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The Intonational Asymmetry Between Argument and Adjunct in Japanese*

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1. Introduction

This paper addresses the question of whether there is a systematic difference between the properties of argument and adjunct constructions in the Japanese intonation system. Based on results from an experiment I show that argument and adjunct are intonationally distinguished from one another in Japanese. There is also certain degree of inter-speaker variation in how these two structures are intonationally differentiated, and the distinction is neutralized under certain circumstances pertaining to prosodic constituent length. To explain the intonational argument–adjunct distinction as well as the variation and neutralization, I give an optimality theoretic (OT, Prince and Smolensky 1993) account, utilizing a expanded version of Selkirk's focus prominence constraints (Selkirk 1999) and a small set of markedness constraints on prosodic structure that interact with them. More specifically, I show that the approach of focus prominence constraints that require certain syntactic categories to be associated to certain prosodic phrasing levels is valid in Japanese. To account for the neutralization of prosodic argument-adjunct distinction, I propose a constraint on prosodic constituent length that is analogous to the foot binarity constraint but crucially different in that it refers to a higher prosodic level. I also demonstrate that the inter-speaker variation can be explained by adopting Anttila's (1997, 2002) partial ordering model.

The remainder of the paper is organized as follows: in §2, I provide some background information on this issue; in §3, the experiment and the results are described;

* I thank John Kingston, Joe Pater, Tom Roeper, Lisa Selkirk, Mariko Sugahara, and the editor of the volume for comments and discussions on earlier drafts. Also, thanks to Della Chambless for stylistic improvement.

in §4, I give an OT account of the consistent differences in pitch pattern found in the experiment. In §5, I summarize the discussion and give a brief conclusion.

2. Overview and background

2.1. Argument-adjunct distinction in English sentence prosody

It is well known that the argument-adjunct distinction is reflected in prosody of English (Gussenhoven 1983ab, Selkirk 1984, 1995a). Gussenhoven (1983a) uses the results of a perceptual experiment to argue that a predicate that is new in the context (hereafter referred to as *focused*) can be legitimate without a pitch accent if the following argument carries one, while it cannot be grammatical if it is followed by an accented adjunct. Thus, the sentence in (1a) is an appropriate answer to either of the sentences in (1a) and (1b), but (2c) is grammatical as the answer to (2a) only. In order for (2c) to be legitimate, both *teaches* and *Ghana* must be accented.

(1) a. And what is your contribution to society?
b. What exactly is it you are creating?
c. We create BUSiness.

(2) a. Where does he teach?
b. *What does he do?
c. He teaches in GHAna.
(The capitalization indicates the presence of a pitch accent on the syllable.)

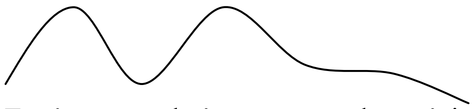
Selkirk (1995a) essentially makes the same point as Gussenhoven on the intonational asymmetry between argument and adjunct. She points out that the difference is whether the assignment of a pitch accent to the head is optional or obligatory.

Birch and Clifton (1996) experimentally confirm the theories of Gussenhoven's (1983b) and Selkirk's (1995a). They test the relationship between intonational focus and interpretation of sentences in English using two tasks. Listeners were asked to decide whether each question-answer pair made sense as a conversation. They accepted sentences which contained a single accent like *she teaches MATH* as well as those containing two accents *she TEAches MATH* as the answers to a question sentence *isn't Kerry pretty smart?*. However, they rated the doubly-accented sentences more natural than the singly-accented ones. From these results, Birch and Clifton conclude that single accenting on the object is acceptable for a sentence in which the whole VP is new, although it is dispreferred relative to double accenting on both the verb and the object for the same interpretation.

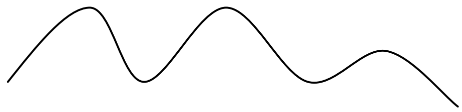
2.2. Prosodic distinction between argument and adjunct in Japanese: Uechi (1998)

Uechi (1998) argues that there is also a systematic intonational difference between argument and adjunct in Japanese.[1] According to him, the way they are distinguished in Japanese is parallel to English. He argues that a head is pronounced higher when it is preceded by an adjunct than by an argument.[2] Consider the two sentences in (3a) and (3b):

(3) Context: What did John do?



a. Zyo'n-wa ha'mmaa-o kowa'sita.
John-Nom hammer-Acc break-past
"John broke a hammer."



b. Zyo'n-wa ha'mmaa-de kowa'sita.
John-Nom hammer-with break-past
"John broke (something) with a hammer."

Both sentences consist of three accented words: a subject NP, an argument NP or an adjunct PP (postpositional phrase), and a verb. Pitch accents are denoted by the apostrophes. The pitch contours drawn above them illustrate the intonational difference between argument and adjunct claimed by Uechi. The pitch peak on the head verb with respect to the one on the preceding item is higher when it is an adjunct than when it is an argument. He claims that both are *downstep* cases; that is, the pitch range is distinctively lowered after an accented word. He calls the intonation pattern in (3a) a case of *total downstep* (downstep without initial rise on the verb) and the pattern in (3b) *partial downstep* (downstep with initial rise).

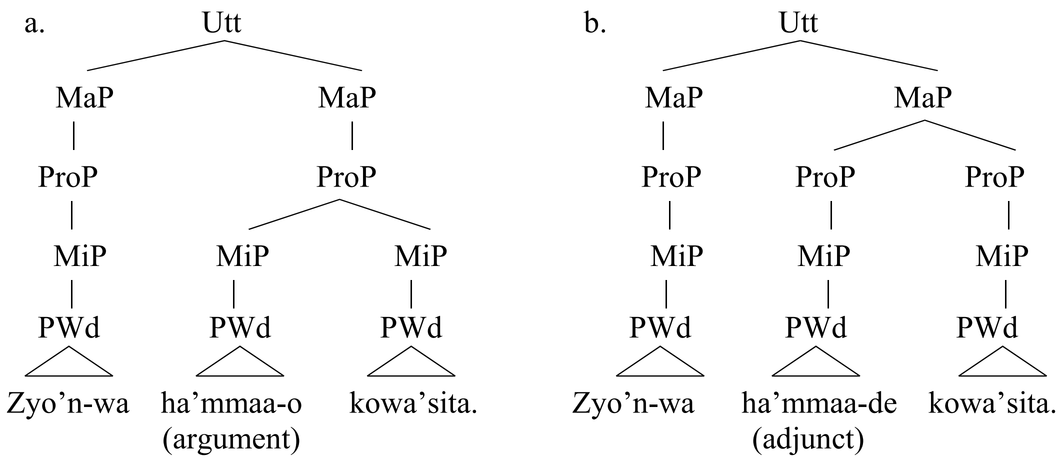
The systematic intonational difference between argument and adjunct claimed by Uechi poses a problem in differentiating between them in phonological representation: the difference in pitch contour between (3a) and (3b) cannot be expressed with the prosodic constituents generally assumed for Japanese intonational phonology, i.e., *Major Phrase* (*MaP*) (also known as *Intermediate Phrase*) and *Minor Phrase* (*MiP*) (also known as *Accentual Phrase*) (Pierrehumbert and Beckman 1988, Selkirk and Tateishi 1991). More specifically, given that MaP is defined as the domain of downstep (cf. Pierrehumbert and Beckman 1988), (3a) and (3b) cannot be differentiated in terms of MaP since downstep occurs in both cases. It is not possible to consider the VP in (3a) to form a single MiP while that in (3b) forms two MiPs, as long as we assume that the generally acknowledged definition of MiP, i.e., the prosodic domain that contains at most one pitch accent, holds. The VP in (3a) has two pitch accents in it.

The solution to this problem that Uechi (1998) proposes is to posit a new prosodic phrasing level between MaP and MiP, called "Focus Projection Phrase" (ProP). He defines this phrasing level as the domain of total downstep.[3] Integrating the intonation of this new prosodic constituent will provide the phonological representations in (4a) and

[1] He discusses the prosodic differences between argument and adjunct only for accented words. The experiment to be presented involves cases of unaccented words as well as accented words.
[2] Note that Japanese is a head-final language where it shows the argument/adjunct-head configuration.
[3] He points out that ProP is also the domain of Focus Projection (Selkirk 1995a). In a phrase, an internal argument and the head of the phrase can be the domain of a ProP. Also, a whole phase can be the domain of a ProP if the head is F-marked.

(4b), which correspond to (3a) and (3b), respectively.[4]

(4) a. b.



In (4a), the VP forms a single ProP since the pitch of the head verb is totally downstepped with respect to the preceding argument. In the structure in (4b), on the other hand, the head verb is realized as only partially downstepped with respect to the preceding adjunct, and consequently the VP constitutes two ProPs.

There are at least two reasons why Uechi's (1998) findings need to be replicated. First, they are based on his intuition, not on experimental data. It is necessary to test whether we need to add the additional level, ProP, to the prosodic hierarchy. Second, the distinction between Uechi's total and partial downstep appears to be a subtle one. We need empirical evidence for or against this. In the following section, I will report the experiment carried out to examine these issues and consider what prosodic structures could distinguish argument and adjunct.

3. The prosody of argument and adjunct in Japanese

3.1. The data

The phonetic data examined here were obtained from three speakers of Tokyo Japanese: EO (female), HK (female) and KO (male). Each speaker read the eight sentences shown in (5) five times in a sound-attenuated room.

(5) a. Accented short argument
Ao'yama-no Ina'mori-ga me'mo-o yo'nde-iru-rashi'i.
Aoyama-Gen Inamori-Nom memo-Acc read-prog-seem[5]
"Inamori from Aoyama seems to be reading the memo."

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[4] PWd in (4) is an abbreviation of Prosodic Word.
[5] Nom=Nominative, Gen=Genitive, Acc=Accusative, Prog=progressive.

b. Accented short adjunct
Ao'yama-no Ina'mori-ga Na'ra-de no'nde-iru-rashi'i.
Aoyama-Gen Inamori-Nom Nara-Loc drink-prog-seem
"Inamori from Aoyama seems to be drinking in Nara."

c. Accented long argument
Ao'yama-no Ina'mori-ga yama'mori-o naga'mete-iru-rashi'i.
Aoyama-Gen Inamori-Nom mountain ranger-Acc look-prog-seem
"Inamori from Aoyama seems to be looking at the mountain ranger."

d. Accented long adjunct
Ao'yama-no Ina'mori-ga yama'miya-de
Aoyama-Gen Inayama-Nom site for religious service-Loc
naya'nde-iru-rashi'i.
distressed-prog-seem
"Inamori from Aoyama seems to be distressed in the site for religious service."
e. Unaccented short argument
Oyama-no Inayama-ga momo-o monde-iru-rashi'i.
Oyama-Gen Inayama-Nom peach-Acc kneed-prog-seem
Inayama from Oyama seems to be kneading the peach.

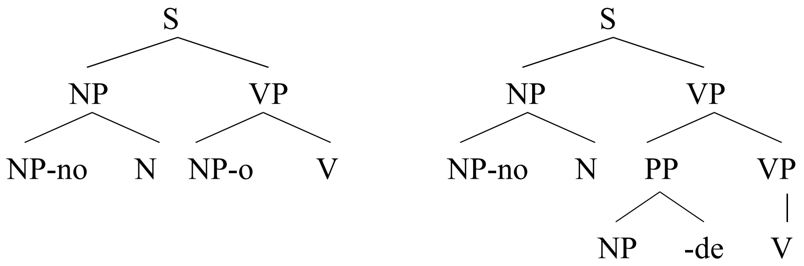
f. Unaccented short adjunct
Oyama-no Inayama-ga niwa-de yonde-iru-rashi'i.
Oyama-Gen Inayama-Nom yard-Loc call-Prog-seem
"Inayama from Oyama seems to be calling in the yard."

g. Unaccented long argument
Oyama-no Inayama-ga yamaimo-o narabete-iru-rashi'i.
Oyama-Gen Inayama-Nom yam-acc arrange-Prog-seem
Inayama from Oyama seems to be arranging yams.

h. Unaccented long adjunct
Oyama-no Inayama-ga yamagoya-de narande-iru-rashi'i.
Oyama-Gen Inayama-Nom mountain hut-Loc wait in a line-prog-seem
"Inayama from Oyama seems to be waiting in a line in a mountain shed."

Each sentence consists of four words: a subject NP consisting of two nouns is followed by the genitive case marker *-no*, and a VP made up of a noun and a verb. Half of the eight sentences contain an argument, and the other half contain an adjunct. When the noun in the VP is an argument it serves as a direct object of the following head verb, which is clear from the accusative case marker *-o*. When it is an adjunct it constitutes a postpositional phrase consisting of a noun followed by the locative particle *-de*. It is assumed here that an adjunct is adjoined to a Maximal Projection (VP) category The syntactic structures given in (6a) and (6b) will make the assumptions about syntactic structure clearer.

(6) a. argument b. adjunct



There are two more conditions in which the sentences are systematically varied: *accentedness* and *length*. Accentedness was manipulated in the experiment because strings of accented words are known to exhibit very different pitch patterns from those of unaccented words in that they show higher pitch peaks and valleys (Pierrehumbert and Beckman 1988, Selkirk and Tateishi 1988, 1991). Also, Uechi (1998) only investigated accented words.

Word length was also systematically varied with the idea that the distance between two accents (either pitch accents H*+L tones or phrasal H tones) may affect the realization of one or both of them. One reasonable possibility is that the accent in one of the words is greatly reduced to the extent that it is prosodically merged with the other word into a single prosodic constituent, especially when they are unaccented (cf. Selkirk and Tateishi 1988). In the experiment we have two conditions: short and long. When the sentence is "short" there are two intervening moras between two accents; when it is "long", there are four. For instance, the verb phrase for the accented short condition was *me'mo-o yo'ndeirurasii* "seem to read the memo", in which the number of intervening moras between the two H tones is two: *mo* and *-o*. The verb phrase used for the accented long condition was *yama'mori-o naga'meteirurasii* "seem to see the mountain ranger," in which the number of intervening moras is four: *mo*, *ri*, *-o*, and *na*. The examples given in (7) illustrate this point:

(7) a. Short (two intervening moras) b. Long (four intervening moras)

a. [me' mo o] [yo' n de]
μ **μ** **μ** μ μ μ
| |
HL HL
memo-Acc read

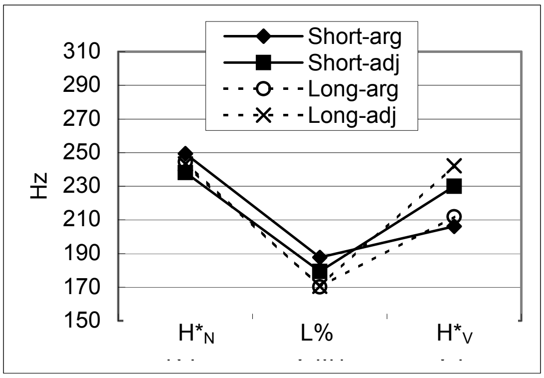
b. [o ma' wa ri o] [na ga' me te]
μ μ **μ** **μ** **μ** **μ** μ μ μ
| |
HL HL
policeman-Acc look

In the following sections, I will describe the patterns observed in the obtained phonetic data. For reasons of exposition, we discuss the sentences consisting of all-accented words first, and then turn to the unaccented sentences.

3.2. *Accented sequence*

The three panels in Figure 1 show the mean fundamental frequency (F0) values in the VPs of the sentences in the accented condition. The F0 values were measured at designated points: the accented mora of the noun (H^*_N), the first mora of the verb (L%), and the accented mora of the verb (H^*_V). Our main interest here is the relative F0 peak height between the noun and the verb in the VP because it provides the information about the phrasing level assigned to the verb with respect to the preceding noun. The F0 values used for comparison are the values of H^*_V subtracted from H^*_N (referred to as [H^*_N-H^*_V]). An ANOVA was performed for each speaker with [H^*_N-H^*_V] as the dependant variable, and with the independent variables of argument-adjunct distinction (abbreviated as ArgAdj hereafter) and length.

I present the results for each speaker individually because the obtained patterns vary among them. We can make two observations from EO's data (Figure 1a). First, we can see that the mean F0 value for H^*_V is substantially higher, with respect to the preceding H^*_N mean values, after adjunct than after argument. Note that the mean values for H^*_N are quite stable, so we can say that the verb peak in the adjunct condition is higher than the one for the argument condition. Second, the H^*_V mean values do not appear to be very different from one another between the short and the long sequences.



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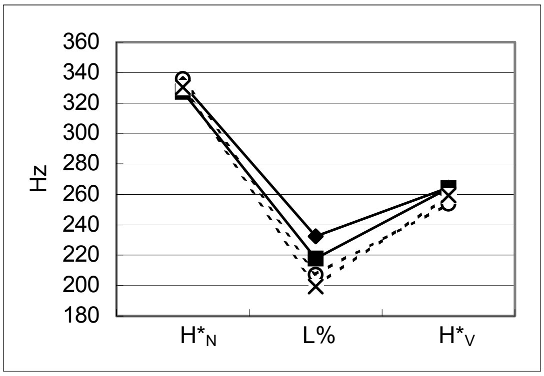

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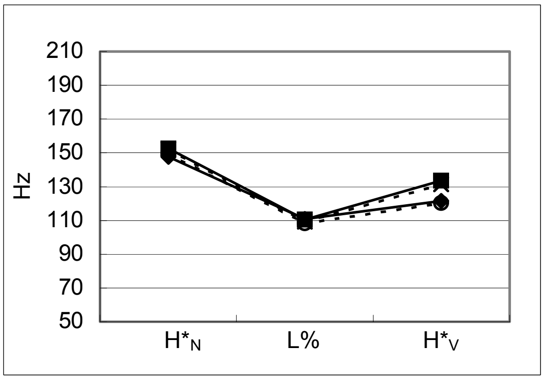

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Figure 1: Mean values of the first morae of the noun and the head verb for accented sequence: (a) EO, (b) HK and (c) KO.

The results of an ANOVA confirm the two observations: there was a significant main effect of ArgAdj ($F(1,16)=15.242$, $p=.017$.), no main effect of length ($F(1,16)=5.698$, $p=.075$), and no interaction was found between ArgAdj and length ($F(1,16)=236$, $p=.653$.

These results tell us that the F0 peak of the verb is higher with respect to the F0 peak of the noun when the verb follows an adjunct than when it follows an argument. The F0 peak of the verb is almost as high as the previous peak in the adjunct case in some tokens, which suggests that the former peak is not downstepped with respect to the latter peak. This in turn indicates that there is a MaP boundary between the adjunct and the verb.

Contrary to the observations obtained from EO, HK's data do not seem to show much difference in the mean values of H^*_V (and of H^*_N). Regardless of argument-adjunct and short-long distinctions, the mean values of H^*_V are close to one another. The statistical analysis showed that there was no significant main effect of ArgAdj ($F(1,16)=10.216$, $p=.060$) but that there was a main effect of length ($F(1,16)=23.997$, $p=.008$). There was no interaction ($F(1,16)=.402$, $p=.560$). The mean H^*_V-H^*_N value was significantly greater for the long condition than for the short condition. This means that the F0 peak of the verb is lower with respect to the preceding peak when a greater number of moras intervenes between them.

At a first glance, KO appears to show the same tendency as EO: the F0 levels on the verb are higher for the adjunct condition than for the argument one, for both of the length conditions. However, the differences are small. No statistical significance was found in an ANOVA: ArgAdj ($F(1,16)=3.797$, $p=.069$), length ($F(1,16)=.828$, $p=.376$), interaction between ArgAdj and length ($F(1,16)=1.899$, $p=.187$). These suggest that KO does not differentiate between argument and adjunct.

3.3. Evaluating Uechi's (1998) claim

Given our experimental results reported above, we are in a good position to evaluate Uechi's (1998) claim of the intonational distinction between argument and adjunct. Recall that I argue for EO's data that the phrasing level assigned to the verb in the adjunct condition is MaP and the one in the argument condition is MiP.

The characterizations of the phrasing patterns described in the previous sections provide evidence against Uechi's (1998) claim. He claims that a head verb is partially downstepped with respect to the preceding noun when it is an adjunct forming a prosodic constituent that is higher than MiP and lower than MaP, i.e., ProP. He also argues that a verb is totally downstepped when the preceding noun is an argument, and the phrasing level assigned to it is MiP. However, speaker EO showed no downstep in the adjunct-verb sequence, which contradicts the claim regarding partial downstep. Also this finding provides evidence that there is a MaP boundary between the adjunct and the verb, which disconfirms Uechi's ProP analysis. Second, HK and KO did not show any acoustic evidence of distinguishing argument and adjunct intonationally, which is simply at odds with Uechi's claim. That is, the distinction was neutralized. Finally, all speakers showed an F0 rise at the beginning of the verb in both of the short and long argument conditions, which is solid evidence against Uechi's total downstep. We can say that there is a MiP boundary between the noun and the verb. Thus, the MaP-MiP distinction is enough to capture the prosodic difference between argument and adjunct. Uechi's ProP theory is too rich.

3.4. HK's length effect

Let us consider how we can characterize the significant main effect of length in HK's data. It is likely that this effect originates from the difference in L% tone between the noun and the verb, which affects the peak height on the verb.[6] Figure 1b shows that the H^*_V values are somewhat lower in the long condition than in the short condition, and the same pattern is found in L%, but in a much more magnified way. The results of an ANOVA with H^*_N-L% as the dependent variable, and ArgAdj and length as independent variable showed there was a main effect of length ($F(1,16)=23.997$, $p=.008$) such that the F0 dip between the noun and the verb is lower in the long condition than in the short condition. We can see that the effect of the L% tone, realized very low between the noun and the verb in the long condition, is still seen in the following H tone.

Whether or not this difference in H^*_N-L% between the short and long conditions can be a reflex of the MiP-MaP difference is the question one should ask here. Our answer here is negative, because what is crucial for a F0 peak to start a new MaP is a pitch range reset where the speaker's pitch range is pulled back to his/her initial level, which we did not find in HK's data (Pierrehumbert and Beckman 1988). Pierrehumbert and Beckman, in fact, also point out that the L% tone in the last MiP within a MaP tends to be lowered relative to a MaP-internal boundary L. However, this lower L% tone usually occurs with the following higher H* tone, which suggests that what is observed here may have a different origin.

One possibility is suggested by Kubozono (1993). He shows that the L% tone is realized lower as the number of low-pitched moras between two H*+L tones increases. His explanation for this effect is phonetic. When the number of low-pitched moras is small, there is a temporal constraint that limits the extent of pitch fall occurring over a given span of time, but when the number is larger, there is no such constraint because the pitch fall can complete itself in the larger span of time. The verbs used in the experiment had two low-pitched moras after the H*+L tone of the previous noun in the short condition (e.g. *me'**mo-o** yo'nde* 'read a memo') and four low-pitched moras in the long condition (*oma'**wari-o na**ga'mete* 'look at the policeman'). We expect lower L% tone values for the latter case due to the greater number of low-pitched moras.

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[6] Note that we are not in a good position to identify the tone that is responsible for the F_0 dip, particularly in the short condition. The candidates are of course the L trailing tone of the HL pitch accent of the noun and the L% tone associated to the first mora of the verb. Usually, only one valley was seen between H^*_N and H^*_V in the short condition, probably because as Kubozono (1993) argues, the temporal distance between the two accentual HL tones is too small for both of them to be realized independently. I am grateful to John McCarthy for pointing this out.

3.5. *Summary: Accented condition*

The discussion of the accented data is summarized in Table 1. The top row shows the two schematized F0 contours observed in the experiment, which I call "pitch range reset" and "downstep", respectively. In the second row, the prosodic representation that corresponds to each of the F0 contours is given. The remaining rows illustrate the patterns that each speaker showed with respect to ArgAdj and length. Only EO showed an argument-adjunct distinction intonationally, between the phrasing levels of MiP and MaP. HK and KO did not have such a distinction: both showed the "downstep" pattern for argument and adjunct. As for the length effect, none of the speakers showed any difference.

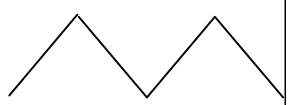
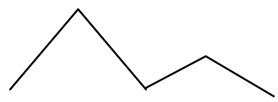
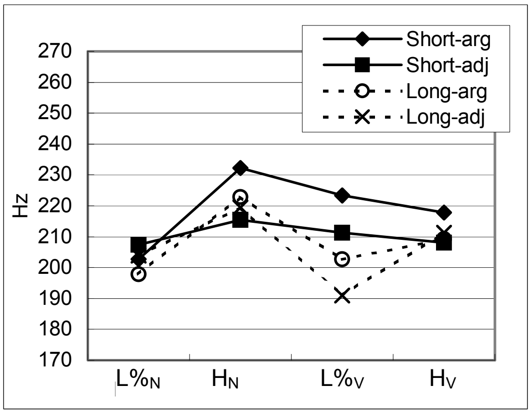
<table>
<tr><td colspan="2">Pitch pattern</td><td>a. Pitch-range reset

N V</td><td>b. Downstep

N V</td></tr>
<tr><td colspan="2">Assumed prosodic representation</td><td>Utt
MaP MaP
MiP MiP
PWd PWd</td><td>Utt
MaP
MiP MiP
PWd PWd</td></tr>
<tr><td rowspan="2">EO</td><td>Short</td><td>adjunct</td><td>argument</td></tr>
<tr><td>Long</td><td>adjunct</td><td>argument</td></tr>
<tr><td rowspan="2">HK</td><td>Short</td><td></td><td>adjunct, argument</td></tr>
<tr><td>Long</td><td></td><td>adjunct, argument</td></tr>
<tr><td rowspan="2">KO</td><td>Short</td><td></td><td>adjunct, argument</td></tr>
<tr><td>Long</td><td></td><td>adjunct, argument</td></tr>
</table>

Table 1: Summary of the pitch patterns for the accented sequence

3.6. *Unaccented sequence*

Let us now examine the data obtained from the unaccented sequences. The three graphs in Figure 2 show each speaker's mean F0 values of the first two moras at the beginnings of the noun and verb in the target VPs. Each measuring point is referred to as follows: the first and second moras of the noun as $L\%_N$ and H_N, respectively, and the first and the second morae of the verb as $L\%_V$ and H_V respectively.

Two measures were employed: H_N-$L\%_V$ (hereafter I will call it "FALL") and that of H_V-$L\%_V$ (hereafter "RISE"). The latter measure was employed here assuming that it reflects *initial rise* at the beginning of the verb. The reason FALL was adopted is that there was a concern that the argument-adjunct difference may be reflected on the pitch fall



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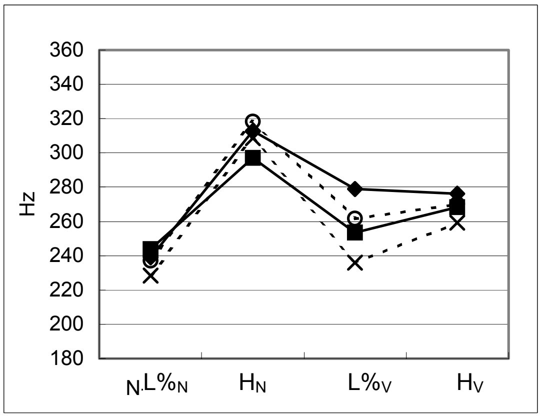

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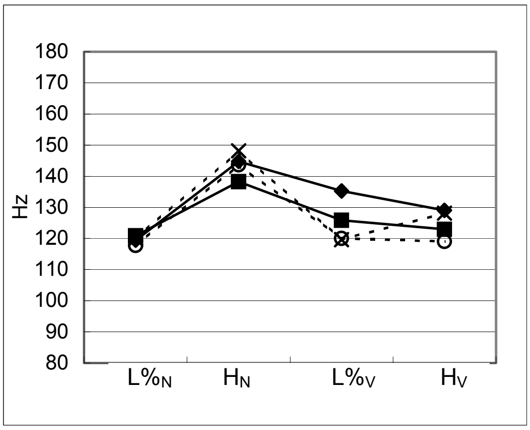

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Figure 2: Mean values of the first morae of the noun and the head verb for unaccented sequence: (a) EO, (b) HK and (c) KO.

from H_N to $L\%_V$.

3.6.1. Long condition

We will discuss the data in the long condition first, and then the short condition. Before examining each speaker's data in detail, let us go through the results of the ANOVAs conducted on the obtained data. All the tests were performed on the two measures FALL and RISE in the same format as the one used on the accented data: ArgAdj and length were the independent variables. The results are summarized inTable 2.

Let us start with speaker EO (Figure 2a). One pattern that can be seen in the long condition is that an initial rise is observed between the noun and the verb for the argument and adjunct conditions. What is different between the two conditions is its degree. The mean value of RISE was significantly larger for the adjunct condition than for the argument condition. There was a significant interaction between ArgAdj and length. Looking at Figure 2a we can see that the difference in FALL values between argument and adjunct is larger in the long condition than in the short condition, which indicates that the argument-adjunct difference is neutralized in the short condition due to the shortness of

	FALL		RISE	
EO	ArgAdj	$F(1,16)=1.388$, $p=.256$	ArgAdj	$F(1,16)=14.693$, $\mathbf{p<.001}$
	Length	$F(1,16)=66.013$, $\mathbf{p<.001}$	Length	$F(1,16)=70.468$, $\mathbf{p<.001}$
	ArgAdj*Length	$F(1,16)=14.217$, $\mathbf{p=.020}$	ArgAdj*Length	$F(1,16)=11.810$, $\mathbf{p=.026}$
HK	ArgAdj	$F(1,16)=8.074$, $\mathbf{p=.012}$	ArgAdj	$F(1,16)=10.214$, $\mathbf{p=.033}$
	Length	$F(1,16)=31.877$, $\mathbf{p<.001}$	Length	$F(1,16)=3.863$, $p=.067$
	ArgAdj*Length	$F(1,16)=1.477$, $p=.528$	ArgAdj*Length	$F(1,16)=.185$, $p=.689$
KO	ArgAdj	$F(1,16)=5.029$, $\mathbf{p=.039}$	ArgAdj	$F(1,16)=23.157$, $\mathbf{p=.001}$
	Length	$F(1,16)=75.465$, $\mathbf{p<.001}$	Length	$F(1,16)=59.689$, $\mathbf{p=.001}$
	ArgAdj*Length	$F(1,16)=3.279$, $\mathbf{p=.014}$	ArgAdj*Length	$F(1,16)=6.994$, $p=.057$

Table 2: Summary of ANOVAs for unaccented data. Significant results at the level of .05 are in bold.

the words making up the VP, but emerges in the long condition.

In HK's data (Figure 2b), the F0 contour for the long adjunct condition showed a clear initial rise, but it is not very clear whether the one in the long argument condition is a solid one or not. The results of the ANOVAs showed that that the VP in the adjunct condition showed significantly greater fall and rise than the VP in the argument condition.

KO (Figure 2c) also showed a significant difference for ArgAdj in both FALL and RISE. The F0 falls and rises were significantly greater for the adjunct condition than for the argument condition. He did not show an initial rise on the verb in the argument condition whereas we can see a clear one in the adjunct condition. This suggests that KO distinguishes argument from adjunct not by the degree of initial rise, but rather by its presence or absence. Note that the interaction was significant for RISE. Figure 2c suggests that the argument-adjunct distinction may be made only in the long condition.

How can we relate these results to the phonological representation? We have observed three different patterns in the long unaccented data: EO showed the distinction with different degrees of initial rise; HK with different degrees of pitch fall and initial rise; KO with the presence or absence of initial rise. I take these differences as categorical, hence phonological ones. That is, each pattern in the argument and adjunct conditions within a speaker reflects a prosodic representation distinct from one another.

I argue that the VP in EO's long argument condition has a prosodic representation in which the noun and the head verb each form a MiP within a single MaP, and that the VP in the long adjunct condition has a representation in which each word forms a MaP. There are two reasons for this claim. First, initial rise is observed between the noun and the verb for both argument and adjunct conditions. This suggests that both constituents each form at least a MiP (Pierrehumbert and Beckman 1988, Selkirk and Tateishi 1988, 1991) Second, Selkirk et al. (2003) discovered that in a sequence of all unaccented words there is considerable difference in the degree of initial rise between MiP and MaP boundaries. The effect is always greater at a MaP boundary than at a MiP one. The rise seen in the adjunct condition is quite sharp to the extent that it may be equivalent to the initial rise at the beginning of the noun.

In HK's data, the obtained patterns are not as straightforward as for EO. There are two possibilities. One is that there is a MiP boundary between the noun and the verb in the argument condition and a MaP boundary in the adjunct condition. The other is that the two constituents form a single MiP in the argument condition and two MiPs in the adjunct condition. We take the latter view. The reason is that although we found a significant difference in both Fall and Rise, the initial rise observed in the adjunct condition is simply too small for a MaP-initial rise.

The nature of the distinction between argument and adjunct found in KO's data seems to be much clearer than that displayed by HK. It was mentioned above that his way of realizing the distinction between argument and adjunct is whether initial rise occurs or not. This pattern fits the criterion for deciding whether a word contains a MiP or not. Thus, I hypothesize that the noun and the verb form a single MiP in the argument condition while they each form a MiP in the adjunct condition.

3.6.2. Short condition

The common pattern observed in the short condition is that for all speakers there appears to be no initial rise between the noun and the verb, except in HK's short adjunct condition (mean values are plotted in solid lines in Figure 2). For EO and KO, F0 declines gradually from H_N to H_V for both of the argument and adjunct conditions, which is an indication of the absence of a MiP boundary between the noun and the verb. A significant interaction was found for EO (for FALL and RISE) and for KO (for FALL), implying that the argument-adjunct difference was substantial only in the long condition. Since no indication of a MiP boundary was found, it is reasonable to assume that for these two speakers the noun and the verb constitute a single MiP.

HK showed a statistically significant difference for FALL and RISE such that greater F0 fall and rise were observed in the adjunct condition. I assume the same prosodic structure as we posited in the long condition: a MiP boundary in the adjunct condition, but no MiP boundary in the argument condition.

Speaker HK behaves in a different way from the other two speakers, particularly with respect to the adjunct condition. In Figure 2b, we can see some degree of initial rise. An examination of each token, however, revealed that the five tokens in the short adjunct condition consisted of three contours with initial rise and two without one. This suggests that assigning a MiP-level break before the verb is optional when it is preceded by an adjunct. In the argument condition, initial rise never occurred, but the flat or slightly falling pitch pattern was observed, which is more or less the same as KO's long argument condition. Therefore, the prosodic structure we assumed for this pattern is the one in which I the noun and the verb form a single MiP.

3.7. Summary: Unaccented condition

Table 3 is a summary of the conclusions we have reached for the F0 patterns and their corresponding phonological representations. We have found four distinctive pitch patterns: I call them (a) "big initial rise", (b) "little initial rise", (c) "flat", and (d) "linear interpolation", respectively. The reason I do not phonologically distinguish (c) and (d) is that we did not have any speaker who distinguished argument from adjunct with respect to the presence of a plateau at the beginning of the verb. In the long condition, EO makes the distinction between MaP and MiPs. This pattern is consistent with her accented data. HK and KO’s argument-adjunct distinctions are assumed to be made between MiP and PWd. In the short condition, however, EO and KO do not make any intonational distinction between argument and adjunct. HK uses MiP and PWd for the distinction, with the optionality of MiP- and PWd-level phrasings for adjunct.

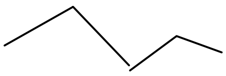
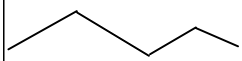
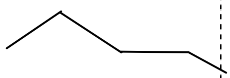
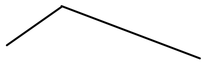
<table>
<tr><td colspan="2" rowspan="2">Pitch pattern</td><td>a. big initial lowering</td><td>b. little initial rise</td><td>c. flat</td><td>d. Linear interpolation</td></tr>
<tr><td>
N V</td><td>
N V</td><td>
N V</td><td>
N V</td></tr>
<tr><td colspan="2">Assumed prosodic representation</td><td>Utt
MaP MaP
| |
MiP MiP
| |
PWd PWd</td><td>Utt
|
MaP
MiP MiP
| |
PWd PWd</td><td colspan="2">Utt
|
MaP
|
MiP
PWd PWd</td></tr>
<tr><td rowspan="2">EO</td><td>Short</td><td></td><td></td><td colspan="2">adjunct, argument</td></tr>
<tr><td>Long</td><td>adjunct</td><td>argument</td><td colspan="2"></td></tr>
<tr><td rowspan="2">HK</td><td>Short</td><td></td><td>adjunct</td><td colspan="2">adjunct, argument</td></tr>
<tr><td>Long</td><td></td><td>adjunct</td><td colspan="2">argument</td></tr>
<tr><td rowspan="2">KO</td><td>Short</td><td></td><td></td><td colspan="2">adjunct, argument</td></tr>
<tr><td>Long</td><td></td><td>adjunct</td><td colspan="2">argument</td></tr>
</table>

Table 3: Summary of the pitch patterns for the unaccented sequence

4. Prosody of argument and adjunct and constraint interaction

4.1. Focus prominence constraints interact with markedness constraints on prosodic structure

So far, based on our experiment, we have seen that there is an intonational distinction between adjunct and argument in Japanese. In this section, I will present an account of the patterns and variation found in the experiment within the framework of Optimality Theory (Prince and Smolensky 1993).

The patterns we saw in § 3 are obtained by positing a family of syntax-phonology interface constraints *focus prominence* (Truckenbrodt 1995, Selkirk 1999) which require that a category of a certain type in the surface morphosyntactic representation (PF)[7] be

[7] Following Selkirk (1999) it is assumed here that PF is a level of representation where not only surface syntactic structure but also information on tones (tonal morphemes) and informational structure (focus

associated to the prominence of a particular prosodic phrasing level in the surface phonological representation (PR). These interact with another small set of other markedness constraints which function as "well-formedness" constraints on prosodic structure.

To account for the variation found among the speakers, it is hypothesized that each speaker has a different grammar: i.e., each speaker has a different ranking of the same set of constraints. Rankings differ among the speakers can differ in two ways. One is that the ranking of constraints A and B is A >> B in one speaker while it is B >> A in another speaker. The other is that the ranking between two constraints A and B in the grammar of one speaker is fixed while they are "unranked" with respect to each other in the grammar of another speaker (cf. Anttila 1997, 2002; Anttila and Cho 1998). We will see both types of ranking differences below. The first type of ranking difference accounts for the variation among the speakers and the second type the variation within a single speaker.

I propose an extended version of Selkirk's (1999) *focus*[8] *prominence* theory as the basic architecture of the analysis that accounts for the argument-adjunct asymmetry in Japanese. The focus prominence theory was originally proposed to explain the argument-adjunct asymmetry in English. Selkirk argues for two focus prominence constraints that refer to different "projection levels" of syntactic category, i.e., maximal projection level (XP) and zero-bar level (X^0), and thereby the phrasing levels that the head is associated to can be differentiated between head-argument and head-adjunct structures. They are formulated in (8). FocProm XP: $\subset$ ΔMaP is violated when a syntactic category of the maximal projection level does not contain the head of a MaP, while focProm X^0: $\subset$ ΔMiP is violated when a syntactic category of the zero-bar level does not contain the head of a MiP.

(8) a. **focus Prominence: XP $\subset$ ΔMaP (focProm XP: $\subset$ ΔMaP)**
The terminal string of a focused XP in PF corresponds to a string in PR which contains the head prominence of a MaP.

b. **focus Prominence: X^0 $\subset$ ΔMiP (focProm X^0: $\subset$ ΔMiP)**
The terminal string of a focused X^0 in PF corresponds to a string in PR which contains the head prominence of a MiP.

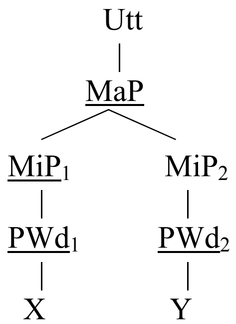
The symbol "Δ" stands for Designated Terminal Elements (DTE, Liberman and Prince, 1977). The DTE of a prosodic phrasing level refers to a prosodic terminal constituent that is associated to a phrasing level with an unbroken path of prosodic heads. For example, consider a prosodic representation such as the one in (9). The heads are denoted by underlining the constituents at each level. In this representation ΔUtt refers to the terminal prosodic constituent X because the path of prosodic heads connected to the Utt

features) are also available.

[8] Focus is written in lower-case letters, indicating the distinction from her other constraint that refers to "contrastive" focus (denoted as FOCUS).

from it is unbroken. The constituent X is also ΔMaP, because the path from X to MaP is unbroken. The constituent Y, on the other hand, is not ΔMaP, due to MiP_2 not being the head of MaP (= not underlined). Note, however, that ΔMiP_2 is Y because PWd_2 is the head of MiP_2.

(9)



The extension on the focus prominence constraints proposed in this paper is to enrich this constraint family in such a way that they refer to other different prosodic categories. Specifically, I will proposed the following constraint:

(10) **focus Prominence: XP ⊂ ΔMiP (focProm XP:ΔMiP)**
The terminal string of a focused XP in PF corresponds to a string in PR that contains the head prominence of a MiP.

We found in our experiment that the argument-adjunct distinction can be made not only between MaP and MiP but between MiP and PWd (see Table 4), which suggests that the two focus prominence constraints (8) are not rich enough to fully account for the patterns reported in § 3.

Another type of syntax-phonology interface constraint which is assumed to be at play is Accent ⊂ ΔMiP, which requires that an accented word be associated to at least a MiP (Selkirk 2000). This constraint captures the fact that every accented word shows initial rise at its beginning.

(11) **Accent ⊂ ΔMiP**
An accented lexical item in PF corresponds to a string in PR that contains the head prominence of a MiP.

It has been suggested that a family of binarity constraints are part of the universal constraint set (Bickmore 1990, Selkirk 2000). These constraints evaluate constituents of particular prosodic levels in terms of whether they immediately dominate two elements in the level below them. The "two" can be "at least two" (minimality constraint) or "at most two" (maximality constraint). One example of such constraints assumed in the paper is Binary MiP (PWd), which requires that a MiP consist of at least two PWds.

(12) **BinMiP(PWd)**
A MiP must be at least binary at the PWd level.

This constraint is well motivated in Japanese phonology. As Ito (1990) shows in their word minimality constraint, a word in Japanese must minimally contain two moras (also Poser 1990 for the role of binary feet in Japanese).

One of the important findings in the experiment is the "length effect" found in the unaccented condition: the intonational distinction between argument and adjunct seen in the long condition is neutralized in the short condition (see Table 4). The way of formalizing this length dependant contrast is to revise the basic format of a binarity constraint in such a way that it calls for binarity not just at the prosodic phrasing level that is one level lower than the one the constraint refers to but at two levels below it. The constraint I propose is the one in (13).

(13) **BinMiP(Ft)**
A MiP must be binary at the foot level.

This way of formulating BinMiP allows us to assess the well-formedness of a MiP with respect to foot structure. A MiP that consists of a single foot is violated by this constraint, which is, as will be shown below, exactly the situation we have in our materials in the short condition.

The NonFinality constraint defined in (14) also interacts with focus prominence constraints. Since sentence phonology is our current interest, I assume that the domain of the constraint is Utterance. What this constraint does is to scan the prosodic constituents in an Utterance-final position and to penalize them if they are heads, a single violation for each head. Note that this formulation of NonFinality is different from the approach adopted by several studies where the constraint in fact constitutes a family of constraints such as NonFinality ($\underline{\mu}$, $\underline{\sigma}$, <u>Ft</u>, <u>PrWd</u> …) (Kubozono 1994; Sugahara 1999; Tanaka 2000). The NonFinality constraint assumed here does not assume transitivity of headedness or unbroken path of prosodic heads. It also does not restrict the range of the headedness relation to two prosodic categories that are in immediate dominance relation.

(14) **NonFinality**
The head of a prosodic category must not be in the rightmost position in an Utterance.

The last set of constraints are the three alignment constraints in (15) (McCarthy and Prince 1993), which are responsible for determining the position of the head at each prosodic level. Specifically, these three constraints guarantee that the head of an Utterance is the rightmost MaP within the Utterance; that of a MaP is the leftmost MiP, and that of a MiP is the leftmost PWd (Selkirk, 1999; Sugahara, 1999; Truckenbrodt, 1995). We do not discuss the alignment constraints any further in the paper since it is assumed that all of the prosodic structures to be considered satisfy them.

(15) a. **Align-R (<u>MaP</u>, Utt)**
Align the right edge of a prominent MaP with the right edge of Utt.

b. **Align-L (<u>MiP</u>, MaP)**
Align the left edge of a prominent MiP with the right edge of MaP.

c. **Align-L (<u>PWd</u>, MiP)**
Align the right edge of a prominent PWd with the right edge of MiP.

4.2. An OT analysis

4.2.1. Speaker EO: Accented sequence

Let us now turn to the discussion of the constraint ranking for each speaker. Let us start with EO's accented sequence. As summarized in Table 1, the patterns EO showed in the experiment were that she distinguished argument and adjunct in such a way that the verb in VP is associated to the MiP-level prominence when it is preceded by an argument and the MaP-level prominence when it is preceded by an adjunct. We also found that length did not affect these phrasing patterns for the accented condition, which suggests that the binarity constraints are ranked sufficiently low.

Assuming that the verb in the noun-verb sequence is associated to the phrasing level of MaP in the adjunct condition, focProm XP: ⊂ ΔMaP, the constraint calling for an XP-level morphosyntactic constituent to be associated to the MaP-level prominence, is satisfied. But having the verb associated to a MaP also constitutes a structure in which the head MaP is located at the final position in the Utterance, which violates NonFinality. We rank NonFinality below focProm XP: ⊂ ΔMaP since the output prosodic structure satisfies the latter constraint, incurring violation of the former one. The tableau that shows focProm XP: ⊂ ΔMaP >> NonFinality is given in (16):

(16) focProm XP: ⊂ ΔMaP >> NonFinality
EO input: short/long, accented, adjunct-verb

	$[PP\ [V]_{VP}]_{VP}$ HL HL	focProm XP:⊂ ΔMaP	NonFinality
☞a	$\{(\underline{PWd})_{\underline{MiP}}\}_{MaP}\ \{(\underline{PWd})_{\underline{MiP}}\}_{\underline{MaP}}$		*MaP, *MiP, *PWd
b	$\{(\underline{PWd})_{\underline{MiP}}\ (\underline{PWd})_{MiP}\}_{\underline{MaP}}$	*!	*MaP, *PWd
c	$\{(\underline{PWd}\ PWd)_{\underline{MiP}}\}_{\underline{MaP}}$	*!	*MaP, *MiP

Candidate (16a) has the phrasing structure in which the verb receives the MaP-level prominence and is the only candidate in our current candidate set that satisfies focProm XP: ⊂ΔMaP. However, this candidate incurs violations of NonFinality. Candidates (16b) and (16c) have the prosodic structures in which the verb receives the

MiP- and PWd-level prominences, respectively. These candidates incur fewer violations than candidate (16a) with respect to NonFinality, but cannot be optimal because of the violation of the higher ranked constraint FocProm XP: ⊂ ΔMaP.

Based on the results of the experiment, we suggested that EO (in fact all speakers) always assigned the MiP-level or more prominence to the verb if it is accented. The fact that we never observed a clear case where an accented word is associated to a phrasing level less than MiP suggests that Accent ⊂ ΔMiP is always satisfied by the output form. The tableau in (17) shows that candidate (17c) cannot be chosen as optimal due to Accent ⊂ ΔMiP, with an argument-verb input. Candidate (17a), in which the verb is given the MaP-level prominence is ruled out by NonFinality. Note that this tableau does not provide a ranking argument between Accent ⊂ ΔMiP and NonFinality.

(17) Accent ⊂ ΔMiP, NonFinality
EO input: short/long, accented, argument-verb

	$[NP\ \ V]_{VP}$ HL HL	Accent⊂ ΔMiP	NonFinality
a	$\{(\underline{PWd})_{\underline{MiP}}\}_{MaP}$ $\{(\underline{PWd})_{\underline{MiP}}\}_{\underline{MaP}}$		*MaP, *MiP, *PWd!
☞b	$\{(\underline{PWd})_{\underline{MiP}}$ $(\underline{PWd})_{MiP}\}_{\underline{MaP}}$		*MaP, *PWd
c	$\{(\underline{PWd}\ PWd)_{\underline{MiP}}\}_{\underline{MaP}}$	*	*MaP, *MiP!

Combining (16) with (17), we obtain the following summary tableau in (18) to account for the difference between argument and adjunct for speaker EO's accented condition:

(18) FocProm XP: ⊂ ΔMaP>> NonFinality
Accent ⊂ ΔMiP
EO input: short/long, accented, (a) adjunct-verb, (b) argument-verb

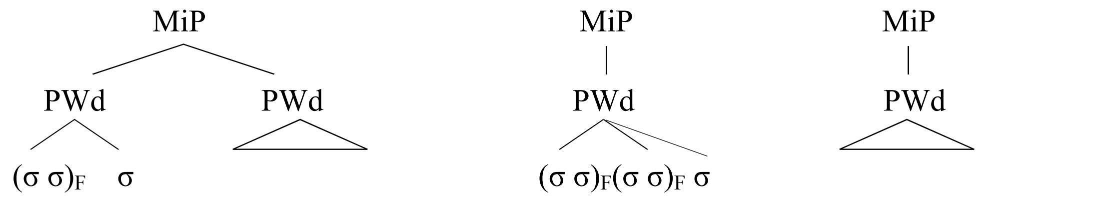
a	$[PP\ \ [V]_{VP}]_{VP}$ HL HL	focProm XP: ⊂ΔMaP	NonFinality	Accent ⊂ΔMaP
☞i	$\{(\underline{PWd})_{\underline{MiP}}\}_{MaP}$ $\{(\underline{PWd})_{\underline{MiP}}\}_{\underline{MaP}}$		*MaP, *MiP, *PWd	
ii	$\{(\underline{PWd})_{\underline{MiP}}$ $(\underline{PWd})_{MiP}\}_{\underline{MaP}}$	*!	*MaP, *PWd	
iii	$\{(\underline{PWd}\ PWd)_{\underline{MiP}}\}_{\underline{MaP}}$	*!	*MaP, *MiP	*
b	$[NP\ \ V]_{VP}$ HL HL			
i	$\{(\underline{PWd})_{\underline{MiP}}\}_{MaP}$ $\{(\underline{PWd})_{\underline{MiP}}\}_{\underline{MaP}}$		*MaP, *MiP, *PWd!	
☞ii	$\{(\underline{PWd})_{\underline{MiP}}$ $(\underline{PWd})_{MiP}\}_{\underline{MaP}}$		*MaP, *PWd	
iii	$\{(\underline{PWd}\ PWd)_{\underline{MiP}}\}_{\underline{MaP}}$		*MaP, *MiP	*!

The constraint Accent ⊂ ΔMiP is separated from the other two constraints because from the analysis given so far, we cannot rank it with respect to the other constraints. When the input is an argument-verb sequence, focProm XP: ⊂ ΔMaP is satisfied by all of the candidates, and the decision of the winner is passed down to the lower ranked constraints. Candidate (18bii) is evaluated optimal with respect to NonFinality and Accent ⊂ ΔMaP, which are not ranked with each other.

4.2.2. Speaker EO: Unaccented sequence

EO's data show more variation in the unaccented condition than in the accented one. We consider the length effect in the short condition first and then turn to the long condition. Recall that in the short condition, EO neutralizes the argument-adjunct distinction into a single structure in which the verb is associated to a PWd. Given that the argument-adjunct distinction is lost in this particular environment, we need to assume the existence of another constraint that is responsible for that effect. Consider the two phrases in (19):

(19) a. Short condition b. Long condition



a. $[[[\text{niwa}]_{NP}\text{-de}]_{PP}\ [\text{yondeirurasii}]_{VP}]_{VP}$
yard-Loc call-prog-seem
"seem to be calling at the yard"

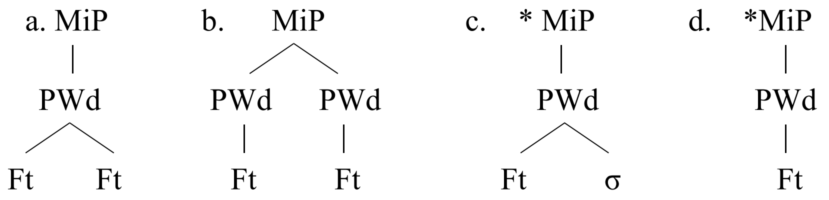
b. $[[[\text{yamagoya}]_{NP}\text{-de}]_{PP}\ [\text{narandeirurasii}]_{VP}]_{VP}$
yam-Loc wait in a line-prog-seem
"seem to wait in a line at the mountain hut"

They are the VPs used in the experiment for the short unaccented adjunct condition (19a) and the long unaccented adjunct condition (19b). I have constructed the prosodic structures that are hypothesized from the results of the experiment. The two PP structures in (19) reveal a difference in foot structure between the PWds in (19a) and (19b). The PWd in (19a) contains only a single foot while the one in (19b) consists of two feet.

Given the fact that the two PWds in the VP form a single MiP in the short condition, one possible interpretation is that the argument/adjunct used in the short condition is too short to be an independent MiP. I propose that the constraint we need is one that requires a MiP to be at least binary at the foot level (= containing at least four moras), i.e., BinMiP(Ft), which is formulated in (12). Note that this constraint refers to the prosodic constituency that is two-levels lower than the MiP level, which is analogous to the moraic binarity requirement for a foot in Japanese (Poser 1990).

BinMiP(Ft) captures the distinction between the prosodic structures in (20a-b) and (20c-d). A word can form a MiP with itself if it contains at least two feet as in (20a). The constraint does not exclude the structure in (20b) because the MiP contains two feet.

(20c) is not legitimate because one of the elements at the foot level is not parsed into a foot and thus, this MiP counts as containing only one foot. The structure in (20d) is hopeless: it contains just a single foot, without any unparsed syllable.

(20)


Let us now consider where this constraint is ranked in EO's grammar with respect to the other constraints we have seen so far for EO. The length effect suppresses the prosodic contrast between argument and adjunct such that a single form with the prominence level of PWd on the verb is obtained. This suggests that we need to rank BinMiP(Ft) above focProm XP: ⊂ ΔMaP, as illustrated in (21).

(21) BinMiP(Ft) >> focProm XP: ⊂ ΔMaP
EO input: short, unaccented, adjunct-verb

	[PP [V]$_{VP}$]$_{VP}$ Ft σ	BinMiP(Ft)	focProm XP:⊂ ΔMaP
a	{(PWd)$_{MiP}$}$_{MaP}$ {(PWd)$_{MiP}$}$_{MaP}$	*!	
b	{(PWd)$_{MiP}$ (PWd)$_{MiP}$}$_{MaP}$	*!	*
☞c	{(PWd PWd)$_{MiP}$ }$_{MaP}$		*

The prosodic structures of candidates (21a) and (21b) involve a MiP which contains only a single foot followed by an unparsed syllable in the PP, in violation of BinMiP(Ft). Note that candidate (21b) is harmonically bounded by candidate (23a), which means that it can never be optimal. The PWd for the PP in candidate (21c) constitutes a MiP *together with* the PWd for the V, which satisfies the requirement of BinMiP(Ft). This MiP is long enough to contain two feet.

Now we are in a good position to incorporate Accent ⊂ ΔMiP into the constraint hierarchy that has been established so far. To see where this constraint is ranked we need to consider the accented sequences, because it evaluates accented constituents only. We saw above that an accented word always shows the MiP-level prominence, which was guaranteed by Accent ⊂ ΔMiP. This suggests the ranking Accent⊂ ΔMiP >> BinMiP(Ft). The ranking argument is provided in (22), with the input for the short accented condition.

BinMiP(Ft) favors the structure where the two PWds form a single MiP together (22c) over the one where each of them forms a MiP independently (22a) and (22b). However, Accent ⊂ ΔMiP outranks BinMiP(Ft), which eliminates candidate (22c).

Note that the optimal candidate cannot be determined between (22a) and (22b) by this ranking (which is indicated by the bracketed hand-shape). In order to obtain the correct output we need another constraint, i.e., focProm XP: ⊂ ΔMaP As has been

(22) Accent ⊂ ΔMiP >> BinMiP(Ft)
EO input: short, accented, adjunct-verb

	[PP [V]VP]VP HL HL Ft σ	Accent⊂ ΔMiP	BinMiP(Ft)
(☞)a	{(PWd)MiP}MaP {(PWd)MiP}MaP		*
b	{(PWd)MiP (PWd)MiP}MaP		*
c	{(PWd PWd)MiP }MaP	*!	

(☞): actual winner

established in (21), this constraint is ranked below BinMiP(Ft), and we can obtain the desired result, as illustrated in (23).

Candidate (23b) violates focProm XP: ⊂ ΔMaP while candidate (23a) does not, because the verb does not constitute a MaP in (23b) but it does in (23a). Candidate (23c) is ruled out by the undominated Accent ⊂ ΔMiP, and cannot compete with candidate (23a) although the ranking BinMiP(Ft) >> focProm XP: ⊂ ΔMaP favors candidate (23c) over candidate (23a).

(23) Accent ⊂ ΔMiP >> BinMiP(Ft) >> focProm XP: ⊂ ΔMaP
EO input: short, accented, adjunct-verb

	[PP [V]VP]VP HL HL	Accent ⊂ ΔMiP	BinMiP(Ft)	focProm XP:⊂ΔMaP
☞a	{(PWd)MiP}MaP {(PWd)MiP}MaP		*	
b	{(PWd)MiP (PWd)MiP}MaP		*	*!
c	{(PWd PWd)MiP }MaP	*!		*

Finally, let us now consider the long unaccented case for EO. In this condition EO's patterns were the same as the ones seen in the corresponding accented case. As shown in the tableaux in (24), the current constraint appropriately chooses candidate (24ai) when the input is an adjunct-verb sequence, but the same ranking cannot pick out the candidate we want here (24biii) when the input is an argument-verb sequence.

In (24b), focProm XP: ⊂ ΔMaP is no longer at play because the verb in the VP only constitute a X^0-level constituent, which causes the indeterminacy of the optimal output between candidates (24bii) and (24biii).

I suggest here that the constraint at play is focProm X^0: ⊂ ΔMiP (see the definition in 8), instead of focProm XP: ⊂ ΔMaP. This constraint calls for a X^0-level constituent to have the MiP-level prominence. Also, we need to guarantee the length effect in the short unaccented condition. These considerations suggest that focProm X^0: ⊂ ΔMiP is ranked below BinMiP(Ft). The tableau in (25) shows this. The optimality of candidate (24biii) is illustrated in the tableau in (26).

(24) EO input: long, unaccented, (a) adjunct-verb, (b) argument-verb

a	[PP [V]VP]VP	Accent ⊂ ΔMiP	BinMiP (Ft)	focProm XP:⊂ΔMaP	NonFin
☞i	{(PWd)MiP}MaP{(PWd)MiP}MaP				*MaP,*MiP *PWd
ii	{(PWd)MiP (PWd)MiP}MaP			*!	*MaP,*PWd
iii	{(PWd PWd)MiP }MaP			*!	*MaP, *MiP
b	[NP V]VP				
i	{(PWd)MiP}MaP{(PWd)MiP}MaP				*MaP,*MiP, *PWd!
(☞)ii	{(PWd)MiP (PWd)MiP}MaP				*MaP,*PWd
iii	{(PWd PWd)MiP }MaP				*MaP, MiP

(☞): actual winner

(25) BinMiP(Ft) >> focProm X^0: ⊂ ΔMiP
EO input: short unaccented adjunct-verb

	[PP [V]VP]VP Ft σ	BinMiP(Ft)	focProm X^0: ⊂ ΔMiP
a	{(PWd)MiP}MaP {(PWd)MiP}MaP	*!	
b	{(PWd)MiP (PWd)MiP}MaP	*!	
☞c	{(PWd PWd)MiP }MaP		*

(26) EO input: long unaccented argument-verb

	[NP V]VP	BinMiP(Ft)	focProm X^0: ⊂ ΔMiP	NonFinality
a	{(PWd)MiP}MaP {(PWd)MiP}MaP			*MaP, *MiP, *PWd!
☞b	{(PWd)MiP (PWd)MiP}MaP			*MaP, PWd
c	{(PWd PWd)MiP }MaP		*	*MaP, MiP!

The tableau in (25) is identical with the one in (21), except that candidate (21b) is harmonically bounded by the other two candidates in (21), while candidate (25b), which is the same structure as (21b), is not in (25). Candidate (25c) surfaces because BinMiP(Ft) crucially outranks focProm X^0: ⊂ ΔMiP.

The input is the long unaccented argument-verb configuration in (26). Candidate (26a) is ruled out by the three violations of NonFinality. The prosodic structure of candidate (26c) violates focProm X^0: ⊂ ΔMiP because the verb only forms a PWd. Candidate (28c) also violates NonFinality twice. The one violation of focProm X^0: ⊂ ΔMiP and the two violations of NonFinality eliminate candidate (26c). Note that we cannot determine the ranking between focProm X⁰: ⊂ ΔMiP and NonFinality: candidate (26a) and (26c) are both harmonically bounded by the winning candidate (26b).

One may point out that the constraint that is responsible for ruling out candidate (24biii) should be Accent ⊂ ΔMiP, not focProm X^0: ⊂ ΔMiP, because the verb used in the long unaccented condition is in fact accented (*narabeta-iru-rashi'i* "arrange-prog-seem"), with a pitch accent on the penultimate mora.

It is true that a H*+L tone is associated to the final suffix *-rashi'i*, but its morphological status is different from the H*+L tone associated to a root morpheme such as the first H*+L tone in the verb used in the long accented condition (e.g. *naya'nde-iru-rashi'i* "distressed-prog-seem"): the former H*+L tone is associated to a suffix and the latter one to a root. An idea based on my own intuition is that H*+L tones associated to roots are phonologically more prominent than those associated to affixes, which may be reflected by higher F0 peaks and falls for the root H*+L tones than for the affix ones. This makes a prediction that a root H*+L tone after an unaccented word in a compound like *watari-aru'ku* "wander from place to place (go over + walk)" is more salient than an affix H*+L tone after an unaccented root such as *narabeta-iru-rashi'i*. Intuitively, the highest pitch peak falls on the accented mora *ru* in *watari-aru'ku*, but it falls on the second mora *ra* in *narandeirurashi'i*, which corresponds to the phrasal H tone, not to the H*+L tone. This remains to be verified empirically.

What we need to do here then is to modify the definition of Accent ⊂ ΔMiP in such a way as to ensure that only the accented words that carry a pitch accent on their roots are subject to the evaluation of this constraint. It is hypothesized here that roots and certain class of suffixes[9] are lexically specified as [+dominant] (McCawley 1968). Accent ⊂ ΔMiP only evaluates items with the [+dominant] specification. The new definition of this constraint is given in (27):

(27) **Accent ⊂ ΔMiP [+dominant] ([+dom])**
An accented lexical item which is specified for [+dominant] in PF corresponds to a string in PR that contains the head prominence of a MiP.

According to this definition, Accent ⊂ ΔMiP [+dom] does not say anything about the H*+L tone appearing in the suffix *-rashi'i*, the suffix in the verb in the long unaccented condition.

Let us take a look at a summary of the constraint ranking for EO here. We have seen five constraints: focProm XP: ⊂ ΔMaP, focProm X^0: ⊂ ΔMiP, NonFinality, BinMiP(Ft) and Accent ⊂ ΔMiP. The whole ranking for EO is given in (28):

[9] Suffixes such as *–ppo'(i)* "of the nature of, resembling" and *-ya* "running the business of" delete pitch accent in a neighboring morpheme including root (Poser 1984).

(28) Ranking summary for EO

Accent ⊂ ΔMiP
|
BinMiP(Ft)

focProm X^0: ⊂ ΔMiP   focProm XP: ⊂ ΔMaP
|
Non Finality

4.2.3. Speaker HK and KO: Accented sequence

Let us now turn to HK and KO's accented condition. We can treat the two speakers together because they showed the same patterns with respect to the accented sequence. The pattern we have to account for here is that there is no argument-adjunct distinction: the verb is always associated to the MiP-level prominence, regardless of it being preceded by an argument or adjunct.

In order to account for the mapping of two different syntactic structures onto a single phonological structure, we need to posit that in HK and KO's constraint hierarchies NonFinality outranks focProm XP: ⊂ ΔMaP, as in the tableau in (29):

(29) NonFinality >> FocProm XP: ⊂ ΔMaP
HK & KO input: short/long, accented, adjunct-verb

	$[PP\ [V]_{VP}]_{VP}$ HL HL	NonFinality	focProm XP: ⊂ ΔMaP
a	$\{(\underline{PWd})_{\underline{MiP}}\}_{MaP}\ \{(\underline{PWd})_{\underline{MiP}}\}_{\underline{MaP}}$	*MaP, *MiP, *PWd!	
(☞)b	$\{(\underline{PWd})_{\underline{MiP}}\ (\underline{PWd})_{MiP}\}_{\underline{MaP}}$	*MaP, *PWd	*
c	$\{(\underline{PWd}\ PWd)_{\underline{MiP}}\}_{\underline{MaP}}$	*MaP, *MiP	*

This tableau only shows that candidate (29a) cannot be the optimal representation, and does not tell us which of the other two candidates is the actual output. Just as EO's accented case, I assume that Accent ⊂ ΔMiP is at play here.

The tableaux in (30) show how the candidate in which the verb has the MiP-level prominence is chosen as optimal for both kinds of input: adjunct-verb and argument-verb. It can be seen that in both tableaux (30a) and (30b) the highest ranked NonFinality prevents the structure where the verb is associated to the MaP-level prominence (30ai and 30bi) from being chosen as the output. Accent ⊂ ΔMiP, which has not been ranked with respect to NonFinality and FocProm XP: ⊂ ΔMaP, rules out the representation in which the verb is only given the PWd-level prominence.

Finally, let us consider the ranking between Accent ⊂ ΔMiP and BinMiP(Ft). Since Accent ⊂ ΔMiP does not evaluate unaccented lexical items, we need to consider prosodic structures which contain lexical accent. The ranking we saw in the analysis of accented EO's data, was Accent ⊂ ΔMiP >> BinMiP(Ft). The decision is based on the

(30) NonFinality >> FocProm XP: ⊂ ΔMaP
Accent ⊂ ΔMiP
KO & HK input: short/long, accented, (a) adjunct-verb, (b) argument-verb

a	[PP [V]$_{VP}$]$_{VP}$ HL HL	NonFinality	FocProm XP:⊂ ΔMaP	Accent⊂ ΔMaP
i	{(PWd)$_{MiP}$}$_{MaP}$ {(PWd)$_{MiP}$}$_{MaP}$	*MaP, *MiP, *PWd!		
☞ii	{(PWd)$_{MiP}$ (PWd)$_{MiP}$}$_{MaP}$	*MaP, *PWd	*	
iii	{(PWd PWd)$_{MiP}$ }$_{MaP}$	*MaP, MiP	*	*!
b	[NP V]$_{VP}$ HL HL			
i	{(PWd)$_{MiP}$}$_{MaP}$ {(PWd)$_{MiP}$}$_{MaP}$	*MaP, *MiP, *PWd!		
☞ii	{(PWd)$_{MiP}$ (PWd)$_{MiP}$}$_{MaP}$	*MaP, PWd		
iii	{(PWd PWd)$_{MiP}$ }$_{MaP}$	*MaP, MiP		*!

fact that we did not find any length effect. We did not find one in the data for HK or KO, either. This suggests that we can assume the same ranking for KO and HK. The tableau that shows the ranking is already provided in (22) above.

The rankings that we have established so far for speakers HK and KO are given in (31). Since they show identical patterns in the accented condition, they share the two ranking hierarchies.

(31) Interim summary rankings for HK and KO
a. NonFinality >> FocProm XP: ⊂ ΔMaP
b. Accent ⊂ ΔMiP >> BinMiP(Ft)

4.2.4. Speaker KO: Unaccented sequence

KO behaved slightly differently from HK in the unaccented condition. So we discuss HK and KO separately. Let us begin with KO's short condition. The patterns observed are the same as EO's: there is only one representation in which the verb is associated to the PWd-level prominence, with no argument-adjunct distinction. Therefore, the same constraint ranking as EO's that is responsible for the length effect can be assumed for KO, i.e., BinMiP(Ft) >> focProm XP: ⊂ ΔMaP, focProm X^0: ⊂ ΔMiP (see the tableaux in (21) and (25) for the ranking arguments). Combining this ranking with those in (31) yields the one in (32).

Let us now consider KO's long unaccented condition. The pattern we want to account for here is that the argument-adjunct distinction is realized between MiP and PWd levels. The constraints that play a role are NonFinality, focProm XP: ΔMaP and focProm X^0: ⊂ ΔMiP. The other two constraints, Accent ⊂ ΔMiP and BinMiP(Ft), cannot be at work here because we are dealing with sentences in the long unaccented condition.

(32) Constraint ranking for KO (provisional):

Accent $\subset \Delta$MiP
|
NonFinality BinMiP(Ft)

focProm XP: ΔMaP focProm X^0: $\subset \Delta$MiP

Regarding the above three constraints, we have established NonFinality >> focProm XP: $\subset \Delta$MaP for speaker KO. This ranking does not fully account for the pattern we want to explain. Consider the tableaux in (33):

(33) KO input: long, unaccented, (a) adjunct-verb, (b) argument-verb

a	$[\text{PP} \;\; [\text{V}]_{\text{VP}}]_{\text{VP}}$ Ft Ft	NonFinality	FocProm XP: $\subset \Delta$MaP	FocProm X^0: $\subset \Delta$MiP
i	$\{(\underline{\text{PWd}})_{\underline{\text{MiP}}}\}_{\text{MaP}} \; \{(\underline{\text{PWd}})_{\underline{\text{MiP}}}\}_{\underline{\text{MaP}}}$	*MaP, *MiP, *PWd!		
☞ii	$\{(\underline{\text{PWd}})_{\underline{\text{MiP}}} \; (\underline{\text{PWd}})_{\text{MiP}}\}_{\underline{\text{MaP}}}$	*MaP, *PWd	*	
iii	$\{(\underline{\text{PWd}} \; \text{PWd})_{\underline{\text{MiP}}}\}_{\underline{\text{MaP}}}$	*MaP, MiP	*	*!
b	$[\text{PP} \;\; \text{V}]_{\text{VP}}$ Ft Ft			
i	$\{(\underline{\text{PWd}})_{\underline{\text{MiP}}}\}_{\text{MaP}} \; \{(\underline{\text{PWd}})_{\underline{\text{MiP}}}\}_{\underline{\text{MaP}}}$	*MaP, *MiP, *PWd!		
💣ii	$\{(\underline{\text{PWd}})_{\underline{\text{MiP}}} \; (\underline{\text{PWd}})_{\text{MiP}}\}_{\underline{\text{MaP}}}$	*MaP, *PWd		
☞iii	$\{(\underline{\text{PWd}} \; \text{PWd})_{\underline{\text{MiP}}}\}_{\underline{\text{MaP}}}$	*MaP, MiP		*

💣: wrong winner

We posit focProm X^0: $\subset \Delta$MiP in the constraint hierarchy we have established in (32). But this constraint does not help us obtain the right output in (33b). In (33a), although we cannot rank this constraint with respect to NonFinality and focProm XP: $\subset \Delta$MaP, the presence of focProm X^0: $\subset \Delta$MiP yields the correct output together with the other two constraints when the input is an adjunct-verb sequence. However, the three constraints give us a wrong winner candidate (33bii) when the input is an argument-verb sequence, as shown in the tableau in (33b).

The proposal to solve this problem is to posit the constraint focProm XP: $\subset \Delta$MiP, obtained by extending Selkirk's (1999) focus prominence constraints. In the original focus prominence constraints proposed in Selkirk (1999), XP-level and X^0-level categories in PF can only be associated to ΔMaP and ΔMiP, respectively. This predicts that argument and adjunct are prosodically distinguished *only* between MiP and MaP, which is not the case in our experiment. More precisely, we have found more than one way of distinguishing argument and adjunct in Japanese: in one case the distinction is made between MiP and MaP but in another case it is between PWd and MiP. The original focus prominence theory, therefore, needs to be enriched so that the two different ways of distinguishing argument and adjunct are captured. Positing a constraint such as focProm XP: ⊂ ΔMiP is a way of capturing this variation.

Moreover, assuming a focus prominence constraint referring to an XP-level category and associating it to the MiP-level prominence allows us to account for the argument-adjunct difference seen in KO's data in a parallel way to the difference obtained from EO's data. We explain the difference between argument and adjunct by the vacuous satisfaction of focProm XP: ⊂ ΔMiP when the input is an argument-verb sequence.

The next consideration is what kind of constraint would interact with the proposed constraint focProm XP: ⊂ ΔMiP. I suggest here that it is one of the well-established constraints on prosodic structure size BinMiP(PWd), which calls for a MiP to be binary at the PWd level (Selkirk 2000, Sugahara 1999), as illustrated in (34):

(34) focProm XP: ⊂ ΔMiP >> BinMiP(PWd) >> focProm X^0: ⊂ ΔMiP
KO input: long, unaccented, (a) adjunct-verb, (b) argument-verb

a	[PP [V]$_{VP}$]$_{VP}$ Ft Ft	FocProm XP: ⊂ ΔMiP	BinMiP(PWd)	focPromX^0: ⊂ ΔMiP
☞i	{(<u>PWd</u>)$_{MiP}$ (<u>PWd</u>)$_{MiP}$}$_{MaP}$		**	
ii	{(<u>PWd</u> PWd)$_{MiP}$ }$_{MaP}$	*!		*
b	[NP V]$_{VP}$ FtFt			
i	{(<u>PWd</u>)$_{MiP}$ (<u>PWd</u>)$_{MiP}$}$_{MaP}$		*!*	
☞ii	{(<u>PWd</u> PWd)$_{MiP}$ }$_{MaP}$			*

BinMiP(PWd) is sandwiched between focProm XP: ⊂ ΔMiP and focProm X^0: ⊂ ΔMiP. In the tableau in (34a), candidate (34ai) is optimal though it incurs two violations of BinMiP(PWd), because the other candidate violates the higher ranked focProm XP: ⊂ ΔMiP. The tableau in (34b) shows that the already established ranking BinMiP(PWd) >> focProm X^0: ⊂ ΔMiP, which we cannot see in the other tableau, is necessary. Neither of the two candidates violates focProm XP: ⊂ ΔMiP, so the decision of the optimal candidate is passed down to the two lower ranked constraints. The two MiPs in candidate (34bi) each contain only a single PWd, which incurs two violations of BinMiP(PWd). Candidate (34bii) only violates focProm X^0: ⊂ ΔMiP ranked below BinMiP(PWd), and hence is chosen as optimal.

One can see that the way these constraints choose the outputs is exactly the same as we saw in the analysis of EO's patterns. The crucial point here is that focProm XP: ⊂ ΔMiP, which outranks BinMiP(PWd), penalizes the structure where the verb is assigned the PWd-level prominence, i.e., candidates (34aii) and (34bii), only when the input is an adjunct-verb sequence. Candidate (34ai) contains two MaPs, each of which consists of a single PWd, and thus incurs two violations for BinMiP(PWd). However, this candidate is optimal due to BinMiP(PWd) being outranked by focProm XP: ⊂ ΔMiP. When the input is an argument-verb, on the other hand, focProm XP: ⊂ ΔMiP is vacuously satisfied by both of the candidates in (34b), which passes the decision of the optimal form down to the two lower-ranked constraints. We have evidence that BinMiP(PWd) is ranked above focProm X^0: ⊂ ΔMiP: we did not find a case in which the verb has the MiP-level prominence when it is preceded by an argument. From this ranking we can estblish candidate (34bii) as the optimal form.

Finally, let us consider where the ranking we have just established, focProm XP: ⊂ ΔMiP >> BinMiP(PWd) >> focProm X^0: ⊂ ΔMiP, is ranked with respect to the other constraints that have been posited. In order to get the length effect in the short unaccented condition, BinMaP(Ft) is necessarily ranked above focProm XP: ⊂ ΔMiP. The tableau that shows the ranking argument is provided in (35).

(35) BinMiP(Ft) >> focProm XP: ⊂ ΔMiP
KO input: short, unaccented, adjunct-verb

	$[PP\ [V]_{VP}]_{VP}$ Ft σ	BinMiP(Ft)	focProm XP: ⊂ ΔMiP
a	$\{(\underline{PWd})_{MiP}\}_{MaP}\ \{(\underline{PWd})_{\underline{MiP}}\}_{\underline{MaP}}$	*!	
b	$\{(\underline{PWd})_{\underline{MiP}}\ (\underline{PWd})_{MiP}\}_{\underline{MaP}}$	*!	
☞c	$\{(\underline{PWd}\ PWd)_{\underline{MiP}}\}_{\underline{MaP}}$		*

Candidate (35c) is the phrasing pattern we observed for KO's short unaccented condition, which is correctly obtained by focProm XP: ⊂ ΔMiP being crucially outranked by BinMiP(Ft). The prosodic structure in which the verb is associated to the MiP-level prominence in (35b) and the one in which it is associated to the MaP-level prominence in (35a) fatally violate the higher ranked BinMiP(Ft).

We now have the complete constraint ranking for KO, which is given in (36):

(36) Constraint ranking for KO (final version):

```
                    Accent ⊂ ΔMiP
                          |
NonFinality         BinMaP (Ft)
        \          /          \
focProm XP: ⊂ ΔMaP    focProm XP: ⊂ ΔMiP
                              |
                        BinMiP(PWd)
                              |
                     focProm X0: ⊂ ΔMiP
```

4.2.5. Speaker HK: Unaccented sequence

The patterns that HK showed in the unaccented condition were almost identical to those of KO. The only difference was that HK showed optionality in the adjunct-verb sequence in the short unaccented condition, between the structure where the verb is associated to the MiP-level prominence and the one where it is associated to the PWd-level prominence (see §3.6.2). My proposal for this variation is that HK has a constraint ranking in which two particular constraints, BinMiP(Ft) and focProm XP: ⊂ ΔMiP, are unranked with respect to each other. Following the idea of Anttila (2002), it is assumed here that the actual ranking is randomly chosen between BinMiP(Ft) >> focProm XP: ⊂ ΔMiP and focProm XP: ⊂ ΔMiP >> BinMiP(Ft) and that, as a consequence, one of the two different optimal forms also surfaces randomly. Note that this is compatible with our experimental data: among the five tokens in the short adjunct condition, three contours showed initial rise and two did not.

This situation is illustrated in (37) and (38). The wavy vertical lines between focProm XP: ⊂ ΔMiP and BinMiP(Ft) indicate that they are unranked.

(37) Optional Ranking: focProm XP: ⊂ ΔMiP >> BinMiP(Ft)
HK input: short, unaccented, adjunct-verb

	[PP [V]$_{VP}$]$_{VP}$ Ft σ	Non Finality	BinMiP(Ft)	focProm XP: ⊂ ΔMiP
a	{(PWd)$_{MiP}$}$_{MaP}$ {(PWd)$_{MiP}$}$_{MaP}$	*MaP *MiP *PWd!	*	
b	{(PWd)$_{MiP}$ (PWd)$_{MiP}$}$_{MaP}$	*MaP *PWd	*!	
☞c	{(PWd PWd)$_{MiP}$ }$_{MaP}$	*MaP *MiP		*

(38) Optional Ranking: focProm XP: ⊂ ΔMiP >> BinMiP(Ft)
HK input: short, unaccented, adjunct-verb

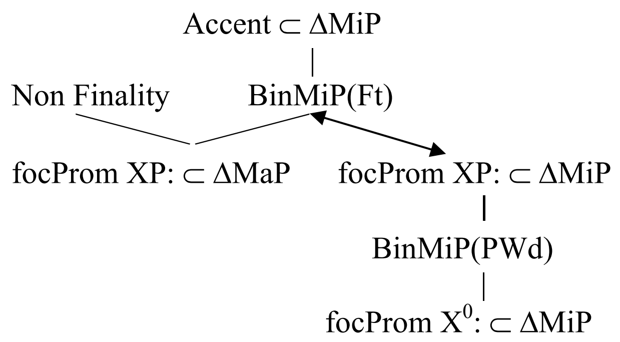
	[PP [V]$_{VP}$]$_{VP}$ Ft σ	Non Finality	focProm XP: ⊂ ΔMiP	BinMiP(Ft)
a	{(PWd)$_{MiP}$}$_{MaP}$ {(PWd)$_{MiP}$}$_{MaP}$	*MaP *MiP *PWd!		*
☞b	{(PWd)$_{MiP}$ (PWd)$_{MiP}$}$_{MaP}$	*MaP *PWd		*
c	{(PWd PWd)$_{MiP}$ }$_{MaP}$	*MaP *MiP	*!	

One of the randomly chosen rankings in (37) is identical to KO's being seen in (36), and it chooses candidate (37c) as the optimal form, due to BinMiP(Ft) ranked higher than focProm XP: ⊂ ΔMiP. Candidate (37a) is harmonically bounded by candidate (37b), and hence cannot be optimal.

In the other randomly chosen ranking in (38), a different prosodic structure becomes the optimal form. Candidate (38c), which is optimal in (37), is eliminated by focProm XP: ⊂ ΔMiP, ranked higher than BinMiP(Ft). The output is in fact not determined by focProm XP: ⊂ ΔMiP being crucially ranked above BinMiP(Ft), but by the undominated NonFinality. Candidate (38a) can never be the optimal candidate because it is eliminated by the greater number of violations of NonFinality among the three candidates. Consequently, we obtain the phrasing structure in which the verb in the VP is associated to the MiP-level prominence, candidate (38c).

The complete ranking for HK is summarized in (39). The arrow in the ranking indicates that BinMiP(Ft) and focProm XP: ⊂ ΔMiP are unranked, with respect to one another.

(39) Constraint ranking for HK



There are two constraints which we have not used to account for EO's patterns: focProm XP: ⊂ ΔMiP and BinMiP(PWd). We did not see the effect of these constraints in EO's hierarchy, although potentially they can be in conflict with some of the constraints in the hierarchy. For example, focProm XP: ⊂ ΔMiP can be ranked below BinMiP(Ft), because this constraint disfavors the structure that BinMiP(Ft) favors. The fact that we found only the phrasing pattern in which the verb in the VP has the PWd-level prominence in the short unaccented condition tells us that BinMiP(Ft) outranks focProm XP: ⊂ ΔMiP. The tableau for this is identical to the one in (35) above.

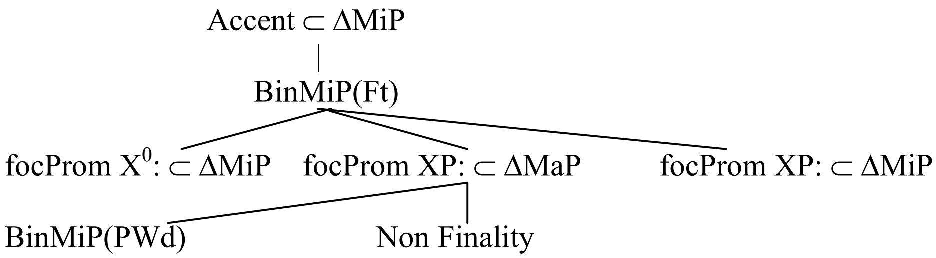
BinMiP(PWd) could also have a ranking argument with focProm XP: ⊂ ΔMaP. One such case is the long accent adjunct condition. Consider the tableau in (40). FocProm XP: ⊂ ΔMaP favors candidate (40a), penalizing the other two candidates by giving a single violation to each of them. Candidate (40c) is, on the other hand, favored by BinMiP(PWd). The ranking of focProm XP: ⊂ ΔMaP over BinMiP(PWd) guarantees that candidate (40a), where the verb has the MaP-level prominence, is respected more than candidate (40c). Candidate (40b) violates both constraints, and thus it can never be optimal.

(40) focProm XP: ⊂ ΔMaP >> BinMiP(PWd)
EO input: long, accented, adjunct-verb

	$[PP\ [V]_{VP}]_{VP}$ HL HL	focProm XP: ⊂ ΔMaP	BinMiP(PWd)
☞a	$\{(PWd)_{MiP}\}_{MaP}$ $\{(PWd)_{MiP}\}_{MaP}$		*
b	$\{(PWd)_{MiP}$ $(PWd)_{MiP}\}_{MaP}$	*!	*
c	$\{(PWd\ PWd)_{MiP}\}_{MaP}$	*!	

We have arrived at EO's final constraint ranking, which is shown below:

(41) Ranking summary for EO (final version)



5. Conclusion

In this paper I have shown that argument and adjunct are intonationally distinguishable in Japanese. Based on the experiment reported in the paper, we have seen that the ways in which the distinction is made in the two languages are parallel in that a head preceded or followed by an adjunct is associated to a greater prosodic prominence than a head preceded or followed by an argument. However, we have seen in the results of the experiment that the argument–adjunct distinction show a certain amount of inter- and intra-speaker variation. We observed both inter- and intra-speaker variation and influences of accentedness and of prosodic constituent length.

I have also presented an OT account of the patterns and variation observed in the experiment. I have shown that the complex patterns concerning the prosodic distinction between argument and adjunct is accounted for in terms of the interaction of the extended focus prominence constraints with a small set of markedness constraints on prosodic structure, including BinMiP(Ft), BinMiP(PWd) and NonFinality.

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