The Syntax and Phonology of Aoyagi plus Rendaku Compounds

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Abstract

This thesis provides an overview of the issues in the phonological voicing rule 'rendaku', which affects compounds, and its relation to phonological phrasing and syntax in Japanese. Previous analyses have focused on the direction of branching, the category of compounds, and accentedness in the hope of shedding light on a complex aspect of Japanese phonology. Since rendaku is assumed to apply only at word boundaries, it has been used as a test of word-hood by Poser (1984; 1990) in his analysis of a special class of prefixes that appear to allow a minor phrase boundary between them and the root to which they attach. This is unusual because the prefixes and stems appear to resist internal modification, which does imply that these are syntactic words that have phonological boundaries where there is no syntactic boundary. This indirect model of syntax to phonology mapping is investigated to see whether there really is such a syntax-phonology mismatch in such examples. Contrary to Poser's analysis, what is shown here is that these prefixes can trigger rendaku in some cases, which suggests an alternative syntactic analysis. Furthermore, evidence from accentedness and scope relations shows a regular pattern that explains the presence of a phrasal accent contour, and a lexicalist approach is used to account for the structure of prefixed examples. In order to achieve this, a new morphological category, proposed by Kageyama (2001; 2016), is used to show how lexical integrity and compound structure can be maintained.

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Introduction

Several competing theories of syntax to phonology mapping have developed over the course of the last 20 – 30 years, and they often assume two separate structures of representation (Ishihara, 2015). Some theories, such as Nespor and Vogel (1986) and Poser (1990), assume indirect mapping, whereas others, such as Chomsky, Halle, and Lukoff (1956), Cinque (1993), and, more recently, Ito and Mester (2013) take a more direct approach, assuming that syntactic constituent boundaries are what determine the phonological counterparts.

Presented here are some of the arguments for an indirect approach, from Poser (1990), in relation to an interesting class of prefixes known as 'Aoyagi prefixes'. These prefixes present a problem for direct syntax to phonology mapping approaches, because they display accent patterns that suggest they are independent words, but yet their syntactic behaviour suggests they are bound to their stems. They are usually followed by a phonological phrase boundary, which should correspond to the edge of a syntactic word, but the non-separability of the prefix and stem makes this analysis problematic.

What will be shown here is that these prefixes have a special morphological status that allows them both to be bound and also display characteristics usually associated with compounding.

Crucial to this aim is evidence from Japanese compounding and the phonological rule, rendaku, also known as 'sequential voicing'. Rendaku affects any compound root that begins with a voiceless obstruent, and has the effect of changing the obstruent from voiceless to voiced. It has been widely studied from different perspectives, so not much more will be said about how it works. However, there is an overview of some of the more important arguments of the last 30 years, including Otsu's (1980) paper, which introduced C-command into the analysis for the first time, and Rosen's (2001) PhD thesis, which carried out an analysis on rendaku roots in order to try and establish what factors influence rendaku propensity. As

will be shown in chapter 1, rendaku is a notoriously unpredictable rule, and there are numerous factors at play in whether a word undergoes it or not.

The structure of the thesis is as follows: Chapter 1 provides an introduction to rendaku, its environments, and some of the well-known analyses that have been proposed. Direction of branching (Otsu, 1980) and mapping of syntactic brackets (Tokizaki, 1999; 2008) are particularly relevant for the later discussion.

Chapter 2 provides a brief overview of the relevant phonological constituents in Japanese. Of particular importance is the division by McCawley (1968), Poser (1984), and Kubozono (1993) of the phonological phrase into major and minor phrases.

Chapter 3 is a detailed look at some of the claims by Poser (1984; 1990) with regards to minor phrase boundaries and the structure of Aoyagi prefixes and their related words. Data is presented from a dictionary search for items involving the prefixes and instances of rendaku, and an analysis is carried out on the roots undergoing the rule to try and determine whether Rosen's (2001) and van der Weijer's (2013) observations about 'frequency' can explain the data.

Chapter 4 proposes some structures that might explain the patterns of rendaku that have been observed, as well as a possible solution to the syntax/phonology mismatch observed by Poser (1990). Furthermore, Kageyama's 'word plus' morphological category is discussed because of recent work that suggests it may have some bearing on the unusual accent properties observed with the Aoyagi prefixes.

Chapter 5 is the discussion section where the arguments for and against the structures in chapter 4 will be discussed in more detail, and a proposal is made regarding the correct analysis for the Aoyagi + rendaku counterexamples.

The term 'Aoyagi prefix' or 'prefix' is used throughout this thesis when referring to the class of items that have been analysed by Poser and others as being prefixes, but this does not assert that this is the appropriate or accurate category. It is simply for ease of reference.

Acknowledgements

Having studied for two degrees in the linguistics department at York, I have had the pleasure of learning from a number of great teachers, and I have made a lot of good friends as well. Therefore, there are many people that I could thank for helping me to reach this point. Six years ago I visited the university for an open-day and met Sam Hellmuth, who was so friendly and enthusiastic about linguistics and the university that I knew I was making the right choice in applying. She also helped me several times in the years that followed that first meeting, so I am very grateful.

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Author's Declaration

I declare that this thesis is a presentation of original work and I am the sole author. This work has not previously been presented for an award at this, or any other, University. All sources are acknowledged as References.

1 Rendaku: An overview

1.1 Conditions/Restrictions

Rendaku, also known as sequential voicing, is a phonological rule that affects the right hand member of certain compounds by changing word-initial voiceless obstruents into voiced ones. In example (1) the obstruent [k] of the citation form of *kuni* is changed to [g], and in (2) the [h] of *hako* is changed to [b].

(1) *sima* *kuni* --> *sima**g**uni*
island country 'island country'

(2) *ki* *hako* --> *ki**b**ako*
wood box 'wooden box'

In some cases this involves a change in manner of articulation, because of historical sound change (Vance, 2007), and in others there is more than one possible rendaku equivalent. The table in (3) is adapted from Tsujimura (2014: 52), and shows the full range of Japanese obstruents and their voiced counterparts.

(3) Japanese voiceless obstruents and their rendaku equivalents

s	-->	z	t^s	-->	z/d^z	tʃ	-->	dʒ
ʃ	-->	dʒ	t	-->	d	k	-->	g
ç	-->	b	ɸ	-->	b	h	-->	b

Historical evidence suggests that rendaku may have arisen from a shortening of either genitive *no* or the dative *ni* to just an alveolar nasal, which then had a voicing effect on the following consonant before disappearing (Frellesvig, 2010; Ito and Mester, 2003). However, this cannot account for some modern instances of rendaku, or cases of reduplication that display rendaku (Martin, 1987; Rosen, 2001).

In determining where rendaku occurs, it is also useful to use the term *juncture*, as used by Chomsky, Halle and Lukoff (1956) and Chomsky and Halle (1968), and state that rendaku can only occur at word junctures (symbolised by #) and not morpheme junctures (symbolised by +). Ito and Mester (2003: 80) note that only compounds involving independent words, or roots that have been inflected to create a word, can undergo rendaku; compounds comprising only roots do not undergo rendaku. Examples of both types are shown in (4) and (5).

(4) Word compound:
nikum *are* ***g****uti* 憎まれ口
hate PASS mouth
'words that make oneself hated'

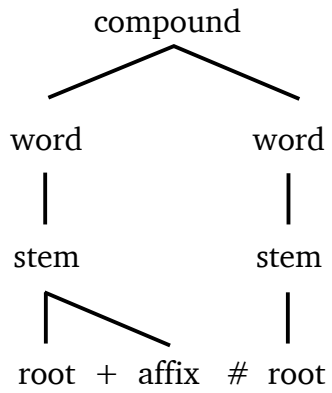
(5) Root compound:
too *kyoo* 東京
east capital
'Tokyo'

Examples from Ito and Mester (2003)

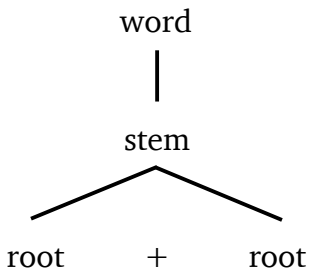
In (4) the passive morpheme *are* is adjacent to *kuti* 'mouth', which undergoes rendaku and becomes *guti* because *nikum* + *are* forms a word that then triggers the rendaku effect. In contrast, no rendaku is triggered in (5) because *too* is not a full word, so there is no # boundary between *too* and *kyoo*. This distinction is shown more clearly by the following tree diagrams in (6) adapted from Ito and Mester (2013).

(6)

a. Word compound



b. Root compound



Previous analyses have shown that rendaku mostly acts to mark the head in endocentric compounds, which explains why it does not occur in *dvandva* compounds or deverbals.[1] Example (7) is a dvandva compound, which has a pair-like reading, and is therefore exocentric, and in example (8) a noun and a verb are combined to form a new compound with the meaning 'painter' (Sugioka, 1984); in both cases rendaku does not occur.

(7)	*siro*	*kuro*	-->	*sirokuro*
	white	black		'black and white'

(8)	*e*	*kaki*	-->	*ekaki*
	picture	paint		'painter'

The absence of rendaku in these cases is also expected if, as mentioned above, rendaku voicing originated from the shortening of nasal initial particles *no* and *ni* because these particles could never appear between two conjoined nouns, nor after deverbals of the argument type where the correct particle would be accusative *o* (Ito and Mester, 2003: 86).

[1] Deverbals are divided into two types: argument type and adjunct type. The former generally resist rendaku, whereas the latter, where there is a clear modifier and head relation, tend to allow it (Yamaguchi, 2011). This distinction will be taken up again in chapter 4.

It is likely that dvandva compounds were originally separate words connected by a conjunction, such as *to* 'and' in old Japanese (Martin, 1987: 99), in which case the two words would not be directly adjacent – a necessary requirement for the application of rendaku, since the rule is sensitive to # boundaries.

There are also some well-documented restrictions on the application of rendaku, such as the native word preference and *Lyman's law*. Japanese words can be divided up into three general etymological categories, which are: wago (native), kango (Chinese), and gairaigo (foreign). Words that undergo rendaku are almost exclusively from the wago category, but it is possible for a kango or a gairaigo word to be the left hand member (also known as a rendaku trigger) in a rendaku compound (Otsu, 1980). Examples of each type are shown in (9) – (11) from Otsu (1980).

(9)	wago / wago:	*take*	*sao*	-->	*take**z**ao*
		bamboo	pole		'bamboo pole'
(10)	kango / wago:	*eiga*	*suki*	-->	*eiga**z**uki*
		movie	like		'movie fan'
(11)	gairaigo / wago:	*garasu*	*to*	-->	*garasu**d**o*
		glass	door		'sash door'

1.2 Lyman's Law

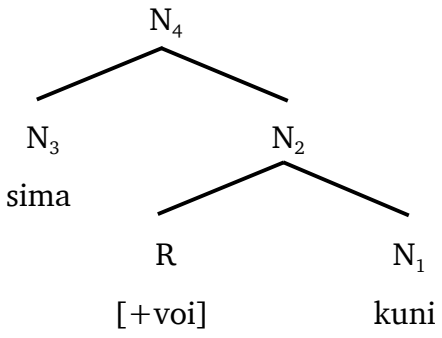
Lyman's law was first documented in Motoori Norinaga's (1822) *Kojiki-den*, and later by American linguist Benjamin Smith Lyman, who the rule was named after (Martin, 1987). It is a type of dissimilation that prevents two or more voiced obstruents from occurring in the same word (Tsujimura, 2007) so that, despite all other conditions being optimal, rendaku is blocked because a voiced obstruent is already present in the second member of a compound (Mester and Ito, 1989: 277).

Within the autosegmental framework, it is possible to represent Lyman's law as a deletion rule that affects the voicing tier. As shown in (12), the voicing tier of a potential rendaku segment is realised as [+voi] and becomes Ø if there is another [+voi] segment to its right (Mester and Ito, 1989).

(12) [+voi] --> Ø / ___ [+voi]

Mester and Ito (1989) envisaged rendaku voicing as a morpheme in its own right, and this idea has been developed in more recent work where rendaku voicing is proposed to be a linking morpheme that is left-adjoined to the right-hand member of a rendaku compound. So, example (1) would be structured as shown in example (13), where 'R' stands for the linking rendaku morpheme that causes *kuni* to become *guni* (Ito and Mester, 2003: 84).

(13)



It is possible, however, for rendaku to occur twice in longer compounds, leaving a root with two obstruents, because Lyman's law can be related to a more general restriction in Japanese that disallows two obstruents within one native morpheme (Ito and Mester, 2003; Rosen, 2001). If a word is formed from two morphemes, and rendaku applies, the new word can then undergo the rule once more. Rosen provides the example in (14) where first *ha* 'piece' undergoes rendaku when it is combined with *koto* 'say' and

then the resulting word *kotoba* ‘word’ undergoes the rule once more when combined with *onna* ‘woman’.

(14)

koto	+	*ha*	=	*koto**b**a*	言葉
say		piece		‘word/language’	
onna	+	*kotoba*	=	*onna**g**otoba*	女言葉
woman		word		‘women’s speech’	

The one obstruent per morpheme hypothesis is further supported by examples like (15)a-c where the first members of each compound contain voiced obstruents, but rendaku is still triggered (Rosen, 2001: 16).

(15)

a. *ebi*	+	*kani*	=	*ebi**g**ani*	海老蟹
shrimp		crab		‘crayfish’	
b. *hiza*	+	*hone*	=	*hiza**b**one*	膝骨
knee		bone		‘knee bone’	
c. *kugi*	+	*hako*	=	*kugi**g**ako*	釘箱
nail		box		‘nail box’	

This is contrary to what Otsu (1980) and Tokizaki (2008) have observed. Otsu (1980) notes that Lyman’s law appears to block rendaku in complex compounds, and that this is evidence for the cyclic nature of compound formation. For instance, in (16) rendaku occurs on *hako* ‘box’ but not on *hasibako* ‘chopstickbox’ in (17).

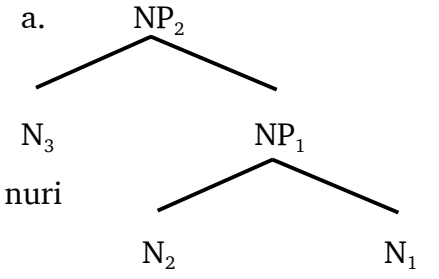
(16) *hasi* + *hako* = *hasi**b**ako* 箸箱
chopstick box ‘chopstick box’

(17) *nuri* + *hasibako* = *nurihasibako* / **nuribasibako* 塗箸箱
lacquer chopstick box ‘a lacquered box for chopsticks’

The starred form in (17) *nuribasibako* is possible, but only if the compound *nuribasi* ‘lacquered chopsticks is formed first. This is can then combine with *hako* with the interpretation ‘a box for lacquered chopsticks’ (Otsu, 1980). The corresponding structures for each are shown in (18)a and (18)b.

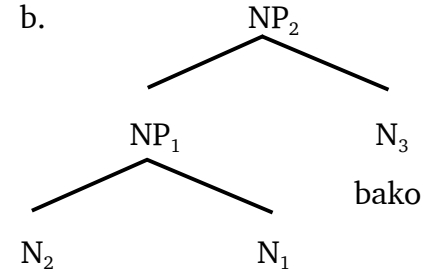
(18)

a.



‘a lacquered box for chopsticks’

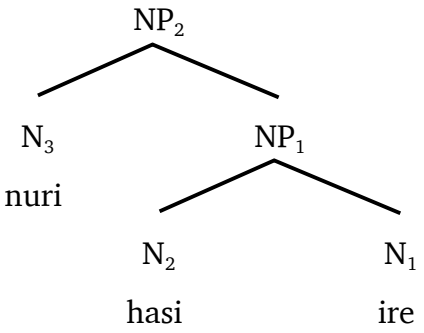
b.



‘a box for lacquered chopsticks’

In (18)b, *nuribasi* is formed first, and can combine with *hako*, triggering the rendaku form *bako*, because there is no voiced obstruent in *hako*. Furthermore, because *hako* is a separate morpheme from *nuribasi*, Lyman’s law does not block rendaku, as predicted. However, Otsu (1980) notes that Lyman’s law can’t explain the rendaku blocking that occurs in an example like (19). Here, the word *hasiire* ‘chopstick case’ is formed, and there is no voiced obstruent to block rendaku. Nevertheless, rendaku fails to apply on *hasiire*.

(19)



'lacquered chopstick case'

1.3 The right branch condition

Otsu's explanation for the above examples is that rendaku obeys the *right branch condition*, which says that a potential rendaku word must be on a right branch at the lowest level of representation (Otsu, 1980: 219). In both (18)a and (19) *hasi* is a left branch constituent, whereas in (18)b it is a right branch constituent. Therefore, it doesn't matter that NP_1 *hasiire* is on the right branch of NP_2 because it is not a terminal node and rendaku cannot apply.

Similarly, Tokizaki (1999; 2008) proposes that prosodic boundaries, which are mapped from the brackets of syntactic constituents, are responsible for the application or non-application of some phonological rules, including rendaku and lateralisation in Korean. Examples like (18)a and (18)b would have the bracketed structures shown in (20)a and (20)b, respectively.

(20)

a. [*nuri* [*hasi bako*]]

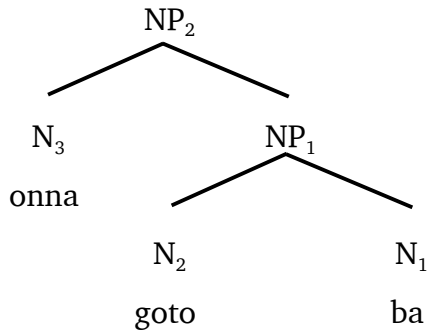
b. [[*nuri basi*] *bako*]

What is important is whether the prosodic boundary is mapped from a left or a right bracket. A boundary from a left bracket can block rendaku, which is what prevents rendaku on *hasi* in (20)a, but it can apply at a

boundary from a right bracket, which is what permits rendaku on *hako* in (20)b (Tokizaki, 2008: 3).

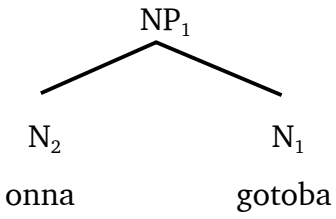
If Rosen's (2001) example (14) is correct, it provides a problem for both Tokizaki's (2008) and Otsu's (1980) analysis, since the internal structure would be as in (21).

(21)



Here, *goto* is a on a left branch, so should be blocked under Otsu's right branch condition, and also under Tokizaki's analysis, where a prosodic boundary mapped from a left bracket would be between *onna* and *koto*. The only way this can be reconciled is with the alternative structure in (22), where *gotoba* is simply an N rather than an NP.

(22)



This raises the question of whether rendaku compounds should be treated as derived words, or if they are learned and stored in the lexicon as full words. This has been considered by Rosen (2001), who states evidence for both cases. Firstly, as mentioned in section 1.2, the nature of Lyman's law seems to suggest morphological derivation of rendaku compounds. Secondly, rendaku can be a productive rule, as evidenced by new rendaku

compounds that have come into use in the last century and by experiments that show native Japanese speakers apply rendaku when asked to pronounce novel compounds (Rosen, 2001). This adds further weight to the argument for derivation.

On the other hand, Japanese compounding is quite restrictive when compared to English, so not all combinations of words are acceptable, even if they are semantically compositional. Furthermore, there are many examples, such as those in (23), that aren't semantically compositional, and therefore must be learned and stored in the lexicon as whole words (Rosen, 2001).

(23)

a. *yoko* ***g****uruma* 横車
side car
'interference'

b. *kuti* ***b****i* 口火
mouth fire
'beginning of a conversation'

c. *moto* ***d****e* 元手
origin hand
'monetary capital'

Rosen (2001) also mentions the phonological unpredictability of certain compounds, particularly with regard to pitch accent, and the example in (23)c is one such example. As will be shown in chapter 3, the rendaku trigger *moto* in (23)c is one of a special class of prefixes that have unusual pitch accents and usually don't trigger rendaku.

1.4 Rendaku lovers and haters

Despite the rules and restrictions for rendaku outlined above, there are still exceptions and unusual cases that have often defied explanation, and led some scholars to the conclusion that rendaku is largely unpredictable. McCawley (1968: 87) in studying rendaku, states that he cannot fully explain the rule because the data are 'bewildering'. Even the very robust Lyman's law has some exceptions, but these are very unusual and/or of questionable legitimacy (Otsu, 1980).

There are, however, a number of common words that tick all of the rendaku boxes, and are not excluded by any of the known restrictions on rendaku, but nevertheless fail to undergo the rule. Furthermore, there are some words that seem to undergo it in some compounds, but not in others. These cases have been analysed in detail by Rosen (2001), who compiled extensive lists of words with different levels of rendaku propensity. Rosen distinguished three categories: rendaku 'lovers' (always undergo rendaku), rendaku 'haters' (never undergo rendaku), and words that sometimes undergo rendaku and sometimes don't (van der Weijer et al (2013) calls the last category rendaku 'doubters'). Some examples from Rosen (2001) are shown in examples (24) - (26), with definitions from *Jisho*.

(24) Rendaku lovers:

a.	*take*	-->	*ao*	*dake*	青竹
	bamboo		green	bamboo	'green bamboo'
b.	*take*	-->	*ma*	*dake*	真竹
	bamboo		true	bamboo	'giant timber bamboo'
c.	*huro*	-->	*asa*	*buro*	朝風呂
	bath		*morning*	*bath*	'morning bath'

d.	*huro*	-->	*suna*	*buro*	砂風呂
	bath		sand	bath	'sand bath'

(25) Rendaku haters:

a.	*tuti*	-->	*kabe*	*tuti*	壁土
	earth		wall	earth	'plaster'
b.	*tuti*	-->	*soko*	*tuti*	底土
	earth		bottom	earth	'subsoil'
c.	*saki*	-->	*sita*	*saki*	舌先
	before		tongue	before	'tongue tip'
d.	*saki*	-->	*mise*	*saki*	店先
	before		shop	before	'shop front'

(26) Rendaku doubters:

a.	*hara*	-->	*sasa*	*hara*	笹原
	field		bamboo grass	field	'bamboo grass field'
b.	*hara*	-->	*kuwa*	*bara*	桑原
	field		mulberry	field	'mulberry field'
c.	*kusa*	-->	*natu*	*kusa*	夏草
	grass		summer	grass	'summer grass'

d.	*kusa*	-->	*hotaru*	*gusa*	蛍草
	grass		firefly	grass	'dayflower'

Following up on Rosen (2001), van der Weijer et al. (2013) attempt to explain the variation that is observed in examples like (24) - (26) through the notions of *frequency* and *family size* of the root involved. Two types of frequency were measured: frequency of root in isolation, which is the number of occurrences within a corpus, and family frequency, which is the amount of individual occurrences of compounds with a particular root. Family size is a measurement of how many different types of compound a root is used in (van der Weijer et al, 2013: 136).

Several hypotheses were made regarding the frequency of the root, as well as its position within the compound (left or right hand member), and how this might affect the occurrence of rendaku. Frequency of a root in isolation and family size of a root as a left hand member were both found to increase the likelihood of rendaku (van der Weijer, 2013: 141). The correlation between family size of the root as a left-hand member and propensity for rendaku is unusual, and contrary to the hypothesis formulated by van der Weijer et al. Their prediction was that, given that rendaku applies to the right hand member of compounds, a root that is commonly a right-hand member would have more opportunities for rendaku, and therefore have a stronger association with the rendaku form. What the results actually show is the opposite; commonness as a left-hand member is a strong predictor for rendaku.

1.5 Summary

This section has provided an introduction to the phonological voicing rule known as rendaku and some of the major findings about when and how it applies. Firstly, it is a rule that changes a voiceless obstruent to a voiced one when it is word initial in the right-hand member of a compound. In particular, it occurs in order to mark the head in endocentric compounds,

which is why it is uncommon in other types of compounds, such as dvandvas, where there is no clear modifier + head relationship.

There are several well-known restrictions on the application of rendaku, including: no root compounding, which restricts the rule to application at word boundaries only; the wago preference, which restricts the rule to mainly native words; the right-branch condition, which requires a rendaku candidate to be right-adjoined to the rendaku trigger; and Lyman's Law, which disallows two voiced obstruents within the same morpheme.

Despite these clear rules and restrictions, there are many other cases where rendaku doesn't occur when it should, or does occur when it shouldn't. Some recent research by van der Weijer et al. (2013) suggests family size of the root as an important factor in determining whether a particular root will be more or less likely to undergo the rule.

The next chapter gives an overview of some of the relevant phonological categories of Japanese compounds.

2 Intonational Phrases: An overview

2.1 The Mora

The category of 'mora' is crucial to Japanese phonology, and is the phonological category below the level of the word and the syllable in Selkirk's (1984) phonological hierarchy. This means that an English word of two syllables, such as 'London', is divided up into four morae in Japanese, like so – /ro/ /N/ /do/ /N/ (Tsujimura, 2007). Here, the word 'London' consists of two CV morae and two velar nasals. Syllables can vary in the length and time they take to produce, but morae, at least in Japanese, are analysed as taking the same time to articulate, regardless of whether they are comprised of C, V, or CV (Ladefoged and Johnson, 2011).

(1) Types of one-mora segment:
- Consonant plus a vowel eg. *ka* か, *ki* き, *ku* く
- Single vowel eg. *a* あ, *i* い, *u* う
- First consonant of a geminate eg. *gakki* 楽器 'musical instrument'
- Velar nasal eg. *hoN* 本 'book'

(Tsujimura, 2007)

Whether the syllable has a role in the phonology of Japanese is under debate, but the mora is the unit of rhythm in Japanese (Labrune, 2012: 143), as well as being the category that phonological rules refer to (McCawley, 1968: 133), and the basis for Japanese 'Haiku' poetry (Kubozono, 1999: 33). Modern Japanese *hiragana* and *katakana* scripts represent 46 morae, but these can be modified by palatalisation, gemination, or voicing, to form a total of 103 distinctive morae (Labrune, 2012: 144).

2.2 The Minor Phrase

The minor phrase is one of two intonational phrases that are discussed in Japanese – the other one is the major phrase (Kubozono, 1993: 115). It is defined in numerous ways in the literature, including as the smallest unit that has a tonal pattern in Japanese (Poser, 1990), and as the domain of initial lowering (McCawley, 1968). The tonal pattern is described by Poser (1990) as LH(L), which means a rise from low tone to high tone that usually remains high, but can also fall again. If the tone falls again, the syllable after the mora where the fall occurs is accented (Poser, 1990).

The tonal patterns of Japanese phrases are very important, and Japanese dictionaries often give detailed descriptions of these. McCawley (1968: 132) provides a table from the dictionary *Meikai Kokugo Jiten*, which shows the possible shapes for different sized words – from one mora to six – and supports Poser's (1990) analysis that once a high tone falls to a low tone, it never rises again within the same minor phrase. McCawley (1968: 133) also notes that accented and unaccented one-mora nouns are identical in isolation, since both are pronounced with a high tone, and accent is only identifiable when there is a following mora for the low tone to be realised.

Minor phrases can consist of one prosodic word or a maximum of three (Selkirk and Tateishi, 1988: 323). However, if more than one accented word occurs, usually only the leftmost accent is realised; this is known as *accent resolution* (Poser, 1990). Selkirk and Tateishi (1988) also state that not all prosodic words necessarily constitute minor phrases, and that accentedness is the only diagnostic of minor phrases. Furthermore, the category of prosodic word must be distinct from the minor phrase for two reasons: one, words and functional words may be joined together to form a phonological constituent, regardless of their accentedness; and two, as mentioned above, the prosodic word serves as a unit of measurement that restricts the complexity of a minor phrase (Selkirk and Tateishi, 1988).

As well as the phonological definition of a minor phrase, there are morphosyntactic definitions. Poser (1984: 148) states that the minimal

minor phrase is the phonological word, plus any of the particles listed in (2).

(2) Particles that form a single minor phrase with a lexical item
- Case or topic eg. *ga* 'nom', *o* 'acc', *ni* 'dative'
- Quantificational eg. *mo* 'even', *dake* 'only'
- Sentence final eg. *ka* 'interrogative', *yo* 'emphatic'
- Conjunctions eg. *to* 'and', *ya* 'such as'
- Copulas eg. *da*, *desu*

It is assumed that the particles in (2) cannot form minor phrases on their own, and that they become part of the same minor phrase as their host. However, there are other examples of minor phrases that can be formed from two independent minor phrases being condensed into one (Kubozono, 1993: 127). Poser (1984: 143) provides verbal examples, using the gerundive suffix *te*, where two different phrasings result in different meanings. Observe the examples in (3) and (4) using the gerund of the verb *yomu* 'read' and the verb *miru* 'see.'

(3) yónde míru
reading see
'read and see'

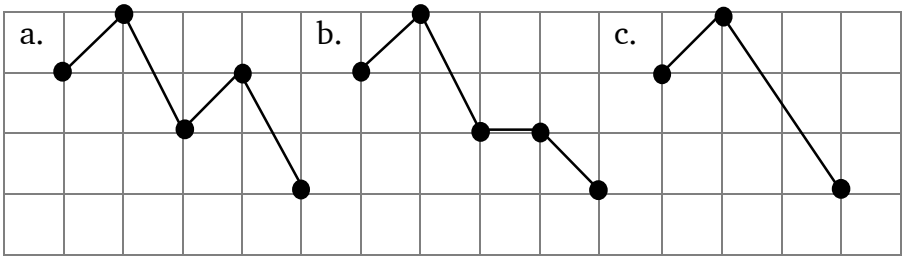
(4) yónde miru
reading see
'tries reading'

In (3), both words constitute separate minor phrases because they both retain their accents. The result is that the gerundive suffix acts as a conjunction, which yields the interpretation of 'read and see'. Example (4), on the other hand, is a unified minor phrase, because the accent on *miru* has been dropped, which results in the meaning 'tries reading' (Poser 1984:

143). In fact, the pitch contours for (3) show that this sequence is actually a major phrase, since the tone raises only to mid level for *miru* before falling again (Poser 1984: 162).

Kubozono (1993), however, questions the concept of 'minimal minor phrase' as outlined by Poser, and argues that minor phrases are formed by mapping syntactic and morphological structure to the phonology, from categories that may form minor phrases on their own. Kubozono (1993: 128) provides examples containing the particles in (2), as well as verbal examples of the type in (3) and (4), and argues that three types of pitch contour, shown in (5), can be observed in the data. The contours in (5)a and (5)c are what Poser claims represent two minor phrases and one minor phrase, respectively. The contour in (5)b is known as *total downstep* by Kubozono or *total catathesis* by Poser, who claims that this does not occur in Japanese at all (Kubozono, 1993: 125).

(5)



Kubozono argues that there is variation in how minor phrases are formed, and that there is no underlying intonational structure that must be modified in order to combine minor phrases. The information about what can form a minor phrase comes from the syntax, which is then divided up at PF. This accounts for the intonational variation observed in compounds such as (6) (% symbol = minor phrase boundary) (Kubozono, 1993: 131).

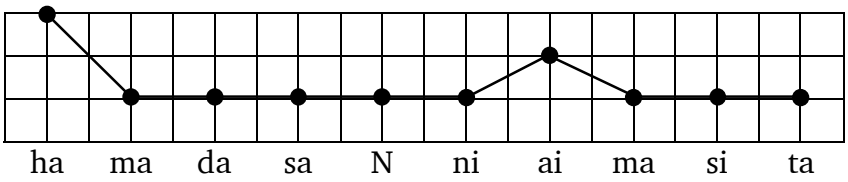
(6) % a̲kai % ha̲na % --> 'red flower'

% a̲kai hana % --> 'red flower'

2.3 The Major Phrase

McCawley's (1968: 138) definition of the major phrase states that it can consist of one or more minor phrases, but that only the first minor phrase has a high pitch. The following minor phrases within the major phrase still have only one high pitch, but the pitch is not as high as the preceding minor phrase. In McCawley's view, this makes these 'mid pitch' levels somewhat similar to secondary stress in English. Example (7) is from McCawley (1968) and shows the division of phrases and pitch levels for a sentence in Japanese.

(7) MaP
MiP MiP
hamada-san ni aimasita
mr. hamada DAT meet-PAST
'I met Mr. Hamada'



The mid pitch of the second phrase is known as *downstep* or *catathesis* (Vance, 2008), not to be confused with the *total downstep / catathesis* contour shown in (5)c.

Minor phrase combinations that can form major phrases include:

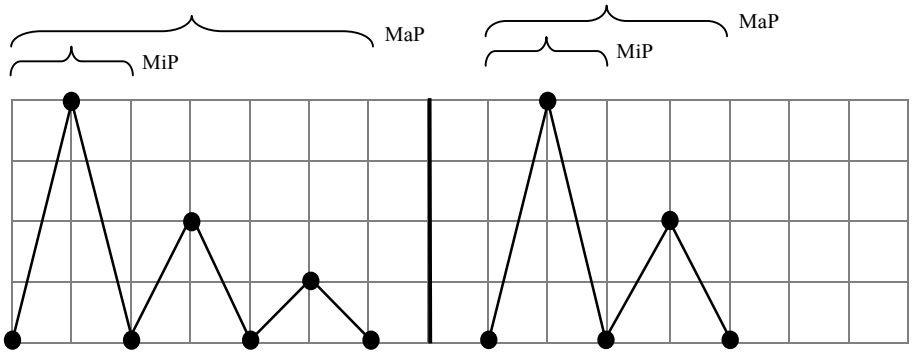
- adjective + noun + particle
- adjective stem + negative
- noun + particle + verb

Furthermore, it is possible for only one minor phrase to be accented or for the whole sequence to be unaccented (Vance, 2008: 182).

There also exist two competing views on whether the downstep effect may be realised multiple times within the major phrase. Poser (1984) and Kubozono (1993) both support the idea that the downstep effect occurs on

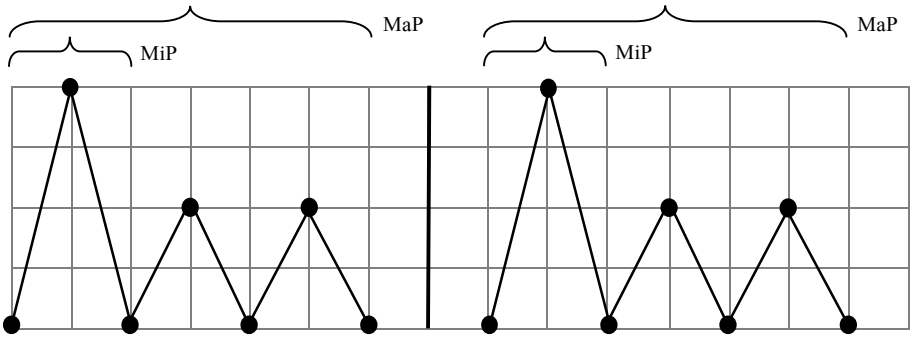
every following minor phrase within the major phrase, so that each mid level accent is relative to the previous accent, whereas McCawley (1968) and Selkirk and Tateishi (1991) hold the opposite view (Ishihara, 2015). The Poser (1984) and Kubozono (1993) type is known as cumulative downstep, and is shown in (8), where the line in the middle represents a major phrase boundary, after which the pitch contour is allowed to rise up to the highest point once more (Ishihara, 2015).

(8)



The McCawley (1968) and Selkirk and Tateishi (1991) pattern, non-cumulative downstep, is shown in (9). Here, the pitch contour rises up at each following minor phrase, but to the same height as the previous one.

(9)



Selkirk and Tateishi (1991) also propose the following rule in (10) for mapping major phrases to syntactic categories.

(10) Major Phrase: {Left, XP}

This rule means that the left edge of a maximal syntactic projection is mapped to the left edge of a major phrase, and has been developed as the *end-based theory* of syntax to phonology mapping (Ishihara, 2015).

Selkirk and Tateishi (1991) argue that the pattern in (8) is based on [Adj] [Adj] [N] combinations, and is restricted to cases where there is no left edge of a maximal projection that comes between the two accents. In the case of [Adj] [Adj] [N], there is no maximal projection boundary intervening, so the pattern is expected. However, when other data are considered, the pitch patterns are actually similar to (9) (Selkirk and Tateishi, 1991: 533).

Furthermore, the mapping principle stated in (10) is only one way, so the boundary of an XP is mapped to the boundary of a major phrase, but not the other way around (Ishihara, 2015).

2.4 Summary

This chapter introduced the basic unit of Japanese phonology, which is the mora. In Selkirk's (1984) prosodic hierarchy, it is below the level of the syllable, and has an important role in the timing of Japanese and the application of phonological rules.

The intonational phrase has also been divided into two distinct categories in Japanese. The first is the minor phrase, which is the domain of lexical accent, and, in syntax, corresponds to a word plus any case particles, sentence final particles, quantifiers, conjunctions, or copulas. The other type of intonational phrase is the major phrase. It can consist of one or more minor phrases, but the initial minor phrase realises a higher pitch accent than any of the following phrases, which is a phenomenon known as downstep or catathesis.

The next chapter introduces the Aoyagi prefixes, which have been shown to display unusual accent patterns that seem to imply a mismatch between syntax and phonology.

3 The 'Aoyagi' Prefixes

3.1 Summary of Poser (1990)

As shown in the previous section, if a Japanese word undergoes initial lowering, that is, a fall from high tone to a low tone, it is considered evidence that it constitutes a minor phrase (McCawley, 1968; Selkirk and Tateishi, 1988). Furthermore, Poser (1990) asserts that minor phrases can only have one instance of lowering per phrase, and that the syllable where the fall occurs is accented. In cases of compounds, accent resolution takes place, which leaves only the leftmost accent remaining (Poser, 1990: 1), and any affixes or particles are contained in the same minor phrase (1984: 148).

A problem for this definition of minor phrase arises in what Poser (1990) calls 'Aoyagi prefixes' after an original paper by Aoyagi (1969). The term refers to a number of words that have been traditionally analysed as prefixes, and should, under the definition outlined above, attach to their hosts as part of the same minor phrase. However, the tone patterns of these prefixes when combined with a word suggest a different structure. As Poser (1984; 1990) points out, in some cases there are two accents, and in others there is a fall in tone after the prefix, and then a rise in tone for the stem. Neither pattern is possible if the current definition of minor phrase is to be maintained, because it implies the instance of two minor phrases within one word.

The categorisation of these words as prefixes is a contentious one, and Poser (1990) considers the possibility that these are separate words, in which case the presence of two minor phrases is unsurprising. However, in defence of their status as prefixes, Poser (1990) points to their failure to undergo word level phonological rules, such as rendaku – a point that will be returned to later in the chapter. Furthermore, Poser (1990) provides detailed examples of how Aoyagi prefixes do not behave like other prenominal modifiers that are classed as independent words – namely,

demonstratives and adjectives – and how scope relations imply that they are lexically attached. In the first case, it is not possible for an adjective to intervene between an Aoyagi prefix and its stem, but it is possible for an adjective to intervene between a demonstrative and an NP. Note the contrasting grammaticality of examples (1) and (2), adapted from Poser (1990). The underlined portions are the Aoyagi prefixes.

(1)

a. sono yuumei na daiziN
that famous COP minister
'that famous minister.'

b. *<u>moto</u> yuumei na daiziN
former famous COP minister
'a formerly famous minister.'

(2)

a. sono erai na daigaku
that distinguished COP university
'that distinguished university.'

b. *<u>ki</u> erai na daigaku
your distinguished COP university
'your distinguished university.'

Further evidence that these words are attached to their hosts comes from scope relations in phrases that include conjunctions or genitives. Poser (1990) shows that only narrow scope readings are available with the Aoyagi prefixes in examples (3) and (4).

(3) moto daiziN no komoN
former minister GEN advisor
'advisor to the former minister'

(4) moto syuusyoo to daitooryoo
former Prime-minister CONJ President
'the former Prime-minister and the President'

Here, the prefix *moto* can only modify the word immediately to its right, and not the whole phrase. In (3) the phrase refers to a former minister's advisor, and not to a former advisor to a minister, and in (4) the phrase must refer to two different people, and cannot refer to one person who is the former Prime-minister and also the President. When contrasted with examples (5) and (6), where *moto* is replaced by the demonstrative *sono*, it becomes clear that there is a structural difference between these two.

(5) sono daiziN no komoN
that minister GEN advisor
'that minister's advisor' / 'that advisor of ministers'

(6) sono syuusyoo to daitooryoo
that Prime-minister CONJ President
'that Prime-minister and President' / 'that Prime-minister and the President'

Examples adapted from Poser (1990)

Notice that (5) and (6) are ambiguous because they allow both a wide and a narrow scope reading. Example (5) can mean either a particular minister's advisor or a particular advisor who advises ministers, and (6) can refer to one person or two, unlike the corresponding Aoyagi example in (4). This, according to Poser (1990), provides strong evidence that

Aoyagi prefixes are attached to their stems, with which they form a single word. Demonstratives, on the other hand, are independent words, because they can be separated from an NP and can allow multiple scope readings.

3.2 Criticism of Poser (1990)

There are some issues with Poser's (1990) analysis of Aoyagi prefixes, which will be tackled in this section. The first is the point referred to earlier regarding rendaku. Poser (1990: 3) states that Aoyagi prefixes do not trigger rendaku, which is a word level rule as discussed in chapter 3, and uses this as partial evidence against their status as independent words. He goes on to say that almost all of the Aoyagi prefixes, bar one, are of Sino-Japanese origin, and mostly attach to Sino-Japanese stems (Poser, 1990: 7). The full list of Aoyagi prefixes from Poser (1990) is shown in (7), and the native Japanese exception that Poser refers to is *moto*.

(7) Aoyagi prefixes from Poser (1990)

boo	a certain	某	*ki*	your (formal)	貴
doo	above-mentioned	同	*ko*	deceased	故
gen	original	元	*moto*	former	元
han	anti-	反	*tai*	anti-	対
han	pan-	汎	*tyoo*	ultra	超
hi	un-	非	*zen*	former	前
hon	the present	本	*zen*	all	全

Poser (1990) does not provide the kanji for each prefix, so the kanji shown in (7) have been added by myself, and verified by native Japanese speakers. Furthermore, Kageyama (2001) lists the following two words as examples of Aoyagi prefixes.

(8) Additional Aoyagi prefixes from Kageyama (2001)

ryoo	both	両
kaku	each	各

Using the above kanji and a powerful online Japanese dictionary, it is easy to find numerous counter examples to Poser's (1990) claim that these words do not trigger rendaku. Each kanji was searched for using *Jisho* (available at www.jisho.org), which is powered by numerous sources, including, the Electronic Dictionary Research and Development Group – a collection of dictionaries comprising: JMdict, KanjiDic2, JMnedict, and Radkfile – a collaborative project led by Jim Breen at Monash University (Ahlström, et al, 2015; Breen, 2015). In addition, each kanji was searched for in the Rendaku Datbase compiled by Irwin, Miyashita, and Russell (2016), and existing examples were cross-referenced. Out of the 16 prefixes listed in (7) and (8), there were a total of 106 instances of rendaku, representing 12 of the original 16 prefixes. For two of the words, *ki* and *ko* only one example was found for each. These, along with examples of the six words, are shown in (9). The full list of 106 counter examples can be found in the appendices.

(9) Aoyagi prefixes + rendaku

a.	*doo*	同	-->	*doo**z**ei*	同勢	'Party/company'
b.	*gen*	元	-->	*gen**b**uku*	元服	'Manhood ceremony'
c.	*moto*	元	-->	*moto**d**e*	元手	'Funds/capital'
d.	*hon*	本	-->	*hon**z**an*	本山	'Head temple'
e.	*ki*	貴	-->	*ki**d**ai*	貴台	'Honorific (letters)'
f.	*ko*	故	-->	*ko**z**an*	故山	'One's native place'
g.	*zen*	前	-->	*mae**b**a*	前歯	'Front tooth'
h.	*zen*	全	-->	*zen**j**i*	全治	'Complete recovery'
i.	*ryoo*	両	-->	*ryoo**g**awa*	両側	'Both sides'

From the evidence in (9), and in the rest of the counter examples, it is clear that Poser's (1990) claim – that Aoyagi prefixes don't trigger rendaku – is incorrect. True, the majority of words cited in *Jisho* as containing these words do not show any evidence of rendaku, so Poser's rule still seems to be robust, even if it is not exceptionless. However, a look at these counterexamples suggests that maybe these can indeed be considered as independent words; in which case, the instance of a minor phrase boundary is easily explained.

Firstly, a closer look at the examples in (9) reveals some interesting points regarding the various readings available for Japanese kanji. Notice that in (9)g the citation form on the left is different from the form that the word takes in the compound on the right. The word *zen* 'former' is pronounced *mae*, which is the kun'yomi reading rather than the on'yomi. This is a crucial observation, because it goes back to another claim made by Poser (1990: 3) that all of the Aoyagi prefixes, except *moto*, are of Sino-Japanese origin. This also appears to be incorrect, as there are numerous examples where these words appear in compounds, are pronounced with their kun'yomi reading, and also trigger rendaku. The word *zen* 'former' in particular appears in 18 compounds where the reading is kun'yomi. Furthermore, *moto* 'former' appears in at least three compounds, and *ryoo* 'both' appears in one compound where the form is *moro*, for the name of a sumo move (Ahlström, et al, 2015). When compounds that don't undergo rendaku are considered, the number of kun'yomi readings increases drastically - a point that will be returned to in the next section.

The key point here is that, as mentioned in chapter 1, there is a well-known restriction against rendaku in Sino-Japanese stems (Irwin, 2005; Otsu, 1980; Yamaguchi, 2011; among others). This is not to say that rendaku never occurs in Sino-Japanese stems. In fact, Rosen (2001) has shown that such an assumption is misguided, and there are in fact numerous criteria involved in whether a stem does or does not undergo

rendaku. Nevertheless, there is a strong preference for native Japanese stems in the application of rendaku, as shown by Vance's (1996) comparison of two samples representing 100 native words and 100 Sino-Japanese words. The investigation found that rendaku occurred in at least one compound for 87% of the native words and for only 10% of the Sino-Japanese words (Vance, 1996: 25). Therefore, although the presence of Sino-Japanese elements doesn't completely block rendaku, it does reduce the likelihood of it (Irwin, 2012; 2014).

Poser (1990) is correct in saying that most of the Aoyagi prefixes are of Sino-Japanse origin, but it is precisely this that works against the application of rendaku in many cases. Therefore, it is not the best criteria on which word-hood should be judged. This being said, of the 106 counter examples there are only 38 where the prefix is in the kun'yomi reading, so there is still a significant number of examples where the on'yomi reading has no bearing on whether the stem undergoes rendaku.

So Aoyagi prefixes can, in some cases, trigger rendaku, which is a phonological rule that applies only in compound words. Furthermore, they are not productive, so the words they are associated with form a fixed class. These properties provide good evidence that Aoyagi prefixed words are in fact standard compounds, but are stored in the lexicon as suggested by Rosen (2001). In which case, a further problem arises for Poser's (1990) analysis.

In (2), the Aoyagi prefix cannot be separated from its stem by an adjective, which Poser (1990) uses as evidence that the prefixes are bound morphemes. However, if these words are compounds that are stored in the lexicon, non-separability is an expected property arising from the principle of lexical integrity (Kageyama, 1999). This has also been called the *lexicalist hypothesis* by Anderson (1992: 84) and states that "the syntax neither manipulates nor has access to the internal form of words". The proposal is that Aoyagi prefixes can be analysed along similar lines to the lexicalist view of inflectional suffixes, which proposes a simple, non-branching structure for such items (Sells, 1995).

Returning to Poser's (1990) point regarding the scope that the Aoyagi prefixes can take, the examples in (3) and (4) involve the use of the genitive marker and a conjunction, respectively. These examples demonstrate that only a narrow scope reading is possible, but Poser (1990) does not provide any examples that are not phrasal. In fact, there are examples where the Aoyagi prefixes can take wide scope over a longer structure, but these examples are formed without the use of the genitive *no* or a conjunction. Observe the following examples from Martin (1975: 750). Aoyagi prefixes are underlined.

(10) kyúu syokumíNti zídai 旧植民地時代
old colony period
'the old colonial period'

(11) síN kéNpoo zídai 新憲法時代
new constitution period
'the new era of the constitution'

In (10) and (11) the Aoyagi prefixes *kyuu* 'old' and *siN* 'new' are accented, and so are the following words – exactly the accent pattern described by Poser (1990; 1984) as indicating more than one minor phrase. However, the prefixes in these examples are interpreted as taking wide scope over the following material, so that *kyuu* and *siN* modify *zidai* rather than only the immediately adjacent words (Martin, 1975). This is directly contradictory to the evidence presented in (3) and (4) where only narrow scope readings are possible. The reason for this, Martin (1975) claims, is directly related to the accented nature of the words, as described by Poser (1990; 1984).

Compare (10) and (11) to the examples in (12) and (13), where the Aoyagi prefixes are *not* accented. Now the interpretation is different, because the Aoyagi prefixes take only narrow scope over the immediately

adjacent word, so that *kyuu* and *siN* modify *syokumiNti* and *keNpoo*, respectively.

(12) kyuu syokumíNti zídai 旧植民地時代
old colony period
'the old-colony period'

(13) siN kéNpoo zídai 新憲法時代
new constitution period
'the era of the new constitution'

What this shows is that when Aoyagi prefixed words are combined with another word to form a complex compound, the presence of an accent provides crucial information as to the scope reading of the compound; when the accent is present, the scope is wide, and when it is not, the scope is narrow (Martin, 1975: 750).

Poser (1984: 149) does allude to the relationship between accentedness and scope, but only within the word, noting that the prefixes do not always show evidence of a boundary, and that the presence or absence of it can be used to distinguish between certain examples that involve adjectival suffixes. In certain words, however, a boundary cannot occur because a wide scope interpretation is impossible. Compare the narrow scope example in (14), where the prefix is realised with a low tone relative to the stem, with the ungrammatical example in (15), where the whole word has a high tone.

(14) hi niNzyoo teki 非人道的
in human like
'inhumane'

(15)	*hi	niNzyoo	teki	非人道的
	in	human	like	
	‘inhumane’			

In summary, three of Poser’s (1990) claims are falsified by the above evidence: Aoyagi prefixes don’t trigger rendaku, only one prefix, *moto*, is of native Japanese origin, and Aoyagi prefixes can’t take scope over longer structures. The first of these claims is part of Poser’s evidence that these morphemes are bound, and the second one tries to add weight to the first, but fails to consider a number of examples presented here that are of native Japanese origin, and *do* trigger rendaku. The evidence presented here is not sufficient to prove that the Aoyagi prefixes are free morphemes, but it does justify a re-examination of these cases. In the following sections, further evidence will be analysed to try and understand why these discrepancies exist, and what they can tell us about the structure of these compounds.

3.3 Analysis of the Aoyagi prefixes

To return to a point above, this section will analyse the prefixes and their readings to see how this may have affected the application of rendaku. The above section mentioned the Sino-Japanese restriction, which is indeed strong, and there are other conditions, such as Lyman’s law, under which rendaku should not be expected to occur. Related to this is whether the stem contains an obstruent at all. That is, if the stem begins with a sound other than an obstruent, it can’t be expected to undergo the rule, because rendaku applies specifically to obstruents. For example, neither of the words in (16) are eligible for rendaku for the following reasons: the right-hand member in (16)a begins with an already voiced non-obstruent consonant, and the right-hand member in (16)b is a vowel.

(16)

a. 同様 doo yoo ‘identical’

b. 同意 doo i ‘agreement/consent’

Furthermore, taking the first example from (7), *boo*, there are nine words listed in *Jisho* where the word is a left-hand member, but rendaku is not triggered in any of these cases. A closer look at these words reveals that two out of the original nine are ruled out because their right hand members already begin with voiced obstruents; these are underlined in (17). The remaining seven examples in (17)a – g are all eligible for rendaku, but fail to undergo the rule.

(17)

a. 某氏 boo si ‘a certain person’

b. 某所 boo sya ‘a certain place’

c. 某省 boo syoo ‘a certain ministry’

d. 某社 boo sya ‘a certain company’

e. 某誌 boo si ‘a certain publication’

f. 某国 boo koo ‘a certain country’

g. 某高校 boo koo koo ‘a certain high school’

h. 某日 boo jitsu ‘a certain day’

i. 某月 boo getsu ‘a certain month’

Undoubtedly, there are many examples amongst the words that contain Aoyagi prefixes where rendaku cannot apply, due to the reasons just mentioned. However, these cases will not be the main focus here. Clearly there are a great many more examples where rendaku could occur, but it doesn’t, which is what led Poser (1990) to make the claim that the prefixes do not trigger rendaku. The remainder of this chapter looks at the status of some of the Aoyagi prefixes, and also considers some of the

findings of van der Weijer et al. (2013) as a possible predictor of rendaku in these cases.

Firstly, *Jisho* actually has 15 entries for *boo*, but only the 9 words in (17) are compounds, so the other 6 cannot be considered for rendaku analysis. Two of these other entries are just the on'yomi and kun'yomi readings for the character in isolation, which leaves four other entries that are not compounds; these are shown in (18).

(18)

a.	何某	nani gasi	'a certain person/amount'
b.	某々	boo boo	'so and so'
c.	某かの金	nanigasika no kane	'a certain some of money'
d.	某の仕業	boo no si waza	'the work of so and so'

In (18)a *boo* appears on the right, and is pronounced with the kun'yomi reading *gasi*, and in (18)b it appears on both the left and the right as part of a reduplicated word (the character 々 indicates that the left hand character is repeated). Interestingly, (18)b seems to have two other readings as well as *boo boo*, which are - *nanigasi koregasi* and *nanigasi soregasi*. However, the meaning remains the same. In (18)a it appears as the second member of a compound, so it could be acting as a suffix in this case. Note, it can also be written with the genitive morpheme *no* as in (19) (Ahlström, et al, 2015).

(19) 何の某 nan no gasi 'a certain person/amount

Similar expressions can be formed with *nan* + *no*, such as *nan no hito* 'what kind of person' and *nan no tabemono* 'what kind of food'. In these cases, the right hand member is an independent noun phrase, and the same would appear to be true of (19).

The two other examples, (18)c and (18)d, both show the prefix apparently being used as an adjective with the genitive marker *no* and modifying a following noun. As mentioned above, prefixes usually only attach to nouns or adjectives (Shibitani, 1990: 218). When the other Aoyagi prefixes are considered, there are more examples like (18)c and (18)d. Some of these expressions are shown in (20).

(20)

a. 同の字点
   doo no jiteN 'Kanji iteration mark
b. 元の木阿弥
   moto no mokuami 'ending up back at the start'
c. 元の鞘に収まる
   moto no sayani asamaru 'to be reconciled'
d. 元の通り
   moto no toori 'as it was before'
e. 非の打ち所がない
   hi no utidokoro ganai 'unimpeachable'
f. 本の少し
   hoN no sukosi 'just a little'
g. 前の世
   mae no yo 'previous existence'
h. 前の週
   mae no syuu 'previous week'

These examples show that the Aoyagi prefixes are more than just prefixes. They can be used in a variety of ways, and not all the words that contain them are eligible for rendaku analysis because they are not compounds, and their syntactic structures do not provide the right environment for rendaku to occur. Furthermore, this structure with genitive *no* in a modifying capacity resembles the historical account of

how rendaku was formed from a reduction of a nasal particle (Frellesvig, 2010; Ito and Mester, 2003), as mentioned in section 1.1. Example (20)d actually has a rendaku alternative – *moto**d**oori* – which is shown example 14 in Appendix 1.

Next is the analysis of the roots in terms of family size, as defined by van der Weijer et al (2013). As mentioned in chapter 1, the van der Weijer study frequency of the root in isolation was found to be the strongest predictor of rendaku, followed by family size of the root as a left hand member. Frequency in isolation was investigated by searching for all instances of the roots within a corpus of Japanese, and the same corpus was used for investigating family size of the root as a left hand member. Since no suitable corpus was available for this project, frequency in isolation could not be investigated. However, family size of the root as a left hand member could be tested using *Jisho*. This was done by selecting the right-hand member of each of the 106 counter examples and putting them into *Jisho*. For each one, words were singled out where the character appeared at either the beginning or the end of a word. Some right-hand members, such as 山, occurred more than once in the 106 counter examples. Therefore, the number of roots was reduced down to 79.

Of the 79 roots, 40 were listed with more left-hand member words than right-hand member words (50.6%), 38 were listed with more right-hand member words (48.1%), and 1 was listed with an even number of left-hand and right-hand member words (1.3%). For some of the roots, the left-hand pattern was particularly strong. For instance, of the 1,340 entries for 三, 1,240 were as a left-hand member (92.5%), and only 100 were as a right-hand member (7.5%). Similarly, 高 had a total of 1180 entries, 1,062 of which were as a left-hand member (90%) with only 118 as right-hand members (10%).

There were also some cases where the difference was only minimal. For instance, 手 had a total of 1,016 entries, which were divided up into 572

left-hand members (56.3%) and 444 right-hand members (43.7%). The full list of results is shown in the appendices.

This investigation into family size of the root as a left-hand member shows that only just over 50% of the rendaku roots in the counterexamples have larger left-hand member family sizes, so it is unlikely that this is what is influencing the application of rendaku. As mentioned, frequency of root isolation might still be a factor, but this is left open for further study.

3.4 Summary

This chapter has shown some of the data presented by Poser (1984; 1990) to argue that Aoyagi prefixes represent a mismatch between phonology and syntax because of the presence of a phonological boundary within a word. The evidence for this comes from the following: the accentual nature of the prefixes, which suggests they constitute a minor phrase on their own; and the non separability of the prefixes from their stems, which suggests the prefix + stem forms a word that cannot be modified from within.

Such an analysis also predicts that rendaku cannot be triggered by an Aoyagi prefix because there is no word boundary between the prefix and the stem. This prediction is borne out for the majority of cases, but a new investigation here has shown that there are in fact a number of examples where Aoyagi prefixes and rendaku can co-occur.

In light of the new evidence for Aoyagi prefixes triggering rendaku in some cases, there must either be some reanalysis of Poser's (1990) data, or some reanalysis of the boundaries where rendaku can apply. As stated in chapter 1, rendaku is a phonological rule that applies at a # boundary. If these words are indeed prefixes, as Poser suggests, then the conditions for rendaku need to be altered to allow it to apply at + boundaries as well. However, this alteration would raise the question of why it can apply at the boundary of these prefixes, and not other affixes.

In the following chapter, some syntactic structures will be proposed with the aim of shedding light on how and when rendaku can apply with Aoyagi prefixes.

4 Possible syntactic structures

4.1 Introduction

This section will propose some possible structures for the rendaku compounds seen so far, before moving onto an analysis to account for the Aoyagi + rendaku cases.

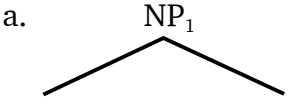
Based on Ito and Mester's (2003) distinction between roots and words, as mentioned in Chapter 1, the Aoyagi prefixes may be considered bound affixes with only a + boundary between them and the root word. If this is the case, rendaku should not be expected to occur in any of the examples involving Aoyagi prefixes.

Therefore, a new category will be proposed in order to account for the 106 prefix + rendaku cases.

4.2 Deverbals

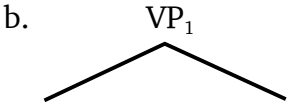
As noted by Yamaguchi (2011), the argument type, as in (1)a, is considered a type of noun phrase, whereas the adjunct type, as in (1)b is considered a predicate. Both form minor phrases, and word boundaries allow rendaku to occur in both types, but more so with adjunct than with argument type. This is most likely related to accentedness, and also to the modifier + head relationship. (Yamaguchi, 2011).

(1) a.



tume 'nail' kiri 'cut'

b.

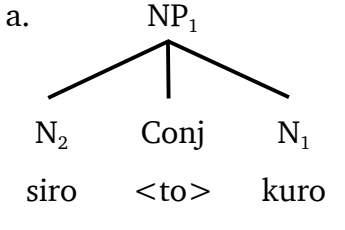


usu 'thin' giri 'cut'

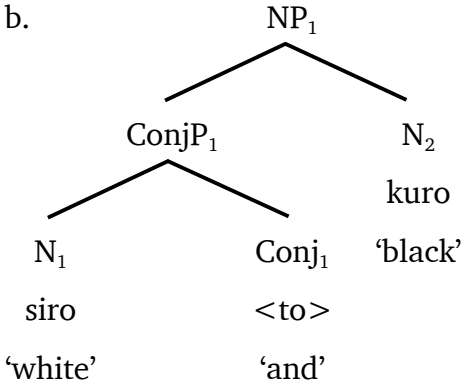
4.3 Dvandva

For the dvandva compounds, there are two proposed structures, shown in (2)a and (2)b. (2)a is a flat, ternary structure, and (2)b is a layered, binary structure based on Munn's (1993) adjoined structure where the conjunction is the head of a phrase that is adjoined to the higher NP. The proposal is that, regardless of the correct structure, dvandva compounds contain a null conjunction that removes the adjacency of the two NPs, thus, blocking rendaku. Both $ConjP_1$ and NP_1 form phonological phrases, and a right bracket boundary is mapped between $Conj_1$ and N_2. However, with no adjacency, this is irrelevant. The same structure can also be proposed for the case of an overt conjunction, and rendaku will not apply, since the sequence is no longer a compound.

(2) a.



b.



4.4 Aoyagi prefix + rendaku

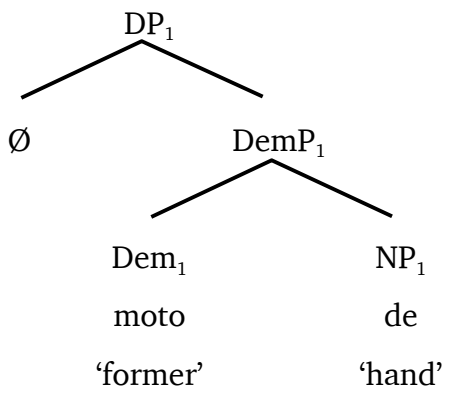
Returning to Poser's (1990) remarks, examples (1) and (2) in chapter 3 show that demonstratives and Aoyagi prefixes do not behave in the same way when intervening adjectives are introduced. Therefore, it is reasonable to expect that demonstratives and Aoyagi prefixes occupy different structural positions. If this is the case, it should be possible for a demonstrative to occur with an Aoyagi prefixed word, just as it is possible to modify it with an adjective, providing it is placed to the left. However, Poser does not investigate this possibility.

In fact, most of the 106 Aoyagi + rendaku cases do not allow modification by demonstratives. From the grammaticality judgements of native speakers, it seems that only nine examples possibly allow demonstratives. Furthermore, three of the prefixes (反 非 超) that did not trigger any rendaku may allow modification by a demonstrative in other examples.

This might not be surprising in some cases, such as *boo* 'a certain' because definiteness is already a semantic feature of the prefix, which makes the use of a demonstrative unnecessary in the same way as an example like '*this the car'. Furthermore, the other prefixes have been described as acting like determiners or quantifiers (Kageyama, 2016). Kayne and Pollock (2009) have shown that both English and French demonstratives can be decomposed into parts that correspond to definite and deictic elements. In English *th-* is definite and *-at* or *-is* are the deitic components, and in French it is *ce* which acts as the definite, with *-là* or *-ci* acting as the deictics. This is known as 'the split DP hypothesis' (Yanagida, 2013).

However, Japanese demonstratives are not the same as English and French ones, because they don't always carry a feature for definiteness (Yanagida, 2013). Therefore, it should be possible for the demonstratives to occur with these examples, and because they mostly do not, the proposal here is that the Aoyagi prefixes could be demonstratives, as shown in (3).

(3)



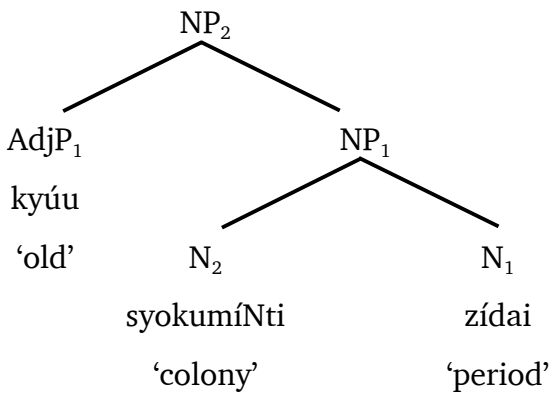
This structure is based on the split DP analysis from Yanagida (2013), where the Spec, DP position is reserved for checking a definite feature that is not present in Japanese demonstratives. So, if the entire Aoyagi + stem is analysed as a DemP, then there is a word boundary between prefix and the stem, which can trigger rendaku. Under this analysis, a minor phrase boundary can be present between the two, providing an explanation for Poser's (1990) observation. Furthermore, it accounts for the restriction on demonstratives occurring with Aoyagi prefixes, because they occupy the same structural position.

However, this analysis does not account for the small number of cases where demonstratives can occur, and it also suggests that it is possible to left-adjoin a modifier to NP_1. As shown by Poser (1990), inserting a modifier is not possible with these examples. Furthermore, a lexicalist approach, as in Sells (1995) would not provide the word boundary required for rendaku to occur.

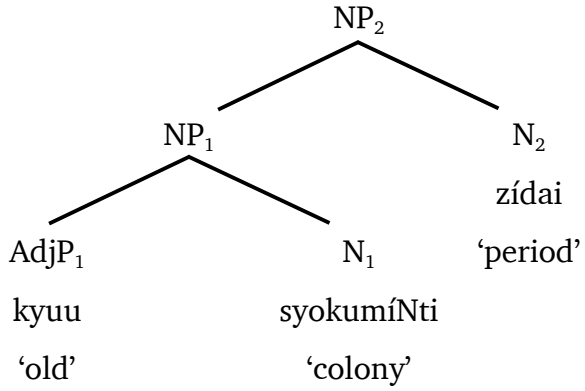
There is also another possibility, however, which is that the accentedness of the Aoyagi prefixes and their stems plays a crucial role, not just in the application or non application of rendaku, but in the structure of the whole compound. If one or more of the elements is accented, as suggested by Martin (1975), and since accentedness and rendaku seldom co-occur (Yamaguchi, 2011), this would explain why so many of the Aoyagi prefixes fail to trigger it. The cases where rendaku is triggered are the unaccented cases.

To return to examples (10) - (13) from chapter 3, these cases showed how accentedness was related to scope. The tree structures for examples (10) and (12) are shown in (4) and (5) below.

(4)



(5)



So, in (4) there are three accented words, corresponding to three minor phrases, in Poser's and McCawley's terms. There is no word internal minor phrase boundary because it is clear that the Aoyagi prefix is an AdjP taking wide scope over NP_1. In order to get the corresponding narrow scope reading, the accent must be dropped from *kyuu* 'old', which then corresponds to the structure shown in (5). Here, NP_1 is a minor phrase because it contains two words, but only one accent.

4.5 The morphological catergory 'word plus'

Kageyama (2001; 2016) has also proposed a special morphological category known as 'word plus' that can be used to account for the Aoyagi cases. It is a category larger than the word but with no syntactic status and variable accent patterns, which are termed *lexical accent* and *phrasal*

accent (Kageyama, 2016). The lexical accent appears in examples like (5) and connects the prefix with the following word by realising a high tone on the second mora of the prefix, which then continues onto the initial mora of the root with no minor phrase boundary in between. The phrasal accent, on the other hand, corresponds to (4) and the pattern observed by Poser (1990), where the initial mora of the prefix is accented, before falling and rising again on the root word, signalling a separate minor phrase (Kageyama, 2016: 500). Furthermore, the unusual patterns observed by Poser (1990) are actually not exclusive to the Aoyagi prefixes, and may occur in longer compounds, as shown by examples (6) and (7) from Kageyama (2016: 501). The accented portions are represented by capital letters, and the minor phrase boundaries by forward slashes.

(6) *koKURITU-DAigaku / gakutyoo* 国立大学学長
national-university president
'president of a national university

(7) *ZEnkoku / gassyoo-konkuuru* 全国合唱コンクール
all-Japan chorus-contest
'all-Japan chorus contest'

In addition, these examples are also bound by the principle of lexical integrity, as shown by the unacceptability of inserting genitive particles into the compounds, as in (8) and (9) (Kageyama, 2016: 501).

(8) **kokuritu no daigaku / gakutyoo* *国立の大学学長
national GEN university president
'president of a national university

(9) **zenkoku / gassyoo no konkuuru* *全国の合唱コンクール
all-Japan chorus GEN contest

'all-Japan chorus contest'

So, from this analysis, it seems the Aoyagi prefix accent patterns are not as unusual as first thought, and can be attributed to a new category – word plus. This category allows the occurrence of a phrasal accent and a phonological phrase boundary without being a maximal projection, while maintaining lexical integrity with the root noun.

The diagram shown in (10) from Kageyama (2016) illustrates the crossover and related features of the category. It will be referenced again in the following chapter.

(10)

syntactic categories	XP		
	X'		phrasal accent
morphological categories	Word Plus		
	Word		
	Root		lexical accent

4.6 Summary

This chapter has shown some of the possible syntactic structures that can account for the Aoyagi + rendaku examples, and introduced a new morphological category – word plus. The following chapter will discuss these potential structures in more detail in order to come up with a theory that best accounts for the data.

5 Discussion

The problem encountered earlier in the thesis was that the Aoyagi cases present what appears to be a syntactic atom with a phrasal boundary, but no word boundary, and some cases where rendaku is triggered. Rendaku is supposed to be a word level phonological rule, so there must be some other way to account for it. In the last chapter, Kageyama's (2001; 2016) word plus category was shown to be capable of accounting for the unusual accent patterns described by Poser (1990) and Martin (1975) among others. If Kageyama's (2016) structure and paradigm from section 4.5 example (10) is accepted for the other data, then it should be able to account for the rendaku data as well. So, ordinarily, words trigger rendaku, but in some special cases it can also be triggered by word plus and the following boundary. Therefore, the proposal is to modify Kageyama's (2016) paradigm in the following way.

(1)

syntactic categories	XP	phrasal accent	
	X'		
morphological categories	Word Plus	can trigger rendaku	
	Word		
	Root	lexical accent	

The paradigm in (1) shows the feature of rendaku triggering for word and word plus categories only. As noted in chapter 1, roots do not trigger rendaku and neither do intermediate or maximal projections. Therefore, this modification only serves to account for the class of prefix + rendaku cases examined in this thesis. Furthermore, it maintains the lexical integrity of the compounds, since this is a property of word plus affixed words.

There is also the question of why so few of the Aoyagi examples trigger rendaku. There are several possible explanations for this. Firstly, as mentioned in section 4.2, Yamaguchi (2011) has noted that rendaku and

accentedness are juxtaposed in deverbals, with rendaku occurring more often with the adjunct type compounds, which are endocentric, and accentedness occurring more with the argument type compounds, which are not. The 106 counter examples include 25 adjunct type deverbals, and the rest can be analysed as endocentric, prefix + N compound nouns. Furthermore, it has been shown by Martin (1975), that accentedness can play a role in the scope relations of complex compounds, and act as a bridge to connect the prefix with the stem, and both accentedness and rendaku have been shown to do a similar job in compound words, i.e. mark the head or the root of the compound. Therefore, as mentioned in section 4.4, the occurrence of rendaku infers the absence of accentedness, and vice versa.

Returning to the issue of lexical integrity, another important issue is semantic compositionality. Many of the 106 counter examples are idiomatic and cannot be deciphered from their component members. Some examples are shown in (2) - (4).

(2) *gen* ***b****uku* 元服
origin clothing
'manhood ceremony'

(3) *hon* ***z****an* 本山
main mountain
'head temple'

(4) tui tatu 対立
opposite stand
'confrontation'

As mentioned by Rosen (2001) in chapter 1, such compounds must necessarily be stored in the lexicon as whole words, and there needs to be

a way of doing so that is minimally complex, able to store the individual components, and able to keep the compound relationship of the two intact in order to allow rendaku to occur.

There are historical cases of words that were originally derived compounds, and were compositional, but have since undergone lexicalisation, and the etymology is no longer clear in everyday language (Rosen, 2001). Others were historically compound words that underwent rendaku, and now just resemble compounds whose second members already begin with voiced obstruents. Many of the Aoyagi + rendaku compounds are archaic or uncommon, so it could be that some of these are simply examples of lexicalised compound words from old Japanese.

However, as mentioned in section 1.3, an example like *onna**g**otoba* 'woman's speech' can only exist if *koto**b**a* 'word' is formed first and is stored in the lexicon as N, rather than NP. So, Rosen (2001) proposes an *xy* template for storing such compounds in the lexicon so that the individual members can be retrieved later, and relevant features, such as rendaku and accentedness, can be applied.

The word plus analysis provides a better account than the structures provided in section 4.4 because it explains the fact that the syntax cannot see into and modify the internal structure of these compounds. Furthermore, the cases where demonstratives cannot occur are best explained by the semantic mismatch arising from the determiner-like features that are present in many of the Aoyagi prefixes (Kageyama, 2016).

Therefore, the syntactic structure proposed for the Aoyagi + rendaku cases follows the non-branching lexicalist view of suffixes, as proposed by Sells (1995), except that the new category of word plus is brought to bear on these special cases in order to account for the rendaku effects observed in the 106 prefix + rendaku examples.

Concluding remarks

This thesis has attempted to explain some of the syntax/phonology mapping processes present in Japanese compounding and rendaku. Compounding is extremely prevalent in Japanese, and only a small subset has been presented here. However, the dvandva and Aoyagi cases represent some of the more interesting and unexplained phenomena.

Poser's (1990) analysis was cross-examined and found to be incorrect in some areas. In particular, the assumption that Aoyagi prefixes are not independent words was cast into some doubt with the evidence of rendaku from the counter examples. However, it was shown that these examples are in fact lexical words with no branching, but not quite in the way that Poser (1990) envisaged. Word plus is a morphological category between the word and the phrase, and it explains both the presence of a minor phrase boundary following the prefixes, and the application of rendaku, under the assumption that rendaku can be triggered by the category of the word or word plus.

Also of importance are Martin's (1975) and Kageyama's (2016) observations regarding accentedness and scope. These accounts provide a solution to Poser's (1990) observations regarding phrasal accent appearing on a prefix. The domain of accentedness is still a phonological phrase, but this can also correspond to the category of word plus, and accentedness can have implications for the syntactic structure in more complex cases. Lack of accent on the Aoyagi prefix corresponds to a narrow scope structure, whereas presence of an accent corresponds to a wide scope structure.

Aspects that require further analysis include the influence of vocabulary stratum on both the rendaku triggers and the roots. As mentioned, there is a strong preference for native Japanese stems and roots, and many of the Aoyagi prefix examples belong to the Sino-Japanese stratum. Therefore, more research is needed to fully understand this.

The deverbal examples also need more thoroughly examining, and this investigation only talked about the argument type and the adjunct type. There are in fact several other argument types, involving unaccusative and intransitive verbs (Kageyama, 1993, cited in Yamaguchi, 2011).

Furthermore, a more comprehensive analysis involving corpus data is required in order to establish what, if any, effect frequency of root in isolation has on the 106 counter examples. This was the strongest predictor of rendaku in van der Weijer's study, and it would hopefully provide more insight than the present investigation.

Appendices

Appendix 1: Prefixes + Rendaku

1.	同勢	どうぜい	Party/Company
2.	同朋	どうぼう	Companions/fellows (also どうほう)
3.	同部屋	どうべや	Sumo wrestlers from the same stable
4.	同構え	どうがまえ	Kanji radical 13
5.	元治	げんじ	Genji era
6.	元三	がんざん	New year period (1st - 3rd of Jan)
7.	元服	げんぶく	Manhood ceremony (also げんぷく)
8.	元手	もとで	Funds/capital
9.	元締	もとじめ	Manager
10.	元高	もとだか	Principal (eg. In a loan)
11.	元田	もとだ	Motoda (surname)
12.	元種	もとだね	Raw material
13.	元綱	もとづな	Motodzuna (surname)
14.	元通り	もとどおり	As before (deverbal)
15.	元口	もとぐち	Motoguchi (surname)
16.	元込め	もとごめ	Breech-loading (deverbal)
17.	反り橋	そりばし	Arched bridge
18.	反り形	そりがた	Warped shape

19.	反り刀	そりがたな	Curved sword
20.	本葉	ほんば	The first leaves after cotyledon
21.	本山	ほんざん	Head temple
22.	本腰	ほんごし	Strenuous effort
23.	本尊	ほんぞん	Principle object of worship
24.	本革	ほんがわ (本皮)	Real leather
25.	本組み	ほんぐみ	(Page) Makeup (deverbal)
26.	本曇り	ほんぐもり	Low-cloud overcast (deverbal)
27.	本鞘	ほんざや	Spread
28.	本刷り	ほんずり	Press run (deverbal)
29.	本田	ほんでん	Rice paddy
30.	本田	ほんだ	Honda (surname)
31.	本裁ち	ほんだち	Cutting out pieces (deverbal)
32.	本立て	ほんだて	Bookends (deverbal)
33.	本棚	ほんだな	Bookshelf
34.	本通り	ほんどおり	Main street (deverbal)
35.	本箱	ほんばこ	Bookcase
36.	本腹	ほんばら	Legitimate (child)
37.	本百姓	ほんびゃくしょう	Granger, farmer
38.	本節	ほんぶし	Quality fried bonito
39.	本普請	ほんぶしん	Construction

40.	本降り	ほんぶり	Regular rainfall (deverbal)
41.	本星	ほんぼし	Real culprit (police slang)
42.	本船	もとぶね	Mother ship
43.	本木	もとぎ	Original stock
44.	本窯	もとがま	Motogama
45.	串本節	くしもとぶし	Skewered quality fried bonito
46.	貴台	きだい	Honorific for company correspondence
47.	貴人	うまびと	Aristocrat
48.	富貴草	ふうきぐさ	Japanese spurge (plant)
49.	故山	こざん	One's native place
50.	対立	ついだつ	Confrontation
51.	前歯	まえば	Front tooth
52.	前日	まえび	Eve of an event (formal)
53.	前髪	まえがみ	Forelock/Fringe
54.	前側	まえがわ	Front side/Anterior
55.	前垂	まえだれ	Apron (deverbal)
56.	前広	まえびろ	Previous/Beforehand
57.	前書	まえがき	Preface (deverbal)
58.	前借	まえがり	Loan (deverbal)
59.	前触	まえぶれ	Previous notice/harbinger (deverbal)
60.	前貸	まえがし	Advance payment (deverbal)

61.	前立	まえだて	Plume (deverbal)
62.	前付	まえづけ	Preliminaries (deverbal)
63.	前頭	まえがしら	Rank-and-file wrestlers in sumo
64.	前払	まえばらい	Pre-payment (deverbal)
65.	前倒	まえだおし	Acceleration (of payment schedule)
66.	前開	まえびらき	Open at the front
67.	前神	まえがみ	Maegami (surname)
68.	前島	まえじま	Maejima Island
69.	前景気	まえげいき	Outlook/Promise
70.	前相撲	まえずもう	Preliminary sumo bouts
71.	手前勝手	てまえがって	Selfish
72.	北前船	きたまえぶね	Cargo ships (Edo period)
73.	御前様	ごぜんざま	A nobleman
74.	備前反り	びぜんぞり	Bizen ware curving
75.	備前作り	びぜんづくり	Bizen ware making
76.	備前造り	びぜんづくり	Bizen ware structuring
77.	備前創り	びぜんづくり	Bizen ware manufacturing
78.	備前包丁	びぜんぼうちょう	Bizen knife
79.	松前漬け	まつまえづけ	Matsumae pickles
80.	門前払い	もんぜんばらい	Refuse someone at the door
81.	前輿	さきごし	Front palanquin carrier

82.	前張り	さいばり	Covering private parts（deverbal)
83.	前貼り	まえばり	Covering private parts（deverbal)
84.	全治	ぜんじ	Complete recovery（also ぜんち)
85.	全土	ぜんど	The whole country
86.	全山	ぜんざん	The whole mountain
87.	両着	もろざし	Double underarm grip (sumo)
88.	両刃	りょうば	Double edged (also もろは)
89.	両側	りょうがわ	Both sides
90.	両口	りょうぐち	Both openings, two people
91.	両国	りょうごく	Both countries, a district of Tokyo
92.	両腰	りょうごし	Katana and Wakizashi
93.	両損	りょうぞん	Loss on both sides
94.	両為	りょうだめ	For the benefit of both parties
95.	両蓋	りょうぶた	Hunting-case watch
96.	両切り	りょうぎり	Plain cigarette (deverbal)
97.	両建	て りょうだて	Straddling (deverbal)
98.	両隣	りょうどなり	Both Sides
99.	両替	りょうがえ	Change, money exchange (deverbal)
100.	両替機	りょうがえき	Money changing machine
101.	両替屋	りょうがえや	Money changing shop
102.	両替人	りょうがえにん	Money exchanger (deverbal)

103. 両替所　りょうがえじゃ　Money exchange counter (deverbal)

104. 両掛り　りょうがかり　Double corner approach in ‘go’ (deverbal)

105. 両開き　りょうびらき　Double door (deverbal)

106. 両蓋時計りょうぶたどけい　Hunting-case watch

Appendix 2: Family size of roots as left and right hand members

Left hand member majority roots

	Root		Left	Right
1.	三	-	1240	100
2.	手	-	572	444
3.	締	-	43	8
4.	高	-	1062	118
5.	田	-	336	170
6.	通	-	316	161
7.	腹	-	127	87
8.	百	-	175	14
9.	普	-	99	2
10.	降	-	93	22
11.	山	-	760	606
12.	腰	-	82	41
13.	尊	-	61	31
14.	裁	-	54	40
15.	歯	-	151	90
16.	日	-	1374	963
17.	垂	-	84	13
18.	広	-	297	35

19. 借 - 82 16

20. 触 - 39 12

21. 貸 - 63 4

22. 立 - 355 141

23. 付 - 183 98

24. 払 - 29 9

25. 倒 - 42 29

26. 相 - 408 207

27. 開 - 275 57

28. 土 - 306 141

29. 口 - 323 262

30. 国 - 2009 1185

31. 腰 - 82 41

32. 損 - 47 42

33. 切 - 292 59

34. 建 - 144 34

35. 隣 - 49 14

36. 掛 - 87 42

37. 時 - 313 218

38. 創 - 83 18

39. 張 - 254 53

40.	包	-	73	28

Total	**Left**	**Right**
	12,464	5,211

Right hand member majority roots

	Root		Left	Right
1.	勢	-	34	126
2.	朋	-	3	4
3.	部	-	121	820
4.	構	-	132	176
5.	治	-	62	250
6.	服	-	47	133
7.	綱	-	22	167
8.	箱	-	43	111
9.	節	-	66	194
10.	込	-	10	26
11.	橋	-	77	278
12.	形	-	134	429
13.	葉	-	75	215
14.	革	-	62	90
15.	組	-	129	134
16.	曇	-	7	10

17. 刷 - 20 36

18. 台 - 268 316

19. 人 - 878 1671

20. 草 - 156 295

21. 輿 - 9 11

22. 髪 - 38 80

23. 書 - 205 709

24. 頭 - 189 209

25. 景 - 76 83

26. 着 - 148 158

27. 刃 - 17 25

28. 星 - 176 624

29. 船 - 144 308

30. 窯 - 6 10

31. 為 - 87 89

32. 蓋 - 17 40

33. 替 - 17 48

34. 様 - 11 242

35. 島 - 106 1462

36. 作 - 187 264

37. 造 - 87 199

38.	漬	-	13	34

Total	**Left**	**Right**
	3,954	10,151

Even left and right member roots

Root		Left	Right
1.	側	-	75	75

	Left	**Right**
Total	75	75

Combined totals

	Left	**Right**
Total	16,318	15,806
%	50.8%	49.2%

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