

Defining the Prosodic Word in Japanese

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1. Introduction

Japanese is one of the languages that have been quite extensively studied and analyzed by linguists in the recent past. Among the many analyses and theories proposed in regard to the language, one interesting problem that remains to be further investigated concerns its prosodic hierarchy. In particular, the prosodic word in Japanese has not been given satisfactory treatment in any theoretical framework, hence the theme of this paper.

Phonological rules refer not only to a segment or a group of segments but also to the domain of some prosodic constituent. The domain of each constituent in the prosodic hierarchy is generally defined on the basis of different phonological and morphosyntactic information, but the resulting constituents are not necessarily the same as any constituents found outside the phonological component (Nespor and Vogel 1986). Therefore, I advocate the prosodic hierarchy of Japanese shown in (1). As indicated by the mark (<), the domains form a hierarchy, with each domain being included in the next domain higher up.

- (1) *The Prosodic Hierarchy of Japanese:*
mora < syllable < foot < prosodic word
< accentual phrase < intonational phrase < utterance

The prosodic word in Japanese has been defined by some linguists in the recent studies on Japanese phonology. Among them, Hamano (1998) defines it as the domain of accent, and also as the domain containing at most one glottal stop; Ito and Mester (2003) claim that it is the domain that permits at most one HL fall; Kubozono (2005) states, referring to the domain of contraction and

accentual processes, that the optimal form of a prosodic word in Japanese is up to four moras long. However, such definitions are inadequate, if not incorrect. For one thing, there are a large number of prosodic words in which there is no accented syllable or an accentual HL fall as described in (2a). For another, many prosodic words in Japanese consist of more than four moras as shown in (2b).

- (2) a. *accentless prosodic words* (-wa is the accentless topic marker):
sakura (-wa) 'cherry blossoms' LHH(H) akari
(-wa) 'light' LHH(H) taiko (-wa) 'drum' LHH(H)
tomodati(-wa)'friends' LHHH(H)
- b. *longer than four moras* (ma- and bu- are intensifier prefixes):
ma-t-tadanaka 'the very middle' ma-p-putatu 'right in two'
bu-k-korosu 'to kill' bu-t-tobasu 'to knock down'

Therefore, the purpose of this paper is twofold: to provide a satisfactory definition of the prosodic word, and to analyze postnasal voicing and *rendaku*, or sequential voicing, in the Yamato vocabulary of Japanese. Our arguments are based on the consensus that Japanese is made up of four lexical strata: Yamato, Sino-Japanese, Foreign and Mimetic (see, for example, Ito and Mester 1995). Thus the following discussion focuses upon the Yamato vocabulary, although there will be brief discussions with respect to the others when necessary and by way of comparison.

This paper is organized as follows. Section 2 examines the aforementioned definitions of the prosodic word, and then presents a new definition. Section 3 analyzes postnasal voicing and *rendaku*,

employing the newly provided definition, and claims that postnasal voicing occurs within a prosodic word, and *rendaku* across prosodic word boundaries. Section 4 discusses reduplication and mimetics, showing that the differences between the two types of reduplicated forms support our definition. Thus, I argue that once the prosodic word is clearly defined, phonological phenomena such as postnasal voicing and *rendaku* observed typically in the Yamato vocabulary will be better understood.

2.1 Definition of the Prosodic Word

As pointed out in the Introduction, Hamano's definition of the prosodic word as the domain of accent is misleading. Referring to Kenstowicz (1994), she claims that the prosodic word is the domain of accent or stress. She also states that accent in Japanese is associated with a syllable and maximally appears once in a prosodic word as a pitch fall. The latter part of her statement is echoed in Ito and Mester (2003), when they say that the prosodic word is the domain that permits at most one accentual HL fall. There are two problems with this sort of definition. First, as we have already seen in (2a), there are many prosodic words that do not have an HL fall. Second, the domain of accent is better classified as the accentual phrase as stated in Pierrehumbert and Beckman (1988) and Kubozono (1993). Pierrehumbert and Beckman, for example, describe that "the accentual phrase is the smallest prosodic unit that is well defined in terms of its tone pattern; it is the domain of lexical accent pattern as traditionally described in phonological treatments of Japanese." On page 118, they show their prosodic hierarchy which indicates the accentual phrase dominating the prosodic word.

The definition provided by Kubozono (2005) is also untenable. He claims that contraction of Sino-Japanese compounds occurs in the domain of up to four moras. He also concludes, after examining the accentual processes of mimetics, that four-mora mimetics constitute a prosodic word, or one accentual unit. Thus, his definition not only runs

counter to some prosodic words shown in (2a) and (2b), but also fails to distinguish the prosodic word from the accentual phrase.

The problems with these definitions naturally lead us to the first question: What is the satisfactory definition of the prosodic word in Japanese? I will define the prosodic word, as in (3):

(3) Definition of the Prosodic Word (Japanese)

The domain of the prosodic word is a base plus certain prefixes, suffixes, and/or an intensifier infix.
e.g., *ma-m-maru* 'perfect circle'

I will use the term 'base' in a restricted sense, meaning the part of a word remaining when all affixes have been removed, i.e., equivalent to 'root'. Thus, for example, the word *mammaru* ('perfect circle') can be analyzed into the base *maru* plus the emphatic prefix *ma-*, and the intensifier infix (i.e., C) inserted immediately after the first mora, which acquires its consonantal features from the consonant that follows it.

2.2 Affixation and the Prosodic Word

Let us now move on to the next question: Which affixes can be attached to a base? As described in (3), there are three kinds of affixes that can be attached to a base: prefixes, suffixes, and an infix. I agree with Hamano (1998) that the domain of the prosodic word may contain at most one intensifier infix, i.e., a glottal stop in her terminology. Therefore, let me begin with the process of infixation in emphatic forms. In order to emphasize an expression, an infix, or 'a consonantal slot' to be more exact, will be inserted in the position immediately after the first mora of its emphatic form, and that consonantal slot acquires its features from the consonant that follows it, so that the end result becomes a geminate as shown in (4). Thus, in most cases the creation of an emphatic form and the process of infixation occur in tandem.

(4) Infixation in Japanese (*ma-* and *bu-* are emphatic prefixes) :

ma-k-kuro (> kuro 'black') ma-s-siro
 (> siro 'white') ma-n-naka (> naka 'middle')
 bu-t-tobasu (> tobasu 'to fly') bu-k-korosu (> korosu
 'to kill') but-t-tadaku (> tadaku 'to beat')
 cf. minna (> mina 'all of us') yappari (> yahari /yapari/
 'probably')

There are, however, a few cases in which an intensifier infix is inserted within a single word, turning it into an emphatic form as, for example, *minna* and *yappari*. The examples in (4) indicate the representative prefixes that will be attached to a base in order to form an emphatic expression in Japanese.

Other commonly used prefixes are *mi-* and *o-*, which are the representative honorific prefixes. Even if an honorific prefix is attached to a base to form a polite expression, no infixation takes place as can be expected. Look at the examples in (5):

(5) *Honorific prefixes:*

mi-: mi-kuni 'nation' mi-kaō 'face' mi-kotoba 'words'
 mi-kokoro 'mind'
o-: o-tosi 'age' o-siri 'buttock' o-sigoto 'work' o-tegami
 'letter'

Generally, the prosodic word in Japanese is larger than the foot, which is bi-moraic, and smaller than the accentual phrase, which is the domain of lexical accent assignment. There are, however, some cases in which accent is re-assigned to the whole prosodic word when the honorific prefix *o-* is attached to it. Some such examples are given in (6a). The prefix assigns accent to the mora that immediately follows it. As a result, we can observe the pitch fall: that is, H (= high tone) changes to L (= low tone) on the third mora. This is because in Japanese, there is a pitch fall immediately after an accented mora. Although accent appears to be reassigned to the prosodic word, it is a superficial phenomenon caused by the fact that the whole prosodic word in some cases is equal to the accentual phrase in size, as shown in (6b).

(6) a. sigoto (LHH) → osigoto (LHLL)
 tegami (LHH) → otegami (LHLL)
 cf., okuni (LHH) okotoba (LHHH)
 (> kotoba 'words' LHH)

b. Accentual Phrase

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 Prosodic Word

Lastly, let me discuss suffixation. I will focus upon verb-inflectional suffixes as the candidates for this phenomena. Observe the examples in (7):

(7) *-ta* (past tense) : mita > mi 'see' + ta
 tabeta > tabe 'eat' + ta
-te (gerundive) : mite > mi + te tabete > tabe + te
-tara (conditional) : mitara > mi + tara
 tabetara > tabe + tara
-tari (nonexhaustive litig) : mitari > mi + tari
 tabetari > tabe + tari

When a verb inflectional suffix is attached to a verbal base, the newly created form becomes a prosodic word. Clearly, no change in pitch is observed in the examples described in (7).

3.1 Postnasal Voicing in Japanese

Postnasal voicing or the so-called NC voicing is one of the well-known phonological phenomena in Japanese. In fact, numerous analyses have been proposed in the past concerning this phenomenon (for example, Ito and Mester 1998, Rice 2005, Nasukawa 2005, and Kurisu 2006). It is generally regarded as categorical voicing assimilation that occurs in nasal-obstruent clusters in the Yamato vocabulary as in (8):

(8) tomo 'gragon-fly' tambo 'rice field' humbaru 'to stand
 firm' kaNgae 'thought' hundosi 'loincloth'
 (*tompo *tampo *humparu *kaNkae *huntosi)

Although the process of postnasal voicing has often been discussed in the past, no linguists have ever clearly stated its prosodic domain. I claim in this paper that it occurs within a prosodic word.

In the Yamato vocabulary postnasal voicing is obligatory, so that there are no examples of a nasal followed by a voiceless obstruent. However, this is not the case with other lexical strata words, which means that postnasal voicing is not obligatory in those other strata. Look at the examples in which postnasal voicing is ignored in (9):

(9) *Sino-Japanese vocabulary:*

simpai 'worry' sinkoku 'serious' sintoo 'penetration'

Mimetic vocabulary:

tonton 'knocking sound' konkon 'a rap on the door'

panpan 'the crack of the guns'

Foreign vocabulary:

pinku 'pink' tento 'tent' tempo 'tempo'

We can also observe the phenomenon of postnasal voicing in the process of deriving some verbs, as in (10):

(10) Verbal root	Past	Gerundive	Conditional	Gloss
sin	sin-da	sin-de	sin-dara	die
kam	kan-da	kan-de	kan-dara	chew
sum	sun-da	sun-de	sun-dara	finish
yom	yon-da	yon-de	yon-dara	read

cf., *sin-ta

As I have shown in (7), the Past, Gerundive and Conditional suffixes are *-ta*, *-te* and *-tari*, respectively. Obviously, each of these verb-inflectional suffixes becomes voiced after the root-final nasal. All these derived forms belong to the prosodic word category. Therefore, the voicing cannot be considered an independent phenomenon; it is the postnasal voicing phenomenon that we have thus far discussed.

There is still another group of words that seems to lend itself to postnasal voicing. They are the words that belong to the so-called vulgar speech style (see, for example, Kurisu 2006). The form *hun-* which derives from *humi-* is called "the *ombin* form of *humi-*". Some examples are given in (11):

(11) *Hun-* form

hunzukeru (> humitukeru 'to trample down')

hungiru (> humikuru 'to make up one's mind')

hunjibaru (> humisibaru 'to tie up')

There is no doubt that these are the examples of postnasal voicing. The *hun-* forms are by no means exceptional phonologically, i.e., as long as postnasal voicing is concerned. Thus in the Optimality theoretic framework, postnasal voicing is regarded as the highest-ranking constraint, allowing no exceptions.

3.2 Rendaku

Rendaku, or sequential voicing, is one of the topics widely discussed in Japanese phonology. It will continue to be studied as an important topic since it is not yet quite clearly understood. For example, many linguists have recently discussed this topic in the book entitled *Voicing in Japanese* (2005), but a large part of the phenomenon still remains a mystery. Generally, *rendaku* is a rule that voices the initial voiceless obstruent in the second member of a non-coordinate compound. Look at the examples in (12):

(12) *Rendaku*

oo 'big' + koe 'voice' > oogoe ko 'small' + taiko 'drum'

> kodaiko

kami 'paper' + hukuro 'bag'

> kamibukuro ([h] historically derives from /p/)

hosi 'star' + sirusi 'mark' > hosijirusi

aki 'autumn' + sora 'sky' > akizora.

A cursory glance at these examples might lead us to a conclusion that the phenomenon can be accounted for straightforwardly. However, it is not such a simple matter. There are three types of constraints, as pointed out by many linguists, that block the application of the otherwise productive rule: phonological, morphosyntactic, and semantic constraints. Let us briefly review these constraints one by one, before moving on to the discussion of

its domain.

The first one is a well-known phonological constraint called Lyman's Law. According to Ito and Mester (2003), Benjamin Lyman was the first Western scholar who described the blocking phenomenon in the 19th century, hence the name of the constraint. It says that if there is a voiced obstruent in the second member of a compound, *rendaku* does not occur. Some examples are given in (13):

(13) *Rendaku and Lyman's Law*

- ko 'small' + hituji 'sheep' > kohituji (*kobituji)
 yama 'mountain' + kaji 'fire'
 > yamakaji (*yamagaji)
 take 'bamboo' + tomo 'dragonfly'
 > taketombo (*takedombo)
 oo 'big' + sigoto 'job' > oosigoto (*oojigoto)

This is a robust constraint, but one compound was pointed out by some linguists as an exception, which is given in (14):

(14) nawa 'rope' + hasigo 'ladder' > nawabasigo

As the second member contains a voiced obstruent, it must block the application of *rendaku*. The actual form, however, has the initial voiceless obstruent of the second member voiced, against our expectation. Vance (1987) claims that *hasigo* itself is probably a compound (i.e., *hasigo* < *hasi* 'bridge' + *ko* 'offspring'), and thus should be treated differently. In any case, Lyman's Law is a powerful phonological constraint that works against *rendaku*.

The second type of constraint is morphosyntactic. There are several such constraints as in (15):

(15) a. *Coordinate compounds:*

- oya 'parent' + ko 'child' > oyako (*oyago)
 yomi 'reading' + kaki 'writing'
 > yomikaki (*yomigaki)
 ama 'sweet' + kara 'salty' > amakara (*amagara)
 yama 'mountain' + kawa 'river' > yamakawa

(meaning 'mountains and rivers')

cf. yamagawa ('mountain river')

b. *Compound verbs:*

- nori 'ride' + kaeru 'change'
 > norikaeru 'change trains' (*norigaeru)
 osi 'push' + taosu 'fall'
 > ositaosu 'push somebody down' (*osidaosu)
 tati 'separate' + kiru 'cut'
 > tatikiru 'break off' (*tatigiru)
 nomi 'drink' + hosu 'make empty'
 > nomihosu 'drink up' (*nomibosu)
 cf. hunzokeru 'to trample down'

c. *OV compounds* (i.e., Object + Verb composition):

- sakana 'fish' + turi 'catch'
 > sakanaturi 'fishing' (*sakanaduri)
 mono 'thing' + hosi 'dry'
 > monohosi 'drying clothes' (*monobosi)
 kami 'hair' + sori 'shave'
 > kamisori 'hair-shaver' (*kamizori)
 zookin 'dustcloth' + kake 'hanger'
 > zookinkake 'hanger for dustcloth'
 cf. zookingake 'wiping with a dustcloth'

These are the representative morphosyntactic constraints claimed by many linguists (see, for example, Vance 1987, and Ito and Mester 2003). No exceptions except the *hun-* forms (15.b) due to postnasal voicing have yet been reported.

The last type of constraint pointed out by some linguists (for example, Vance (1987), and Haraguchi 2004) is semantic: that is, some words of particular meanings are immune to *rendaku*, Vance gives an example of *himo* (meaning 'string'), which is the second member of a compound, as in *kutu* 'shoe' + *himo* > *kutuhimo* (**kutubimo*) 'shoestring'. *Kojien* (1991), an authoritative Japanese dictionary, lists 39 two-word compounds whose second members are spelled *himo* in Chinese character, meaning 'string', and there is no single case that shows *rendaku*. However, this semantic constraint is the most elusive as regards *rendaku*, with many lexical exceptions. Observe the examples in (16):

(16) *Semantic constraint* :

- a. itiban 'first' + tori 'bird'
 > itibandori 'first chicken that cries in he morning'
 umi 'sea' + tori > umidori 'sea gull'
 oya 'parent' + tori > oyadori 'parent bird'
 watari 'migratory' + tori > wataridori 'migratory bird'
- b. ko 'small' + tori > kotori 'little bird like a sparrow'
 sira 'white' tori > siratori 'white bird like a swan'
 niwa 'garden' + tori > niwatori 'chicken'
 yaki 'grill' + tori > yakitori 'barbecued chicken'

Kojien (1991) contains a total of 197 two-word compounds, whose second members are spelled *tori* 'bird' in Chinese character. Out of 197, only 33 examples, i.e., roughly 17% are pronounced [tori] as in (16b), and the rest are all pronounced [dori]. In other words, there is indeed a strong tendency to voice the initial obstruent of the second member of a compound. What can we say about the words in (16a) and (16b)? From these examples, one may conclude that the examples whose second members are pronounced [dori] are transparent in meaning: that is, the meaning of each compound is the meaning of the two words combined, whereas the compounds of the other type are not so transparent in meaning. This generalization, indeed, seems to cover some examples of type (16a), but a careful examination reveals that there are many examples of the same type that are not so transparent in meaning such as *jidori* 'local bird', *kankodori* 'cuckoo', and *kazamidori* 'weather cock'.

Using the same Japanese dictionary, I examined another group of two-word compounds whose second members are spelled *ki* 'tree' in Chinese character. There were 201 such compounds in total, of which 71 examples, i.e., about 35% had their second members pronounced [ki], and the rest [gi]. This clearly indicates that the percentage of voicelessness with respect to the initial obstruent of the second members in such compounds varies from one group to another.

One interesting fact that should be noted in passing is that among the compounds whose

second members are spelled *ki* in Chinese character, three examples (i.e., *huyu* 'winter' + *ki*, '*waka* 'young' + *ki*, and *sio* 'salt' + *ki*) have both [ki] and [gi] as alternative pronunciations. In the following discussion, I will refer to the phonological and morphosyntactic constraints, excluding this elusive semantic constraint.

3.3 *Rendaku* and the Prosodic Word

Having examined the constraints that block the application of *rendaku*, I claim that blocking occurs across prosodic word boundaries, which invalidates the claim made in Ito and Mester (2003) that the whole compound constitutes a single prosodic word. Let us go back to the examples of (12), and see how it works in (17):

(17) *Reanalyzing into Prosodic Words*

- a. [oo][koe] > oogoe
 b. [kami][hukuro] > kamibukuro
 c. [hosi][sirusi] > hosijirusi

Clearly, *rendaku* occurs across prosodic word boundaries in these examples. A question that immediately arises is this: Why doesn't *rendaku* occur across prosodic word boundaries in some other compounds, then? The answer is this: those compounds that do not undergo *rendaku* due to the constraints discussed above will be reanalyzed into single prosodic words, as in (18):

(18) *Single Prosodic Words*

- a. [ko-hituji]
 b. [yama-kaji]
 c. [take-tombo]
 d. [oo-sigoto]

What, then, are the advantages of analyzing the examples of (18) as single prosodic words? One advantage is that *rendaku* will be considered a phenomenon that occurs only across prosodic word boundaries. Another advantage is that minimal pairs like *yamakawa* ('mountains and rivers') and *yamagawa* ('mountain river') or *oyako* ('parent

and child') and *oyago* ('parent') can be described unambiguously as in (19) below :

- (19) a. [yama-kawa] > yamakawa
 vs. [yama][kawa] > yamagawa
 b. [oya-ko] > oyako vs. [oyago] > oyago
 where (-) is a morpheme-boundary marker.

Still another advantage is that the first member of a compound, whether it contains a voiced obstruent or not, makes no difference in current Japanese as far as *rendaku* is concerned as can be understood from our analysis.

4. Reduplication and Mimetics

There are two types of reduplicated forms in Japanese: regular reduplicated forms and reduplicated mimetics. Reduplicated mimetics abound in Japanese; in fact, a large number of adverbs belong to this group. For example, *katakata* ('clatter') and *patapata* ('pitter-patter') echo the sounds we hear, and *hurahura* ('wavering') and *nyoronyoro* ('wriggling') indicate the manner in which an insect or an animal moves. They will be turned into adverbs by attaching the suffix *-to*. In contrast, regular reduplicated forms, which acquire an intensive/pluralizing property, are created by copying the base of a word, and thus should be distinguished from reduplicated mimetics (see, for example, Ito and Mester 2003). What is surprising with respect to the latter type of reduplication, however, is that they show the effect of *rendaku*, just like the compounds we have thus far discussed. Look at the examples in (20):

- (20) *Regular reduplicated forms*
 a. sina 'article' + sina > sinajina
 kami 'god' + kami > kamigami
 ki 'tree' + ki > kigi
 hana 'flower' + hana > hanabana
 hito 'person' + hito > hitobito
 tokoro 'place' + tokoro > tokorodokoro
 b. karu 'light' + karu > krugaru
 saki 'ahead' + saki > sakizaki

tika 'near' + tika > tikajika
 hie 'cold' + hie > hiebie

The examples in (20a) can be used as nouns, while the examples in (20b) can be used as adjectives by attaching the suffix *-to* or *-ni* to them. Clearly, reduplicated mimetics behave just like coordinate compounds, whereas regular reduplicated forms follow the pattern of non-coordinate compounds, as far as *rendaku* is concerned.

If we apply the definition of the prosodic word proposed in this paper to the two types of reduplicated forms, the same results will be obtained as we did with compounds. Look at the examples in (21):

- (21) a. [kata-kata] 'clatter'
 [pata-pata] 'pitter-patter'
 [hura-hura] 'wavering'
 [nyoro-nyoro] 'wriggling'
 b. [sina][sina] 'articles'
 [kami][kami] 'gods'
 [karu][karu] 'lightly'
 [saki][saki] 'in the future'

Obviously, the examples of (21a) are not subject to *rendaku*, while the examples of (21b) undergo that process. This is because what is reduplicated in (21b) is a base in each case, which in turn supports our proposed definition of the prosodic word.

5. Conclusion

In this paper I have argued that the definitions of the prosodic word in Japanese provided by some linguists in the past are not adequate. Thus I have defined the prosodic word as the constituent consisting maximally of a base plus certain affixes, emphatic prefixes, and/or an intensifier infix, and proposed that according to our definition, postnasal voicing occurs within a prosodic word, and *rendaku* across prosodic word boundaries without exceptions, provided that reanalysis takes place. This also leads to a conclusion that compounds and regular reduplicated forms behave exactly alike as

far as *rendaku* is concerned.

Further, I have argued that there are three kinds of constraints that block the application of *rendaku*: that is, phonological, morphosyntactic, and semantic constraints, of which the semantic constraint remains largely elusive. Ohno (2005) says that *rendaku* has always been irregular. Nevertheless, there is a strong tendency to voice the initial obstruent of the second member of a non-coordinate compound in the Yamato vocabulary. Since it does not basically apply in the other strata of vocabulary, it seems possible that the other strata, particularly the Sino-Japanese, have had some impact on this phenomenon historically, making it possible for the Yamato vocabulary to admit a large number of exceptions. In fact, some compounds have alternative pronunciations as we have presented in this paper. Since we know very little about this exceptional behavior, further research is definitely needed.

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