Default accentuation and foot structure in Japanese: Evidence from Japanese adaptations of French words (published in) *Journal of East Asian Linguistics vol 9,1* (2000), pp 55-96.

Shigeko SHINOHARA
CNRS, France
shinohara@psycho.univ-paris5.fr

Default Accentuation and Foot Structure in Japanese: Evidence from Japanese Adaptation of French Words

1 Introduction

Recent research on Japanese phonology has focused on issues of accentuation. Two interesting questions that have been raised in works such as Katayama (1995, 1998) and Suzuki (1995) are the existence of a default accentuation pattern and the relationship between foot structure and accentuation. In this paper we will exploit a novel source of data to demonstrate conclusively that Japanese has a default accent pattern and that this pattern follows from a foot structure that arises from a specific constraint ranking in an Optimality Theoretic grammar.

In this paper, we treat the standard variety of Japanese based on a Tokyo dialect. We will refer to it as Japanese. Japanese is a pitch accent language. For many Japanese words the accent is lexical: a word can be accented or unaccented, and in the accented class the location of the accent is unpredictable. However, in certain classes of the lexicon, such as certain loanwords, prosodically derived words, bound morphemes and some others, words lack an accent specification. Consequently, the accent is assigned to those items by default. The antepenultimate position (the syllable containing the antepenultimate mora) has been recognized as the unmarked accentuation pattern in Japanese in previous research (McCawley 1968, Yamada 1990, Haraguchi 1991 among others). We will attempt a more detailed analysis of the position of default accentuation in Japanese by using a novel source of data that reveals the default accent in a particularly clear manner.

We will study mainly the accentuation patterns in Japanese adaptations of French words. In addition, adaptation of English words will be discussed for comparison. By Japanese adaptation, we mean the spontaneous rendition of words of a foreign language (L2) into Japanese by a Japanese speaker who has acquired the sound system of L2 as a second language. This phenomenon is found, for

instance, in the speech of Japanese interpreters who must render "on line" names and other foreign terms into Japanese. For example, the adapted form of the French word étagère |etaJER| 'shelf' is /etazje'eru/, while that of the English word picnic |pɪknɪk| is /pi'kunikku/[1] (for broader aspects of the adaptation process, cf. Paradis and LaCharite 1997, Shinohara 1997b). According to our study of Japanese adaptation, the accentuation of adapted forms falls into two broad categories: 1) the accent is carried over from the accent of the source word, which is the case for the adaptations of English words; 2) no accent is recognized in the source word and the accent is assigned by default, which is the case observed in adaptations of French words. The latter case reveals the Japanese default accentuation patterns in a particularly clear manner.

Our analyses confirm that default accent in Japanese is related to its foot structure, like accentuation in many other languages. Concerning the foot structure of Japanese, it has become an established fact in recent studies that words derived by prosodic processes have bimoraic feet. Bimoraic feet are found in formations such as hypocoristics (Poser 1990, Tateishi 1991a), abbreviations of compound words (Itô 1990, Itô and Mester 1992, Suzuki 1995), truncation of loanwords (Itô 1990, Itô and Mester 1992, Suzuki 1995) and Japanese musicians' reverse argot, "Zuuja-Go" (Poser 1990, Tateishi 1991a, Itô, Kitagawa and Mester 1995). However, little evidence about the foot structure of lexical words, as opposed to prosodically derived words, has been found so far. As we see from the existence of a number of monomoraic words in the standard Tokyo dialect - /me/ 'eye', /ha/ 'tooth', /te/ 'hand' - a foot does not seem to be a requirement on Japanese lexical word output forms (cf. the Foot Binarity requirement of McCarthy and Prince 1993a).

Several previous studies have examined the relation between Japanese pitch accent and foot structure. The unmarked antepenultimate accent (accent on the syllable containing the antepenultimate mora) has been analyzed as a left-headed

bimoraic rightmost foot with an extrametrical mora at the right edge (Yamada 1990, Haraguchi 1991 among others). Although this is a valid analysis, it requires some modification in order to account for more patterns, such as the pre-antepenultimate accent (accent on the syllable containing the pre-antepenultimate mora) recognized in loanwords (Katayama 1995, Suzuki 1995), which is also found in our data of French word adaptations. Another analysis of the default accent is proposed by Tateishi (1991b) using right-headed bimoraic (iambic) feet constructed from the right edge of strings. Following Akinaga's (1981) generalization, Tateishi (1991b) remarks that three- and four-mora nouns are often unaccented. In order to account for these patterns together with the antepenultimate ones in shorter and longer forms, he posits extrametrical feet on both edges of the word so that the accent cannot be present in three- and four-mora words. In our data, however, the accent is regularly present on three- and four-mora forms, which suggests that the statistical preponderance of unaccented three- and four-mora words in the native lexicon is a phenomenon independent of the default accentuation process. Moreover, as Tateishi himself remarks, prosodically derived words of three- or four-mora length can be accented, as in /te'rebi/ (abbreviated from /terebi'zjoN/) 'television'. The analysis using extrametricality at both edges of the word requires an ad hoc account for the presence of accent in such forms. More importantly, the approach taken by Yamada (1990) and Haraguchi (1991) with nonfinal (trochaic) feet is more consistent with the structure of prosodically derived words: the abbreviated form of /demoNsutoreesjoN/ 'demonstration' is demo with a bimoraic trochaic foot on the left edge, instead of a canonical iamb LH, *(demoN) (Itô 1990, "( )" indicate foot grouping).

Katayama (1995) and Suzuki (1995) investigate default accentuation in loanwords and each gives a distinct analysis in terms of foot structure. In Katayama (1995) the main issue is the variation between antepenultimate and pre-

antepenultimate accentuation. As in Suzuki (1995), Katayama (1995) recognizes the pre-antepenultimate accent as an innovative accentuation taking over the antepenultimate one. In certain loanwords, one or the other (or both as variants) is used (see section 5.1 for examples). These authors attribute a distinct grammar to each pattern. In our study of the adaptation of French words, we also observe both accent patterns. Based on the observation of our data in sections 5.1, 5.2, we will propose another analysis of the two patterns in section 7.2. For the problem of determining the lexical vs. default status of accent in variable patterns, adaptation is a good source of evidence. Due to the fact that loanwords are stored in the lexicon and transmitted from one speaker of Japanese to another, it is often difficult to know if an accent pattern is lexically stored or predictable. Since adaptations are produced "on line" there is no question of them being stored.

Putting aside the treatment of variants, the analysis of the default accent in Katayama (1995) is as follows. Antepenultimate patterns arise from a final extrametrical foot plus rightmost accent: /go'o(suto)/, 'ghost'. Thus, this analysis does not claim a direct relation between the accent and foot structure. For the pre-antepenultimate accent, the two are related by a constraint (Accent-to-Head) forcing the high pitch of the accent to match the head of a foot. Suzuki's (1995) analysis is close to the one that we will present as far as the role of feet in accentuation is concerned. Essentially, what differentiates the two analyses is the treatment of a light + heavy syllable sequence (LH). This problem is discussed in section 7.2.3.

Another issue regarding Japanese accent and foot structure concerns the accentuation of compound nouns. Poser (1990) posits a foot at the end of compound strings; the presence or absence of lexical accent on the remaining portion of the second noun determines the position of the accent in the entire compound noun. Kubozono (1995) refines Poser's analysis. He argues that the relevant invisible portion is a syllable instead of a foot, but a NonFinality-Foot

constraint is also active in the compound accentuation process. Since compound accentuation involves alignment of accent to the internal word boundary as an important factor (see section 6.2 for more information), it cannot be treated as parallel to a single morphemic word. Hence, we will not consider compound accents in this paper.

By using data from Japanese adaptations of French words we will show that in the basic default patterns a nonfinal trochaic foot defines the position of accent - essentially the Latin stress rule. The patterns are further affected by some other factors, such as syllable structure of the output forms, position of epenthetic vowels and grammatical classes.

A recent investigation of accentual patterns in adaptations in North Kyungsang Korean (NK; Kenstowicz and Sohn 1998) shows results similar to our study in two ways. NK is another pitch accent language where the location of accent is mostly unpredictable in the native lexicon. Accentuation in adaptations either follows accent patterns constrained by their syllable structure (the initial heavy syllable attracts the doubled accent: [p^{h}e'nti'um] 'Pentium') or they are accented on the penultimate mora: [ameri'k^{h}a] 'America'. The latter is recognized as the default accent found in limited sectors of the native lexicon. Thus, in NK, as in the case of Japanese, the adaptation data confirm the existence of a default accentuation; also, the default pattern is defined by a final trochaic foot.

The remainder of the paper is organized as follows. In section 2, we will give information about the data and the general processes of adaptation. Section 3 introduces the pitch accent system of Tokyo Japanese. Facts about accentuation in adapted forms are presented in sections 4 and 5, and examples of the default accent found in the Japanese lexicon are shown in section 6. In section 7, we propose an Optimality Theoretic (Prince and Smolensky 1993) analysis of the default accentuation.

2 Japanese adaptations of foreign words

2.1 Data

Data were collected from native speakers of Tokyo Japanese from the same generation (30-40 years old) residing in Paris (for French word adaptation) or in London (for English word adaptation). For the data of each language, the author gave informants a written word list. The informants were asked to convert the sounds of French or English words in the list to Japanese ones following the type of adaptation employed in code-switching or by interpreters when a Japanese equivalent is not available (e.g., proper nouns). For the French data, three informants adapted about 500 French words orally and the author transcribed them. The procedure was repeated after a few weeks so that any variation could be observed. For the English data, three other informants who studied in London sent their adapted forms of 200 words to the author. The adapted forms are uniform with well-defined variation. Most importantly, the informants were able to judge whether a given adapted form was well-formed or not. See Shinohara (1997b) for more discussion of the corpus of data analyzed here.

2.2 General processes of adaptation

General processes of adaptation are shown in (1) with examples of French word adaptations. Three levels are recognized, but they do not need to be temporally ordered.

(1) Processes of adaptation

Input:	French forms	Ex: calmer, bac |kalme|, |bak|
Segmental level	Segmental correspondence	karme, bak
Syllabic level	Vowel epenthesis, Prefinal syllable lengthening	karume, bakku
Accentual level	Pitch accent assignment	ka'rume, ba'kku
Output:	Adapted forms	/ka'rume/, /ba'kku/

On the segmental level, French segments are substituted by Japanese ones. On the syllabic level, French consonants not immediately followed by a vowel within a word are syllabified via vowel epenthesis, since only the following syllable structures are allowed in Japanese.

(2)

Light syllable: (C)(j)V (ex. /ha/ 'tooth', /tja/ 'tea')

Heavy syllables: (C)(j)VV (ex. /too/ 'tower', /dai/ 'title')

(C)(j)VN (ex. /teN/ [teN̩] 'point')

(C)(j)VQ (ex. /haQ.pa/ [hap:a] 'leaf')

(N: moraic nasal)

(Q: moraic obstruent; the first half of a geminate obstruent)

On the syllabic level, the phenomenon we will call 'pre-final lengthening' is also observed. When a foreign word ends in a syllable closed by a single consonant as in bac |bak| 'tub', the prefinal syllable of the adapted form is lengthened either by consonant gemination (this is the case for |bak| → /baQku/) or by vowel lengthening (as in the case of bar 'bar' |baR| → /baaru/), depending on various factors (Shinohara 1996, see also Tsuchida (to appear) among others for a similar phenomenon in English loanword adaptation). On the accentual level, the pitch accent is assigned. In this paper, we will concentrate on the accentual level.

3 Pitch accent and lexical specification in Tokyo Japanese

In this section, we will briefly illustrate the pitch accent system of Tokyo Japanese and its lexical specification.

In a Japanese word, the accent is marked by a falling pitch. The accented syllable is the one just before the drop in pitch. In the word /koko'ro/ 'heart', the pitch drops after the second syllable; it is perceived as the accented syllable. In an accented heavy syllable, the pitch falls after the first mora. In /ko'omori/ 'bat', the first syllable is a heavy one consisting of a long vowel. In the heavy syllable, only the first mora can bear the accent.

We will turn now to the place of accent. A Japanese word is either specified as accented or unaccented. In nouns, the accent is mostly lexical and any syllable can be accented. In (3) three-syllable words are followed by an accentually neutral subject marker ga; since any syllable can bear the accent, and a word can be also unaccented, there exist four possible accent patterns.

(3)

Three-syllable nouns followed by the subject marker-ga	me'gane-ga 'glasses'	koko'ro-ga 'heart'	otooto'-ga 'brother'	usagi-ga 'rabbit'

The first word in (3) /me'gane/ is accented on the initial syllable, the second one /koko'ro/ is accented on the second syllable, the word /otooto'/ is accented on the final syllable (in this case the accent is audible only when this word is followed by an accentually neutral particle such as ga), and the word /usagi/ is unaccented. When a word is unaccented, unlike the finally accented one, there is no fall in pitch when it is followed by ga. The noun accentuation patterns are summarized as follows: for a word of n syllables there exist n + 1 possible accentuation patterns.

By contrast, the accentuation of underived verbs and underived adjectives is limited to two types: accented or unaccented. If they are accented, the position of

the accent is predictable. In the infinitive form, the accent falls on the syllable containing the penultimate mora (cf. (4)).[2]

(4)

	accented		unaccented	
verbs	tabe'ru ha'iru omo'o	'eat' 'enter' 'ponder'	nemuru kaeru	'sleep' 'change'
adjectives	haja'i waru'i	'fast' 'bad'	akai marui	'red' 'round'

4 Accentuation in adapted forms of English

In relation to accent specification, we will present some data from the adaptation of English words. The place of pitch accent in adapted forms of English words corresponds to the primary stress position in the English word as shown in (5).

(5)

Nouns	Adapted forms	Verbs	Adapted forms
pícnic	/pi'kunikku /	mátter	/ma'taa/
ínfluence	/i'NhurueNsu/	órganize	/o'oganaizu/
behávior	/bihe'ibijaa/	invéstigate	/iNbe'sutigeito/
techníque	/tekuni'iku/	implý	/iNpura'i/
dífficulty	/di'Fikarutii/	contríbute	/koNtori'bjuuto/

The primary accent (or stress) of an English word is marked by a relative prominence manifested by amplitude and duration increase. The accented syllable is also the anchoring site of the pitch accents for intonation contours (cf. Liberman 1975). In spite of the distinct realization of the accent in both languages, the accented syllables in English words seem to be recognized as the carrier of a lexical accent in the Japanese adaptation process.

5 Facts about accentuation in adapted forms of French words

In contrast to the English case, in French words, no accent is recognized by Japanese speakers. Nevertheless, an accent is assigned to certain positions in the adapted forms. In French, phrase final syllables are lengthened. We might think of

several reasons why French phrase final lengthening is not recognized as accent by Japanese speakers: 1) because it is fixed, it is deduced as nonlexical; 2) the phonetic correlates (duration in the French accent and pitch drop in Japanese) do not allow a correspondence between them; 3) French final accent is phrasal in nature and so might not be interpreted as a lexical property. Without sufficient evidence from the adaptation of other languages, we cannot determine the reason. We will, thus, simply assume no accent specification in the French input to the Japanese adaptation process.

In this section, we discuss some of the general properties of accentual adaptation that emerge from our study: the basic antepenultimate pattern, variation in HLH sequences, noun vs. verb accent, and the shift of accent from an epenthetic vowel.

5.1 Syllable structure and accent tendencies

McCawley (1968) made a generalization about the unmarked position of accent for loanwords (/erebe'etaa/ 'elevator') or nonsense words in Japanese (a sequence of Japanese vowels /aiu'eo/), which is the syllable containing the antepenultimate mora. Although this is valid for certain syllable sequences, we find another type of accentuation in adapted forms of French words: accent on the syllable containing the pre-antepenultimate mora. This accentuation was also recognized by Katayama (1995) and Suzuki (1995) as an alternative loanword accentuation. According to these authors, the choice between the "antepenultimate" and "pre-antepenultimate" is understood either as an idyosyncratic property of the item: /bita'miN/ 'vitamin' vs. /to'rɔFii/ 'trophy', /si'NFonii/ 'symphony' vs. /baabe'kjuu/ 'barbecue'; or as a variation of a given item: /areru'gii/ or /are'rugii/ 'alergy', /kaadi'gaN/ or /ka'adigaN/ 'cardigan'. However, in our data, the choice between these two accentuations is determined by the syllable structure of the output forms (see section 5.2).

Here are the patterns that allow us to observe the basic default accentuation. The patterns in (6) show that forms ending in a light syllable carry the accent on the antepenultimate mora.

(6)

a	/masi'kuri/	mâchicoulis	|maSikuli|	'machicolation'
b	/Fira'teri/	philatélie	|Filateli|	'philately'
c	/are'ruto/	alerte	|alERt|	'alert'
d	/kurju'dite/	crudité	|kRydite|	'raw vegetables'
e	/torabe'suti/	travesti	|tRavEsti|	'travesty'

When the final syllable of an output is heavy, the accent falls on the syllable containing the pre-antepenultimate mora as shown in (7).

(7)

a	/po'tiroN/	potiron	|pOtiRõ|	'pumpkin'
b	/sa'rasaN/	sarrasin	|saRazé|	'wheat flour'
c	/ro'maraN/	romarin	|ROmaRé|	'rosemary'
d	/powa'NsoN/	poinçon	|pwésõ|	'punch'

In the data below (8), the adapted forms end in /ru/ or /su/. These forms behave like the ones ending in a heavy syllable.

(8)

a	/ri'dearu/	l'idéal	|lideal|	'ideal'
b	/ba'gateru/	bagatelle	|bagatEl|	'junk'
c	/ro'rearu/	l'Oréal	|lOReal|	'brand name'
d	/be'neFisu/	bénéfice	|benefis|	'benefit'
e	/me'disisu/	Médicis	|medisis|	'person's name'

For /su/ ending forms, accent on the antepenultimate position (/bene'Fisu/) is also an alternative. To a certain extent, this type of variation is also observed for /ru/ ending forms, yet considerably less than for /su/. We propose to regard the final

/ru/ (or /su/) plus the preceding syllable nucleus as a unit equivalent to a heavy syllable.[3]

It follows from the patterns we have seen that if we construct a bimoraic foot from the end of these forms but exclude the final syllable (whether heavy or light), the accent falls on the first mora of the final foot, hence, on the head of the rightmost nonfinal foot, similar to Classical Latin (Prince and Smolensky 1993, Mester 1994). We will assume that this is the canonical default accent pattern in Japanese. (Formal analysis of this along with other facts will be presented in the section 7.2.). Some of the other patterns appearing in certain established loanwords (as opposed to the adapted forms, shown above in the present section) may fall into the variation categories that we will discuss below. A small number of other forms carry fixed lexical accents through processes unknown to us (e.g. /bita'miN/ 'vitamin').

5.2 Variation

The following syllable sequences have a stable accentuation pattern in our adaptation data (H: a heavy syllable, L: a light syllable, v : an epenthetic vowel)[4]: L'L, H'L, L'LL, LL'LL, H'H, L'H, L'LH, LvL'L, LvL'H. Whereas for the sequences of HLL and HLH, we observe the following variations:

(9)

H'LL/HL'L :

a	/a'Ntere/aNte're/	intérêt	|étɛrɛ|	'interest'
b	/ko'Npani/koNpa'ni/	compagnie	|kõpaˆi|	'company'
c	/gorugo'Nzora/gorugoNzo'ra/	gorgonzola	|gɔRgõzɔla|	'gorgonzola'

H'LH/HL'H :

d	/mo'NtoroN/moNto'roN/	Montholon	|mõtɔlõ|	'Place name'
e	/pa'NteoN/paNte'oN/	Panthéon	|pàteõ|	'Pantheon'

We will group HLL and HLH together as HLσ. These are the syllable sequences which pose a problem in grouping the penultimate light syllable with the

preceding heavy syllable. In moraic languages, there are different strategies for parsing a light-heavy or a heavy-light syllable sequence into bimoraic feet. In Classical Latin, bimoraic contiguous footing is assured by syllable shortening: /HLH/ → [HLL] (Mester 1994). In Tongan, where penultimate accent is imposed, an /HL/ input appears as [LL'L]; here a final bimoraic foot is assured by breaking up H into LL (Prince and Smolensky 1993). In our data, however, we do not find any change in syllable quantity. What we find instead is a variation. In this adaptation, the /HLσ/ output sequences are accented either as H'Lσ or as HL'σ, in contrast to the stable antepenultimate accent, L'L(σ). Recall that (LL)σ sequences are always accented on the antepenultimate syllable : /po'tiroN/ < potiron 'pumpkin', /o'tari/ < otarie 'otary' indicating the bimoraic grouping is stable.

Note that a grouping of a light syllable together with a following syllable formed by /ru/ or /su/ (i.e. /Lru/ or /Lsu/ as an inseparable unit) is to some extent applicable to the first two syllables of the sequences LLLL and LLLH. Thus, like the case of HLσ we find variations for the sequences /LruLσ/ and /LsuLσ/.

(10)

a	/ma'rutine/maruti'ne/	martinet	|maRtinE|	'swift'
b	/e'sutoma/esuto'ma/	estomac	|Estoma|	'stomach'
c	/o'rutoraN/oruto'raN/	Ortolan	|0Rt0là|	'place name'

See section 7.2.4 for the analysis of the variation.

5.3 Grammatical categorization

Input items can be categorized for accentuation patterns in the process of adaptation. Adapted forms of French verbs and adjectives may be accented according to Japanese verb/adjective accentuation patterns (i.e. either accented, in which case the accent falls on the syllable containing the penultimate mora, or unaccented, cf. section 3). We will study the verb case (because some French

adjectives are undistinguishable from their corresponding noun forms, e.g. anglais 'English' (adjective) or 'English language' (noun)). We find the following accentuation patterns in our data.

(11)

French	words	Informant 1	Informant 2	Informant 3
allumer	|alyme| 'to lighten'	a'rjume	arju'me	arju'me
tapisser	|tapise| 'to weave'	ta'pise	tapi'se	ta'pise tapi'se
tapoter	|tapote| 'to tap'	ta'pote	tapo'te	ta'pote tapo'te
écouter	|ekute| 'to listen'	ekute	eku'te	ekute
bricoler	|bRikOle| 'to fix up'	buri'kore	buriko're	buri'kore buriko're
imaginer	|imaZine| 'to imagine'	ima'zine	imazi'ne imazine	imazi'ne
localiser	|lOkalize| 'to locate'	roka'rise	rokari'ze rokarize	rokari'ze

We recognize three accentuation patterns in the verb class: (12a) below is the regular default pattern for French adaptations also found in nouns, whereas the patterns (12b) and (12c) are particular to the verb class. Each informant used different combinations of two or more patterns.

(12)

a ima'zine (regular default accent, antepenultimate)

b imazi'ne (verb pattern, penultimate)

c imazine (verb pattern, unaccented)

The (b) (penultimate) and (c) (unaccented) correspond to Japanese verb accentuation patterns. We see, thus, for the verb class, informants choose an accentuation pattern from the default accent and the two verb accentuation types.

It seems that a specification for certain classes of the lexicon is optionally applied, and items are processed through the grammar corresponding to this specification. We will refer to the penultimate accent patterns as the "verb accentuation". We will analyze the verb accentuation based on the results of our analysis of the default accentuation in a later section.

5.4 Epenthetic vowels do not carry the accent

Another important fact about accentuation in adaptations of French words is the avoidance of placing accent on epenthetic vowels. In the examples in (13) and (14) below, the adapted forms end in a light syllable; hence, we expect that the accent falls on the antepenultimate mora. This is true when the antepenultimate position has a correspondent vowel in the French input form as in (13).

(13) (Epenthetic vowels are italicized.)

a	/o'tari/	otarie	|otaRi|	'otary'
b	/masi'kuri/	mâchicoulis	|maSikuli|	'machicolation'
c	/are'ɲu*to*/	alerte	|alERt|	'alert'
d	/*to*rabe's*u*ti/	travesti	|tRavEsti|	'travesty'

Notice in examples (13c, d) the epenthetic vowels are counted for determining the antepenultimate moraic position, otherwise /a'rer*uto*/ and /tora'bes*u*ti/ with the accent in a syllable closer to the beginning of the form would be yielded.

When the antepenultimate mora contains an epenthetic vowel, the accent seems to shift away from the predicted default position.

(14)

a	/s*u*ti'ro/	stylo	|stilo|	'pen'
b	/ab*u*ri'ko/	abricot	|abRiko|	'apricot'
c	/dak*u*ti'ro/	dactylo	|daktilo|	'typing'
d	/kok*u*ri'ko/	coquelicot	|k0kliko|	'poppy'
e	/pato*ro*'na/	patronat	|patRona|	'patronate'

f	/se'r*u*k*u*r*u*/	cercle	|sERkl|	'circle'
g	/s*u*pe'k*u*t*o*r*u*/	spectre	|spEktR|	'spectrum'

In forms ending in a heavy syllable, when the pre-antepenultimate position contains an epenthetic vowel, the accent shifts from the predicted position in the same way as the above case (cf. (15)).

(15)

a	/rob*u*ro'sjoN/	Reblochon	|RoblOSõ|	'name of a cheese'
b	/rib*u*re'zoN/	livraison	|livRezõ|	'delivery'

Note that these are stable patterns in contrast with the variation that we saw in 5.2 (e.g. pa'NteoN/paNte'oN Panthéon).

The "shifting effect" is also observed in the verb accentuation. Below are examples from verb accentuation of one of the informants. She regularly accented the penultimate mora of the output forms as in (16).

(16)

a	/imazi'ne/	imaginer	|imaJine|	'to imagine'
b	/rokari'ze/	localiser	|lOkalize|	'to locate'

But in (17) the penultimate mora contains an epenthetic vowel, in this case, the accent shifts from the penultimate mora.

(17)

a	/koNko'k*u*te/	concocter	|kõkOkte|	'to prepare'
b	/seke's*u*t*o*re/	sequéstrer	|sEkestRe|	'to sequester'
c	/Fi'r*u*t*o*re/	filtrer	|filtRe|	'to filter'

We can see from the data that an epenthetic vowel constitutes a prosodic position relevant to accent assignment, but cannot carry the accent on itself. This reveals an ordering paradox in derivational analyses between epenthesis and accentuation. Using the conclusions regarding the regular accentuation patterns

found in adaptation of French words drawn from section 5.1, let us formulate the default accentuation rule and epenthesis rule as in (18) and (19).

(18) **Accent rule**

Assign extrametricality to the final syllable and then construct a left-headed bimoraic foot.

(19) **Syllabification rule (or rule of epenthesis)** (cf. (2) for the syllable structure of Japanese)

(In order to syllabify segments) insert a vowel after (released) consonants not immediately followed by a vowel.

Supposing the input to be the French segments, if we first apply the rule of epenthesis and secondly the rule of accentuation, a wrong result, the accent on the epenthetic vowel, obtains for the adapted forms where the antepenultimate syllable is filled by an epenthetic vowel as in (20).

(20) abricot (Correct form: /ab*u*ri'ko/)

|abRiko|	Input
ab*u*riko	Epenthesis
a(b*u*'ri)<ko>	Accentuation
*/ab*u*'riko/	Wrong result

Now suppose the accentuation rule precedes epenthesis, i.e. the accentuation rule applies on the basis of French vowels alone. Another wrong result, accent before the antepenultimate syllable, obtains for forms such as /arer*uto*/ alerte where the antepenultimate syllable is filled by a French vowel and the following syllables are filled with epenthetic vowels.

(21) alerte (Correct form: /are'ruto/)

|alERt|	Input
(a')<lERt>	Accentuation
(a')<rerut*o*>	Epenthesis
/a'rerut*o*/	Wrong result

In adaptation, the same surface vowels, thus, behave differently when one is the epenthetic vowel (/o/ after /t/ and /d/, /u/ elsewhere) and the other is a lexical one. There are other such languages. Analyses of the vowel /i/ in Maltese Arabic (Hume 1992) and of the /e/ in Arbizu dialect of Basque (Hualde 1991) show that the lexical vowels are specified for vowel features, whereas epenthetic ones are underspecified. As for accentuation, the distinction between a lexical vowel and an epenthetic vowel holds for schwa in Mohawk (Michelson 1988, Hagstrom 1997) and /i/ in Palestinian Arabic (Brame 1974 cited in Kenstowicz 1981): the accent skips over the epenthetic vowels in these languages. However, unlike our case they do not count as a prosodic constituent, hence, they do not present the ordering paradox we find in our data.

As a solution to the ordering paradox, we might consider an analysis in which all the prosodic rules apply before vowels features are filled in, i.e., syllabification applies leaving the features of epenthetic vowels empty; in the next stage, the accentuation rule will count empty vowel slots but with a constraint barring the empty slots from carrying the accent; finally, the empty vowel positions are filled with vowel features. In order for the accent rule to apply, while at the same time avoiding empty slots, a rule of accent shift may be required. However, neither a constraint barring accented epenthetic vowels, nor a rule shifting the accent from an epenthetic vowel to a lexical one can predict the directions of accent shift. Note that in (14a-e) the accent shifts to the right; while in (14f,g) it shifts to the left. Therefore, this approach requiring an accent shift rule would not solve the

problem. We will reconsider this problem from an Optimality perspective in section 7.2.2. Both forms with problematic syllable sequences for foot grouping as well as the default accent assignment will receive a better treatment in the OT analysis. Before we move on to an analysis of default accentuation, we will examine briefly the areas of the lexicon where the default accent seems applicable.

6 Default accent in the Japanese lexicon

In this section, we will establish a relationship between the accentuation in adaptation and that in Japanese lexicon. The accent patterns predicted by the default accentuation are found in certain marginal parts of the Japanese lexicon. Our hypothesis is that the default accentuation applies to any items unspecified for accentuation in the Japanese lexicon. Certain domains of lexicon can be unspecified for the accent. There are two categories: 1) short forms comprised of up to four moras and 2) long ones. Forms belonging to the first category include truncated forms and bound morphemes. In longer forms, the following domains have limited accentuation patterns: compounds, loanwords, proper names. In these domains, a single accentuation type does not seem to account for all the accentuation patterns of each group. One of the patterns corresponds to the default accentuation. In other cases, they can be accented according to certain other mechanisms such as compound accentuation or they are unaccented.

6.1 Short forms

Truncated forms and bound morphemes may be unspecified for the accent. They are short (up to four moras) and the default accent applies to them almost without exception (see below for the exceptions). Here are a few examples of each category above: i) two types of truncated forms: truncated loanwords and hypocoristics, ii) bound Sino-Japanese morphemes (morphemes introduced from Chinese dialects between 6th and 16th centuries. They present phonological characteristics distinct from the indigenous lexicon or Yamato vocabulary.).

6.1.1 Truncated loanwords

Loanwords in Japanese of which the length is more than five moras are often truncated to between two and four moras (Itô 1990, Itô and Mester 1992). This process is productive. Truncated loanwords are accented according to the default patterns, regardless of the accent of the corresponding full forms, except certain familiarized items and four-mora forms, which may be unaccented.

(22)

a /tjo'ko/ < /tjokore'eto/ 'chocolate'

b /de'mo/ < /demoNsutore'esjoN/ 'demonstration'

c /te'rebi/ < /terebi'zjoN/ 'television'

d /a'nime/ or /anime/ < /anime'esjoN/ 'animation'

e /Fa'Nde/ < /FaNde'esjoN/ '(make-up) foundation'

f /riha'biri/ or /rihabiri/ < /rihabirite'esjoN/ 'rehabilitation'

6.1.2 Hypocoristics

Truncated proper names are usually two moras in length and can be followed by a hypocoristic suffix /-tjaN/ (Poser 1990, Tateishi 1991a); they are accented on their initial syllables (in accord with antepenultimate default accent) whatever the accent of the corresponding original form is.

(23)

a /sa'na-tjaN/ < /sanae/

b /ha'na-tjaN/ < /ha'nako/

c /ma'sa-tjaN/ < /masa'nori/

d /sjo'o-tjaN/ < /sjooi'tiroo/

6.1.3 Bound Sino-Japanese morphemes

Sino-Japanese morphemes are at most two moras in length. Among them, there are a number of morphemes used as bound morphemes. According to our observation, they are invariably accented on their initial syllable when cited in isolation.

(24)

a /se'N/ 'river'

b /ko'o/ 'high'

c /si'ki/ 'knowledge'

6.2 Long forms

6.1.4 Compound words

In compound words consisting of two nouns, N1 and N2, there are generally three types of accentuation. First, N2 accent is preserved (25a). Second, the accent is aligned with N1-N2 boundary (25b). There are two sub-categories: when N2 is shorter than three moras, the accent is assigned to the syllable preceding N2; when N2 is longer than two moras, the accent is assigned to the first syllable of N2. Third, the whole sequence is unaccented (25c). The choice among these three patterns is determined by N2. N1 accent does not play any role in compound accentuation patterns. For a more detailed analysis, readers may refer to McCawly (1968), (1977), Kubozono (1993b), (1995) among others. Note that variations are common in compound accents.

(25)

a. N2 accent preserved:

/miNsju#sju'gi/ < /miNsju/ (bound morpheme) + /sju'gi/ 'democracy'

/geNzi#monoga'tari/ < /geNzi/ + /monoga'tari/ 'Story of the Genji's'

/siro#asupa'ragasu/ < /si'ro/ + /asupa'ragasu/ 'white asparagus'

/gakusjuu#saNkoosjo'/ < /gakusjuu/ + /saNkoosjo'/ 'reference book'

b. The accent is aligned with N1-N2 boundary:

/sinohara'#ke/ < /sino'hara/ + /ke/ (bound morpheme) 'The Shinohara's'

/zjooho'o#bu/ < /zjoohoo/ + /bu/ (bound morpheme) 'intelligence agent'

/koo#ke'tuatu/ < /ko'o/ + /ketuatu/ 'hyper tension'

/oNna#to'modati/ < /oNna'/ + /tomodati/ 'female friend'

/metiru#a'rukooru/ < /me'tiru/ + /arukooru/ 'metyle alcohol'

c. Unaccented:

/rosia#go/ < /ro'sia/ + /go/ (bound morpheme) 'Russian'

/sjakai#too/ < /sja'kai/ + /to'o/ 'Socialist Party'

We have found a few examples which do not pattern with any of the above; they are accented according to the default pattern.

d. Default accent (?):

/koo#ketu'atu/ < /ko'o/ + /ketuatu/ 'hypertension'

/tee#ketu'atu/ < /te'e/ + /ketuatu/ 'low blood pressure'

In the examples in (d), N2 is originally unaccented. When it is compounded the accent is neither aligned with the morpheme boundary, nor is it unaccented. But the accent is the one predicted by the default accentuation rule. This seems to apply only to compounds that are well integrated into the vocabulary. It is possible that these items behave as a single morphemic unit. A simple test may reveal that solely compound accentuation applies to unassimilated compounds such as /seizjoo#ke'tuatu/ 'normal blood pressure'. It is worth investigating compounds in more depth in order to confirm the relationship between the default accent and the morphological status of compound words. If it turns out that the default accent appears only in assimilated compounds, the default accent can be regarded as a mark of a single morpheme.

6.1.5 Loanwords

The majority of single morpheme loanwords that neither reflect the stress accent of the original word nor are unaccented often carry the default accent. (Below, the accent in the original word is marked by an accent mark in the orthography.)

(26)

a /tjokore'eto/ 'chócolate'

b /erebe'etaa/ 'élevator'

c /ku'rasu/ 'cláss'

d /ho'teru/ 'hotél'

e /do'rama/ 'dráma'

6.1.6 Proper nouns

Proper nouns such as personal names, place names, pseudonyms are either unaccented or accented. When they are accented, the patterns follow the default accentuation.

(27)

Accented personal name		Unaccented personal name	
a	a'kira	g	minoru
b	ma'doka	h	nagisa
c	koi'zumi	i	itiroo
d	sakaki'bara	j	matumoto
e	zjuNi'tiroo	k	kiNtaroo
f	hikoza'emoN	l	keNzaburoo

In sum, in this section we have seen that in some sectors of the Japanese vocabulary where there is no contrast in position of accent, the accented position is identical to the default accent that we identified earlier.

7 Analysis

We have defined the basic default accent pattern in Japanese as the head of a non-final bimoraic foot (cf. section 5.1). In this section, we propose an analysis of default accentuation in Japanese based on metrical foot construction. In the preceding section, we mentioned some of the "prosodically derived" words, namely truncated loanwords and hypocoristics. We will start our analysis by reviewing some of these prosodically derived forms. The prosodic structure of the prosodically derived words forms the basis of our analysis of the default accent patterns.

Hypocoristics are formed on a bimoraic template /µµ+suffix, tjaN/ (Poser 1990, Tateishi 1991a).

(28)

a (a'ki)-tjan < aki'taka 'personal name'

b (ma'a)-tjan < manami 'personal name'

c (a't)-tjan < a'tuko 'personal name'

Abbreviations of compound words have the template of two bimoraic feet in most cases: (μμ)(μμ), but shorter forms also exist (Itô 1990, Itô and Mester 1992, Suzuki 1995).

(29)
a (rimo)(koN) < rimooto koNtorooru 'remote control'
b (waa)(puro) < waado purosessaa 'word processor'
c (tere)ka < tereFoN kaado 'telephone card'

Truncations of loanwords have a bimoraic template at the left edge of the output (Itô 1990, Itô and Mester 1992, Suzuki 1995).

(30)
a (a'ni)me < anime'esjoN 'animation'
b (de'mo) < demoNsutore'esjoN 'demonstration'

Japanese musician's argot (Zuuja-Go, ZG) forms are defined as having a bimoraic foot in nonfinal position (Poser 1990, Tateishi 1991a, Itô, Kitagawa and Mester 1995).

(31)
a (jano)pi[5] < pijano 'piano'
b (zuu)zja < zja'zu 'Jazz'
c (gai)(kiti) < kitiga'i 'crazy'
d (zjaa)(mane) < maneezjaa 'manager'

In studies of the prosodically derived forms, their accentuation has been largely neglected. More generally, only a few points have been made on the relation between the Japanese pitch accent and the foot structure of Japanese words. By using the data from adaptation, we will be able to forge a link between the foot structure and the default accentuation in Japanese.

7.1 Comparison between the 'accentual cuts' of adapted forms and 'prosodically derived words'

We will first examine the prosodic structure of the domain of accentuation in the adapted forms. We will call the sub-string of the adapted form consisting of the accented syllable and everything to the right the "accentual cut". The following are some examples of the accentual cut.

(32)

a'Nnu	/dua'Nnu/	douane 'custom'
si'kuri	/masi'kuri/	mâchicoulis 'machicolation'
ro'to	/ro'to/	loto 'lotto'

(33) compares the syllable structure of three types of forms : 1) truncation/compound abbreviation (TR/AB), 2) reverse language (ZG), and 3) the accentual cuts from Japanese adaptations of French words.

(33)

Inventory of the syllable structure of prosodically derived words and adapted forms (## indicates the beginning of a form; - the potential existence of one or more preceding syllables.)

	Truncation/ Compound Abbreviation		**Reverse language (ZG)**		**Accentual cut from adapted form**	
1.	LL	tjoko < tjokoreeto	*LL		a.*-L'L	(except variation HL'L/H'LL, see 4)
					b.##L'L	ro'to loto
2.	LLL	anime < animeesjoN/ tereka < tereFoNkaado	LLL	janopi < piano	-L'LL	ma'radi maladie

3.	HL	FaNde < FaNdeesjoN/ kaNpe < kaNniNgupeepaa	HL	siime < mesi	-H'L	dua'Nnu douane
4.	HLL	haNkati < haNkatiihu/ waapuro < waadopurosessaa	HLL	gaikiti < kitigai	-H'LL	a'Ntere intérêt but cf. also aNte're
5.	HH	baateN < baateNdaa maikoN < maikurokoNpjuutaa	HH	hiikoo < koohii	-H'H	powa'NsoN poinçon
6.	LLH	eakoN < eaakoNdisjonaa katudoN < katuretudoNburi(?)	LLH	tekoheN < heNteko	-L'LH	po'tiroN potiron

7.	LLLL risutora < risutoraku tjuariNgu natumero < natukasin omerodii	LLLL okekara < karaoke	See 2. (a.LL'LL) (b.##LLLL)	masi'kuri mâchicoulis Cf. also unaccented pattern in four-mora forms, masikuri
8.	*LH	*LH	a ?-L'H b.##L'H	See 6, but variation in H'LH/HL'H mo'NtoroN/ moNto'roN Montholon ka'doo cadeau
9.	*LHL	*LHL	See 3.	

Glosses: (TR/AB: source: Suzuki 1996 and common usage collected by the author) tjoko 'chocolate', anime 'animation', tereka 'telephone card', FaNde 'foundation', kaNpe 'cheat sheet', risutora 'restructuring', natumero 'oldies', haNkati 'handkerchief', waapuro 'wordprocessor', baateN 'bartender', maikoN 'micro PC', eakoN 'air conditioner', katudoN 'cutlet bowl'; (ZG: source Itô, Kitagawa and Mester 1995) janopi 'piano', siime 'meal', okekara 'karaoke', tekoheN 'strange', gaikiti 'crazy', hiikoo 'coffee', (Adaptation of French words) loto 'lotto', maladie 'sickness', intérêt 'interest', poinçon 'punch', potiron 'pumpkin', mâchicoulis 'machicolation', Montholon 'a place name', cadeau 'gift'.

Remarkably, the inventory of the accentual cuts corresponds very closely with the prosodic structure of prosodically derived words (truncation/compound abbreviation and reverse language (ZG)). As was shown in previous studies these

prosodically derived words are analyzed in terms of feet. This association leads us to the following hypothesis:

(34) **Hypothesis**: Default accent is assigned by constructing bimoraic feet.

We will examine this hypothesis within the framework of Optimality Theory (Prince and Smolensky 1993, McCarthy and Prince 1993ab, 1995). We will construct bimoraic feet in adapted forms taking into consideration the factors we have seen in the previous sections such as the exclusion of the final syllable in foot construction, the avoidance of accent on epenthetic vowels and the noun-verb class distinction.

7.2 Analysis of default accent in Optimality Theory

In the following five sections we present an Optimality Theoretic (Prince and Smolensly 1993) analysis of the adaptation data. First we establish the constraint ranking to produce the normal antepenultimate accent; then the treatment of epenthetic vowels. The discussion then passes to the uniform accentuation of LLH# sequences vs. variable accent of HLH# sequences. The section concludes with a discussion of verbal accent.

We have found the optimality framework particularly useful for the analysis of the data. Key features that play a role in our analysis include the idea of conflicting constraints and the view that lower ranking constraints can under the appropriate circumstances make their presence felt to describe emergence of unmarked universal patterns.

7.2.1 Default position

The canonical antepenultimate accent can be obtained by ranking the following constraints (cf. Prince and Smolensky 1993: 58 on Latin antepenultimate accent).

(35)

Head-Left (Head-L): Trochaic feet.

Align (F, R, PrWd, R) (Align-R): Align the right edge of every foot with the right edge of a prosodic word (PrWd).

Non-Finality (NonFin): No prosodic head (accented foot (F) or accented syllable (S)) of PrWd is final in PrWd.

Foot-Binarity (Max/MinBin): Feet are binary at some level of analysis.

Parse-Syllable (Parse-S): Parse every syllable into a foot.

Japanese words have at most one accent. To proceed with the discussion we will assume that there is only one foot for the accentuation in a Japanese prosodic word, although there is no evidence bearing on the impossibility of multiple feet[6]. Following McCarthy and Prince (1993b), non-iterative foot-parsing can be obtained by ranking Parse-S under Align-R as shown below.

(36)
Align-R >> Parse-S

		Align-R	Parse-S
1. →	SS(SS)		**
2.	(SS)(SS)	**!	

In (36), candidate 1 wins over candidate 2 by virtue of having an aligned foot. The final foot of candidate 2 is also perfectly aligned, but the other foot is not; it is misaligned by two syllables.

Let us determine the ranking between the rest of the constraints above through examination of the simplest case of a form with a sequence of four light syllables. In (37), candidate 1, better aligned to the right than candidate 2, wins by the effect of the constraint Align-R, while candidate 3, which is better aligned to the right, loses against candidate 1. This shows the Non-Finality constraint in force.

(37)
Align-R >> Align L
NonFin >> Align-R
mâchicoulis /masi'kuri/

	maSikuli	NonFin	Align-R	Align-L
1. →	ma(si'ku)ri		*	*
2.	(ma'si)kuri		**!	
3.	masi(ku'ri)	F!		**

The basic ranking to generate antepenultimate accent is thus Foot-Binarity, Head-Left, Non-Finality >> Align-Right >> Parse-Syllable.

7.2.2 Epenthetic vowel

Now let us turn to the cases where an epenthetic vowel occupies the antepenultimate position. Recall the fact that when the antepenultimate mora is epenthetic, the accent avoids the epenthetic vowel (e.g. stylo |stilo| /*su*ti'ro/). We formulate the following constraint, assuming that the salience of the French syllable nuclei is stored as being "prominent" in the input and somehow referred to in the output evaluation[7].

(38) ***v (epenthetic vowel)**: A nonprominent nucleus cannot be the head of a foot[8].

We found in section 5.4 that the fact that the epenthetic vowels are counted as a prosodic constituent but do not carry accent creates an ordering paradox in a derivational analysis. Here an output oriented approach, such as OT, has no explanation for why the output requires reference to a property of the input. We should seek an appropriate principle governing the correspondence between relative prominence of an input and that of an output.

Aldrete (1995b) proposes the following input-dependent constraint to account for the avoidance of accent on epenthetic vowels and the metrical invisibility of epenthetic vowels.

(39)

Head(PCat)-Dep: Every segment contained in prosodic head PCat in S2 has correspondent in S1. If PCat is a prosodic head in S2, and PCat contains β then, $\beta \in$ Range.

This constraint is meant to link directly the presence or absence of a segment in the input to its prosodic status in the output. When PCat is that of syllable, it can deal with our case since the absence of a segment in the input makes a bad head syllable in the output to carry the accent. Further, the status of epenthetic vowels as a prosodic constituent is expressed by the low-ranked Head(Foot)-Dep. It is, thus, a possible treatment for the problem.

It is essential in our case that the epenthetic vowels have no correspondents in the input, since the same output vowel can be accented when it has a correspondent in the input (/kurju'dite/ < |kRydite| <u>crudité</u> 'raw vegetable'). However, we also recognize that cross-linguistically epenthetic vowels tend to be minimal in character - short, high or central (Japanese /u/ is the shortest among the five vowels (Beckman 1982 among others)). Related to the prominence of segments and accent in the output level, weak lexical vowels have a tendency to avoid accent as well. For instance, in Mokskan the accent avoids high vowels (Kenstowicz 1993b, 1997 based on Tsygank 1975) and in Chuckchee the central vowel (Kenstowicz 1993b, 1997 based on Krause 1979, Skorik 1961). Aldrete (1995b)'s approach may miss the parallelism between the behavior of epenthetic vowels and that of weak vowels. Furthermore, in Japanese adaptation, the input semivowels are rendered as vowels but such vowels avoid accent (see note 13). We attribute the fact that epenthetic vowels reject prosodic prominence (accent) to their phonetic or phonological salience. We eschew the formal analysis of this association and proceed with the discussion making use of the constraint *v (38).

In order to account for cases involving *v, we have to make a decision whether to accept head-shift or degenerate feet in the winning candidates. Depending on

which option we choose we have two alternative rankings, as we will show shortly. In the ranking in (40) where we allow head-shift, the winner is 4. Consequently, candidates 1, 2 and 3 must be excluded by constraints ranked above Head-L. Candidate 3 can be ruled out by ranking NonFin above Head-L, candidate 2 can be excluded by ranking Align-R above Head-L, and finally candidate 1 is excluded by ranking *v above Head-L.

(40)
*v, NonFin >> Align-R >> Head-L
abricot /aburi'ko/

	abRiko	*v	NonFin	Align-R	Head-L
1.	a(bu'ri)ko	*!		*	
2.	(a'bu)riko			**!	
3.	abu(ri'ko)		F!		
4. →	a(buri')ko			*	*

The ranking between *v and NonFin can be determined by taking a two-syllable form the first syllable of which contains an epenthetic vowel. In this case, the accent falls on the second syllable. As shown below, NonFin is dominated by *v.

(41)
*v >> NonFin
prix /puri'/

	pRi	*v	NonFin
1	(pu'ri)	*!	F
2 →	(puri')		FS

The other possibility that we must consider is that the foot structure of /aburi'ko/ is abu(ri')ko with a degenerate foot. To allow degenerate feet, we adopt the Minimal Binarity-2moras (MinBin) constraint of Green and Kenstowicz (1995).

(42) **Minimal Binarity-2moras** (MinBin): A metrical foot contains at least two moras.

By allowing a degenerate foot, Head-L can be satisfied. In (43), in order to let candidate 1 win against candidate 2, we need to place Head-L above MinBin. Since candidate 3 with an initial accent loses to candidate 1, Align-R must dominate MinBin. The ranking NonFin >> Align-R being established, the NonFin violation is fatal to candidate 5; thus NonFin also dominates MinBin. Comparison between candidates 1 and 4 tells us that *v dominates MinBin.

(43) Head-L >> MinBin
*v, NonFin >> Align-R >> MinBin
abricot /ab*u*ri'ko/

	abRiko	*v	NonFin	Head-L	Align-R	MinBin
1. →	abu(ri')ko				*	*
2.	a(b*u*ri')ko			*!	*	
3.	(a'b*u*)riko				**!	
4.	a(b*u*'ri)ko	*!			*	
5.	ab*u*(ri'ko)		F!			

In this ranking, since Head-L dominates MinBin, the winning candidate for the form /p*u*ri/ < prix has a degenerate foot as shown in (44). Since candidate 2 incurs more NonFin violations than candidate 1 does, *v dominates NonFin.

(44)
*v >> NonFin
prix /p*u*ri'/

	pRi	*v	NonFin
1	(p*u*'ri)	*!	F
2 →	p*u*(ri')		FS

We thus conclude the basic ranking for the default accentuation is one of the two following possibilities:

(45)
(A) ranking with a head displacement (vσ') option:

*v >> NonFin >> Align-R >> Head-L, Parse-S

FtBin (MinBin)[9] >> Head-L

(B) ranking with a degenerate foot (σ') option:

*v >> NonFin >> Align-R >> MinBin, Parse-S

Head-L >> MinBin

7.2.3 Pre-antepenultimate accent

Both rankings can yield the accentuation patterns in longer forms as well. This can be illustrated with two examples. The syllable sequence of LLH output forms have the pre-antepenultimate mora accent (see above). The right result is produced by the constraint rankings above as shown in (46) and in (47).

(46)
(A) ranking
potiron /po'tiroN/

	potiRõ	NonFin	Align-R	Head-L
1.	poti(ro'N)	FS!		
2.	(poti')roN		*	*!
3. →	(po'ti)roN		*	

(47)
(B) ranking
potiron /po'tiroN/

	potiRõ	NonFin	Head-L	Align-R	MinBin
1. →	(po'ti)roN			*	
2.	poti(ro'N)	FS!			
3.	(poti')roN		*!	*	
4.	po(ti')roN			*	*!

In the analyses above, we did not consider the possibility of constructing a bimoraic foot that breaks up a heavy syllable. However, we might consider that moras are directly footed without passing through syllables. If this is the case, we need a constraint that guarantees the integrity of a syllable within a foot (Prince and Smolensky (1993) suggest that Principle of Syllabic Integrity is a function in GEN, thus, it is taken for granted.). Disregarding syllable boundaries, a sequence of LH or HL could be parsed into feet as (μ.μ)μ (a period indicates a syllable boundary) or μ(μ.μ) respectively: /potiroN/ can be parsed as /po(ti'ro)N/ which would satisfy NonFin and relative AlignR, but this is ill-formed. A constraint on

Syllabic Integrity is a type of constraint defining the prosodic hierarchy (cf. Headedness of the Prosodic Hierarchy, Selkirk (1993): a constituent of level C^i in the Prosodic Hierarchy must dominate a constituent of level C^{i-1} i.e. of the next level down). We formulate Prosodic Hierarchy constraint (ProH) referring not only to the syllable-foot relation but also to the links between each level in the prosodic hierarchy as follows:

(48) **Prosodic Hierarchy** (ProH): An edge of prosodic constituent C cannot occur inside a constituent inferior to C.

This constraint is respected in the sequence of LLH in our adaptation so that *LL'H is not found. The dominance of this constraint explains also the absence of LH or LHL shapes in the truncation where a bimoraic foot is always placed at the left edge of a form (cf. */demoN/, */demoNsu/ but /demo/ < /demoNsutoreesjoN/ 'demonstration' Itô (1990), Itô and Mester (1992)). Suzuki (1995), however, allows the violation of misalignment between the right edge of a foot and that of a syllable in order to explain the accentuation of some loanwords of the shape -L'H: /esuki'moo/ 'Eskimo', /kaNga'ruu/ 'kangaroo' analyzed as having (μ.μ)μ structure. The forms above are found beside -L'LH: /ene'rugii/ 'energy' and -H'LH: /ka'adigaN/ 'cardigan'. She considers both patterns default accentuation: one is obtained by reranking two constraints.[10] In our data, we also find variation between H'LH and HL'H although the L'LH pattern is stable. We will consider a solution for the variation without violating ProH in the next section and won't consider the violability of ProH any longer in this paper. Before turning to the variation case, we will test our rankings on another longer but stable form.

In case the number of nonfinal syllables exceeds a binary foot size and an epenthetic vowel appears in the otherwise predicted accented position such as in LvLH sequence, accent falls on the penultimate syllable. In order to account for this case, we need to exclude a potential larger foot grouping such as (σ'σσ)σ ; otherwise, as shown in (49) and (50), the candidate with a ternary foot would be

wrongly chosen.

(49)
(A) ranking
Reblochon /roburo'sjoN/

	ROblOSõ	Align-R	Head-L
1	ro(buro')sjoN	*	*!
2 ?	(ro'buro)sjoN	*	

(50)
(B) ranking
Reblochon /roburo'sjoN/

	ROblOSõ	Align-R	MinBin
1	robu(ro')sjoN	*	*!
2 ?	(ro'buro)sjoN	*	

To avoid the wrong choice, a constraint disallowing parsing into larger than binary feet, which we refer to Maximal Binarity (MaxBin), is needed.

(51) **Maximal Binarity** (MaxBin): A metrical foot contains at most two moras or two syllables.

At this stage, we can place MaxBin anywhere before Head-L in the (A) ranking, and anywhere before MinBin in the (B) ranking. In the next section, we will examine MaxBin more closely.

7.2.4 Variation

Let us recall that a variation is observed in HLσ sequences (cf. section 5.2):

(52)
H'LL/HL'L : a'Ntere/aNte're intérêt 'interest'
H'LH/HL'H : mo'NtoroN/moNto'roN Montholon 'place name'

Let us treat the variation in the HLσ case with the rankings that we established in the preceding section. Ranking (A) where FtBin dominates Head-L predicts (H')Lσ pattern to be the winner. This is illustrated in (53) with the example Montholon having two variants: /mo'NtoroN/ and /moNto'roN/.

(53)
The original (A) ranking: FtBin (Max/MinBin) >> Align-R
Montholon /mo'NtoroN/

	mõtolõ	Max/MinBin	Align-R	Head-L
1. →	(mo'N)toroN		**	
2.	(mo'Nto)roN	*!	*	
3.	moN(to')roN	*!	*	

Since Align-R also dominates Head-L, we have to place FtBin (i.e. Max/MinBin) higher than Align-R, otherwise candidate 2 and candidate 3 would win over (H')Lσ for being better aligned.

The next step is to account for the HL'σ variant. There are two ways of obtaining variation: with a single ranking with more than one constraint of equal strength which would allow more than one candidate to win; or with reranking of two constraints each one of which allows a distinct candidate to win, and assume that speakers can switch from one grammar to the other without referring to any input specification. In both cases, the grammar(s) accounting for the variation should not affect the other stable cases. We will take one of the approaches depending on results of the analysis. Let us continue the analysis of the case at hand. By ranking MinBin lower than Align-R and MaxBin, the H(L')σ form, candidate 2 in (54), can this time become the winner.

(54)
Reranked (A) : MaxBin, Align-R >> MinBin
Montholon /moNto'roN/

	mõtolõ	MaxBin	Align-R	MinBin	Head-L
1.	(mo'N)toroN		**!		
2. →	moN(to')roN		*	*	
3.	(mo'Nto)roN	*!	*		
4.	(moNto')roN	*!			*

In order to rule out candidate 3 with a trimoraic foot we need to divide FtBin into its two components, MaxBin and MinBin ; and MaxBin dominates MinBin.

If we assume reranking to be minimal, we may conclude that MaxBin dominates MinBin in the original (A) ranking. Another result worth noting is that we need to accept degenerate feet also in the (A) ranking, in order to account for the variant in (54).

Additional ordering in (A) ranking:

(55) MaxBin >> **MinBin** >> **Align-R** >> Head-L

Reranked (A):

(56) MaxBin >> **Align-R** >> **MinBin** >> Head-L

Let us now turn to the analysis of the same case under the (B) ranking repeated below:

(57)

*v >> NonFin >> Align-R >> MinBin, Parse-S

Head-L >> MinBin

MaxBin >> MinBin

Ranking (B), where Align-R dominates MinBin, predicts H(L')σ to be the winner in case MaxBin dominates MinBin as in (58). Thus, in this case again we need to split FtBin into two types; MaxBin and MinBin. When MaxBin dominates MinBin, candidates with bigger feet than bimoraic ones such as (HL)σ are ruled out and candidate H(L')σ with a degenerate foot is the winner.

(58)

The original (B) ranking: MaxBin >> MinBin

Montholon /moNto'roN/

	Mõtolõ	Align-R	MaxBin	MinBin
1. →	moN(to')roN	*		*
2.	(mo'N)toroN	**!		
3.	(mo'Nto)roN	*	*!	

When MinBin dominates MaxBin as in (59), (H'L)σ is predicted to be the winner.

(59)
Reranked (B) : MinBin >> MaxBin
Montholon /mo'NtoroN/

	mõtolõ	Align-R	MinBin	MaxBin
1.	moN(to')roN	*	*!	
2. →	(mo'Nto)roN	*		*

Thus, HL'σ/H'Lσ variants obtain by reversing MaxBin and MinBin.

When MinBin dominates MaxBin in the alternant (B) ranking, we have to ensure that the ranking does not yield a wrong variant in the case of LvLσ sequence. If MinBin dominates MaxBin then it may appear that Lv(L')σ will lose out to (L'vL)σ. But there is no variation here. The only variation is in the HLσ sequence. To distinguish the two cases, we clarify that it is MaxBin defined on moras (MaxBinM) that alternates with MinBin. MaxBin on syllables (MaxBinS) remains top-ranked and hence will exclude (L'vL)σ and allow Lv(L')σ to win under both of the (B) rankings as shown in tableaux (60) and (61).[11]

(60)
The original (B) ranking: MaxBinS, MaxBinM >> MinBin
Reblochon /roburo'sjoN/

	ROblOSõ	MaxBinS	MaxBinM	MinBin
1 →	robu(ro')sjoN			*
2	(ro'buro)sjoN	*!	*	

(61)
Reranked (B): MaxBinS, MinBin >> MaxBinM
Reblochon /roburo'sjoN/

	RoblOSõ	MaxBinS	MinBin	MaxBinM
1 →	robu(ro')sjoN		*	
2	(ro'buro)sjoN	*!		*

Additional ordering in (B) ranking:

(62) MaxBinS, **MaxBinM** >> **MinBin**

Reranked (B):

(63) MaxBinS, **MinBin** >> **MaxBinM**

Here are the results of all that we have studied so far:

(64)

Integral (A) ranking:

*v >> NonFin >> MaxBin >> **MinBin** >> **AlignR** >> Head-L >> Parse-S

MaxBin >> Head-L

Reranked (A):

*v >> NonFin >> MaxBin >> **AlignR** >> **MinBin** >> Head-L >> Parse-S

MaxBin >> Head-L

Integral (B) ranking:

*v >> NonFin >> AlignR >> **MaxBinM** >> **MinBin**, Parse-S

Head-L, MaxBinS, **MaxBinM** >> **MinBin**

Reranked (B):

*v >> NonFin >> AlignR >> **MinBin** >>**MaxBinM**, Parse-S

Head-L, MaxBinS, **MinBin** >> **MaxBinM**

We are unable to decide which ranking is closer to the truth. Let us, however, consider some implications comparing the two rankings. In the (A) ranking, there seems to be some redundancy in allowing both degenerate feet and head-shift. The existence of monomoraic words suggests that degenerate feet are a possible option in Japanese, while we have no independent evidence for head-shift in Japanese accentuation. The (B) ranking, on the other hand, requires an additional constraint, MaxBinS; this is due to the move of allowing feet larger than bimoraic ones. A good thing about the (B) ranking is that reranking between the foot type constraints appears conceptually simpler than reranking between different types of constraints, namely, Alignment and foot type in the (A) ranking. These remarks are however not sufficient for deciding which ranking is superior. Trade-offs between head-shift and foot size in our analyses lead us to more general questions about the universal constraints on foot form:

(65)

1. Do we allow head-shift, i.e. change between trochaic and iambic rhythms within a language?
2. Is a foot grouping larger than binary permissible?

The head-shift solution seems awkward, but a stronger constraint could dominate a rhythmic constraint: in the analyses of Cohn and McCarthy (1994) and Kenstowicz (1995a) for Indonesian, a stronger stem suffix alignment constraint changes the head position in a foot to the right from the left-head pattern in monomorphemic cases. In addition, Catalan hypocoristic truncation (Cabré and Kenstowicz 1995), which is based on a trochaic foot grouping, allows the (LH) foot type only when the preceding syllable is heavy (i.e. (H)(LH)), so that exhaustive parsing is ensured while at the same time a rhythmically non harmonic (HL) grouping is avoided (cf. Prince and Smolensky 1993: 59). Concerning question 2, results from the (B) ranking imply that a moraic foot system may allow bisyllabic grouping to a certain extent : when MinBin dominates MaxBin, the foot form (HL) may be the winner. This may be due to the fact that while a (HL) foot certainly violates the bimoraic constraint, it satisfies the bisyllabic constraint. Other foot types larger than bimoraic violate more constraints: feet with a sequence of three syllables such as (LLL) violates bimoraic and bisyllabic groupings, and a foot of two heavy syllables (HH) violates the bimoraic constraint to an even greater extent than (HL) does, because (HH) has four moras while (HL) has three. If (HL) is allowed by virtue of being bisyllabic, then Maximum Binarity still holds on the syllabic level in the Japanese grammar (cf. Catalan hypocoristic truncation, which is minimally bimoraic and maximally bisyllabic ; Cabré and Kenstowicz 1995). We will leave these questions open.

7.2.5 Verb accentuation

We shall now account for the verb accentuation patterns. Recall that one of the verb accentuation patterns in Japanese is accent on the syllable containing the

penultimate mora, e.g., /tabe'ru/ 'to eat', /ha'iru/ 'to enter', /omo'o/ 'to think'. This pattern is also observed in the adapted forms of French verbs /imazi'ne/ < imaginer 'to imagine' (the other types are the regular default and unaccented patterns, cf. section 5.3). When the penultimate position contains an epenthetic vowel, the accent shifts leftward, for example, /koNko'k*u*te/ < concocter 'to prepare' /seke's*u*to*o*re/ < sequéstrer 'to sequester'. We will first construct rankings for the canonical penultimate verb accentuation pattern, and then determine how it interacts with the constraint *v.

For the penultimate accentuation pattern, some minimal modifications must be made from the regular default constraint ranking. First, the final syllable may be parsed into the left-headed bimoraic foot; this means Non-Finality is not in effect in the verb class; hence, Align-R dominates Non-Finality.

(66) shows that simply by reversing Align-R and NonFin in both the regular default rankings (A) and (B) the penultimate accent is obtained. The relevant parts of each ranking, Align-R and NonFin, converge, so a single tableau is presented for both rankings. In the (A) ranking, Align-R and NonFin dominate Head-L, and in the (B) ranking, Align-R and NonFin dominate MinBin. Neither Head-L nor MinBin plays any crucial role here because the candidates 2, 3 and 5 violating either Head-L or MinBin are already ruled out by Align-R or by NonFin.

(66)
localiser /rokari'se/

	l0kalize	Align-R	NonFin
1 →	roka(ri'ze)		F
2	roka(rize')		FS
3	roka(ri')ze	*!	
4	ro(ka'ri)ze	*!	
5	ro(kari')ze	*!	

Second, another constraint is necessary to insure that the final mora will not be accented in case the penultimate syllable contains an epenthetic vowel. In the

example /koNko'*k*ute/ < concocter, the form is accented on the antepenultimate syllable. The accent is shifted to the left from the penultimate syllable. If it were shifted to the right, the final mora would be accented. We will formulate a constraint that forbids the accent to fall on the final mora as follows :

(67) **NonFin-μ**: The final mora cannot be a prosodic head[12].

Here again both rankings yield the same output, but we show it in two separate tableaux in order to demonstrate the difference from the default case where we had to make a choice between head-shift and degenerate-foot options (cf. tableaux (40) and (43)). Under the (A) ranking, the winning candidate 3, carrying the accent on the antepenultimate mora, violates Align-R, while ill-formed candidates 1 and 2 violate *v or NonFin-μ respectively.

(68)
*v, NonFin-μ >> AlignR under Modified (A) ranking
concocter /koNko'*k*ute/

	kõk0kte	*v	NonFin-μ	Align-R	NonFin	Head-L
1	koNko(k*u*'te)	*!			F	
2	koNko(k*u*te')		*!		FS	*
3 →	koN(ko'k*u*)te			*		

Under Reranked (A), Align-R and MinBin change place without affecting the result. Since a candidate such as koN(ko')kute violating MinBin incurs more Align-R violations, it will be eliminated regardless of which constraint ranks higher.

Under the (B) ranking, a better aligned candidate, candidate 2, is ruled out by NonFin-μ, showing that NonFin-μ dominates Align-R in this ranking as well.

(69)
*v, NonFin-µ >> AlignR under Modified (B) ranking
concocter /koNko'*k*ute/

	kõk0kte	*v	NonFin-µ	Align-R	NonFin	MinBin
1	koNko(k*u*'te)	*!			F	
2	koNkok*u*(te')		*!		FS	*
3 →	koN(ko'k*u*)te			*		

Under Reranked (B), MaxBinM and MinBin change place. Again, this transposition does not affect the ranking that we have establishe d. We will omit the tableau showing the effect of this transposition.

In order to determine the ranking between the first two constraints, *v and NonFin-µ, we need a form where the final mora would be the only potential accent shift site, such as louer |lwe| 'to rent'. The input |lwe| yields /r*u*e'/, accented on the second vowel, not on the epenthetic one[13]. This fact shows that *v dominates NonFin-µ in both rankings. Each ranking chooses a distinct ouput. In ranking (A), where MinBin is undominated, the output is right-headed.

(70)
Modified (A) ranking
louer /r*u*e'/

	lwe	*v	NonFin-µ	Align-R	NonFin	Head-L
1	(r*u*'e)	*!		*	F	
2 →	(r*u*e')		*	*	FS	*

Under the (B) ranking, where Head-L is undominated, the optimal candidate has a degenerate foot.

(71)
Modified (B) ranking
louer /r*u*e'/

	lwe	*v	NonFin-µ	Align-R	NonFin	MinBin
1	(r*u*'e)	*!		*	F	
2 →	r*u*(e')		*	*	FS	*

Summary of verb rankings (constraints in bold reverse rankings):

(72)
Modified (A) ranking:

*v >> NonFin-μ >> Align-R >> NonFin >> Head-L, Parse-S

MaxBin >> **MinBin** >> **Align-R** >> Head-L

Modified (B) ranking:

*v >> NonFin-μ >> Align-R >> NonFin >> **MaxBinM** >> **MinBin**, Parse-S

Head-L, MaxBinS, **MaxBinM** >> **MinBin**

We have seen that the difference between the default accentuation and the verb accentuation is basically a matter of reranking Non-Finality and Align-R constraints. Non-Finality-μ emerges in the verb accentuation, because NonFin-F or -S cannot rule out accent on the final mora due to Align-R dominating NonFin-F or -S in this class. The final mora can be accented only in monomoraic forms and in sequences of two light syllables where the first syllable is epenthetic, showing *v is undominated.

8 Conclusion

This paper has examined accentuation patterns in the form of French (and some English) words adapted into Japanese. The data are analyzed within Optimality Theory (Prince and Smolensky 1993).

In our study of Japanese adaptation of English words, the primary stress in an English word corresponds to the position of pitch accent in the adapted form. In contrast with English, no French accent is tracked in the adaptation data of French words, but the accent is attributed to a certain position by default. We assumed that the French input to the Japanese adaptation process lacks accent specification. Adaptation data of French words give an abundant source for analysis of default accent patterns. The patterns that appeared in adapted forms correspond to ones found in marginal sectors of the native Japanese vocabulary, such as proper names and prosodically derived words, where the position of the accent is predictable. The patterns clearly indicate the existence of the default accentuation

in Japanese and a relationship between the prosodic foot structure and the position of the default pitch accent.

In Japanese adaptations of French words, pitch accent falls on the syllable containing the antepenultimate mora of output forms when the final syllable is light (/masi'kuri/ < |maSikuli| mâchicoulis 'machicolation'), and on the syllable containing the pre-antepenultimate mora when the final syllable is heavy (/po'tiroN/ < |potiRõ| potiron 'pumpkin'). These patterns are referred to as "the default accentuation". In the verb class, beside the default and the unaccented patterns, we find the accent falling on the syllable containing the penultimate mora (/rokari'ze/ < |lOkalize| localiser 'to locate'). This is called the "verb accentuation" pattern. In both the default and the verb accentuation, accent avoids falling on epenthetic vowels. We hypothesized that prosodic constituents, the syllable and the mora, and epenthetic vowels play a major role in foot construction. The results of the examination confirm the hypothesis that the placement of the foot determines the default accentuation as well as the verb accentuation. In default accentuation, the accent is defined as optimally being located on the head of a nonfinal bimoraic foot, (μ'μ)σ# (where the final syllable σ may be either light or heavy), while, in the verb accentuation, accent falls on the head of a final bimoraic foot, (μ'μ)#. The avoidance of accent on epenthetic vowels is explained by a top-ranked constraint *v.

Two equivalent constraint rankings ((A) and (B)) were arrived at, depending on the choice between the options of head-shift (in (A)) and degenerate feet (in (B)) in order to account for the accent shift effect which occurs when an accent would otherwise fall on an epenthetic vowel. In the default case, the accent shifts to the right of the canonical position (/abɯri'ko/ < |abRiko| abricot 'apricot', but when this position itself is filled with an epenthetic vowel, the accent shifts to the left, /se'rɯkɯrɯ/ < |sERkl| cercle 'circle'); this can be analyzed as either head-shift

or a monomoraic grouping of the nonfinal foot (a degenerate foot). On the other hand, in the verb accentuation, accent shifts to the left of its canonical position /seke'su*to*re/ < |sEkEstRe| sequestrer 'to sequestrate', showing a dispreference for the final mora carrying the accent.

Variations appear in our data for the forms of HLH and HLL syllable sequences. This is a case where L is "trapped" (Mester 1994) between a preceding H and a following syllable. The accent may fall either on the initial H or on the second L. Neither of the variants, H'Lσ and HL'σ, can satisfy a bimoraic foot grouping, Non-Finality, and Align-R at the same time. The variation is accounted for by reversing the order of two constraints in each ranking. In the (A) ranking, reversing the order of MinBin and Align-R allows either of the candidates (H')Lσ and H(L')σ to win. In the (B) ranking, by reversing MaxBin and MinBin, either H(L')σ or (H'L)σ will be selected. As a result, degenerate feet are necessary for both analyses, while only the (B) ranking allows a trimoraic grouping, (HL).

In order to choose one of the two alternative rankings, we need more restricted universal constraints on possible foot forms: either an absolute ban on head-shift, or an absolute ban on feet larger than bimoraic (in a quantity-sensitive trochaic system). Another theoretical issue to be pursued is the correspondence between input and output prominence. The fact that the epenthetic vowels cannot carry accent but count in the construction of a prosodic constituent for the accentuation is problematic in the derivational approach. In OT, this fact could be translated as epenthetic vowels lacking prominent correspondents (i.e. vowels) in the input; such vowels are prevented from occupying a head position in a foot in the output. However, the correspondence between different kinds of prominence such as this is not readily accounted for by means of ranking familiar constraints. Furthermore, standard OT posits no prosodic structure in the input, which does

not allow for recognition of a syllable head (i.e. nucleus) in the input. This question, thus, requires more reflection and case studies.

Acknowledgements

This paper is based on my dissertation research (Shinohara 1997b). I am indebted to my informants for providing me with the data and to Annie Rialland, Nick Clements, François Dell, Patrick Sauzet, Jacqueline Vaissiere and Irène Tamba for helpful suggestions. I wish to thank two anonymous JEAL reviewers for valuable comments and criticisms and to Benjamin Bruening and Cheryl Zoll for useful comments on an earlier draft of this paper. I gratefully acknowledge helpful discussions with Michael Kenstowicz on several points in the paper. There will be mistakes of interpretation for which I alone am responsible.

Notes

[1] Transcriptions are phonemic. Following customary practice, pitch accents are marked after the accented mora. Input forms are represented between | | and the adapted forms and any other phonemic representations are within / /. Where necessary, phonetic transcriptions are indicated by [ ].

[2] Verbs and adjectives derived from nouns preserve the accent of the noun e.g., /he'Nka-suru/ 'to change' < /he'Nka/ 'change', /sjoozi'ki-da/ 'honest' < /shoozi'ki/ 'honesty'. For the accentuation of underived verbs/adjectives forms other than the infinitive one, see McCawley (1968).

[3] In a study of 'prefinal lengthening' in syllabification (see section 2.2), the segments /r/ and /s/ manifest a certain 'invisibility' as well (see Shinohara 1996). We suspect that this fact is related to a particular phonological status of these segments in Japanese grammar, since they are used as epenthetic consonants in some contexts in the native stratum of Japanese: /tabe-(r)-u/ 'eat, non past' vs. /kak-u/ 'write'; /haru(s)ame/ 'rain in spring' < /haru/ 'spring'+ /ame/ 'rain'. We will leave this issue for future research.

[4] Except LLLL, HLL and LvLL sequences, for which we find unaccented variants. We leave it as a task for future research to explain why these sequences tend to be unaccented. It is notable that according to Sugito (1992) 76% of four mora words in Japanese are unaccented. See also note 6.

[5] ZG is, in most cases, unaccented: /iihi/ < /hi/' 'fire', /siina/ < /na'si/ 'doen't exist', /buusuto/ < /suto'obu/ 'heater'. However, certain items are accented; in this case the patterns follow the default accentuation: /su'nite/ < /te'nisu/ 'tennis', /pu'ita/ < /ta'ipu/ 'type' (see Itô, Kitagawa and Mester 1995 ROA version for more information). For the unaccented patterns, we suppose a process of "deaccentuation" that applies to familiarized items or to the items where a disguising effect is expected such as the case of argot (See also note 6 for the unaccentedness of four-mora ZG forms).

[6] Some of the four-mora forms of prosodically derived words, namely the abbreviated compounds (hereafter, AB) and the reverse language (ZG) can be analysed as comprising two feet (cf. section 6, b and d) and these four-mora forms are systematically unaccented: /waapuro/ (AB), /natumero/ (AB), /hiikoo/ (ZG). Four-mora forms of truncated loanwords are mostly unaccented too, but they can also follow the default accent patterns: /rihabiri/riha'biri/ 'rehabilitation'. In truncation, bimoraic grouping is not visible as it is in AB and ZG. We therefore suspect a relationship between the FF structure and its unaccentedness, but we leave this as a topic for future investigation.

[7] In our preliminary study of the acoustics of output vowels, there seems to be no difference in phonetic prominence (measured in amplitude, duration, Fo, energy) between the epenthetic vowels and nonepenthetic ones. We suppose that difference in relative phonological prominence is determined by the presence or absence of an input correspondent and not by the properties the output vowels themselves.

[8] In the situation of loanwords, which we distinguish from adaptation where the informants have access to original forms, this constraint does not necessarily hold because a borrower who first places accent on any given loanword may not always refer to its original pronunciation in the source language from which it is borrowed: Hence /kuris*u*'mas*u*/ 'christmas'.

[9] We have not determined the position of the other counterpart of FtBin, namely, MaxBin, yet. It will be discussed later.

[10] We suspect that even in the loanword data the LL'H pattern is marked. More generally loanwords may not be as reliable an indicator of the default accent as adaptations are because they can reflect different stages of integration into the native lexicon as well as other idiosyncrasies. Our adaptation data is more systematic and seems to better accord with cross-linguistically well attested structures or sites of variation.

[11] An anonymous JEAL reviewer remarks that size constraints are typically defined over either moras or syllables but not both. We respond with two observations. First, this view reflects a parametric interpretation of the prosodic structure of a language. But in the Optimality approach taken here Binarity constraints over moras and syllables are different members of the same family of UG constraints. There is no reason why under appropriate circumstances both cannot play an active role in the same language. Second, a related observation: the traditional unit of Japanese prosody is the mora (e.g. Otake (1991) proposes the mora as the unit of speech segmentation). But Itô's (1990) work on truncation with the striking minimal pair maiku<rohoN> 'microphone' vs. demo<NsutoreesjoN> 'demonstration' revealed two separate conditions (with two different prosodic units) simultaneously imposed on the prosodic parse: a minimally disyllabic prosodic word with a bimoraic foot at its left edge.

[12] If this constraint targets a final vowel or syllable, verbs ending in LH such as /omo'o/ ' to ponder' would be incorrectly excluded.

[13] In this example, the French semi-vowel |w| is adapted as /u/, but this /u/ is regarded as a non-prominent vowel, since the correspondent |w| in the input is not a syllable peak. We might consider /u/ is actually epenthetic to break up the |lw| input cluster, and then, /w/ is deleted from the output sequence /we/ because /we/ is an illicit sequence in Japanese. However, French semi-vowels are regularly adapted as vowels. This is shown by the fact that word-initial semi-vowels are also adapted as vowels: |wazo| oiseau 'bird' is adapted as /uwa'zo/, where /w/ is inserted before /a/. Notice that in the form /uwa'zo/, the default accent is shifted to the penultimate position as well.

References

Aldrete, John (1995b) *Faithfulness to prosodic heads*, Ms., University of Massachusetts, Amherst.

Akinaga, Kazue (1981) (ed.). *Meikai nihongo akusento jiten* [Accentuation dictionnary of Japanese] Sanseido, Tokyo.

Beckman, Mary (1982) "Segment duration and the "mora" in Japanese", *Phonetica* 39, 113-135.

Brame, Michael (1973) "On stress assignment in two Arabic dialects", in S. Anderson and P. Kiparsky (eds.), *A Festschrift for Morris Halle*, 14-25, Holt, New York.

Browselow, Ellen (1982) "On predicting the interaction of stress and epenthesis", *Glossa* 16, 115-132.

Cabré, Theresa and Kenstowicz, Michael (1995) "Prosodic trapping in Catalan" *Linguistic Inquiry 26.4*

Cohn, Abigail and McCarthy, John. (1994) *Alignment and parallelism in Indonesian phonology*, Ms., University of Massachusetts, Amherst.

Goldsmith, John (1976) *Autosegmental phonology*, Ph.D. Dissertation, MIT, Cambridge MA.

Green, Thomas and Kenstowicz, Michael (1995) "The lapse constraint", *FLSM* 6, 1-14.

Hagstrom, Paul (1997) "Contextual metrical invisibility in Mohawk and Passamaquoddy", in Bruening, B., Kang, Y. & McGinnis, M. (eds.), *PF Papers at the Interface MITWPL* 30, 113-182, MIT, Cambridge MA.

Halle, Morris and Vergnaud, J-R. (1987) *An essay on stress*, MIT Press, Cambridge, Massachusetts.

Haraguchi, Shosuke (1977) *The tone pattern of Japanese: an autosegmental theory of tonology*, Kaitakusha, Tokyo.

Haraguchi, Shosuke (1991) *A theory of stress and accent*, Foris Publication, Dorecht.

Haraguchi, Shosuke (1994) *Oninron* [Phonology], *Gendai no Eigogaku Siriizu 3*. Kaitakusha, Tokyo.

Hayes, Bruce (1989) "Compensatory lengthening in moraic phonology" *Linguistic Inquiry* 20, 253-306.

Hayes, Bruce (1995) *Metrical stress theory principles and case studies*, The University of Chicago Press, Chicago.

Hualde, Jose. (1991) "Unspecified and unmarked vowels", *Linguistic Inquiry* 22. 1, 205-209.

Hume, Elisabeth (1992) *Front vowels, coronal consonants and their interaction in nonlinear phonology*, Ph.D. Dissertation, Cornell University, Ithaca.

Itô, Junko and Mester, Armin (1992) "Weak layering and word binarity", *LRC-92-09*, University of California, Linguistic Research Center, Santa Cruz.

Itô, Junko and Mester, Armin (1995a) "Japanese phonology," in Goldsmith, J. (ed.), *The handbook of phonological theory* 817-838, Blackwell, Oxford.

Itô, Junko, Kitagawa, Y, Mester, Armin. (1995) "Prosodic faithfulness and correspondence evidence from a Japanese argot," *Journal of East Asian Linguistics* 5, 217-94; a new version in Rutgers Optimality Archive.

Itô, Junko (1989) "A prosodic theory of epenthesis", *Natural Language and Linguistic Theory* 7, 217-59.

Itô, Junko. (1990) "Prosodic Minimality in Japanese" *Chicago Liguistic Society* 26, 2; 213-39.

Katayama, Motoko (1995) "Loanword accent and minimal reranking in Japanese", in Rachel, Walker, Lorenz, Ove and Kubozono, Haruo (eds.) *Phonology at Santa Cruz* 4, 1-12.

Katayama, Motoko (1998) *Optimality thory and Japanese loanword phonology*, PhD. Dessertation, University of California, Santa Cruz.

Kenstowicz, Michael (1981) "Vowel harmony in Palestinian Arabic a suprasegmental analysis," *Linguistics* 19, 449-465.

Kenstowicz, Michael (1993) "Peak prominence stress systems and optimality theory", in *Proceedings of the 1st international conference on linguistics at Chosun university*, 7-22. Foreign Culture Research Institute Chosun University Kwangju, Korea.

Kenstowicz, Michael. (1995a) "Cyclic vs. noncyclic constraint evaluation," *Phonology* 12, 397-436.

Kenstowicz, Michael (1997) "Quality-sensitive stress," in Bertinetto, Pier Marco (ed), *Rivista di linguistica*, 157-187, Pisa.

Kenstowicz Michael, and Sohn, Hyang-Sook (1998) "Accentual adaptation in North Kyungsang Korean," ms. MIT.

Kubozono, Haruo (1993b) *The organisation of Japanese prosody*, Kurosio Publishers, Tokyo.

Kubozono, Haruo (1995) "Constraint interaction in Japanese phonology Evidence from compound accent," in Rachel, Walker, Lorenz, Ove and Kubozono, Haruo (eds.), *Phonology at Santa Cruz* 4, 21-38.

Labrune, Laurence (1993) *Le statut phonologique de /r/ en japonais et en coréen histoire, typologie, structure interne des segments*, Thèse de doctorat, Université Paris 7, Paris

Liberman, Mark (1975) *The intonational system of English*, Ph.D. Dissertation , MIT, Cambridge MA.

Lovins, Julie (1973) *Loanwords and the phonological structure of Japanese*, Ph.D. Dissertation, University of Chicago, Chicago

McCarthy, J. John, and Prince, Alan (1993a) *Prosodic morphology I.* ms., University of Massachusetts, Amherst.

McCarthy, J. John, and Prince, Alan (1993b) "Generalized alignment," *Yearbook of Morphology*, 79-153.

McCarthy, John. & Prince, Alan (1995) "Faithfulness and reduplicative identity," in Beckman, J., Dickey, L. & Urbanczyk, S. (eds.), *UMOP Papers in optimality theory* 18, 249-384, Umass, Amherst Cambridge MA.

McCawley, James (1968) *The phonological component of a grammer of Japanese*, Mouton, The Hague.

McCawley, James (1977) Accent in Japanese. *Studies in stress and accent SCOPIL* 4, 261-302.

Mester, Armin (1994) "The quantitative trochee in Latin", *Natural Language and Liguistic Theory* 12, 1-62.

Michelson, Karen (1988) *A comparative study of Lake-Iroquoian accent*, Kluwer, Dordrecht.

NHK (ed.) (1985) *Nihongo hatuon akusento jiten* [Accent dictionnary of Japanee], Nihon Hoosoo Kyookai, Tokyo

Otake, Takasi (1991) Nihongo onsei no segumenteesyon yunitto [segmentation unit in Japanese phonetics], *Singaku Gihoo SP90-108*, 41-46.

Paradis, Carole. & LaCharité, Darlene. (1997) "Preservation and minimality in loanword adaptation," *Journal of Linguistics* 33.1

Pesesky, David (1996) Some optimality principles of sentence pronunciation, in Barbosa & al. (eds.), *Is the best good enough?*, MIT Press, Cambridge MA.

Pierrehumbert, Janet, and Beckman, Mary (1988) *Japanese tone structure*. MIT Press, Cambridge, Massachusetts.

Piggot, Glyne (1995) "Epenthesis and syllable weight", *Natural Language and Linguistic Theory* 13, 283-326.

Poser, William (1990) "Evidence for foot structure in Japanese," *Language* 66, 78-105.

Prince, Alan (1975) *The phonology and morphology of Tiberian Hebrew*, Ph.D. Dissertation, MIT, Cambridge MA.

Prince, Alan, and Smonlensky, Paul (1993) *Optimality theory constraint interaction in generative grammar*, ms., Rutgers University.

Selkirk, Elisabeth (1993) "The prosodic structure of function words", ms., University of Massachusetts, Amherst.

Shinohara, Shigeko (1996) "The roles of the syllable and the mora in Japanese adaptations of French words," *Cahiers de Linguistique - Asie Orientale* 25(1), 87-112.

Shinohara, Shigeko (1997b) *Analyse phonologique de l'adaptation japonaise de mots étrangers*, Thèse de Nouveau Doctorat, Unversité Paris III. Single-spaced version available in Rutgers Optimality Archive (ruccs.rutgers.edu/roa.html) ROA-243-0298.

Shinohara, Shigeko (1999) "Accentuation of Japanese compound words: interaction between identity of words and metrical structure," ms.

Sugito, Miyoko (1992) "Current and future issues of Japanese phonetic research" *Juten Ryoiki Kenkyuu Nihongoonsei no inrituteki tokutyoo*, 1-9, Ministry of Education, Tokyo.

Suzuki, Hisami (1995) "Minimal words in Japanese," in *Proceedings of CLS* 31, 448-463.

Tateishi, Koichi (1991a) "Les implications théoriques du langage des musiciens japonais," *Langages* 101, 51-72.

Tateishi, Koichi (1991b) "Maximal non-exhaustive invisibility", in *Proceeding of 14th annual meeting of the Kansai Linguistics Society*, 134-144.

Tsuchida, Ayako (to appear) "English loans in Japanese: Constraints in loanword phonology", ms.

Vance, Timothy (1987) *An introduction to Japanese Phonology*. Albany SUNY Press, New York

Yamada, Eiji (1990) Stress assignment in Tokyo Japanese (1) and (2), in *Fukuoka Daigaku Jinbun Ronsoo* 21 1575-604, 22 97-154, Fukuoka Daigaku, Fukuoka.

Yip, Moira (1993) "Cantonese loanword phonology and optimality theory," *Journal of East Asian Linguistics* 2, 261-291.