIN (Ft)	DEP
☜a. μ(μμ')-μμ			*!				*
× b. μμμ-(μ'μ)						*	*
c. μμμ-(μμ')	*!		*!			*	*
d. μμμ-μμ				*!			

(×: wrongly selected, ☜: desired)

In other words, the ranking ALIGN-L (σ', root) >> CULMINATIVITY wrongly excludes the mapping /μμμ-μμ/ → [μ(μμ')-μμ] in (297), while it correctly blocks the mapping /μμμ-μμ'/ →

*[μ(μμ')-μμ]) in (296). What is the difference between these two mappings? The answer lies in the difference in NO-FLOP-PROMINENCE, which is violated only in the latter mapping. This implies that the violation of ALIGN-L (σ', root) should be permitted when NO-FLOP-PROMINENCE is satisfied. Consequently, we need to posit a conjoined constraint [NO-FLOP-PROMINENCE & ALIGN-L (σ', root)]$_{PrWd}$.

As shown in (298), candidate (b) is correctly excluded due to the ranking NON-FINALITY (Ft) >> ALIGN-L (σ', root). The winner is candidate (a), which satisfies [NO-FLOP-PROMINENCE & ALIGN-L (σ', root)]$_{PrWd}$.

(298) N2: two morae, unaccented

/μμμ-μμ/	NON-F (σ)	NO-FLOP& NON-F (Ft)	NO-FLOP& ALIGN-L	CUL	NO-FLOP	NON-F (Ft)	ALIGN -L	DEP
☞a. μ(μμ')-μμ							*	*
b. μμμ-(μ'μ)						*!		*
c. μμμ-(μμ')	*!					*	*	*
d. μμμ-μμ				*!				

In contrast, candidate (a), which violates [NO-FLOP-PROMINENCE & ALIGN-L (σ', root)]$_{PrWd}$, is correctly excluded and candidate (d) is selected as the winner in (299).

(299) N2: two morae, final-accented

/μμμ-μμ'/	NON-F (σ)	NO-FLOP& NON-F (Ft)	NO-FLOP& ALIGN-L	CUL	NO-FLOP	NON-F (Ft)	ALIGN -L	DEP
a. μ(μμ')-μμ			*!		*		*	
b. μμμ-(μ'μ)		*!			*	*		
c. μμμ-(μμ')	*!					*	*	
☞d. μμμ-μμ				*				

In summary, the two properties of deaccenting morphemes are explained by the ranking in which the two conjoined constraints are dominant: [NO-FLOP-PROMINENCE & NON-FINALITY (Ft)]$_{PrWd}$ and [NO-FLOP-PROMINENCE & ALIGN-L (σ', root)]$_{PrWd}$. The effect of ALIGN-L (σ', root) appears only in limited cases, compared to deverbal compounds, where it is more widespread.

3.2.6.4.4.3. Tableaux of deaccentuation

This section shows tableaux comprehensively to confirm the effect of the two conjoined constraints. NON-FINALITY (PrWd') and MAX-PROMINENCE are also included in the tableaux. The tableaux in (300)-(303) show the cases where N2 has two morae. If N2 is final-accented, the original accent cannot be preserved due to NON-FINALITY (σ); therefore, candidate (c) is excluded. Candidates (a) and (b), which undergo accent shift, violate [NO-FLOP-PROMINENCE & ALIGN-L (σ', root)]$_{PrWd}$ and [NO-FLOP-PROMINENCE & NON-FINALITY (Ft)]$_{PrWd}$, respectively. Thus, unaccented candidate (d) is selected as the winner. This is the way to account for deaccentuation.

(300) N2: 2μ, final

/μμμ-μμ'/	NON-F (σ)	NO-FLOP & NON-F (Ft)	NO-FLOP & ALIGN-L	CUL	NO-FLOP	NON-F (Ft)	ALIGN-L	NON-F (PrWd')	MAX	DEP
a. μ(μμ')-μμ			*W	L	*W		*W	*W	L	
b. μμμ-(μ'μ)		*W		L	*W	*W		*W	L	
c. μμμ-(μμ')	*W			L		*W	*W	*W	L	
☞d. μμμ-μμ				*					*	

If N2 is penultimate-accented, both candidate (b) and candidate (d) satisfy the three higher-ranked constraints: NON-FINALITY (σ), [NO-FLOP-PROMINENCE & ALIGN-L (σ', root)]$_{PrWd}$ and [NO-FLOP-PROMINENCE & NON-FINALITY (Ft)]$_{PrWd}$. In this case, deaccentuation does not occur because candidate (d) violates CULMINATIVITY; instead, candidate (b), which preserves the original accent, is selected as the winner.

(301) N2: 2μ, penultimate

/μμμ-μ'μ/	NON-F (σ)	NO-FLOP & NON-F (Ft)	NO-FLOP & ALIGN-L	CUL	NO-FLOP	NON-F (Ft)	ALIGN-L	NON-F (PrWd')	MAX	DEP
a. μ(μμ')-μμ			*W		*W	L	*W	*		
☞b. μμμ-(μ'μ)						*		*		
c. μμμ-(μμ')	*W	*W			*W	*	*W	*		
d. μμμ-μμ				*W		L		L	*W	

If N2 is unaccented, candidates (a), (b), and (d) satisfy NON-FINALITY (σ), [NO-FLOP-PROMINENCE & ALIGN-L (σ', root)]$_{PrWd}$ and [NO-FLOP-PROMINENCE & NON-FINALITY (Ft)]$_{PrWd}$. Candidates (b) and (d) are excluded due to the violation of NON-FINALITY (Ft) and CULMINATIVITY, respectively. Therefore, candidate (a) is selected as the winner.

(302) N2: 2μ, unaccented

/μμμ-μμ/	NON-F (σ)	NO-FLOP & NON-F (Ft)	NO-FLOP & ALIGN-L	CUL	NO-FLOP	NON-F (Ft)	ALIGN-L	NON-F (PrWd')	MAX	DEP
☞a. μ(μμ')-μμ							*	*		*
b. μμμ-(μ'μ)						*W	L	*		*
c. μμμ-(μμ')	*W					*W	*	*		*
d. μμμ-μμ				*W			L	L		L

The tableaux in (303)-(306) show the cases where N2 has three morae. If N2 is final-accented, candidate (a) is selected as the winner because it satisfies [NO-FLOP-PROMINENCE & ALIGN-L (σ', root)]$_{PrWd}$. In contrast, this conjoined constraint excludes candidate (a) (i.e. [μ(μμ')-μμ]) in (300), which explains why deaccentuation is limited to the cases in which N2 has two morae.

(303) N2: 3μ, final

/μμ-μμμ'/	NON-F (σ)	NO-FLOP & NON-F (Ft)	NO-FLOP & ALIGN-L	CUL	NO-FLOP	NON-F (Ft)	ALIGN-L	NON-F (PrWd')	MAX	DEP
☞a. μμ-(μ'μ)μ					*			*		
b. μμ-μ(μ'μ)		*W			*	*W	*W	*		
c. μμ-μ(μμ')	*W				L	*W	*W	*		
d. μμ-μμμ				*W	L			L	*W	

If N2 is penultimate-accented, candidate (a) or candidate (b), both of which satisfy NON-FINALITY (σ), [NO-FLOP-PROMINENCE & ALIGN-L (σ', root)]$_{PrWd}$, [NO-FLOP-PROMINENCE & NON-FINALITY (Ft)]$_{PrWd}$, and CULMINATIVITY, can be the winner. The selection of the actual winner depends on the ranking of NO-FLOP-PROMINENCE and NON-FINALITY (Ft).

(304) N2: 3μ, penultimate

a. NO-FLOP-PROMINENCE >> NON-FINALITY (Ft)

/μμ-μμ'μ/	NON-F (σ)	NO-FLOP & NON-F (Ft)	NO-FLOP & ALIGN-L	CUL	NO-FLOP	NON-F (Ft)	ALIGN-L	NON-F (PrWd')	MAX	DEP
a. μμ-(μ'μ)μ					*W	L	L	*		
☞b. μμ-μ(μ'μ)						*	*	*		
c. μμ-μ(μμ')	*W	*W	*W		*W	*	*	*		
d. μμ-μμμ				*W		L	L	L	*W	

b. NON-FINALITY (Ft) >> NO-FLOP-PROMINENCE

/μμ-μμ'μ/	NON-F (σ)	NO-FLOP & NON-F (Ft)	NO-FLOP & ALIGN-L	CUL	NON-F (Ft)	NO-FLOP	ALIGN-L	NON-F (PrWd')	MAX	DEP
☞a. μμ-(μ'μ)μ						*		*		
b. μμ-μ(μ'μ)					*W	L	*W	*		
c. μμ-μ(μμ')	*W	*W	*W		*W	*	*W	*		
d. μμ-μμμ				*W		L		L	*W	

If N2 is antepenultimate-accented, the winner is candidate (a), which satisfies all the constraints except for NON-FINALITY (PrWd'). Therefore, deaccentuation does not occur.

(305) N2: 3μ, antepenultimate

/μμ-μ'μμ/	NON-F (σ)	NO-FLOP & NON-F (Ft)	NO-FLOP & ALIGN-L	CUL	NO-FLOP	NON-F (Ft)	ALIGN-L	NON-F (PrWd')	MAX	DEP
☞a. μμ-(μ'μ)μ								*		
b. μμ-μ(μ'μ)		*W	*W		*W	*W	*W	*		
c. μμ-μ(μμ')	*W	*W	*W		*W	*W	*W	*		
d. μμ-μμμ				*W				L	*W	

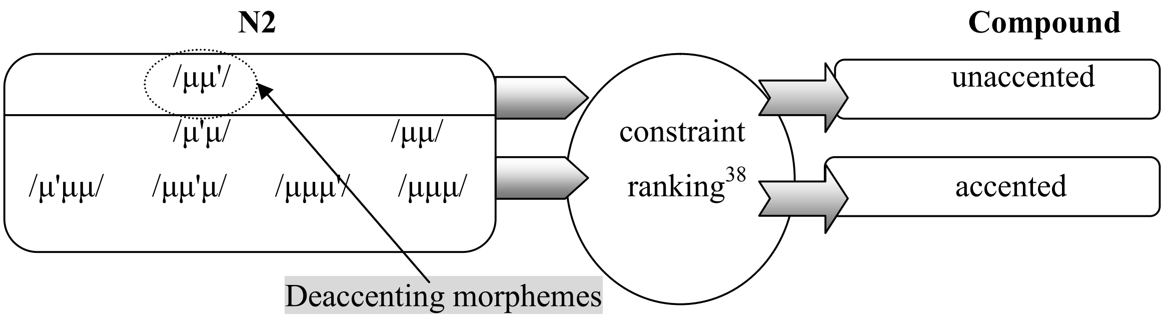
If N2 is unaccented, candidates (a), (b) and (c) violate DEP-PROMINENCE. Candidates (b) and (c) also violate other constraints. Although candidate (d) satisfies DEP-PROMINENCE, it violates CULMINATIVITY, which is ranked higher than DEP-PROMINENCE. Thus, candidate (a) is selected as the winner.

(306) N2: 3μ, unaccented

/μμ-μμμ/	NON-F (σ)	NO-FLOP & NON-F (Ft)	NO-FLOP & ALIGN-L	CUL	NO-FLOP	NON-F (Ft)	ALIGN-L	NON-F (PrWd')	MAX	DEP
☞a. μμ-(μ'μ)μ								*		*
b. μμ-μ(μ'μ)						*W	*W	*		*
c. μμ-μ(μμ')	*W					*W	*W	*		*
d. μμ-μμμ				*W				L		L

In summary, ALIGN-L (σ', root) plays an important role in noun compounds as well as in deverbal compounds. However, the effect of the constraint is less prominent in the former. The violation of ALIGN-L (σ', root) is allowed unless NO-FLOP-PROMINENCE is violated. The OT analysis of deaccenting morphemes proposed in this section has another advantage: it explains the skewed distribution of deaccenting morphemes by constraint interaction rather than by mere specification in the lexicon. As shown in (300)-(306), where the ranking is the same, the effect of deaccentuation appears only for /μμ'/. That is, it is not necessary to limit deaccenting morphemes to /μμ'/ in the lexicon, as shown below.

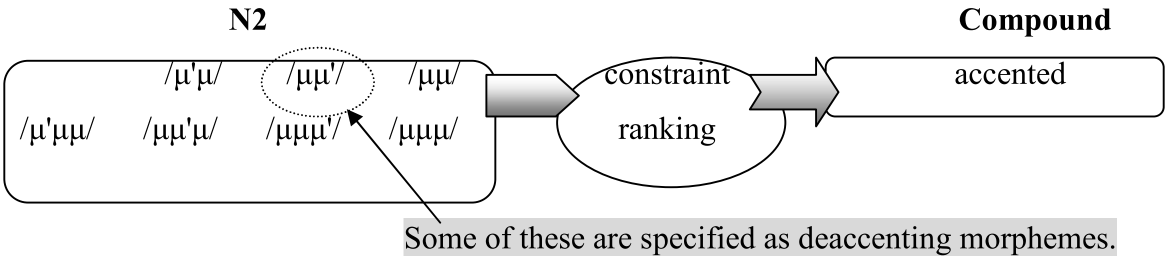
(307) Deaccentuation as the result of constraint interaction



In contrast, deaccenting morphemes are specified in the lexicon as shown in (308) if they are considered to be mere exceptions. In this approach, it is not clear why deaccenting morphemes are limited to /μμ'/.

38 The 'constraint ranking' in (307) and that in (308) are different. The former includes [NO-FLOP-PROMINENCE & ALIGN-L (σ', root)]$_{PrWd}$ and [NO-FLOP-PROMINENCE & NON-FINALITY (Ft)]$_{PrWd}$.

(308) Deaccentuation as the specification in the lexicon



3.2.6.5. Summary

This section compares the constraint rankings of three kinds of compounds: noun compounds (common cases), Type I deverbal compounds, and Type IV deverbal compounds. As shown in (309), the rankings are compared in terms of two aspects: the relationship between NON-FINALITY (Ft) and NO-FLOP-PROMINENCE and the relationship between C[+ACC] and ALIGN-L (σ', root). The former is related to the position of accent (i.e. preservation of penultimate accent or the shift to antepenultimate position), while the latter is related to unaccentedness. These two aspects are important criteria in explaining the similarities and differences among the three kinds of compounds.

(309) Differences among three types of compounds

Type of compound	(i) Preservation of penultimate accent	(ii) Accentedness
Noun compound	**Possible** NON-FIN (Ft), NO-FLOP	・**Accented [2, 3μ]**[39] C[+ACC] >> ALIGN-L (σ', root) , C[-ACC] [Unaccentedness is found in noun compounds which include a deaccenting morpheme.]
Deverbal compound (Type I)	**Impossible** NON-FIN (Ft) >>NO-FLOP	・**Accented / Unaccented [2μ]** ・**Accented [3μ]** ALIGN-L (σ', root), C[+ACC] >> C[-ACC]
Deverbal compound (Type IV)	—	・**Unaccented [2μ]** ・**Accented / Unaccented [3μ]** ALIGN-L (σ', root) >> C[+ACC], C[-ACC]

With regard to the first criterion, NON-FINALITY (Ft) and NO-FLOP-PROMINENCE are freely ranked in noun compounds, so a penultimate accent in the input can be preserved in the output (e.g. watasi + hu'ne → watasi-bu'ne 'carrying across + ship; ferryboat'). On the other

[39] The number of morae of the second element is shown in square brackets.

hand, the penultimate accent is not allowed in Type I deverbal compounds because NON-FINALITY (Ft) dominates NO-FLOP-PROMINENCE. In Type IV deverbal compounds, the stem is final-accented if it is based on an accented root. Consequently, the relationship between the two constraints is unknown.

As for the second criterion, the unaccented pattern is not found in noun compounds since C[+ACC] dominates ALIGN-L (σ', root) and C[-ACC]. On the other hand, as ALIGN-L (σ', root) dominates C[+ACC] in Type IV compounds, only the unaccented pattern is observed when the second element has two morae. If the length of the second element is three morae, there is variation between [+accented] and [-accented], as ALIGN-L (σ', root) is satisfied. C[+ACC] and ALIGN-L (σ', root) are freely ranked in Type I deverbal compounds, so both accented and unaccented patterns are observed when the second element has two morae, showing intermediate behavior between noun compounds and Type IV deverbal compounds. In summary, the differences in accentuation among the three kinds of compounds are analyzed as differences in constraint ranking.

3.3. Motivation of constraint ranking

In Optimality Theory, differences between systems are explained by differences in constraint ranking, and each constraint has some motivation. However, constraint ranking itself is not in general explained by independent evidence, although some related constraints have fixed ranking. This section argues that the constraint ranking in (309) has some motivation which is related to 'lexical categories' of compounds (i.e. nominal /adjectival/verbal). Although nominal compounds and deverbal compounds are nouns morphologically, some of the latter are adjective-like or verb-like, as shown in (56).[40]

This section is organized as follows. First, 3.3.1 argues that 'lexical categories' of deverbal compounds depend on two criteria, based on the discussion of Croft (1991). It is shown that noun compounds are more noun-like than Type I deverbal compounds and that Type I deverbal compounds are more noun-like than Type IV deverbal compounds. 3.3.2 shows that noun-like words are more likely to be accented than adjective-like or verb-like words, which implies that constraints which favor [+accented] (e.g. CULMINATIVITY) are ranked high in the former. 3.3.3 explains the high ranking of NO-FLOP-PROMINENCE in noun

[40] It must be noted that deverbal compounds which are adjectival (e.g. kane-mo'ti 'rich') and deverbal compounds which are verbal (e.g. tati-yomi 'browsing') are not formally adjectives and verbs, respectively. As mentioned in 1.6.3, adjectives and verbs have conjugational endings, such as *taka'-i* 'high (non-past)' and *tabe'-ru* 'eat (non-past)'.

compounds based on 'noun faithfulness' (Smith 2001). 3.3.4 concludes this section with a summary.

3.3.1. 'Lexical category' of compounds

Deverbal compounds, which do not conjugate like real verbs and adjectives, are nouns morphologically. However, as discussed in 1.6, some are adjective-like or verb-like in two respects: meaning and function. First, deverbal compounds have various meanings, such as 'act', 'phenomenon', 'agent', 'instrument', 'property', 'place', 'time', and 'state', as exemplified in (40) and (41). For example, 'agent' and 'instrument' are nominal, while 'property' and 'state' are adjectival, and 'act' is verbal. Second, some deverbal compounds function as predicates by co-occurring with -*suru* 'do' or -*da* (copula)/*no* (genitive), as shown in 1.6.2.2. Deverbal compounds which co-occur with -*suru* 'do' are verbal. For example, both *kusa-ka'ri* 'mowing' (Type I) and *tati-yomi* 'browsing' (Type IV) denote 'acts' semantically, but only the latter can co-occur with -*suru* 'do'. In this respect, the latter is more verb-like than the former. Deverbal compounds which co-occur with -*da* (copula)/*no* (genitive), such as *kane-mo'ti* 'rich' (Type I) and *kuro-koge* 'burned black', are adjectival (Type IV).

This section considers 'lexical category' of compounds (i.e. nominal /adjectival/verbal) based on these two criteria, following Croft (1991). With regard to the noun/adjective/verb distinction, Croft (1991) argues that each syntactic category has a prototypical semantic class and pragmatic function, as shown in (310).

(310) Croft(1991: 55): Prototypical correlations of syntactic categories

	Syntactic Category		
	Noun	*Adjective*	*Verb*
Semantic class	Object	Property	Action
Pragmatic function	Reference	Modification	Predication

The three combinations of semantic class and pragmatic function in (310) (i.e. {Object} × {Reference}, {Property} × {Modification}, {Action} × {Predication}) are typical ones, but there are also non-typical combinations, as shown in (311) with English examples.

(311) English examples of marked and unmarked correlations (Croft 1991: 53)

	Reference	Modification	Predication
Objects	vehicle	vehicle*'s*, vehicul*ar* *of/in/etc.* the vehicle	*be* a/the vehicle
Properties	white*ness*	white	*be* white
Actions	destruc*tion*, *to* destroy	destroy*ing*, destroy*ed*	destroy

In this table, *vehicle*, *white*, and *destroy* are the examples of unmarked combinations. In contrast, the others are marked combinations and have additional morphemes such as *-ness* in *whiteness*.

To return to 'lexical category' of compounds, noun compounds refer to objects (i.e. {Object} × {Reference}). Then, to what combination do Type I and Type IV deverbal compounds belong? As discussed in 1.6, Type I deverbal compounds have various meanings, such as 'agent', 'instrument', 'place', 'time', 'property' and 'act'. Semantically, 'property' is adjectival, and 'act' is verbal, while the others are nominal. First, Type I deverbal compounds which are semantically nominal correspond to {Object} × {Reference} (e.g. hituzi'-kai 'shepherd'), which is the same combination as in noun compounds. Second, Type I deverbal compounds which denote 'property' correspond to {Property} × {Modification}, modifying nouns with *-na* (copula) or *-no* (genitive) (e.g. kane-mo'ti no otoko' 'rich man'). Third, Type I compounds which denote 'act' correspond to {Action} × {Reference}. As discussed in Ito and Sugioka (2002), deverbal compounds where the first element is an internal argument have the function of naming an action, so the pragmatic function in this case is {Reference}, which is "to get the hearer to identify an entity as what the speaker is talking *about*" (Croft 1991: 52). In addition, Type I compounds which denote 'act' require *o* before *suru* 'do' (e.g. kusa-ka'ri o suru 'to mow grass'), which is the same as a noun (e.g. yakyuu o suru 'to play baseball'), as pointed out by Ito and Sugioka (2002).

In contrast, Type IV deverbal compounds which denote 'act' correspond to {Action} × {Predication}. As discussed in Sugioka (2002), they do not require *o* before *suru* 'do' (e.g. (42)-(c) taka-no'zomi suru 'to aim too high'). In addition, they take an object if the verb in the second element is a transitive verb (e.g. (42)-(a) syuuka'nsi o tati-yomi suru 'to browse a weekly magazine'). On the other hand, Type I deverbal compounds cannot co-occur with an object because it is already incorporated into the compound. That is, 'act' in Type I and 'act' in Type IV are different in pragmatic function, although they belong to the same semantic class. Another main meaning of Type IV deverbal compounds is 'state'. As shown in (43), Type IV deverbal compounds which denote 'state' correspond to {Property} × {Modification}, modifying nouns with *-da* (copula) or *-no* (genitive) (e.g. (43)-(b) mizin-giri no yasai 'minced vegetables').

The table in (312) summarizes the discussion above. The three cells which are circled indicate the prototypical combinations (i.e. {Object} × {Reference}, {Property} × {Modification}, {Action} × {Predication}). (A), (B), and (C) in the table refer to noun compounds, Type I deverbal compounds, and Type IV deverbal compounds, respectively.

(312)

	Reference	**Modification**	**Predication**
Objects	(A) watasi-bu'ne (B) hituzi'-kai		
Properties		(B) kane-mo'ti (no) (C) mizin-giri (no)	
Actions	(B) kusa-ka'ri (o suru)		(C) taka-no'zomi (suru)

First, noun compounds show the same combination of semantic class and pragmatic function as real nouns: they refer to objects (e.g. watasi-bu'ne 'ferryboat'). Second, Type I deverbal compounds spread over several types. They show the same combination as real nouns when they refer to 'person', 'instrument', 'place', or 'time' (e.g. hituzi'-kai 'shepherd'). In some cases, they show the same combination of semantic class and pragmatic function as real adjectives, modifying nouns (e.g. kane-mo'ti 'rich'). In other cases, they show a marked combination, referring to actions (e.g. kusa-ka'ri 'mowing'). Third, Type IV deverbal compounds show the same combinations as real adjectives or verbs (e.g. mizin-giri 'minced', taka-no'zomi 'aiming too high').

The table in (313) shows whether each type of compounds satisfies semantic class or pragmatic function of the unmarked combination of each 'lexical category'. An ordinary circle ('○') means that either semantic class or pragmatic function is satisfied, while a double circle ('◎') means that both of them are satisfied. As shown in (313), noun compounds are nominal and Type IV deverbal compounds are adjectival or verbal. Type I deverbal compounds are intermediate between the two, ranging over the three categories. In addition, it must be noted that Type IV deverbal compounds that are verbal are more verb-like than Type I deverbal compounds that are verbal.

(313) 'Lexical category' of compounds

	'Lexical category' of compounds		
	Nominal	Adjectival	Verbal
Semantic class	Object	Property	Action
Pragmatic function	Reference	Modification	Predication
a. Noun compounds	◎		
b. Deverbal compounds (Type I)	◎	◎	○
c. Deverbal compounds (Type IV)		◎	◎

In summary, this section has examined the 'lexical category' of compounds (i.e. nominal/adjectival/verbal) based on the analysis of syntactic categories (i.e. noun/adjective/verb) by Croft (1991), where both semantic class and pragmatic function are required. The subsequent sections focus on the 'nominal' property of compounds. This study posits a scale of the 'nominal' property along which each type of compounds can be placed, based on (313). As shown in (314), noun compounds are more nominal than Type I deverbal compounds, and Type I deverbal compounds are more nominal than Type IV deverbal compounds.

(314) The scale of 'nominal' property of compounds

more nominal ←→ **less nominal**

Noun compounds — Deverbal compounds (Type I) — Deverbal compounds (Type IV)

In the following discussion, it is shown that 'lexical category' affects accentedness and faithfulness (i.e. preservation of the input). The differences in accentedness and faithfulness among the three kinds of compounds are explained by their differences in terms of the 'nominal' property, as shown in (314).

3.3.2. The correlation between 'lexical category' and accentedness: Ranking of C[+ACC]

3.3.2.1. The correlation in various types of word formation

It has been pointed out that accentuation depends on meaning in some areas of Japanese word formation (Kawakami 1984, Sato 1989, Akinaga 2001).This section argues that nominal words are more likely to be accented than adjectival or verbal words, which implies that C[+ACC], a constraint which favors an accented candidate, is ranked high in nominal words. This explains why C[+ACC] is ranked high in noun compounds and ranked low in Type IV deverbal compounds, as shown in (309).

The correlation between 'lexical category' and accentuation is observed in several areas of word formation in Japanese. First, Sino-Japanese binoms (i.e. words which are written with two Chinese characters) whose length is two syllables and three morae tend to be initial-accented when they are nominal, while they tend to be unaccented when they are verbal (Akinaga 2001, Ogawa 2004).[41] This contrast is exemplified by the pairs in (315). In particular, the pair *sa'nka* 'paean' vs. *sanka* 'oxidation', which are identical segmentally, is especially notable.

(315) Sino-Japanese binoms (Nominal vs. Verbal)

a. Nominal meaning: sa'nka 'paean', sa'doo 'tea ceremony', ko'kka 'nation'

b. Verbal meaning: sanka 'oxidation', idoo 'movement', hukki 'comeback'

Second, in some cases, an identical morpheme belongs to two different 'lexical categories', which can cause a difference in accentedness. Although such morphemes have been pointed out individually in previous studies, they can be generalized according to their 'lexical category'. Like the examples in (315)-(a), if words which include such morphemes as the second element have nominal meaning, they are accented. On the other hand, they are unaccented if they have adjectival meaning. For example, the words in (316) are accented in (i), where they are nominal. In contrast, the adjectival forms are unaccented in (ii).[42]

[41] According to Ogawa (2004), a Sino-Japanese word *X* is 'verbal' if a verbalized *X-suru* 'do X' is grammatical, and otherwise it is 'nominal'. *X-suru* has three allomorphs (i.e. *X-zuru*, *X-su* and *X-ziru*), but it is not necessary to take these into account because they do not attach to binoms.

[42] If a word is adjectival, it can co-occur with an adverbial phrase (e.g. **subara'siku/subarasi'i nyuugaku'siki* '*wonderfully/wonderful entrance ceremony' vs. *kanzeN ni zidoosiki* 'completely automatic').

(316) Morphemes which have more than one meanings[43] (Nominal vs. Adjectival)

a. -siki 'ceremony, formula, method' (Kawakami 1984, Sato 1989)

i) nyuugaku'siki 'entrance + ceremony; entrance ceremony'

bunsi'siki 'molecule + formula; molecular formula'

ii) zidoosiki 'automatic + method; automatic'

b. -nensee 'year + life' (Sato 1989)

i) rokune'nsee 'six + year + life; sixth grade'

ii) tanensee 'many + year + life; perennial'

c. -zyoo 'letter, state' (Akinaga 2001)

i) syoota'izyoo 'invitation + letter; invitation card'

ii) hoosyazyoo 'radiation + state; radial'

d. -huu 'wind, style' (NHK 1998)

i) booeki'huu 'trade + wind; trade wind'

ii) nihonhuu 'Japan + style; Japanese style'

e. -ryuu 'flow, style'

i) doseki'ryuu 'earth and rocks + flow; avalanche of earth and rocks'

ii) tooseeryuu 'the present time + style; modern'

Third, Giriko (2009) reports an experiment on nonce words which end with /-ingu/ '-ing' and shows that they tend to be accented when they refer to a person's name. On the other hand, they tend to be unaccented when they refer to an action. Consider the following example.

(317) The suffix /-ingu/ '-ing' (Nominal vs. Verbal)

a. Nominal: Ke'pomingu kantoku 'Mr. Kepoming (director)'
Kepoming director

b. Verbal: kepomingu suru 'do kepoming'
kepoming do

Fourth, person's names may be another example. According to Akinaga (2001), a person's name which is based on a verb is unaccented even if the verb is accented. In contrast, a person's name which is based on a noun shows the same pattern as the corresponding common noun in principle. Some become accented even if the common noun is unaccented.

43 The accentuation of the individual morphemes is not clear.

(318) Person's names (Nominal vs. Verbal)[44]

a. Noun: hibari 'Hibari' (cf. common noun: hibari 'skylark')
   mi'dori 'Midori' (cf. common noun: mi'dori 'green')
   sa'kura 'Sakura' (cf. common noun: sakura 'cherry tree')

b. Verb: minoru 'Minoru' (cf. verb: mino'ru 'bear fruit')
   sigeru 'Shigeru' (cf. verb: sige'ru 'grow thick')
   noboru 'Noboru' (cf. verb: noboru 'go up')

In sum, nominal words are more likely to be accented than adjectival or verbal words. From the point of view of constraints in Optimality Theory, this correlation implies that C[+ACC], a constraint which favors an accented candidate, is ranked high in nominal words. For this reason, C[+ACC] is ranked high in noun compounds and ranked low in Type IV deverbal compounds, and Type I deverbal compounds shows intermediate behavior, as shown in (319). That is, constraint ranking can be motivated in part by independent evidence.

(319)

a. Noun compounds	C[+ACC] >> ALIGN-L (σ', root)	↑ nominal
b. Deverbal compounds (Type I)	C[+ACC], ALIGN-L (σ', root)	
c. Deverbal compounds (Type IV)	ALIGN-L (σ', root) >> C[+ACC]	

3.3.2.2. The correlation in Type I deverbal compounds

As shown in (313), all of the three kinds of 'lexical category' are found in Type I deverbal compounds. The discussion in 3.3.2.1 implies that nominal Type I deverbal compounds are likely to be accented. However, the correlation is likely to be found only in the cases where the second element has two morae because most Type I deverbal compounds where the second element has three morae are accented.

In order to test this hypothesis, this section examines the data in Chapter 2, focusing on Type I deverbal compounds where the second element has two morae. The 'lexical category' of each compound is judged based on the Japanese dictionary *Koojien* (Shimmura (ed.) (1998)), although the author has made a judgement with regard to compounds which do not appear in the dictionary. The judgment of 'lexical category' is based on semantic class (i.e. object/property/action). Therefore, deverbal compounds that denote 'act' are considered to be 'verbal' in this section although they are nominal in terms of pragmatic function. If the judgment is based on pragmatic function, it is impossible to investigate whether there is a

[44] Persons' names which are based on adjectives are discussed in 3.3.3.

difference in accentuation between compounds that denote ‘agent/instrument/place’ and compounds that denote ‘act’.

As shown in (320), the compounds are divided into six patterns: nominal, adjectival, verbal, nominal/adjectival, nominal/verbal, and adjectival/verbal.

(320) Patterns of ‘lexical category’ of Type I deverbal compounds

a. Nominal: e.g. usi + kai$_{acc}$ → usi-kai ‘cow + keeping; cowherd’
b. Adjectival: e.g. hade + suki$_{acc}$ → hade-zuki ‘showy + liking; being fond of display’
c. Verbal: e.g. nazo + toki$_{acc}$ → nazo-toki' ‘riddle + solving; riddle solving’
d. Nominal/adjectival: e.g. mono' + siri → mono-si'ri ‘thing + knowing; knowledgeable person/knowledgeable’
e. Nominal/verbal: e.g. sake + nomi$_{acc}$ → sake-no'mi ‘alcoholic + drinking; drinker/drinking alcohol’
f. Adjectival/verbal: e.g. hone' + nuki → hone-nuki ‘bone + pulling out; with little or no meaning/deboning’

Let us examine the results of the investigation on the correlation between ‘lexical category’ of deverbal compounds and accentuation. In order to compare ‘nominal’, ‘adjectival’ and ‘verbal’, compounds which belong to two categories (i.e. nominal/adjectival, nominal/verbal, and adjectival/verbal) are not included in the following tables.

First, the tables in (321) show the results for the cases where the first element has one mora and the second element has two. The sums of the three tables in (321) are shown in (322). The percentage of [+accented] in ‘nominal’ is lower than that in ‘verbal’, which does not agree with the hypothesis that nominal Type I deverbal compounds are likely to be accented.

(321) Type I, 1μ+2μ

a. [-rendaku]

		Nominal		Adjectival		Verbal		Sum	
[-accented]	0	2		0		0		2	
[+accented]	-1	2	2	0	0	0	0	2	2
	-2		0		0		0		0
	-3		0		0		0		0
Sum		4		0		0		4	

b. [+rendaku]

		Nominal		Adjectival		Verbal		Sum	
[-accented]	0	2		0		7		9	
[+accented]	-1	0	0	0	0	3	3	3	3
	-2		0		0		0		0
	-3		0		0		0		0
Sum		2		0		10		12	

c. Cases where *rendaku* is impossible

		Nominal		Adjectival		Verbal		Sum	
[-accented]	0	6		0		15		21	
[+accented]	-1	0	0	0	0	10	8	10	8
	-2		0		0		0		0
	-3		0		0		2		2
Sum		6		0		25		31	

(322) Type I, 1μ+2μ

	Nominal	Adjectival	Verbal	Sum
[-accented]	10 (83%)	0	22 (63%)	32 (68%)
[+accented]	2 (17%)	0	13 (37%)	15 (32%)
Sum	12 (100%)	0	35 (100%)	47 (100%)

Second, the tables in (323) show the results for the cases where each element has two morae. The sums of the three tables in (323) are shown in (324). The percentage of [+accented] in 'nominal' is 70%, while that in 'verbal' is 27%. This result agrees with the hypothesis that nominal Type I deverbal compounds are likely to be accented.

(323) Type I, 2μ+2μ

a. [-rendaku]

		Nominal		Adjectival		Verbal		Sum	
[-accented]	0	6		0		17		23	
[+accented]	-1	27	5	0	0	24	9	51	14
	-2		13		0		7		20
	-3		9		0		8		17
Sum		33		0		41		74	

b. [+rendaku]

		Nominal		Adjectival		Verbal		Sum	
[-accented]	0	1		2		42		45	
[+accented]	-1	0	0	0	0	4	3	4	3
	-2		0		0		1		1
	-3		0		0		0		0
Sum		1		2		46		49	

c. Cases where *rendaku* is impossible

		Nominal		Adjectival		Verbal		Sum	
[-accented]	0	12		1		53		66	
[+accented]	-1	18	7	0	0	14	7	32	14
	-2		6		0		2		8
	-3		5		0		5		10
Sum		30		1		67		98	

(324) Type I, 2μ+2μ

	Nominal	Adjectival	Verbal	Sum
[-accented]	19 (30%)	3 (100%)	112 (73%)	134 (61%)
[+accented]	45 (70%)	0 (0%)	42 (27%)	87 (39%)
Sum	64 (100%)	3 (100%)	154 (100%)	221 (100%)

This correlation between 'nominal' and [+accented] is exemplified in (325)-(329). In each pair of compounds which have the same second element, (a) is nominal and [+accented], while (b) is verbal and [-accented].

(325) Second element: kiri$_{acc}$ 'cutting'

a. Nominal, [+accented]

tume + kiri$_{acc}$ → tume-ki'ri 'nail + cutting; nail clippers'

b. Verbal, [-accented]

e'n + kiri$_{acc}$ → en-kiri 'relationship + cutting; dissolution of a relationship'

(326) Second element: tori$_{acc}$ 'taking'

a. Nominal, [+accented]

tiri+ tori$_{acc}$ → tiri-to'ri 'dust + taking; dustpan'

b. Verbal, [-accented]

yome + $tori_{acc}$ → yome-tori 'bride + taking; having a woman as wife'

(327) Second element: $kaki_{acc}$ 'scratching'

a. Nominal, [+accented]

mimi' + $kaki_{acc}$ → mimi-ka'ki 'ear + picking; earpick'

mizu + $kaki_{acc}$ → mizu-ka'ki 'water + paddling; web, paddle'

b. Verbal, [-accented]

siro' + $kaki_{acc}$ → siro-kaki 'field + scratching; puddling of a paddy'

(328) Second element: ire 'putting'

a. Nominal, [+accented]

ku'zu + ire → kuzu'-ire 'trash + putting; trash basket'

kane + ire → kane-i're 'money + putting; purse'

b. Verbal, [-accented]

ka'ta + ire → kata-ire 'shoulder + putting; backing up'

te'ko + ire → teko-ire 'lever + putting; supporting'

(329) Second element: nuki 'pulling out'

a. Nominal, [+accented]

se'n + nuki → sen-nu'ki 'cork + pulling; corkscrew'

b. Verbal, [-accented]

aku + nuki → aku-nuki 'harshness + removing; taking out bitterness'

The example in (330) illustrates the correlation between 'lexical category' and accentuation more directly. *Mono* + *$moti_{acc}$* 'thing + having' has both a verbal meaning and a nominal meaning. The compound is unaccented in the former, while it is accented in the latter.

(330) Accentuation of *mono* + *$moti_{acc}$* 'thing + having'

a. Verbal, [-accented]: mono-moti 'keeping one's things'

b. Nominal, [+accented]: mono-mo'ti 'a person with many belongings'

Before moving on to the results for 3μ+2μ, let us examine the position of the accent in 2μ+2μ, which may explain the absence of the correlation in 1μ+2μ. As shown in (331), the percentage of '-2 (penultimate)' is the highest in 'nominal', while the percentage of '-1 (final)' is the highest in 'verbal', although both patterns are [+accented]. That is, the final accent may have a close relationship with 'verbal' compounds.

(331) The percentages of '-1/-2/-3' in [+accented] compounds of 2μ+2μ

	Nominal	Verbal	Sum
-1 (final)	12 (27%)	19 (45%)	31 (35%)
-2 (penultimate)	19 (42%)	10 (24%)	29 (33%)
-3 (antepenultimate)	14 (30%)	13 (30%)	27 (31%)
Sum	45 (100%)	42 (100%)	88 (100%)

On the other hand, (332) shows the results for 1μ+2μ. Although 37% of 'verbal' compounds are [+accented], most of them have an accent on the final syllable. If we assume that final accent is closely related to 'verbal' compounds, the results for 1μ+2μ are not inconsistent with the correlation between 'lexical category' and accentuation proposed in this section. Since unaccented words and words which have final accent show the same pattern of tones without the case particle -*ga*, as stated in 1.4.4, it may not be so odd that the property of final-accented compounds is similar to that of unaccented compounds.

(332) The percentages of '0/-1/-2/-3' in 1μ+2μ

	Nominal	Verbal	Sum
0 (unaccented)	10 (83%)	22 (63%)	32 (68%)
-1 (final)	2 (17%)	11 (31%)	13 (28%)
-2 (penultimate)	0 (0%)	0 (0%)	0 (0%)
-3 (antepenultimate)	0 (0%)	2 (6%)	2 (4%)
Sum	12 (100%)	35 (100%)	47 (100%)

Let us now return to the percentages of [-accented] and [+accented]. (333) and (334) show the results for 3μ+2μ, where the correlation between 'lexical category' and accentuation is also observed. The percentage of [+accented] in 'nominal' is 75%. In contrast, the percentage in 'verbal' and 'adjectival' is 23% and 11%, respectively.

(333) Type I, 3μ+2μ

a. [-rendaku]

		Nominal	Adjectival	Verbal	Sum
[-accented]	0	0	0	0	0
[+accented]	-3	14	1	5	20
		14	1	5	20

b. [+rendaku]

		Nominal	Adjectival	Verbal	Sum
[-accented]	0	4	7	17	28
[+accented]	-3	0	0	1	1
		4	7	18	29

c. Cases where *rendaku* is impossible

		Nominal	Adjectival	Verbal	Sum
[-accented]	0	4	1	6	11
[+accented]	-3	10	0	1	11
		14	1	7	22

(334) Type I, 3μ+2μ

	Nominal	Adjectival	Verbal	Sum
[-accented]	8 (25%)	8 (89%)	23 (77%)	39 (55%)
[+accented]	24 (75%)	1 (11%)	7 (23%)	32 (45%)
Sum	32 (100%)	9 (100%)	30 (100%)	71 (100%)

(335)-(337) show some examples which are explained by the correlation between 'lexical category' and accentuation.

(335) Nominal, [+accented]

a. hituzi + kai_{acc} → hituzi'-kai 'sheep + keeping; shepherd'

b. boosi + $kake_{acc}$ → boosi'-kake 'hat + hanging; hat-rack'

c. inku + kesi → inku'-kesi 'ink + erasing; ink eraser'

d. abura + $sasi_{acc}$ → abura'-sasi 'oil + pouring; oilcan'

e. meesi + ire → meesi'-ire 'visiting card + putting in; card case'

f. tikara' + $moti_{acc}$ → tikara'-moti 'power + having; powerful person'

g. bakuti + uti_{acc} → bakuti'-uti 'gambling + hitting; gambler'

(336) Adjectival, [-accented]

a. i'noti + $kake_{acc}$ → inoti-gake ‘life + risking; desperate’

b. tasuki + $kake_{acc}$ → tasuki-gake ‘a cord used to tuck up the sleeves of a kimono + hanging; with one’s sleeves tucked up’

c. ki'rei + $suki_{acc}$ → kirei-zuki ‘clean + liking; neat, fastidious’

d. zoori + haki → zoori-baki ‘thonged slippers + wearing; wearing sandals’

e. atama' + uti_{acc} → atama-uti ‘head + hitting; reaching the ceiling’

(337) Verbal, [-accented]

a. koromo + kae → koromo-gae ‘clothes + changing; seasonal change of clothing’

b. meegi' + kasi → meegi-gasi ‘name + lending; lending one’s name’

c. i'noti + koi_{acc} → inoti-goi ‘life + asking; pleading for one’s life’

d. kurai + $tori_{acc}$ → kurai-dori ‘numerical position + taking; putting a decimal point’

e. ho'taru + kari → hotaru-gari ‘firefly + hunting for; firefly watching’

f. katami + $wake_{acc}$ → katami-wake ‘memento + distributing; the distribution of mementoes of a deceased person’

g. kagami' + wari → kagami-wari ‘mirror + dividing; the cutting of New Year’s round rice-cakes’

Lastly, (338) and (339) show the results for 4μ+2μ. The percentage of [+accented] in ‘nominal’ is 79%, while that in ‘verbal’ is 30%. That is, the correlation is also found in these cases. Some examples are shown in (340) and (341).

(338) Type I, 4μ+2μ

a. [-rendaku]

		Nominal	Adjectival	Verbal	Sum
[-accented]	0	0	0	0	0
[+accented]	-3	9	0	5	14
		9	0	5	14

b. [+rendaku]

		Nominal	Adjectival	Verbal	Sum
[-accented]	0	1	0	8	9
[+accented]	-3	0	0	0	0
		1	0	8	9

c. Cases where *rendaku* is impossible

<table>
<tr><th colspan="2"></th><th colspan="2">Nominal</th><th colspan="2">Adjectival</th><th colspan="2">Verbal</th><th colspan="2">Sum</th></tr>
<tr><td>[-accented]</td><td>0</td><td colspan="2">3</td><td colspan="2">0</td><td colspan="2">6</td><td colspan="2">9</td></tr>
<tr><td rowspan="2">[+accented]</td><td>-3</td><td rowspan="2">6</td><td>6</td><td rowspan="2">0</td><td>0</td><td rowspan="2">1</td><td>0</td><td rowspan="2">7</td><td>6</td></tr>
<tr><td>-4</td><td>0</td><td>0</td><td>1</td><td>1</td></tr>
<tr><td colspan="2"></td><td colspan="2">9</td><td colspan="2">0</td><td colspan="2">7</td><td colspan="2">16</td></tr>
</table>

(339) Type I, 4μ+2μ

	Nominal	Adjectival	Verbal	Sum
[-accented]	4 (21%)	0	14 (70%)	18 (46%)
[+accented]	15 (79%)	0	6 (30%)	21 (54%)
Sum	19 (100%)	0	20 (100%)	39 (100%)

(340) Nominal, [+accented]

a. rooso'ku + tate$_{acc}$ → roosoku'-tate ‘candle + standing; candlestick’

b. hiyamesi + kui$_{acc}$ → hiyamesi'-kui ‘cold rice + eating; parasite’

c. yoohuku + kake$_{acc}$ → yoohuku'-kake ‘clothes + hanging; coat hanger’

d. syakki'n + tori$_{acc}$ →syakki'n-tori ‘debt + taking; debt collector’

e. yuubin + uke$_{acc}$ → yuubi'n-uke ‘mail + catching; mailbox’

f. koozyoo + ii → koozyo'o-ii ‘prologue + saying; person who narrates a prologue’

(341) Verbal, [-accented]

a. zookin + kake$_{acc}$ → zookin-gake ‘floorcloth + administering; wiping with a cloth’

b. sakimono + gai → sakimono-gai ‘futures + buying; purchase of futures’

c. hoogan + nage$_{acc}$ → hoogan-nage ‘shot + throwing; the shot put’

d. syo'obai + kae → syoobai-gae ‘business + changing; change of occupation’

e. kya'nseru + mati$_{acc}$ → kyanseru-mati ‘cancel + waiting; being on the waiting list’

f. singoo + mati$_{acc}$ → singoo-mati ‘traffic light + waiting; waiting for the light to change’

In summary, the correlation between ‘lexical category’ and accentuation is supported by Type I deverbal compounds where the second element has two morae. Although Type I deverbal compounds are accented in most cases when the second element has two morae, the examples in (342) are explained by the correlation.

(342) The second element: tubusi 'crushing'

a. Verbal, [-accented]: hima + tubusi → hima-tubusi 'time + crushing; killing time'
b. Nominal, [+accented]: goku[45] + tubusi → goku-tu'busi 'grain + crushing; idler'

3.3.2.3. The issue of simplex adjectives and verbs

3.3.2.1 showed that nominal words are more likely to be accented than adjectival or verbal words and argued that the correlation explains the ranking of [+ACC] in noun compounds and deverbal compounds. The survey of Type I deverbal compounds in 3.3.2.2 also verified the relationship between the 'lexical category' and accentedness.

Before moving on to the next section, there is a question which needs to be asked. The argument that nominal words are more likely to be accented than adjectival or verbal words may imply that simplex adjectives and verbs (i.e. real adjectives and verbs, not adjective-like or verb-like nouns) are likely to be unaccented. However, that is not the case. For example, newly coined verbs based on loanwords are accented, such as *misu'-ru* (←miss) 'miss (non-past)' and *sabo'-ru* (←sabotage) 'play truant (non-past)'. With regard to adjectives, Akinaga (2001) indicates that there are very few unaccented adjectives. How can we resolve this apparent contradiction? The solution suggested here is as follows: simplex adjectives and verbs, which have conjugational endings, can be identified morphologically, while it is difficult to identify the 'lexical category' of a deverbal compound morphologically. However, the accentuation of a deverbal compound makes it easy to judge the 'lexical category' of the compound. In contrast, the correlation between the 'lexical category' and accentedness is not necessary in simplex verbs and adjectives.

3.3.3. The correlation between 'lexical category' and preservation of the input: Noun faithfulness

'Lexical category' of compounds motivates another aspect of constraint ranking: the ranking of the faithfulness constraint NO-FLOP-PROMINENCE. As shown in (309), NO-FLOP-PROMINENCE and NON-FINALITY (Ft) are ranked freely in noun compounds, while the former is dominated by the latter in Type I deverbal compounds. This section shows that this difference is explained by Noun Faithfulness (Smith 2001). Smith argues that nouns show phonologically privileged behavior compared to verbs based on examples in several languages and that the privileged behavior is due to a noun-specific faithfulness constraint which is ranked high.

[45] The accent pattern of *goku* is not clear.

For example, nouns may be accented or unaccented, while adjectives and verbs must be accented in the dialect of Japanese spoken in Hakata (Hayata 1985). Smith (2001) proposes the constraint ranking in (343) to explain this difference.

(343) DEP_{N} (ACCENT) >> HAVE ACCENT >> DEP (ACCENT)

HAVE ACCENT is a markedness constraint which requires an accent in an output form. That is, it has the same function as CULMINATIVITY. DEP (ACCENT) is a faithfulness constraint which prohibits insertion of accents. In other words, it is the same function as DEP-PROMINENCE. DEP_{N} (ACCENT) is a noun-specific faithfulness constraint, prohibiting insertion of accents only in nouns.

The following tableaux show the interaction of these constraints. As shown in (344)-(a), DEP_{N} (ACCENT) is irrelevant in verbs, so an accent is inserted due to the ranking HAVE ACCENT >> DEP (ACCENT). In contrast, the absence of accent is allowed in nouns due to the noun-specific constraint DEP_{N} (ACCENT). In other words, nouns can preserve the contrast in the input under the ranking $\text{FAITHFULNESS}_{\text{NOUN}}$ >> MARKEDNESS >> FAITHFULNESS.

(344) Accentedness in Hakata Japanese

a. Verb (e.g. yo'b-u_V ‘call(s)’)

/yob-u/	DEP_{N} (ACCENT)	HAVE ACCENT	DEP (ACCENT)
a. yobu		*!	
☞b. yo'bu			*

b. Noun (e.g. atama_{N} ‘head’)

/atama/	DEP_{N} (ACCENT)	HAVE ACCENT	DEP (ACCENT)
☞a. atama		*	
b. ata'ma	*!		*

Another type of example which is explained in terms of noun faithfulness is persons’ names, which were discussed in 3.3.2.1. As shown in (318), a person’s name which is based on a verb is unaccented irrespective of the accentuation of the verb, while a person’s name which is based on a noun shows the same pattern as the corresponding common noun in principle. In contrast, a person’s name which is based on an adjective is accented irrespective of the accentuation of the adjective, as shown in (345).

(345) Persons' names based on adjectives

a. ki'yosi 'Kiyosi' (cf. adjective: kiyo'-i 'clean')

b. a'tusi 'Atusi' (cf. adjective: atu-i 'thick, kind')

The differences among the three kinds of persons' names are summarized in (346).

(346) Persons' names based on nouns, adjectives and verbs

category of the base word / accentuation of the base word	Noun	Adjective	Verb
[+accented]	[+accented] e.g. mi'dori	[+accented] e.g. ki'yosi	[-accented] e.g. minoru
[-accented]	[-accented] e.g. hibari ([+accented] e.g. sa'kura)	[+accented] e.g. a'tusi	[-accented] e.g. noboru

These differences are explained in terms of differences in constraint ranking and noun faithfulness, as shown in (347). FAITH in these rankings is a constraint which prohibits the epenthesis or deletion of an accent.

(347) The differences in constraint ranking

a. Noun: FAITH$_N$, HAVE ACCENT >> NON-FINALITY (PrWd'), FAITH

b. Adjective: FAITH$_N$, HAVE ACCENT >> NON-FINALITY (PrWd'), FAITH

c. Verb: FAITH$_N$, NON-FINALITY (PrWd') >> HAVE ACCENT, FAITH

Although the rankings for names based on nouns and adjectives are the same, a noun-specific faithfulness constraint is relevant only to the former. Names which are based on verbs have a different ranking, in which HAVE ACCENT is ranked lower.

The tableaux in (348) show the constraint rankings for names based on nouns. If FAITH$_N$ dominates HAVE ACCENT, the absence of an accent in a base word is allowed, as shown in (348)-(b)-(i). In contrast, a new accent is inserted in the opposite ranking, as shown in (348)-(b)-(ii). If a base word is accented, the name is also accented irrespective of the ranking of FAITH$_N$ and HAVE ACCENT, as shown in (348)-(a).

(348) Persons' names based on nouns

a. accented noun

/mi'dori/	FAITH$_N$	HAVE ACCENT	NON-FIN (PrWd')	FAITH
a. midori	*!	*!		*
☞b. mi'dori			*	

b. unaccented noun

(i) unaccented name

/hibari/	FAITH$_N$	HAVE ACCENT	NON-FIN (PrWd')	FAITH
☞a. hibari		*		
b. hi'bari	*!		*	*

(ii) accented name

/sakura/	HAVE ACCENT	FAITH$_N$	NON-FIN (PrWd')	FAITH
a. sakura	*!			
☞b. sa'kura		*	*	*

The tableaux in (349) show the constraint ranking in names based on adjectives. As FAITH$_N$ is irrelevant in these cases, the names are accented whether the adjective is accented or unaccented.

(349) Persons' names based on adjectives

a. accented adjective

/kiyo'si/	FAITH$_N$	HAVE ACCENT	NON-FIN (PrWd')	FAITH
a. kiyosi		*!		*
☞b. ki'yosi			*	

b. unaccented adjective

/atusi/	FAITH$_N$	HAVE ACCENT	NON-FIN (PrWd')	FAITH
a. atusi		*!		
☞b. a'tusi			*	*

Similarly, the contrast in base words is not preserved in names based on verbs, as shown in (350). As FAITH$_N$ is irrelevant and NON-FINALITY (PrWd') is dominant, the names are unaccented irrespective of the accentuation of the verb.

(350) Persons' names based on verbs

a. accented verb

/mino'ru/	FAITH_N	NON-FIN (PrWd')	HAVE ACCENT	FAITH
☞a. minoru			*	*
b. mino'ru		*!		

b. unaccented adjective

/noboru/	FAITH_N	NON-FIN (PrWd')	HAVE ACCENT	FAITH
☞a. noboru			*	
b. nobo'ru		*!		*

Let us now return to compounds again. Noun Faithfulness explains the difference in the ranking of NO-FLOP-PROMINENCE between noun compounds and Type I deverbal compounds.[46] As summarized in (351), NO-FLOP-PROMINENCE is dominated by NON-FINALITY (Ft) in Type I deverbal compounds. In contrast, the two constraints are ranked freely in noun compounds; that is, the faithfulness constraint NO-FLOP-PROMINENCE is ranked higher in noun compounds, compared to Type I deverbal compounds.[47] This is because noun compounds are nominal.

(351)

a. Noun compounds	NON-FINALITY (Ft), NO-FLOP	⇧ nominal
b. Deverbal compounds (Type I)	NON-FINALITY (Ft) >> NO-FLOP	

3.3.4. Summary

In conclusion, 'lexical category' of compounds motivates some aspects of constraint ranking: high ranking of C[+ACC] and NO-FLOP-PROMINENCE is due to the nominal property of compounds. As noun compounds are typical nouns, both constraints are ranked high. In contrast, Type IV deverbal compounds are adjectival or verbal, so C[+ACC] is ranked lower. In Type I deverbal compounds, which range over the three categories, the ranking of C[+ACC] is intermediate, and the ranking of NO-FLOP-PROMINENCE is low.

The table in (352) summarizes the discussion. 'Verbal' in (b) is put in parentheses because Type I deverbal compounds which denote 'act' do not have the function of 'predication' in principle.

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[46] As summarized in 3.2.6.5, the ranking of the two constraints is unknown in Type IV deverbal compounds.

[47] Although the ranking in (351) does not include a noun-specific constraint, it has the same function as the following ranking: NO-FLOP_N, NON-FINALITY (Ft) >> NO-FLOP.

(352) ‘Lexical category’ of compounds and constraint ranking

	‘Lexical category’	C[+ACC]	Faithfulness (NO-FLOP)
a. Noun compounds	nominal	high	high
b. Deverbal compounds (Type I)	nominal/adjectival/(verbal)	intermediate	low
c. Deverbal compounds (Type IV)	adjectival/verbal	low	—

4. Analysis of *rendaku*

This chapter deals with *rendaku* in deverbal compounds, comparing them with noun compounds. As mentioned in 2.1, *rendaku* is related to accentuation in some deverbal compounds: *rendaku* occurs in unaccented compounds, while it is blocked in accented ones. In 4.1, I consider the mechanism of this complementary distribution. Next, 4.2 examines the causal relationship between accent and *rendaku*, considering the cause of the differences in *rendaku* among noun compounds, Type I deverbal compounds, and Type IV deverbal compounds. 4.3 is devoted to the analysis of these differences within the framework of Optimality Theory. Lastly, the discussion is summarized in 4.4.

4.1. Complementary distribution of accent and *rendaku*

As shown in Chapter 2, accent and *rendaku* show complementary distribution in Type I when the second element has two morae. Some examples are given in (353).

(353) Complementary distribution in short compounds of Type I

	[-rendaku]	[+rendaku]
[-accented]		a. ozen-date 'arrangement' b. sikin-guri 'financing' c. koora-bosi 'sunbathing on one's stomach' d. itami-dome 'painkiller' e. siraga-zome 'hair dye to disguise graying' f. zookin-gake 'wiping with a cloth' g. moyoo-gae 'remodeling'
[+accented]	h. roosoku'-tate 'candlestick' i. karuta'-tori 'playing *karuta*' j. hituzi'-kai 'shepherd' k. abura'-sasi 'oilcan' l. sakana'-turi'fishing' m. kuruma'-hiki 'hauler' n. boosi'-kake 'hat-rack'	

However, the complementary distribution disappears when the second element has three morae, as illustrated in (354).

(354) Disappearance of complementary distribution in long compounds of Type I

rendaku / accent	[-rendaku]	[+rendaku]
[-accented]		
[+accented]	a. otibo-hi'roi 'gleaning/gleaner' b. mahoo-tu'kai 'magician' c. susu-ha'rai 'housecleaning' d. netu-sa'masi 'antipyretic' e. hito-sa'rai 'kidnapping' f. kata-ta'taki 'rapping over the shoulders' g. boo-ta'osi 'a game in which players try to pull down the opponents' pole'	h. inoti-bi'roi 'having a narrow escape' i. hito-da'suke 'kindness' i. ude-da'mesi 'trying one's skill' k. usa-ba'rasi 'brightening one's spirits' l. on-ga'esi 'repaying a favor' m. syoki-ba'rai 'beating the summer heat' n. umi-bi'raki 'the beginning of the swimming season'

This section discusses the following two issues: (i) 'What is the cause of complementary distribution of accent and *rendaku*?', and (ii) 'Why does the complementary distribution disappear when the second element is long?' It is argued that these two questions can be accounted for by the alignment of accent and *rendaku*.

This complementary distribution is observed in other types of word formation in Japanese. For example, as mentioned in Tanaka (2005a), it is found in proper nouns, such as place names and family names, albeit in limited cases. Consider the following examples.

(355) Family names whose second element is *ta'* 'rice field' (Sugito 1965, Zamma 2005)

a. [+accented, -rendaku]: mo'ri-ta, yo'ko-ta, to'mi-ta, a'ki-ta
b. [-accented, +rendaku]: yosi-da, ike-da, mae-da, oka-da, matu-da

(356) Family names whose second element is *kawa'* 'river' (Zamma 2005)

a. [+accented, -rendaku]: huru'-kawa, iti'-kawa, yosi'-kawa, nisi'-kawa, mae'-kawa
b. [-accented, +rendaku]: hase-gawa, kita-gawa, tani-gawa, taki-gawa, ima-gawa

(357) Place names whose second element is *sima'* 'island' (Tanaka 2005a, b)

a. [+accented, -rendaku]: syoodo'-sima, ituku'-sima, okino'-sima
b. [-accented, +rendaku]: sakura-zima, miyako-zima, isigaki-zima

With regard to the first issue (i.e. the cause of the complementary distribution of *rendaku* and accent), Tanaka (2005a, b) argues, based on the examples in (357), that both accent and *rendaku* function as a prominence that marks the boundary of a compound, and that one prominence is sufficient to achieve this. However, this explanation may need some modification to exclude the combination of [+accented, +rendaku].

One possible modification is to assume another requirement that the accent and the [+voice] of *rendaku*, both of which mark the boundary of a compound, should be realized on the same syllable, if any. As shown in (358), the accent is on the last syllable of the first element, and the [+voice] of *rendaku* is realized on the first consonant on the second element if the second element has two morae. As illustrated in (358)-(a), *[+accented, +rendaku] is excluded because the accent and [+voice] are not aligned. In contrast, [-accented, +rendaku] and [+accented, -rendaku] (i.e. (358)-(b, c)), in which the boundary is marked only once, are permitted because the requirement of alignment is vacuously satisfied. [-accented, -rendaku] in (358)-(d) is excluded because there is no marking of the boundary, as pointed out by Tanaka (2005a, b).

(358) Alignment of accent and [+voice] of *rendaku* (the second element: two morae)

a. ***[+accented, +rendaku]**

*itami'-dome
[+voi]

b. **[-accented, +rendaku]**

itami-dome
[+voi]

c. **[+accented, -rendaku]**

karuta'-tori

d. ***[-accented, -rendaku]**

*karuta-tori

In addition, this supposed modification also can explain the fact that [+accented, +rendaku] is common when the second element has three morae. As shown in (359), [+accented, +rendaku] is allowed because both the accent and [+voice] of *rendaku* are realized on the first syllable of the second element.

(359) Alignment of accent and [+voice] of *rendaku* (second element: three morae)

a. **[+accented, -rendaku]**

netu-sa'masi

b. **[+accented, +rendaku]**

ude-da'mesi
[+voi]

The alignment of the accent and the [+voice] of *rendaku* is also supported by Sino-Japanese verbs. Some Sino-Japanese morphemes are used as verbs by combining with the light verb *-suru* 'to do', which has the allomorph *-zuru* with the voicing of *rendaku*. The accentuation of the verb depends on whether the Sino-Japanese morpheme selects *-suru* or *-zuru*, as illustrated in (360).

(360) Accentuation of Sino-Japanese verbs

light verb / SJ morpheme	*-suru*	*-zuru*
CVV	yuu-su'ru 'to own' kyuu-su'ru 'to become poor' koo-su'ru 'to resist' guu-su'ru 'to treat' soo-su'ru 'to perform'	doo-zuru / doo-zu'ru 'to be upset' oo-zuru / oo-zu'ru 'to accept' huu-zuru / huu-zu'ru 'to prevent' hoo-zuru / hoo-zu'ru 'to report' koo-zuru / koo-zu'ru 'to lecture'
CVN	kan-su'ru 'to be connected with' san-su'ru 'to produce' men-su'ru 'to face' han-su'ru 'to go against' hun-su'ru 'to disguise oneself'	en-zuru / en-zu'ru 'to perform' men-zuru / men-zu'ru 'to exempt' ron-zuru / ron-zu'ru 'to discuss' nen-zuru / nen-zu'ru 'to wish' an-zu'ru / an-zuru 'to be anxious'

As pointed out in NHK (1998) and Akinaga (2001), /CVV+suru/ and /CVN+suru/ have penultimate accent. On the other hand, /CVV+zuru/ examples are unaccented in most cases, although sometimes pronounced with penultimate accent.[48] /CVN+zuru/ also allows both the unaccented and the accented patterns.

As shown in (361), *{CVV, CVN}-su'ru* has one boundary marking, while **{CVV, CVN}-suru* has none. This is why /{CVV, CVN}+suru/ is always accented. On the other hand, both *{CVV, CVN}-zuru* and *{CVV, CVN}-zu'ru* have at least one marking, so both the unaccented pattern and the accented pattern are allowed in /{CVV, CVN}+zuru/. In this case, [+accent, +rendaku] is not excluded because the accent and the [+voice] of *rendaku* are aligned.

(361) Accent and [+voice] of *rendaku* in Sino-Japanese verbs

a. *-suru*

[+accented, -rendaku]	***[-accented, -rendaku]** (i.e. no boundary)
yuu-su'ru	*yuu-suru

48 The pronunciation of younger people tends to be accented (NHK 1998).

b. *-zuru*

[-accented, +rendaku] **[+accented, +rendaku]**

doo-zuru doo-zu'ru

[+voi] [+voi]

In summary, the complementary distribution of accent and *rendaku* is explained by marking of the compound boundary. Either accent or *rendaku* is sufficient to mark the boundary (Tanaka 2005a, b), and if both are employed, they should be realized on the same syllable.[49]

4.2. The difference in *rendaku* between Type I and Type IV

This section considers why Type I and Type IV differ in *rendaku* application, reviewing two approaches suggested by previous studies. As pointed out in previous studies, Type I tends to be accented and to resist *rendaku*, while Type IV tends to be unaccented and to undergo *rendaku*. These tendencies are consistent with the complementary distribution of accent and *rendaku* discussed in 4.1. Therefore, three hypotheses can be posited with regard to the possibilities of a causal relationship between the types of deverbal compounds and their phonological behavior, as shown in (362).

(362) Three hypotheses

a. Type of deverbal compounds → *rendaku* —c.d.[50]→ accentuation

b. Type of deverbal compounds → accentuation —c.d.→ *rendaku*

c. Type of deverbal compounds → accentuation / → *rendaku*

The first hypothesis is that the difference in types of deverbal compounds (i.e. Type I and Type IV) results in the difference in *rendaku*, which leads to the difference in

[49] There are two cases which this explanation cannot account for. First, **syoo-za'buroo* cannot be excluded because the accent and [+voice] of rendaku are realized on the same syllable, as in (a). Second, neither the accent nor [+voice] is present in Sino-Japanese verbs where the last consonant of the Sino-Japanese morpheme is the first part of the geminate, although younger people tend to pronounce them with the accent.

(a) First names: *tama-sa'buroo* vs. *syoo-zaburoo* (*saburoo* 'the third son') (Haraguchi 2000)

(b) Sino-Japanese verbs: *as-suru* 'press', *nes-suru* 'heat' (younger generation: *as-su'ru*, *nes-su'ru*) (NHK 1998, Akinaga 2001)

[50] The abbreviation 'c.d.' stands for 'complementary distribution'.

accentuation due to the complementary distribution examined in 4.1. The second hypothesis is that the difference in types of deverbal compounds causes the difference in accentuation, which results in the difference in *rendaku* due to the complementary distribution. In the third hypothesis, the difference in types of deverbal compounds directly causes the difference in accentuation and the difference in *rendaku*, respectively; that is, the complementary distribution of accent and *rendaku* is an accidental result.

The first hypothesis is not adopted because the difference in accentuation occurs when *rendaku* is impossible, according to the results of the survey in Chapter 2. As shown in (363), the percentage of [+accented] in Type I is higher than that in Type IV even if *rendaku* is impossible. Some examples are given in (364) and (365).

(363) The percentage of [+accented] in the cases where *rendaku* is impossible (Token Frequency)

Type / Length	Type I (Internal argument, accusative)	Type IV (Adjunct)
{1-4}μ+2μ	37%	8%
{1-4}μ+3μ	96%	84%

(364) Type I

a. meesi + uke_{acc} → meesi'-uke ‘visiting card + catching; card tray’

b. kataki' + uti_{acc} → kataki'-uti ‘enemy + attacking; revenge’

c. tikara' + $moti_{acc}$ → tikara'-moti ‘power + having; powerful person’

d. kusuri + uri → kusuri'-uri ‘medicine + selling; medicine seller’

e. meesi + ire → meesi'-ire ‘visiting card + putting in; card case’

(365) Type IV

a. kika'i + ami_{acc} → kikai-ami ‘machine + knitting; machine-knitted’

b. me'tta+ uti_{acc} → metta-uti ‘thoughtless + hitting; beating a person up’

c. nana'me + $yomi_{acc}$ → naname-yomi ‘obliquely + reading; skipping through the book’

d. $orosi_{acc}$ + uri → orosi-uri ‘wholesale + selling; wholesale’

e. $uresi_{acc}$ + naki → uresi-naki ‘joyful + crying; crying for joy’

The second hypothesis is also rejected because the occurrence of *rendaku* sometimes differs even if the accentuation is the same, as pointed out in Sugioka (1996) and Ito and Sugioka (2002). Consider the following examples.

(366) Type I

a. kubi + turi → kubi-turi ‘neck + hanging; hanging oneself’
b. kane + kari → kane-kari ‘money + borrowing; borrowing money’
c. ne'zi + $kiri_{acc}$ → nezi-kiri ‘screw + cutting; screw-thread cutter’
d. hito + sarai → hito-sa'rai ‘person + kidnapping; kidnapping’
e. he'bi + tukai → hebi-tu'kai ‘snake + manipulating; snake charmer’

(367) Type IV

a. tyu'u + turi → tyuu-duri ‘midair + hanging; hanging in midair’
b. ma'e + kari → mae-gari ‘in advance + borrowing; borrowing something in advance’
c. usu + $kiri_{acc}$ → usu-giri ‘thin + cutting; thinly sliced’
d. tabi' + $tukare_{acc}$ → tabi-du'kare ‘travel + getting tired; fatigue of travel’
e. maru + kakae → maru-ga'kae
‘complete + holding; being completely financed by someone’

Although both (366)-(a-c) and (367)-(a-c) are unaccented, the former resists *rendaku*, while the latter undergoes the process. Likewise, both (366)-(d, e) and (367)-(d, e) have the antepenultimate accent, but only the latter undergoes *rendaku*.

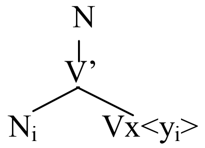
The examples in (364)-(367) indicate that the third hypothesis is plausible: both accentuation and *rendaku* are affected by the types of deverbal compounds and they do not have a direct causal relationship.[51] The next question is how the types of deverbal compounds affect accentuation and *rendaku*. As 3.2.6 analyzed the difference in accentuation between Type I and Type IV, this section focuses on the difference in *rendaku* between the two types.

With regard to the difference in *rendaku*, Ito and Sugioka (2002) give an explanation based on the internal structure of compounds, as shown in (368).

[51] This hypothesis does not mean that complementary distribution of the accent and *rendaku* itself is irrelevant in deverbal compounds. It plays an important role in explaining the variation in accentuation and rendaku within Type I, as discussed in 4.3.

(368) Internal structure of deverbal compounds

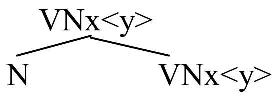
a. Exocentric structure: Internal argument (Type I)



tume + kiri$_{acc}$ → tume-ki'ri

'nail + cutting; nail clippers'

b. Endocentric structure: Adjunct (Type IV)

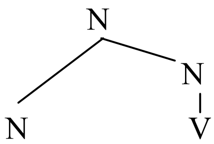


usu + kiri$_{acc}$ → usu-giri

'thin + cutting; thinly sliced'

According to the analysis of Ito and Sugioka (2002), deverbal compounds which include an internal argument have exocentric structure, which does not have a head. In contrast, deverbal compounds which include an adjunct have endocentric structure where the left-hand element modifies the right-hand element. They also posit endocentric structure for deverbal compounds which denote products as in (369). As discussed in 1.6.2.4, they tend to undergo *rendaku*, unlike Type I.

(369) Deverbal compounds which denote products



ume + hosi $_{acc}$ → ume-bosi

'*ume* + drying; pickled *ume*'

Ito and Sugioka (2002) argue that *rendaku* occurs when a compound has a head, pointing out that noun compounds which have the structure 'Modifier-Head' undergo *rendaku* whereas dvandva compounds do not, as shown in (370).[52]

[52] Sugioka (1996) argues that the rendaku feature ([+R]) of the head percolates up to the whole compound in an endocentric structure.

(370) *Rendaku* in noun compounds

a. Modifier-Head

sato + ko → sato-go ‘village + child; foster child’

na'e + ki' → nae-gi ‘seedling + tree; young plant’

a'o + ha → a'o-ba ‘blue + leaf; green leaves’

b. Dvandva

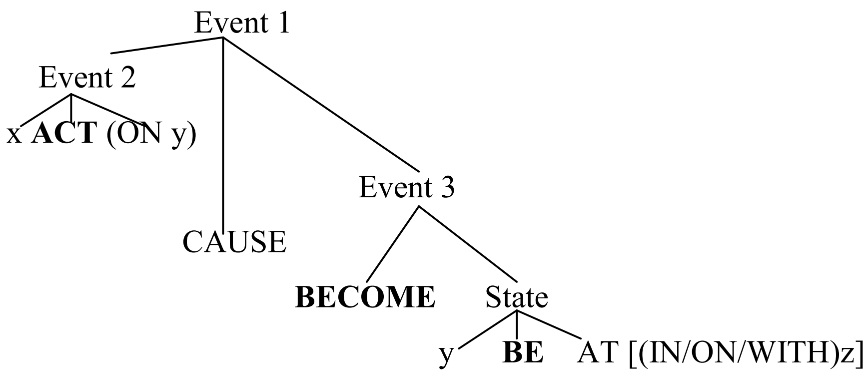
oya' + ko → o'ya-ko ‘parent + child; parent and child’

kusa' + ki' → kusa'-ki ‘grass + tree; plants’

eda + ha → eda-ha ‘branch + leaf; branches and leaves’

Another explanation for the difference in *rendaku* between Type I and Type IV is the difference in the level of word formation, as suggested in Ito and Sugioka (2002). They point out that the two types of deverbal compounds are formed at different levels. On the one hand, deverbal compounds which include an argument are formed at the argument structure level. On the other hand, deverbal compounds which include an adjunct are formed at the LCS (Lexical Conceptual Structure) level, where a verb is decomposed into basic predicates.[53] Consider the LCS for accomplishment verbs in (371), which includes all types of basic predicates (i.e. ACT, BECOME, BE).[54]

(371)



As explained in Sugioka (2002) and Ito and Sugioka (2002), each basic predicate chooses different types of adjuncts as the first element of compounds. First, ACT in ‘Event 2’ selects ‘instrument’ or ‘manner’ as an adjunct (e.g. mizu + arai → mizu-a'rai ‘water + washing; washing a thing without using soap’). Second, BECOME in ‘Event 3’ selects ‘cause’ as an

[53] LCS is put forward in Rappaport and Levin (1988) and Jackendoff (1990).

[54] Accomplishment verbs are one of the four types of verbs in the classification of Vendler (1967) (i.e. stative verb / activity verb / achievement verb / accomplishment verb).

adjunct (e.g. tabi' + tukare_{acc} → tabi-du'kare 'travel + getting tired; fatigue of travel'). Third, BE in 'State' selects 'result' or 'material' as an adjunct (e.g. ku'ro + koge_{acc} → kuro-koge 'black + burning; burned black').

Ito and Sugioka (2002) argue that word formation at the argument structure level is more semantically regular and phonologically transparent than word formation at the LCS level. Type I deverbal compounds, which are formed at the argument structure level, are highly productive, and it is easy to understand their meaning even if a new word is formed, as shown in (372). This property may explain the fact that they tend to be phonologically transparent (i.e. that they are likely to resist *rendaku*).[55]

(372) Productivity of Type I[56]

a.	supu'un	o	mageru	→	supuun-mage
	spoon	ACC	bend		'spoon bending'
b.	ba'gu	o	hirou	→	bagu-hi'roi
	bug	ACC	pick up		'bug hunting'
c.	na'nbaa	o	kaku'su	→	nanbaa-ka'kusi
	number	ACC	cover		'covering the number plate'
d.	te'	o	tata'ku	→	te-ta'taki
	hand	ACC	hit		'clapping one's hands'

In contrast, deverbal compounds which involve an adjunct (i.e. Type IV) are not fully productive. That is, they exhibit what Sugioka (1996) calls 'semi-productivity'. Ito and Sugioka (2002) give the following examples, which are possible but are not used as actual words.[57]

(373) a. instrument + verb: #kuruma-ha'kobi 'carrying something with a car'

b. manner + verb: #haya-sya'beri 'speaking fast'

c. cause + verb: #sigoto-na'yami 'being worried about work'

d. result + verb: #usu-no'basi 'making something thin'

---

[55] A similar argument is also found in Yatabe (1996). He points out that verbal compounds, which have a deverbal element as head, universally undergo fewer phonological rules than root compounds, where there is no predicate-argument relationship between the two elements (e.g. noun compounds). He argues that this generalization explains why *rendaku* is avoided only in deverbal compounds that include an internal argument.

[56] These examples are cited from Ito and Sugioka (2002). The accentuation of the compounds is based on the author's intuition.

[57] # means 'non-actual word'. The accentuation is based on the author's intuition.

Sugioka (1996) also points out that newly coined compounds which involve an adjunct cannot be interpreted by themselves. As illustrated in (374), *hyaku-giri* and *kata-ba'taraki* are interpreted based on *sen-giri* and *tomo-ba'taraki*, respectively.[58]

(374) a. sen-giri 'thousand'-'cut' (finely chopped)
→hyaku-giri 'hundred'-'cut' (not finely chopped)
b. tomo-ba'taraki 'both working (double income)'
→kata-ba'taraki 'one of the pair working (single income)'

Although some compounds have been newly formed recently without a base compound, unlike the examples in (374), they are colloquial expressions and some explanation is necessary to understand their meaning, as illustrated below.

(375) a. otona + kai → otona-gai
'adult + buying; buying something inexpensive in large quantities with earned money'
b. zyake + kai → zyake-gai
'jacket + buying; buying a compact disc or a book because the jacket is impressive'

There are also some examples which show that lexical word formation tends to undergo phonological changes. For instance, Ito and Sugioka (2002) show that syntactic compound verbs and lexical compound verbs differ in the possibility of *onbin*, a kind of consonant assimilation.[59] As shown in (376), the first element of compound verbs is the verb stem, but the final *i* of the verb stem is deleted and consonant assimilation occurs in some cases. What is important is that the deletion of *i* is limited to lexical compound verbs. That is, lexical word formation tends to be less transparent phonologically. In addition, syntactic compound verbs are always transparent semantically unlike lexical compound verbs.

(376) Two kinds of compound verbs
a. Syntactic compound verbs: *i*-deletion is prohibited.
tori-hazimeru/*top-pazimeru 'taking + begin; begin to take'
hiki-tudukeru/*hit-tudukeru 'pulling + continue; continue to pulling'

[58] The examples in (374) are cited from Sugioka (1996: 237). The accentuation of the new compounds is based on the author's intuition.
[59] See Kageyama (1993) for the classification of compound verbs.

b. Lexical compound verbs: *i*-deletion is possible in some cases.
tori-harau/top-parau 'taking + sweep; remove'
hiki-tukeru/hit-tukeru 'pulling + attach; attract/attach'

Another example which shows that lexical word formation tends to undergo phonological changes can be demonstrated, in this case in English. The example in (377), which is given in Ito and Sugioka (2002), shows that the Level I affix *in-* triggers phonological changes such as accent shift, consonant assimilation, and vowel change, while the Level II affix *un-* does not. Also, words with the Level I affix tend to have lexicalized meaning, while the meaning of words with the Level II affix tends to be compositional. For example, *in+famous→infamous* means 'well known for being bad or evil', while *un#famous→unfamous* means 'not famous'.

(377) Level I affix and Level II affix in English

	Level I affix	Level II affix
Accent shift[60]	in+fInite→Infinite	un#fIred→unfIred
Assimilation	in+legal→illegal (*inlegal)	un#lawful→unlawful (*ullawful)
Change of vowel	in+famous→infamous [eɪ] [ə]	un#faded→unfaded [eɪ] [eɪ]

Let us now return to deverbal compounds again. There are two cases which indicate that semantic transparency and productivity have a relationship with phonological transparency. First, *rendaku* often occurs in Type I deverbal compounds, although Type I is more likely to resist *rendaku* than Type IV. Some Type I deverbal compounds which undergo *rendaku* are not semantically transparent, as shown in (378).[61]

(378) a. ozen + tate$_{acc}$ → ozen-date 'tray + standing; arrangement'
b. siki'n + kuri$_{acc}$ → sikin-guri 'finance + reeling; financing'
c. koora + hosi$_{acc}$ → koora-bosi 'shell + drying; sunbathing on one's stomach'
d. i'noti + hiroi → inoti-bi'roi 'life + picking up; having a narrow escape'
e. u'mi + hiraki$_{acc}$ → umi-bi'raki
'sea + opening; the beginning of the swimming season'

[60] Capital letters mean that the vowel is accented.
[61] Suzuki (2008) indicates that deverbal compounds such as *koora-bosi* and *inoti-bi'roi* are metaphorical expressions, and that they are similar to deverbal compounds where the first element is a modifier.

In particular, *ozen-date* 'arrangement' and *inoti-bi'roi* 'having a narrow escape' are in clear contrast to *rooso'ku* + $tate_{acc}$ → *roosoku'-tate* 'candle + standing; candlestick' and *o'tibo* + *hiroi* → *otibo-hi'roi* 'fallen grains of rice + picking up; gleaning/gleaner', which are semantically transparent.

Second, deverbal compounds which denote 'product' (e.g. ume-bosi 'pickled *ume*') tend to undergo rendaku. They are not very productive, as pointed out in Sugioka (1996). Consider the following examples.[62]

(379) a. tamago-yaki 'egg-frying' (egg $frying_{ACT}$/fried egg_{RESULT})

b. tamago-yude 'egg-boiling' (egg $boiling_{ACT}$/*boiled egg_{RESULT})[63]

(380) a. isi-gumi 'stone-put together' (stone $piling_{ACT}$/stone $wall_{RESULT}$)

b. isi-na'rabe 'stone-put side by side' (stone $setting_{ACT}$/*lined $stone_{RESULT}$)[64]

In the examples in (379) and (380), only *tamago-yaki* and *isi-gumi* can be interpreted as result nominals, while the interpretation as an act nominal is always possible. This contrast indicates that act nominals are more productive than result nominals.

In summary, the difference in *rendaku* between Type I and Type IV can be explained in two ways: the internal structure of compounds (i.e. whether a compound has a 'Modifier-Head' relationship or not) or the level of word formation. Although it remains to be seen which analysis is more appropriate, *rendaku* occurrence in Type I deverbal compounds (e.g. ozen-date 'arrangement') and deverbal compounds which denote 'product' (e.g. ume-bosi 'pickled *ume*') may be explained in terms of the latter.

4.3. OT analysis

This section analyzes the difference in *rendaku* and accentuation between the two kinds of deverbal compounds, comparing them with noun compounds, within the framework of Optimality Theory. The table in (381) summarizes the differences in the combinations of [±accented] and [±rendaku] among the three kinds of compounds.

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[62] The examples in (379) and (380) are cited from Sugioka (1996: 236), where accentuation is not represented.

[63] The accentuation of *tamago-yude* is not clear. It may depend on the meaning.

[64] The accentuation is based on the author's intuition.

(381) Combinations of [±accented] and [±rendaku] in three kinds of compounds

Type / 2nd element	Type I Internal argument [*o* (acc)]	Type IV Adjunct	Noun Compound
2μ	**[+accented, -rendaku]** (e.g. hituzi'-kai) **[-accented, +rendaku]** (e.g. itami-dome) complementary distribution	**[-accented, +rendaku]** (e.g. nizyuu-dori)	**[+accented, +rendaku]** (e.g. miyako'-dori)
3μ	**[+accented, -rendaku]** (e.g. netu-sa'masi) **[+accented, +rendaku]** (e.g. umi-bi'raki)	**[+accented, +rendaku]** (e.g. tabi-du'kare) **[-accented, +rendaku]** (e.g. han-gawaki)	**[+accented, +rendaku]** (e.g. kona-gu'suri)

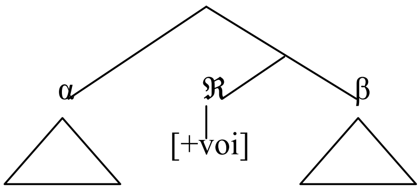
First, deverbal compounds of Type I show complementary distribution of *rendaku* and accent when the second element has two morae (i.e. [+accented, -rendaku] or [-accented, +rendaku]). When the second element has three morae, the combination is [+accented, -rendaku] or [+accented, +rendaku]. Second, the combination is [-accented, +rendaku] in most of the deverbal compounds of Type IV when the second element has two morae. When the second element has three morae, the combination is [+accented, +rendaku] or [-accented, +rendaku]. Third, the combination is [+accented, +rendaku] in most noun compounds regardless of the length of the second element.[65]

As discussed in 3.2.6, the difference in accentedness between the three types of compounds results from the different ranking of three kinds of constraints: ALIGN-L (σ', root), constraints which favor the accented candidate, and constraints which favor the unaccented candidate. This section introduces four other constraints to analyze the differences in *rendaku* and the complementary distribution of the accent and *rendaku*.

First, what constraint motivates *rendaku* occurrence? Ito and Mester (2003) argue that the voicing of *rendaku* results from a feature-sized linking morpheme ℜ, as shown in (382).

[65] A small number of nouns never undergo rendaku (Martin 1987, Vance 1987) (e.g. hasi 'edge', kemuri 'smoke'). They are called 'rendaku-immune'nouns in Rosen (2003).

(382) *Rendaku* as a morpheme



Although *rendaku* voicing violates a faithfulness constraint which prohibits the change of the feature [voice] (i.e. Ident [voice]), *rendaku* occurs if it is dominated by a constraint which requires that the linking morpheme is realized in the output, i.e., Realize Morpheme proposed in Kurisu (2001). The interaction of the two constraints is shown below.

(383) The occurrence of *rendaku* (e.g. kona-gu'suri 'powdered medicine')

/kona'+[voi]+kusuri/	Realize Morpheme	Ident [voice]
a. kona-ku'suri	*!	
☞b. kona-gu'suri		*

In the tableau (383), candidate (a) violates Realize Morpheme because the linking morpheme in the input does not have a phonological exponent in the output. On the other hand, candidate (b) satisfies the constraint because it undergoes *rendaku*. Although candidate (b) violates Ident [voice], it is selected as the winner because Ident [voice] is dominated by Realize Morpheme.

Second, this study posits two constraints based on the discussion in 4.1: Mark Boundary and Align-Acc-Voi. The former constraint penalizes the candidate that has no marking of a compound boundary, and the latter constraint excludes a candidate in which the left edge of the accented syllable is not aligned with the left edge of a linking morpheme [+voice]. Each of these constraints is analyzed as a conjoined constraint. As shown in (384), Mark Boundary is the conjunction of Align-L (root, +voi) and Align-CA. Align-L (root, +voi) requires that the left edge of the second element be aligned with a linking morpheme [+voice], and Align-CA (Kubozono 1995) requires that the accent should be aligned with the boundary between the two elements of a compound.[66]

[66] In Kubozono (1995)'s treatment of noun compounds, Align-CA is defined as follows: 'Align the accent with the boundary between N1 and N2'. This constraint is violated by the unaccented candidate.

(384) MARK BOUNDARY ([ALIGN-L (root, +voi) & ALIGN-CA]$_{PrWd}$)

/μμμ+[+v]+μμ/		ALIGN (root, +voi) & ALIGN-CA	ALIGN-L (root, +voi)	ALIGN-CA
a. μ(μμ')-μμ	[+acc, -r]		*	
b. μ(μμ')-μ$^{[+v]}$μ	[+acc,+r]			
c. μμμ-μμ	[-acc, -r]	*	*	*
d. μμμ-μ$^{[+v]}$μ	[-acc, +r]			*

ALIGN-ACC-VOI is the conjunction of ALIGN-L (σ', [+v]) and ALIGN-L ([+v], σ'). Although these two constraints may seem similar, they evaluate candidates differently. As shown in (385), ALIGN-L (σ', [+v]) penalizes an accented syllable which is not aligned with [+voi]. That is, unaccented candidates (i.e. (c) and (d)) vacuously satisfy this constraint. In contrast, ALIGN-L ([+v], σ') penalizes [+voi] which is not aligned with the accented syllable, so it is satisfied vacuously in candidates (a) and (c).

(385) ALIGN-ACC-VOI ([ALIGN-L (σ', [+v]) & ALIGN-L ([+v], σ')]$_{PrWd}$)

/μμμ+[+v]+μμ/		ALIGN-L (σ', [+v]) & ALIGN-L ([+v], σ')	ALIGN-L (σ', [+v])	ALIGN-L ([+v], σ')
a. μ(μμ')-μμ	[+acc, -r]		*	
b. μ(μμ')-μ$^{[+v]}$μ	[+acc,+r]	*	*	*
c. μμμ-μμ	[-acc, -r]			
d. μμμ-μ$^{[+v]}$μ	[-acc, +r]			*

The four constraints discussed above are defined as below.

(386) Constraints[67]

a. REALIZE MORPHEME: Assign one violation mark for every morpheme in the input that does not have a nonnull phonological exponent in the output.
b. IDENT [voice]: Assign one violation mark for every output segment that differs from its input correspondent in the feature [voice].
c. MARK BOUNDARY ([ALIGN-L (root, +voi) & ALIGN-CA]$_{PrWd}$): Assign one violation mark for every compound where neither accent nor the [+voice] of *rendaku* is present.

[67] In formulating these constraints, I follow McCarthy (2008), who suggests that the definition of constraints should take the form of 'Assign one violation mark for every…'

d. ALIGN-ACC-VOI ([ALIGN-L (σ', [+v]) & ALIGN-L ([+v], σ')]$_{PrWd}$): Assign one violation mark for every compound where the left edge of the accented syllable does not coincide with the left edge of a linking morpheme [+voice].

These constraints, as well as the constraints employed in 3.2.6, are ranked as in (387).

(387) Constraint ranking

a. Deverbal compounds (Type I)
- ALIGN-L (σ', root), C[+ACC] >> C[-ACC]
- REALIZE MORPHEME, IDENT [voice]
- ALIGN-ACC-VOI >> R-M
- MARK BOUNDARY >> IDENT [voi]

b. Deverbal compounds (Type IV)
- ALIGN-L (σ', root) >> C[+ACC], C[-ACC]
- REALIZE MORPHEME >> IDENT [voi]

[The position of MARK BOUNDARY and ALIGN-ACC-VOI is irrelevant.]

c. Noun compounds
- C[+ACC] >> ALIGN-L (σ', root), C[-ACC]
- C[+ACC], REALIZE MORPHEME >> ALIGN-ACC-VOI
- REALIZE MORPHEME >> IDENT [voice]

[The position of MARK BOUNDARY is irrelevant.]

The tableaux in (388)-(393) show how these rankings select correct outputs from the four candidates: [+accented, -rendaku], [+accented, +rendaku], [-accented, -rendaku], and [-accented, +rendaku]. First, the tableaux in (388) and (389) deal with Type I.

(388) Type I (Second element: 2μ) (e.g. hituzi'-kai, itami-dome)

a. [+accented, -rendaku] (e.g. hituzi'-kai)

(i) REALIZE MORPHEME >> IDENT [voice]

/μμμ+[+v]+μμ/		MARK BOUNDARY	ALIGN-ACC-VOI	C [+ACC]	ALIGN-L (σ', root)	C [-ACC]	R-M	IDENT [VOI]
☞a. μ(μμ')-μμ	[+acc, -r]				*	*	*	
b. μ(μμ')-$μ^{[+v]}$μ	[+acc,+r]		*W		*	*	L	*W
c. μμμ-μμ	[-acc, -r]	*W		*W	L	L	*	
d. μμμ-$μ^{[+v]}$μ	[-acc, +r]			*W	L	L	L	*W

(ii) IDENT [voice] >> REALIZE MORPHEME

/μμμ+[+v]+μμ/		MARK BOUNDARY	ALIGN-ACC-VOI	C [+ACC]	ALIGN-L (σ', root)	C [-ACC]	IDENT [VOI]	R-M
☞a. μ(μμ')-μμ	[+acc, -r]				*	*		*
b. μ(μμ')-$μ^{[+v]}$μ	[+acc,+r]		*W		*	*	*W	L
c. μμμ-μμ	[-acc, -r]	*W		*W	L	L		*
d. μμμ-$μ^{[+v]}$μ	[-acc, +r]			*W	L	L	*W	L

b. [-accented, +rendaku] (e.g. itami-dome)

(i) REALIZE MORPHEME >> IDENT [voice]

/μμμ+[+v]+μμ/		MARK BOUNDARY	ALIGN-ACC-VOI	ALIGN-L (σ', root)	C [+ACC]	C [-ACC]	R-M	IDENT [VOI]
a. μ(μμ')-μμ	[+acc, -r]			*W	L	*W	*W	L
b. μ(μμ')-$μ^{[+v]}$μ	[+acc,+r]		*W	*W	L	*W		*
c. μμμ-μμ	[-acc, -r]	*W			*		*W	L
☞d. μμμ-$μ^{[+v]}$μ	[-acc, +r]				*			*

(ii) IDENT [voice] >> REALIZE MORPHEME

/μμμ+[+v]+μμ/		MARK BOUNDARY	ALIGN-ACC-VOI	ALIGN-L (σ', root)	C [+ACC]	C [-ACC]	IDENT [VOI]	R-M
a. μ(μμ')-μμ	[+acc, -r]			*W	L	*W	L	*W
b. μ(μμ')-$\mu^{[+v]}$μ	[+acc,+r]		*W	*W	L	*W	*	
c. μμμ-μμ	[-acc, -r]	*W			*		L	*W
☞d. μμμ-$\mu^{[+v]}$μ	[-acc, +r]				*		*	

(389) Second element: 3μ

a. [+accented, -rendaku] (e.g. netu-sa'masi): IDENT [voice] >> REALIZE MORPHEME

/μμ+[+v]+μμμ/		MARK BOUNDARY	ALIGN-ACC-VOI	ALIGN-L (σ', root)	C [+ACC]	C [-ACC]	IDENT [VOI]	R-M
☞a. μμ-(μ'μ)μ	[+acc, -r]					*		*
b. μμ-($\mu^{[+v]}$'μ)μ	[+acc,+r]					*	*W	L
c. μμ-μμμ	[-acc, -r]	*W			*W	L		*
d. μμ-$\mu^{[+v]}$μμ	[-acc, +r]				*W	L	*W	L

b. [+accented, +rendaku] (e.g. umi-bi'raki): REALIZE MORPHEME >> IDENT [voice]

/μμ+[+v]+μμμ/		MARK BOUNDARY	ALIGN-ACC-VOI	ALIGN-L (σ', root)	C [+ACC]	C [-ACC]	R-M	IDENT [VOI]
a. μμ-(μ'μ)μ	[+acc, -r]					*	*W	L
☞b. μμ-($\mu^{[+v]}$'μ)μ	[+acc,+r]					*		*
c. μμ-μμμ	[-acc, -r]	*W			*W	L	*W	L
d. μμ-$\mu^{[+v]}$μμ	[-acc, +r]				*W	L		*

When the second element has two morae, [+accented, +rendaku] (i.e. candidate (b)) is excluded by the violation of ALIGN-ACC-VOI because the left edge of the accented syllable and the [+voice] of *rendaku* are not aligned. [-accented, -rendaku] (i.e. candidate(c)), which has no marker of the boundary of a compound, is also excluded due to the violation of MARK BOUNDARY. As ALIGN-L (σ', root) and C [+ACC] are freely ranked, [+accented, -rendaku] and

[-accented, +rendaku] (i.e. candidate (a) and candidate (d)) are selected as the winners in (388). This is why complementary distribution of the accent and *rendaku* appears when the second element is short. In contrast, ALIGN-ACC-VOI does not penalize [+accent, +rendaku] (i.e. candidate (b)) when the second element has three morae because the left edge of the accented syllable and the [+voice] of *rendaku* are aligned. In addition, both [+rendaku] and [-rendaku] are allowed due to the free ranking of REALIZE MORPHEME and IDENT [voice]. Therefore, [+accented, -rendaku] and [+accented, +rendaku] (i.e. candidates (a) and (b)) are selected as the winners, as shown in (389).

Next, the tableaux in (390) and (391) deal with Type IV.

(390) Type IV (Second element: 2μ): [-accented, +rendaku] (e.g. nizyuu-dori)

/μμμ+[+v]+μμ/		MARK BOUNDARY	ALIGN-ACC-VOI	ALIGN-L (σ', root)	C [+ACC]	C [-ACC]	R-M	IDENT [VOI]
a. μ(μμ')-μμ	[+acc, -r]			*W	L	*W	*W	L
b. μ(μμ')-μ$^{[+v]}$μ	[+acc,+r]		*W	*W	L	*W		*
c. μμμ-μμ	[-acc, -r]	*W			*		*W	L
☞d. μμμ-μ$^{[+v]}$μ	[-acc, +r]				*			*

(391) Type IV (Second element: 3μ)

a. [+accented, +rendaku] (e.g. tabi-du'kare)

/μμ+[+v]+μμμ/		MARK BOUNDARY	ALIGN-ACC-VOI	ALIGN-L (σ', root)	C [+ACC]	C [-ACC]	R-M	IDENT [VOI]
a. μμ-(μ'μ)μ	[+acc, -r]					*	*W	L
☞b. μμ-(μ$^{[+v]}$'μ)μ	[+acc,+r]					*		*
c. μμ-μμμ	[-acc, -r]	*W			*W	L	*W	L
d. μμ-μ$^{[+v]}$μμ	[-acc, +r]				*W	L		*

b. [-accented, +rendaku] (e.g. han-gawaki)

/μμ+[+v]+μμμ/		MARK BOUNDARY	ALIGN-ACC-VOI	ALIGN-L (σ', root)	C [-ACC]	C [+ACC]	R-M	IDENT [VOI]
a. μμ-(μ'μ)μ	[+acc, -r]				*W	L	*W	L
b. μμ-($μ^{[+v]}$'μ)μ	[+acc,+r]				*W	L		*
c. μμ-μμμ	[-acc, -r]	*W				*	*W	L
☞d. μμ-$μ^{[+v]}$μμ	[-acc, +r]					*		*

When the second element has two morae, the pattern of accentuation is [-accented] because Align-L (σ', root) dominates C [+ACC]. Therefore, candidates (a) and (b) are losers in (390). Candidate (c) is also excluded due to the violation of REALIZE MORPHEME, which dominates IDENT [voice]. Therefore, candidate (d) is selected as the winner. When the second element has three morae, accented candidates (i.e. candidates (a) and (b)) do not violate ALIGN-L (σ', root). Therefore, candidate (b), which also satisfies REALIZE MORPHEME, is selected as the winner if C [+ACC] dominates C [-ACC], as shown in (391)-(a). If C [-ACC] dominates C [+ACC], the winner is candidate (d), as shown in (391)-(b).

In Type IV, *rendaku* almost always occurs because REALIZE MORPHEME dominates IDENT [voice]. Therefore, MARK BOUNDARY is always satisfied, which implies that the ranking of this constraint is irrelevant. The ranking of ALIGN-ACC-VOI, which militates against [+accented, +rendaku] when the second element has two morae, is also irrelevant because the ranking ALIGN-L (σ', root) >> C [+ACC] suffices to exclude candidate (b) in (390).

Third, the tableaux in (392) and (393) deal with noun compounds. *Rendaku* almost always occurs in noun compounds as REALIZE MORPHEME dominates IDENT [voice]. With regard to accentuation, noun compounds are accented in most cases, as ALIGN-L (σ', root) is dominated by C [+ACC]. Therefore, [+accented, +rendaku] (i.e. candidate (b)) is selected as the winner. Although candidate (b) violates ALIGN-ACC-VOI, the violation does not matter because ALIGN-ACC-VOI is dominated by REALIZE MORPHEME and C [+ACC] in noun compounds. The position of MARK BOUNDARY is irrelevant because noun compounds are accented and undergo *rendaku* in most cases.

(392) Noun compounds (Second element: 2μ): [+accented, +rendaku] (e.g. miyako'-dori)

/μμμ+[+v]+μμ/		C [+ACC]	ALIGN-L (σ', root)	C [-ACC]	R-M	IDENT [VOI]	MARK BOUNDARY	ALIGN-ACC-VOI
a. μ(μμ')-μμ	[+acc, -r]		*	*	*W	L		L
☞b. μ(μμ')-$\mu^{[+v]}$μ	[+acc,+r]		*	*		*		*
c. μμμ-μμ	[-acc, -r]	*W	L	L	*W	L	*W	L
d. μμμ-$\mu^{[+v]}$μ	[-acc, +r]	*W	L	L		*		L

(393) Noun compounds (Second element: 3μ): [+accented, +rendaku] (e.g. kona-gu'suri)

/μμ+[+v]+ μμμ/		C [+ACC]	ALIGN-L (σ', root)	C [-ACC]	R-M	IDENT [VOI]	MARK BOUNDARY	ALIGN-ACC-VOI
a. μμ-(μ'μ)μ	[+acc, -r]			*	*W	L		
☞b. μμ-($\mu^{[+v]}$'μ)μ	[+acc,+r]			*		*		
c. μμ-μμμ	[-acc, -r]	*W		L	*W	L	*W	
d. μμ-$\mu^{[+v]}$μμ	[-acc, +r]	*W		L		*		

In conclusion, the rankings of the three kinds of compounds are summarized as follows.

(394) Differences among the three types of compounds

	(i) Accentuation	(ii) *Rendaku*	(iii) Combination
a. Deverbal compounds (Type I)	ALIGN-L (σ’, root), C[+ACC] >> C[-ACC] ⇒[±accented] (2μ) [+accented] (3μ)	R-M, ID [voi] ⇒[±rendaku]	{[+acc, -r] [-acc, +r] (2μ) complementary distribution - - - - - - - - {[+acc, -r] [+acc, +r] (3μ)
b. Deverbal compounds (Type IV)	ALIGN-L (σ', root) >> C[+ACC], C[-ACC] ⇒[-accented] (2μ) [±accented] (3μ)	R-M >> ID [voi] ⇒[+rendaku]	[-acc, +r] (2μ) - - - - - - - - {[-acc, +r] [+acc, +r] (3μ)
c. Noun compounds	C[+ACC] >> ALIGN-L (σ', root) , C[-ACC] ⇒[+accented] (2μ, 3μ)	R-M >> ID [voi] ⇒[+rendaku]	[+acc,+r] (2μ, 3μ)

The first column summarizes the patterns of accentuation, based on the discussion in 3.2.6. The second column deals with the patterns of *rendaku* application. As REALIZE MORPHEME dominates IDENT [voice], *rendaku* occurs in noun compounds and Type IV deverbal compounds. In contrast, both [+rendaku] and [-rendaku] are found in Type I deverbal compounds because the two constraints are freely ranked. The third column deals with the combinations of [accented] and [rendaku]. In noun compounds, the combination of [+accented] and [+rendaku] is permitted although the two boundary markings are not aligned. This is because ALIGN-ACC-VOI is lower ranked. In contrast, ALIGN-ACC-VOI and MARK BOUNDARY take effect in Type I deverbal compounds, which gives rise to the complementary distribution of accent and *rendaku* when the second element has two morae. In Type IV deverbal compounds, the ranking of MARK BOUNDARY is not crucial because it is always satisfied due to the ranking REALIZE MORPHEME >> IDENT [voice]. The ranking of ALIGN-ACC-VOI is also irrelevant because Type IV deverbal compounds are unaccented when the second element has two morae due to the ranking ALIGN-L (σ', root) >> C[+ACC]. To summarize, the differences in *rendaku* and complementary distribution among the three kinds of compounds are also analyzed as a difference in constraint ranking.

4.4. Summary

This chapter argued that the differences in *rendaku* and accentuation between Type I and Type IV arise separately, although complementary distribution of accent and *rendaku* plays an important role within Type I. With regard to the difference in *rendaku*, two approaches suggested in previous studies were reviewed: the internal structure of compounds and the level of word formation. Although both analyses explain the difference between the two types, *rendaku* occurrence in Type I deverbal compounds and deverbal compounds which denote ‘product’ may support the latter.

Another proposal in this chapter was that the complementary distribution of accent and *rendaku* can be analyzed in terms of the alignment of accent and the [+voice] of *rendaku*, both of which are the markings of compound boundaries. Therefore, the two constraints ALIGN-ACC-VOI and MARK BOUNDARY were proposed. The differences among noun compounds, Type I deverbal compounds, and Type IV deverbal compounds were analyzed as differences in constraint ranking within the framework of OT.

5. Conclusion

5.1. Summary of this study

This study conducted a comprehensive survey of accentuation and *rendaku* in deverbal compounds in Japanese, employing a pronunciation dictionary. Furthermore, it gave a theoretical account of the results within the framework of Optimality Theory, comparing deverbal compounds with noun compounds.

From a descriptive viewpoint, the investigation in Chapter 2 not only verified what has been pointed out in previous studies but also revealed some new details, as shown in (395) and (396).

(395) Tendencies pointed out in previous studies

Type / Length of the second element	Type I Internal argument [*o* (acc)]	Type IV Adjunct
2μ	[+accented, -rendaku]	[-accented, +rendaku]
3μ	[+accented, +rendaku]	[+accented, +rendaku]

(396) Results of the survey

Type / Length of the second element	Type I Internal argument [*o* (acc)]	Type IV Adjunct
2μ	(i) [+accented, -rendaku] (ii) [-accented, +rendaku]	[-accented, +rendaku]
3μ	(i) [+accented, +rendaku] (ii) [+accented, -rendaku]	(i) [+accented, +rendaku] (ii) [-accented, +rendaku]

The three patterns which are not included in (395) are encircled by broken lines in (396). First, [-accented, +rendaku] was also observed in Type I when the second element has two morae. However, this result does not disagree with the generalization that Type I is more likely to be accented and resist *rendaku* compared to Type IV. Second, [+accented, -rendaku] was also found in Type I when the second element has three morae. Third, [-accented, +rendaku] was also observed in Type IV when the second element has three morae. These two results imply that the difference between the two types of deverbal compounds still remains even if the second element has three morae.

In addition to Type I and Type IV, the survey also dealt with Type II and Type III, which are the same as Type I in that the first element is an internal argument of the verb. It was shown that the accentuation and *rendaku* of Types I, II, and III are not uniform. That is, it is necessary to deal with the three types separately.

From a theoretical viewpoint, the differences in accentuation and *rendaku* between Type I and Type IV were analyzed within the framework of Optimality Theory. In the analysis, Type I and Type IV deverbal compounds were compared with nominal compounds, which have been investigated in detail in previous studies.

Chapter 3 dealt with the differences in accentuation, pointing out that noun compounds prohibit unaccentedness and allow penultimate accent, unlike deverbal compounds. The differences among noun compounds, Type I deverbal compounds, and Type IV compounds were analyzed as differences in constraint ranking: the position of accent depends on the ranking of NON-FINALITY (Ft) and NO-FLOP-PROMINENCE, and whether unaccentedness is allowed or not depends on the ranking of C[+ACC] and ALIGN-L (σ', root). The fact that unaccentedness tends to be avoided when the second element is long was explained in terms of ALIGN-L (σ', root). This study also explains the mechanism of deaccentuation in noun compounds which include deaccenting morphemes in terms of constraint interaction without simply specifying them as exceptions in the lexicon. In sum, the analysis of accentuation presented in Chapter 3 sheds light on the issue of deaccentuation, which was not explained by derivational approaches as pointed out by Tanaka (2005a), revealing some aspects of the mechanism in terms of constraint interaction.

Another advantage of the analysis in Chapter 3 is the explanation of the rankings for each type of compound in terms of ‘lexical category’ (i.e. nominal/adjectival/verbal). First, this study pointed out that the three kinds of compounds differ in ‘lexical category’, based on the analysis of syntactic categories by Croft (1991), where both semantic class and pragmatic function are required. Concretely, noun compounds are more nominal than Type I deverbal compounds, and Type I deverbal compounds are more nominal than Type IV deverbal compounds. Second, it was argued that C[+ACC] tends to be highly ranked in nominal words, based on some examples in other types of word formation. Likewise, NO-FLOP-PROMINENCE tends to be highly ranked in nominal words, accounted for in terms of noun faithfulness (Smith 2001). As noun compounds are typical nouns, unlike deverbal compounds, NO-FLOP-PROMINENCE and C[+ACC] are highly ranked in the constraint ranking. The difference between Type I and Type IV (i.e. C[+ACC] is lower ranked in the latter) can also be accounted for because the latter has verbal characteristics compared with the former. This explanation is also supported by the variation of accentuation in Type I deverbal compounds. Based on the examination of the data, this study showed that the correlation between 'lexical category' and accentuation is also found in Type I deverbal compounds where the second element has two morae.

The differences in *rendaku* among nominal compounds, Type I deverbal compounds, and Type IV deverbal compounds were also analyzed as differences in constraint ranking in Chapter 4. It was shown that the complementary distribution of accent and *rendaku* plays an important role among Type I deverbal compounds, although the difference in *rendaku* between Type I and Type IV does not result from the difference in accentuation. The complementary distribution of accent and *rendaku* was analyzed in terms of the alignment of two kinds of markings of compound boundaries (i.e. accent and the [+voice] of *rendaku*), which leads to proposing ALIGN-ACC-VOI and MARK BOUNDARY. As these two constraints are ranked high in Type I deverbal compounds, these compounds show the complementary distribution of accent and *rendaku*. This chapter also reviewed two approaches regarding the cause of the difference in the occurrence of *rendaku*: the internal structure of compounds or the level of word formation. Although both analyses are plausible, the latter explains *rendaku* occurrence in Type I deverbal compounds and deverbal compounds which denote 'product'.

As summarized above, this study not only described accentuation and *rendaku* in deverbal compounds comprehensively but also gave theoretical accounts for them, pointing out the relationship between 'lexical category' and accentuation and explaining the complementary distribution of accentuation of *rendaku*.

5.2. Residual issues and a further direction for this study

This study does not give a theoretical account of deverbal compounds and noun compounds in which each element is less than three morae. Although it is difficult to generalize the accentuation patterns of such short compounds due to the relevance of the accentuation of the first element and the abundance of variation, explaining the patterns of short compounds will also shed light on the analysis of longer compounds.

A second issue is related to deaccentuation. The table in (396) does not refer to details of the length of the first element. However, it is relevant in Type IV deverbal compounds where the second element has three morae. As shown in 2.4, most compounds which are [-accented, +rendaku] are 2μ+3μ. Theoretical analyses of this issue will give a better understanding of deaccentuation in Japanese.

Third, the correlation between 'lexical category' and accentuation which is proposed in this study will be supported more strongly if it is verified by experiments which investigate whether the accentuation of new compounds depends on 'lexical category'. In particular, accentuation of short compounds is a good subject of investigation because they tend to show variation in accentuation.

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