

Japanese Major Phrase Formation and NONFINALITY*

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1 Abstract

According to the theory developed by Selkirk (1986), Nespor and Vogel (1986) and among others, the formation of prosodic phrases makes direct reference to some aspects of syntactic structures. Syntax, however, is not the only factor to determine prosodic phrase formation. The Major Phrase formation in Japanese, for example, obeys a purely prosodic NONFINALITY constraint, at the same time it is sensitive to a syntax-prosody interface alignment constraint.

2 The Basic Facts and Assumptions of Japanese Prosody

2.1 The Prosodic Hierarchy

Following Selkirk (1986, 1996), Nespor and Vogel (1986), Pierrehumbert and Beckman (1988) and among many others, I assume that a syntactic representation is parsed into a prosodic hierarchy consisting of layers of categorically distinct prosodic constituents as shown in (1).

(1) Prosodic Hierarchy:	Utt	Utterance
	IntP	Intonational Phrase
	MajP	Major Phrase
	MinP	Minor Phrase
	PWd	Prosodic Word

Each prosodic category in the prosodic hierarchy above is associated with certain phonological features or certain intonational events.¹

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2.2 The Minor Phrase in Japanese

In Japanese, each lexical item is specified for unaccented or accented. An accented word has one and only one bitonal pitch accent, H*+L, associated with some designated mora. In this paper, we will only focus on cases with accented words. Each accented word together with a case marker or a post-position that follows it is usually mapped onto a single Minor Phrase. I assume that a Minor Phrase is a domain delimited by Low boundary tones (henceforth, L%) and a High Phrasal tone (henceforth, H-) following Pierrehumbert and Beckman (1988). L% is associated with the first and the last mora of each Minor Phrase and H- is associated with the second mora of a Minor Phrase. As a result, the F0 contour of each Minor Phrase in Japanese has a mountain-like shape.

2.3 The Major Phrase and the XP-MajP Alignment Constraint

If there is a sequence of two accented Minor Phrases, it has been reported by Poser (1984) and Pierrehumbert and Beckman (1988) that the F0 peak of the second Minor Phrase (henceforth, MinP) may be drastically lowered. However, Selkirk and Tateishi (1991) and Kubozono (1993) have noticed that the pitch range of the second MinP is expanded under certain conditions. Selkirk and Tateishi suggest that it be expanded when its left edge coincides with the left edge of a syntactic XP. Assuming that pitch range expansion takes place at the left edge of a Major Phrase (henceforth, MajP), they have proposed that each XP left edge coincide with the left edge of a MajP. Their proposal is rephrased in terms of Generalized Alignment of McCarthy and Prince (1993) as shown in (2).

(2) ALIGN_L(XP, MajP)

For each XP, there is a Major Phrase such that the left edge of the XP and that of the Major Phrase coincide.

In contrast, Kubozono (1993) has suggested that a pitch range will be expanded at the left edge of a branching syntactic node but not at the left edge of an XP.

Sugahara (1999b) has supported Selkirk and Tateishi's proposal comparing the pitch range of the second noun of the examples in (3) and (4). The first noun and the second noun in (3) form a restrictive modification struc-

¹ In Pierrehumbert and Beckman (1988), Minor Phrase is called Accentual Phrase and Major Phrase is called Intermediate Phrase.

ture. On the other hand, those two nouns in (4) form a non-restrictive modification structure.

- (3) [_{N1} *taishojídai*]-no [_{N2} *shonenmánga*]-no [_{N3} *heiseibájon*]
 [_{N1} the Taisho era]-Gen [_{N2} boy's comics]-Gen [_{N3} Heisei version]
 'The Heisei version of boy's comics written in the Taisho era.'
- (4) [_{N1} *yumeibándo*]-no [_{N2} *shonennáifu*]-no [_{N3} *hittoárubamu*]
 [_{N1} famous band]-Gen [_{N2} Shonen Knife]-Gen [_{N3} hit album]
 'The hit album of Shonen Knife, the famous band.'

In (3), the second noun *shonenmánga* ('boys' comics') denotes a set of any kind of boys' comics. By being modified by the first noun *taishojídai* ('the Taisho era'), the meaning of the entire NP that exclusively dominates the first and the second noun is restricted into a set of a special kind of boys' comics, i.e. a set of boys' comics written in the Taisho era. Because of this, N1 and N2 in (3) form a restrictive modification structure. Following Jackendoff (1977), Kameshima (1989) and others, I assume that N1 in this case adjoins to a non-maximal projection of N2, i.e. to N'2.

On the other hand, in (4), the second noun *shonennáifu* ('Shonen Knife') is a name and denotes a specific rock band. Thus the modification of the second noun by the first does not bring any semantic change in what the entire NP denotes. Hence N1 and N2 in (4) form a non-restrictive modification structure. I assume that the first noun in (4) adjoins to a maximal projection of N2, i.e. NP2, following Kameshima (1989). That is, there is an NP left edge aligned with the left edge of N2 in (4) though there is no such an edge aligned with the left edge of N2 in (3). Except for this difference, those two phrases have exactly the same syntactic structures: the first noun and the second noun form a constituent exclusive of N3, and that constituent and N3 are sisters of the same mother node as shown in Figure 1.

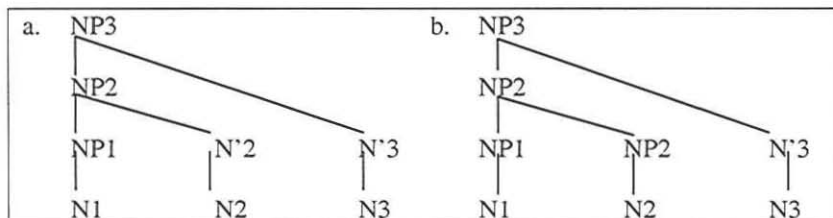


Figure 1: The syntactic structure of the example in (3) is shown in a., and that of the phrase in (4) is shown in b.

Kubozono (1993) and Selkirk and Tateishi (1991) make different predictions here. The former predicts that the F0 peak of N2 in (3) and that of N2 in (4) are realized in the same range because N2's in both (3) and (4) are at the left edge of a non-branching node. On the other hand, the latter predict that the N2 in (4) is realized higher than that in (3) because there is an NP left edge aligned with the left edge of N2 in (4). In Sugahara (1999b), I have obtained a result to support the prediction of Selkirk and Tateishi in an experiment based on one Japanese speaker: the F0 peak of N2 in (4) is significantly higher than that of N2 in (3). Given this, I have concluded that there is a MajP break aligned with the left edge of N2 in (4) but not with the left edge of N2 in (3) as presented in Figure 2.² In this way, $\text{ALIGN}_L(\text{XP}, \text{MajP})$ plays a crucial role in the syntax-prosody mapping in Japanese.

a. Prosodic Representation of (3)	b. Prosodic Representation of (4)
[_{IntP}]	[_{IntP}]
{ _{MajP} }	{ _{MajP} } { _{MajP} }
(_{MinP} NP1) (_{MinP} N'2) (_{MinP} N'3)	(_{MinP} NP1) (_{MinP} NP2) (_{MinP} N'3)

Figure 2: Prosodic representations of (3) and (4).

3 $\text{ALIGN}_L(\text{XP}, \text{MajP})$ and NONFINALITY

There are, however, some limited cases where this edge alignment constraint is violated. Contrary to the case of three-noun structures introduced in the last section, $\text{ALIGN}_L(\text{XP}, \text{MajP})$ is violated by the second noun of some two-noun structure. This does not necessarily mean that $\text{ALIGN}_L(\text{XP}, \text{MajP})$ is invalid. Rather, I will argue, within the framework of Optimality Theory developed by Prince and Smolensky (1993), that it is because a NONFINALITY constraint dominates $\text{ALIGN}_L(\text{XP}, \text{MajP})$ in Japanese.

² Speakers read those target phrases in (3) and (4) embedded in the following context.

[*tokorode*, [target phrase] -*wa* (or -*ga*) -*ne*, ...]
[by the way, [target phrase] -Topic (or -Nominative)-phrase-final particle.]

The phrase-final particle *ne* is associated with a high boundary tone (H%) that designates an Intonational Phrase (IntP) break. Also, there is an IntP break at the end of *tokorode* 'by the way'. As a result, the target phrase together with the topic marker and the phrase-final particle form an IntP by themselves.

3.1 Two-Noun Structures and the Violation of $ALIGN_L(XP, MajP)$

Consider the two-noun restrictive modification structure in (5) and the two-noun non-restrictive modification structure in (6). Their configuration and structural organization is exactly the same as that of the first noun and the second noun in the three-noun structures in (3) and (4). N2 in (5) as well as N2 in (3) does not project NP by itself because N1 and N2 form a restrictive modification structure as shown in a. of Figure 3. On the other hand, N2 in (6) by itself projects a maximal projection as well as the second noun in (4) because N1 and N2 form a non-restrictive modification structure as shown in b. of Figure 3.

- (5) $[_{N1} taishojidai]-no$ $[_{N2} shonenmanga]$
 $[_{N1}$ the Taisho era]-Gen $[_{N2}$ boy's comics]
 'Boy's comics in the Taisho era.'
- (6) $[_{N1} yumeibando]-no$ $[_{N2} shonennifu]$
 $[_{N1}$ famous band]-Gen $[_{N2}$ Shonen Knife]
 'Shonen Knife, a famous band.'

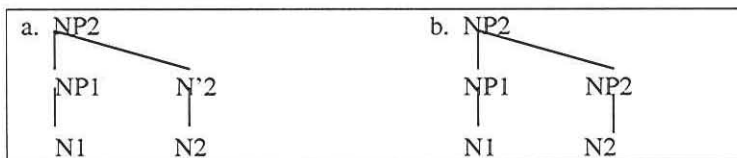


Figure 3: The syntactic structure of the example in (5) is shown in a., and that of the example in (6) is shown in b.

If $ALIGN_L(XP, MajP)$ is fully satisfied by the phrase in (6), the pitch peak of N2 in (6) should be realized higher than that of N2 in (5). It is because the left edge of N2 coincides with an XP left edge. In Sugahara (1999b), I carried out a production experiment based on one Japanese speaker to compare the pitch peak of N2 in the two-noun structure in (5) and that in (6).³ Contrary to the experimental result obtained in the three-noun structures introduced in the last section, what I found was that there was no significant difference between the pitch peak of N2 in (5) and that of N2 in (6). Both the peak of N2 in (5) and that of N2 in (6) are equally realized in a low pitch range. Given this, I have concluded that there is no MajP break aligned with the left edge of N2 in (6) even though its left edge coincides with the left edge of an NP. This is something unexpected unless $ALIGN_L(XP, MajP)$ is

³ Phrases in (5) and (6) are also read in a context shown in Footnote 2.

violable. The schematic representations of the prosodic phrase formation of those two phrases in (5) and (6) are presented in Figure 4.

a. Prosodic Representation of (5)	b. Prosodic Representation of (6)
[_{IntP}]	[_{IntP}]
{ _{MajP} }	{ _{MajP} }
(_{MinP} NP1) (_{MinP} N'2)	(_{MinP} NP1) (_{MinP} NP2)

Figure 4: The prosodic phrase formation of (5) and (6).

3.2 Prosodic Heads and NONFINALITY

In the last section, I showed that $\text{ALIGN}_L(\text{XP}, \text{MajP})$ is violable at the left edge of N2 of the two-noun non-restrictive modification structure in (6). Under the assumption of the Optimality Theory developed by Prince and Smolensky (1993), the most optimal output can violate constraints as far as the violation of those constraints satisfies a more important one. I will argue, in this subsection, that the reason $\text{ALIGN}_L(\text{XP}, \text{MajP})$ is violable at the left edge of N2 in (6) is because $\text{ALIGN}_L(\text{XP}, \text{MajP})$ is dominated by a variety of a NONFINALITY constraint.

3.2.1 IntP-Final MajP

In (a) and (b) of Figure 5, I show two possible prosodic representations of the phrase in (6). The former is a bad representation but it satisfies $\text{ALIGN}_L(\text{XP}, \text{MajP})$: there is a MajP break at the left edge of N2. The latter is the preferred representation but it violates $\text{ALIGN}_L(\text{XP}, \text{MajP})$: there is no MajP break at the left edge of N2 and both N1 and N2 are in the same MajP.

a. Disfavored	b. Preferred
[_{IntP}]	[_{IntP}]
{ _{MajP} } { _{MajP} }	{ _{MajP} }
(_{MinP} NP1) (_{MinP} NP2)	(_{MinP} NP1) (_{MinP} NP2)

Figure 5: One of the disfavored prosodic representations of the two-noun non-restrictive structure in (6) is in (a). The preferred one is in (b).

Now remember the preferred prosodic representation of the three-noun counterpart in (4). N1 and N2 in (4) as well as those in (6) form a non-restrictive modification structure. That is, the left edge of N2 coincides with the left edge of an NP in both (4) and (6). Contrary to N2 in (6), $\text{ALIGN}_L(\text{XP}, \text{MajP})$ is satisfied by N2 in (4) as already discussed in Section 2:

a MajP break is aligned with the left edge of N2 in (4). This is again shown in Figure 6.

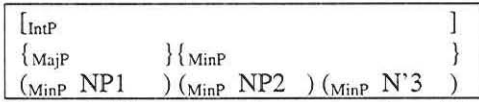


Figure 6: The preferred representation of the three noun structure in (4).

We have to explain why ALIGN_L(XP,MajP) is satisfied at the left edge of N2 of the three-noun structure in (4) but not at the left edge of N2 of the two noun structure in (6). My answer to this question is that an IntP-final MajP dominating only one MinP is prohibited for some reason. This is why we cannot have a MajP boundary at the left edge of N2 in (6). A MajP break aligned with the left edge of N2 in (6) results in an IntP-final MajP dominating only one MinP as shown in a. of Figure 5. On the other hand, it is allowed to have a MajP break at the left edge of N2 in the three noun structure in (4) because it does not cause such a problem: the IntP-final MajP of (4) still dominates two MinP's as shown in Fig 6.

Another question is why an IntP-final MajP that dominates only one MinP is disfavored. In order to answer this question, we need to probe the relation between a prosodic constituent and its head in the next subsection.

3.2.2 Prosodic Heads and Focus Phrasing

According to the Prosodic Prominence Hypotheses in (8) proposed by Selkirk (1997), every prosodic constituent must dominate one and only one immediate head.⁴

(8) Prosodic Prominence Hypothesis (Selkirk 1997b)

Every prosodic constituent is headed by exactly one prosodic constituent one level lower.

In Japanese, the immediate head of a MajP is left-aligned and that of an IntP is right-aligned. This is independently motivated by the study of focus phrasing in Japanese (Selkirk 1999b). Let us first look at some characteristics of focus phrasing in Japanese.

Pierrehumbert and Beckman (1988) and Nagahara (1994) have reported that there is no MajP break between Focus and the following elements even

⁴ It is assumed that Prosodic Prominence is part of GEN. That is, all the possible output representations must satisfy this constraint.

if there is an XP left edge intervening between them. This is shown in Figure 7. Another conspicuous characteristics of the focus phrasing in Japanese is that the left edge of Focus and that of a MajP always coincide together even if there is no XP left edge aligned with the left edge of Focus (Pierrehumbert and Beckman 1988, Nagahara 1994, Truckenbrodt 1995), as shown in Fig 8.

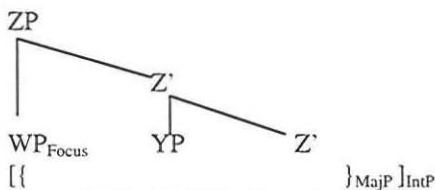


Figure 7: No MajP is aligned with the left edge of YP that follows Focus.

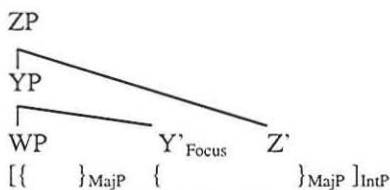


Figure 8: A MajP break aligned with the left edge of Focus.

This paradigm is solved once we take Selkirk's (1999) FOC-PROM in (9) and two alignment constraints in (10) and (11) into consideration.⁵

(9) FOC-PROM (Selkirk 1999)

A constituent that is marked as Focus at the level of syntax must be a head of an IntP.

(10) ALIGN_R(MajP, IntP)

The right edge of each MajP (immediate head of an IntP) and the right edge of the IntP must be aligned with each other.

(11) ALIGN_L(MinP, MajP)

The left edge of each MinP (immediate head of a MajP) and the left edge of the MajP must be aligned with each other.

⁵ A prosodic phrase that is a head of a higher constituent is underlined. Hence, MinP is the immediate head of a MajP, and MajP is the immediate head of an IntP.

The constraint in (9) demands Focus to correspond to a head of an Intonational Phrase. Here, I assume that the relationship of headedness is transitive following Prince and Smolensky (1993). That is, if A is headed by B and B is headed by C, then A is also headed by C. Given this, a MinP (an immediate head of a MajP) is also a head of an IntP as far as the MinP is a head of a MajP (an immediate head of an IntP).

According to FOC-PROM and the transitivity of headedness, a Focus constituent must correspond to a MinP that is an immediate head of a MajP. According to ALIGN_R(MajP, IntP) in (10), a MajP must occupy the right edge of an IntP. This is why there is no MajP break between Focus and the end of an IntP. Also, according to ALIGN_L(MinP, MajP) in (11), a MinP must be at the left edge of a MajP. This is why there is always a MajP break at the left edge of Focus. I assume those two alignment constraints in (10) and (11) are undominated.

3.2.3 NONFINALITY and Phrasal Phonology

Keeping those two undominated alignment constraints in (10) and (11) in mind, let us go back to the main issue introduced in Section 3.2.1: violation of ALIGN_L(XP, MajP) is costless compared to allowing a disfavored IntP-final MajP that dominates only one MinP.

According to the alignment constraints in (10) and (11), an IntP-final MajP is an immediate head of an IntP, i.e. a MajP. The only MinP that is dominated by the IntP-final MajP is also a head of the IntP according to the alignment constraint in (11) and the transitivity of headedness. Given this, we could paraphrase the issue above in the following way: violation of ALIGN_L(XP, MajP) is costless compared to allowing an IntP-final MinP. I suggest that it should be because there is a highly ranked constraint that forbids prosodic heads being final, say some variety of NONFINALITY.

A NONFINALITY constraint was first proposed by Prince and Smolensky (1993) to explain word-stress patterns in Latin and some other languages: a word-stress tends not to fall on the PWD-final syllable or the PWD-final foot. They have explained this that there is a constraint that forbids the head of a PWD being PWD-final, which they have called NONFINALITY. I propose that NONFINALITY play a crucial role not only in prosodic word phonology but also in phrasal phonology. The version of NONFINALITY relevant to Japanese prosodic phrase formation is shown in (13). I further propose that NON-FIN(IntP) in (13) dominate ALIGN_L(XP, MajP) as shown in (14) and in Tableau 1. This is why AL_L(XP, MajP) is violable at the IntP-final position.

(13) NONFINALITY(IntP)

A head of an IntP must not be at the right-most position of the IntP.

(14) $AL_L(\underline{MinP}, \underline{MajP}), AL_R(\underline{MajP}, \underline{IntP}) \gg \text{NONFIN}(\underline{IntP}) \gg AL_L(\underline{XP}, \underline{MajP})$

All the candidates in Tableau 1 satisfy one of the undominated alignment constraints, $ALIGN_L(\underline{MinP}, \underline{MajP})$. The candidate in (c), however, violates the other undominated alignment constraint, $ALIGN_R(\underline{MajP}, \underline{IntP})$, because the MajP is left-aligned. On the other hand, both the candidate in (a) and the one in (b) satisfy $ALIGN_R(\underline{MajP}, \underline{IntP})$ because the MajP is right-aligned. Nonetheless, the candidate in (b) is not optimal because it violates NONFINALITY(IntP) twice: one by the right-most MinP, and the other by the MajP. The candidate (a) is optimal even though it violates $ALIGN_L(\underline{XP}, \underline{MajP})$ because its violation of NONFINALITY(IntP) is minimal.

Tableau 1

(6)	$[_{NP_2} [_{NP_1} N1] \quad [_{NP_2} N2]]$	$AL_L(\underline{MinP}, \underline{MajP})$	$AL_R(\underline{MajP}, \underline{IntP})$	NoFin (IntP)	$AL_L(\underline{XP}, \underline{MajP})$
a.	$\begin{bmatrix} \underline{IntP} \\ \{ \underline{MajP} \} \\ (\underline{MinP} \ N1) \ (\underline{MinP} \ N2) \end{bmatrix}$			$(*\underline{MajP})$	*
b.	$\begin{bmatrix} \underline{IntP} \\ \{ \underline{MajP} \} \{ \underline{MajP} \} \\ (\underline{MinP} \ N1) \ (\underline{MinP} \ N2) \end{bmatrix}$			$(*\underline{MajP})$ $*!\underline{MinP}$	
c.	$\begin{bmatrix} \underline{IntP} \\ \{ \underline{MajP} \} \{ \underline{MajP} \} \\ (\underline{MinP} \ N1) \ (\underline{MinP} \ N2) \end{bmatrix}$		*!	$(*\underline{MinP})$	

In summary, I have argued that the syntax-prosody interface constraint $ALIGN_L(\underline{XP}, \underline{MajP})$ is dominated by a purely prosodic constraint, NONFINALITY(IntP). This is why no MajP break appears at the left edge of the right-most MinP even if there is an XP left edge aligned there.

4 An Alternative: BINARITY constraints

Alternatively, one may propose that it should be the binarity constraints but not NONFINALITY(IntP) that dominate $ALIGN_L(\underline{XP}, \underline{MajP})$ in Japanese. This approach, however, makes a wrong prediction.

It has been suggested by Selkirk (1997a) that BINARY-MIN and BINARY-MAX, which limit the weight of a prosodic constituent, play a crucial role in prosodic phrasing.

(15) BINARY-MAX(MajP)

A Major Phrase can dominate at most two Minor Phrases.

(16) BINARY-MIN(MajP)

A Major Phrase must dominate at least two Minor Phrases.

Having BIN-MAX(MajP) dominate BIN-MIN(MajP) and BIN-MIN(MajP) dominate ALIGN_L(XP,MajP), one can correctly predict that no MajP break appears at the left edge of N2 in the sequence of two nouns in (6) as shown in Tableau 2. Also it correctly predicts that a MajP break appears at the left edge of N2 in the sequence of three nouns in (4) as shown in Tableau 3.

Tableau 2 BIN-MAX(MajP) » BIN-MIN(MajP) » ALIGN_L(XP,MajP)

(6)	[NP ₂ [NP ₁ N1] [NP ₂ N2]]	BIN-MAX	BIN-MIN	AL _L XP
a.	[IntP{MajP (MinP N1) (MinP N2)}]]			*
b.	[IntP{MajP (MinP N1)}{(MinP N2)}]]		*!	

Tableau 3 BIN-MAX(MajP) » BIN-MIN(MajP) » ALIGN_L(XP,MajP)

(4)	[NP ₂ [NP ₁ N1] [NP ₂ N2] [NP ₂ N2]]	B-MX	B-MN	AL _L
a.	[IntP{MajP (MinP N1)}{MajP (MinP N2)(MinP N3)}]]		*	
b.	[IntP{MajP (MinP N1)(MinP N2)(MinP N3)}]]	*!		*

This approach, however, does not make the right prediction for the three-noun structure in (3), which is again shown in Figure 9. The structure does not have an XP left edge aligned with the left edge of N2 because N1 and N2 form a restrictive modification structure. The phrase in (3) is mapped into a single MajP as shown in Figure 9. This alternative approach wrongly predicts that such a representation is not optimal because the MajP dominating three MinP's violates the highly ranked constraint, BINARY-MAX(MajP).

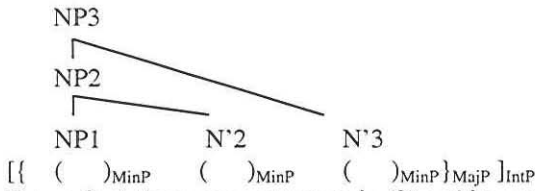


Figure 9: A three-noun structure in (3) and its prosodic representation.

5 Conclusion

I have argued within the framework of Optimality Theory that the syntax-prosody interface constraint which has been considered to play the crucial role in the Major Phrase formation of Japanese could be violable, being dominated by a purely prosodic NONFINALITY constraint.

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