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Tonal alignment and preaccentuation

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Abstract: This paper develops a new analysis of the antepenultimate accent principle that determines the default location of the pitch accent in Japanese words (namely, on the syllable containing the antepenultimate mora). The chief innovation is that this analysis also applies to compounds, where it predicts the location of accent in compounds with "short" N2 (one or two moras) – so-called "preaccentuation" at the end of N1, which often does not coincide with the penultimate mora. In addition, the paper sketches an extension of the analysis subsuming the N2-initial accent characteristic of compounds with "long" N2 (three or four moras).

Keywords: Japanese phonology, Optimality Theory, antepenultimate accent, compound accent

1 Introduction

A frequent phenomenon in the phonology of stress and accent is preaccentuation. To cite a few examples among many, the English suffix *'-ic* attracts word stress to the syllable preceding it (*phótograph~ photográph-ic, Íceland~Icelánd-ic*, etc); Turkish has a whole set of suffixes of this kind (Inkelas 1999), as has the Uto-Aztecan language Cupeño (Alderete 1999); Indo-Iranian has two different agent suffixes, preaccenting *'-tar* and accented *-tár* (reconstructed for Proto-Indo-European as preaccenting **'-tor* and accented **-tér*), as exemplified in Vedic Sanskrit *vâp-tar* 'shearer' and *śami-tár* 'preparer' (Kiparsky 2016). In Japanese, preaccentuation occurs in a variety of cases. The nonpast suffix *'-(r)u* is one of several verbal suffixes that attract the accent to the immediately preceding syllable (*tabe'-ru* "eat", NONPAST)[1]; the pluralizers *'-ra* and *'-tati* and

1 Following general practice, the Japanese pitch accent is marked by an apostrophe after the accented mora; unaccentedness is indicated by a final ¯. The Japanese examples are transcribed in the *kunrei* romanization (see Vance 2008, 13–14), where syllable-final <n> denotes the so-

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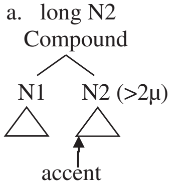
the focus particle *'-sika* "only" assign preaccents to unaccented nouns (*kore'-ra* 'these', *kodomo'-tati* 'children', *kodomo'-sika* 'only the child'); among nominal suffixes, we find preaccenting *'-ke* 'family of' (*Yosida'-ke* 'the Yoshida family') and *'-syu* AGENT (*unte'n-syu* 'driver'). Here we focus on the preaccentuation found in certain types of compounds (which are in fact difficult, and perhaps impossible, to distinguish from "suffixation" cases like *'-ke* and *'-syu*).

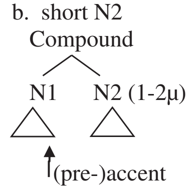
Compounds have always been central to the study of Japanese phonology, and the last twenty years have seen a significant expansion of our understanding of the richness and variety of existing compound structures. Since McCawley's (1965) path-breaking work it has been found useful to distinguish compounds on the basis of the length of their second members (henceforth referred to as "N2", since we are focusing on nominal compounds, which show the greatest accentual variety).[2] The main generalization, depicted schematically in (1), is that when N2 is "long", i.e. longer than 2μ (two moras), compound accent is found on N2 (1a), whereas when N2 is "short" (1μ or 2μ), the accent falls on (the last syllable of) N1 (1b). The latter is traditionally referred to as preaccentuation (see Poser 1984: 76, for example).

(1) a. long N2



yonkoma	+ *ma'nga*	'4-panel comic strip'
genzi	+ *monoga'tari*	'Tale of Genji'

b. short N2



bengo'	+ *si*	'defense lawyer'
uzura'	+ *mame*	'pinto beans'

The need for even finer distinctions (such as between "long" and "overlong" N2) has made Japanese compound accentuation notorious for the apparent complexity of the regularities and subregularities involved. Here Kubozono (2009) made an important contribution in departing from the usual cataloguing of rules, semi-rules, major and minor exceptions, and instead stressing the affinity between the various generalizations governing compound

called moraic nasal, assimilated in place to a following non-continuant and otherwise usually realized as a nasal glide with dorso-uvular contact whenever no place features are available in a following segment. Note also that allophonic palatalization and affrication are not indicated in the *kunrei* transcription, hence ⟨si⟩, ⟨ti⟩, ⟨zi⟩, ⟨tu⟩ denote [ɕi], [tɕi], [d͡ʑi], [tsu], and palatal(ized) segments are denoted by <Cy>, e.g. *kyooto* 'Kyoto', *syoogun* 'Shogun'.

2 For example, verb-verb compounds are all accented, and in the same way as accented simplex verbs (Poser 1984: 74).

accentuation on the one hand and the well-known antepenultimate accent principle (henceforth, AAP) placing the default accent on the syllable containing the antepenultimate mora (Martin 1952: 33; McCawley 1965: 56; see Ito and Mester 2016: 485–488 for a recent analysis). Kubozono suggests that these must ultimately all fall under the same generalization. We are very much in sympathy with the project of reducing all, or at least most, of compound accentuation to the AAP—however, saying it is so does not make it so. After all, the preaccent of *bengo'* + *si*, for example, does not look like placed by an antepenultimate accent rule. In this paper, we take a first step towards the grand unification envisioned by Kubozono and make a formal proposal subsuming preaccentuation under the AAP.

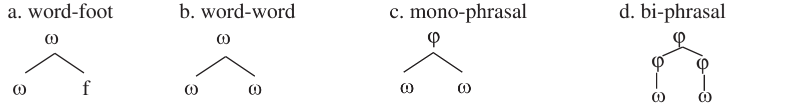
2 Preaccentuation in compounds

2.1 The prosodic typology of compounds

The traditional mora-count classification of compounds depicted in (1) is a surface reflex of a more fundamental distinction between distinct prosodic types. Taking up earlier work by Kubozono et al. (1997) and Ito and Mester (2007), we here propose a prosodic typology of compounds which distinguishes the word compounds and phrasal compounds in (2) (μ = mora, σ = syllable, f = foot, φ = phrase, ω = prosodic word).

(2)

word compounds		phrasal compounds	
a. word-foot	b. word-word	c. mono-phrasal	d. bi-phrasal



tinomi' + go	*tada + ba'taraki*	*hatu + kaoa'wase*	*ko'ohaku + utaga'ssen*
'suckling child'	'unpaid work'	'first face-off'	'red-white song contest'
tiho'o + zei	*tihoo + gi'nkoo*	*tihoo + kensatu'tyoo*	*tiho'o + kookyooda'ntai*
'local tax'	'local bank'	'local prosecutor's office'	'local public organization'

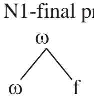
Previous work (Ito and Mester 2007) recognized the three types (2b-d) distinguished by different surface phonological characteristics: Word-word compounds (2b), the prototypical compound structures, are subject to *rendaku* voicing on (Yamato) N2 and receive a compound accent at the beginning of N2, replacing any underlying accents. Phrasal compounds (2cd), with overlong (> 4μ) N2, do not show *rendaku* voicing, and preserve N2's underlying accentuation. Mono-phrasal compounds (2c) are still like word-word compounds (2b) in that they lose any underlying accent within N1, whereas bi-phrasal compounds (2d) do not, and can end up with two accents.

As elaborate as this typology is (for further justification and details, see the work cited), it does not even incorporate the variety of compound structure with short (1μ and 2μ) N2 (with preaccentuation). In our conception, such compounds constitute another type of word compound (2a),[3] with a sub-word-sized N2 (always a foot (f), as we will argue later), resulting in the full quadripartite prosodic typology in (2). Both types of word compounds, ${}_{\omega}[\omega + f]$ (2a) and ${}_{\omega}[\omega + \omega]$ (2b), undergo *rendaku* voicing on N2 (*ko*→ *go, hataraki*→ *bataraki*), formally a linking morpheme connected to the dominating N-node (Ito and Mester 1986: 57; and 2003: 81–87). Prosodic structures similar to (2a), with unequal sisters, are found in Danish compounds, where they manifest themselves in the distribution of the glottal *stød* accent (Ito and Mester 2015a: 17–18): besides the regular ${}_{\omega}[\omega + \omega]$-compounds, ${}_{\omega}[f + \omega]$, ${}_{\omega}[\omega + f]$, and ${}_{\omega}[f + f]$[4] compounds emerge, depending on the size of the members. Bellik and Kalivoda (2017) have recently provided new experimental evidence for these compound structures in Danish.

2.2 Preaccenting compounds

The size of N2 as a crucial factor is a productive generalization, as shown in (3) with the loanword *bizinesu* "business" as N1.

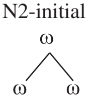
(3) N1-final preaccent



N1 N2

bizinesu' +syoo	'business show'
bizinesu' +man	'~ man'
bizinesu' +gai	'~ street'
bizinesu' +si	'~ magazine'
bizinesu' +gaku	'~ study'

N2-initial accent



N1 N2

bizinesu +ku'rasu	'business class'
bizinesu +sa'abee	'~ survey'
bizinesu +bu'nsyo	'~ manual'
bizinesu +zyo'ohoo	'~ information'
bizinesu +ga'kubu	'~ department'

Examples of short N2 with different input accentual profiles are presented in (4). Here the accentuation of N1 is immaterial, and all accent profiles of N2 (whether

3 We interpret McCawley (1965: 174) rule deleting any internal word boundary "from around a monomorphemic word of less than three morae" as a recognition of this prosodic type.
4 As will be seen in Section 5 below, the compound structure ${}_{\omega}[f + f]$, where the initial member is restricted to a foot, is arguably also another type of compound in Japanese.

underlyingly accented or unaccented) result in the compound accent being placed at the end of N1. There are both systematic and nonsystematic exceptions to this generalization (Akinaga 1998; Kubozono 2009), and we return to some of them in Section 5. The list in (4) is arranged according to prosodic/accentual profile: N2 is 1μ/1σ in (4a), 2μ/1σ in (4b), and 2μ/2σ in (4c-e); N2 is underlyingly unaccented in (4c), has final accent in (4d), and initial accent in (4e).[5]

(4)	N1	N2	$_{\omega}[_{\omega}$[N1] N2]		
a.	*tinomi¯*	*ko¯*	*tinomi' + go*	乳飲み子	'suckling child'
	kei'ri	*bu'*	*keiri' + bu*	経理部	'finance section'
	be'ngo	*si'*	*bengo' + si*	弁護士	'lawyer'
	zassi¯	*sya'*	*zassi' + sya*	雑誌社	'magazine company'
	kana'gawa	*ke'n*	*kanagawa' + ken*	神奈川県	'Kanagawa prefecture'
b.	*sakurada¯*	*mo'n*	*sakurada' + mon*	桜田門	'Sakurada gate'
	denwa¯	*ryo'o*	*denwa' + ryoo*	電話料	'telephone charge'
	onaga¯	*tori¯*	*onaga' + dori*	尾長鶏	'long-tailed cock'
c.	*sarasi¯*	*kubi¯*	*sarasi' + kubi*	晒し首	'displaying beheaded head'
	tento'ri	*musi¯*	*tentori' + musi*	点取り虫	'point-get insect, grade grabber'
	be'ngo	*si'*	*bengo' + si*	弁護士	'lawyer'
	taue'	*uta'*	*taue' + uta*	田植え歌	'rice-planting song'
d.	*sumida¯*	*kawa'*	*sumida' + gawa*	隅田川	'Sumida river'
	tirasi¯	*susi'*	*tirasi' + zusi*	ちらし寿司	'scattered sushi'
	uzura¯	*mame'*	*uzura' + mame*	うずら豆	'(quail) pinto bean'
	si'nri	*ga'ku*	*sinri' + gaku*	心理学	'psychology'
e.	*te'rebi*	*kyo'ku*	*terebi' + kyoku*	テレビ局	'television station'
	nyuugaku¯	*si'ki*	*nyuugaku' + siki*	入学式	'entrance ceremony'
	zyoosya¯	*e'ki*	*zyoosya' + eki*	乗車駅	'boarding station'
	se'ibu	*ge'ki*	*seibu' + geki*	西部劇	'western theater'

When the final syllable of N1 is bimoraic (5), the accent falls on its head, thus moving one mora to the left from the end of N2.

5 The examples in (4e) are all Sino-Japanese (SJ) morphemes, which are never finally accented, due to the (historically) epenthetic nature of the second vowel (Ito and Mester 1996, 2015b). When a native Yamato form is initially accented, it often retains its accent, although sometimes with a preaccenting variant. We return to these cases in Section 5.

(5) Final heavy syllable in N1

undoo⁻	*ka'i*	*undo'o + kai*	**undoo' + kai*	運動会	'(school) athletic meet'
ge'nzai	*ti'*	*genza'i + ti*	**genzai' + ti*	現在地	'current location'
manrui⁻	*sa'ku*	*manru'i + saku*	**manrui' saku*	満塁策	'base-loading strategy (baseball)'
unten⁻	*se'ki*	*unte'n + seki*	**unten' + seki*	運転席	'driver's seat'

The accent avoids the last (nonhead) mora of a heavy syllable, traditionally called *tokusyuhaku* 'special mora', namely, the moraic nasal or the second part of the long vowel or diphthong. These syllable-based factors, which are observed throughout the language, will also be seen to play a role in the analysis of tonal alignment in Section 4.

We now lay the groundwork for the intended unification of compound accent with word accent by first developing an analysis of the AAP (Section 3), which we then extend to also account for preaccentuation in compounds (Section 4), with suggestions for how to subsume the rest of compound accentuation (Section 5).

3 The antepenultimate accent principle (AAP)

3.1 Accents as tonal complexes

Pierrehumbert and Beckman (1988: 124–125) argued that the Japanese accent is best represented not as a simple H tone, but as a tonal H*L complex, where H* indicates the head aligned with the accented mora. Several properties associated with these bitonal accentual complexes make them distinct from other high tones. Poser (1984: 183–259) showed that a strong local lowering and compression of the pitch range (downstep/catathesis) is triggered by a pitch accent, but not by the otherwise similar sequence of higher and lower pitch created by an accentless word, which shows only a relatively weak downtrend (declination). Kubozono (1988) and Kubozono (1993) further found what he referred to as "accentual boost", whereby Japanese accentual H is higher than non-accentual H, even though Japanese accent is otherwise not stress-like (i.e. there is no greater intensity, no greater duration, no alignment with musical beats, etc.). Cross-linguistically, Akinlabi and Liberman (2001) make the important observation that there is a striking similarity between Japanese, a proto-typical pitch accent language, and Yoruba, a proto-typical tone language, in terms of downstep and accentual boost, and it may be worth exploring other well-known pitch accent systems such as those found in the Scandinavian languages (Riad 1996).

While adopting Pierrehumbert and Beckman's (1988) central idea, we are not following the details of their branching tone representation itself (with a single tonal node), but will assume the simpler bitonal representation as in (6), where each tone of the tonal H*L complex is independently associated to a mora, the tone bearing unit of Japanese, in the surface phonological representation. From the perspective of most current phonology within Optimality Theory (OT, Prince and Smolensky 2004), the unity and integrity of tonal complexes are prioritized and violable requirements that need to be enforced by rankable constraints, not by fixed representations. The independent association of the tones will receive crucial support in the analysis of the AAP and of preaccentuation. In our abbreviated representations, the beginning and end of the tonal complex are expressed by brackets as in [*TE-re*]-*bi* (6c): Hyphens separate syllables, and when between brackets, capitalization denotes high tone, lower case low tone; material outside brackets carries phrasal tones not analyzed here, or is toneless (interpolated); for [*Do*] (6d), capital *D* followed by noncapital *o* is our shorthand convention for HL on a single CV-mora.

(6)

	a. *a'me* 'rain'	b. *ho'n* 'book'	c. *te'rebi* 'television'	d. *do'* 'the note C'
Full representation:	σ σ	σ	σ σ σ	σ
	μ μ	μ μ	μ μ μ	μ
	H^* L	H^* L	H^* L	H^* L
	a me	ho n	te re bi	do
Abbreviated representation:	[A-me]	[HOn]	[TE-re]-bi	[Do]

The AAP, the default for the whole language (Kubozono 2009: 168–173; Vance 2008: 119–121), is easiest to illustrate with loanwords, which carry the accent on the syllable containing the antepenultimate mora unless (i) they are unaccented [for reasons rooted in their foot structure, as argued by Ito and Mester (2016)], or (ii) faithfully preserve the accent position of the source word. Illustrative examples appear in (7), where (7a-f) exemplify the AAP in its canonical form, with H on the antepenultimate mora, (7g-i) show H on the preantepenultimate mora, avoiding an antepenultimate nonhead mora, and (7j-l) show H on the penultimate or final mora when no antepenultimate mora is available.

(7)

a.	[PO-te]-to	“potato”	g.	kon-[PYUu]-taa	“computer”
b.	bi-[NIi]-ru	“vinyl”	h.	ri-[KOo]-daa	“recorder”
c.	kaa-[BAi]-do	“carbide”	i.	[BIi]-na-su	“Venus”
d.	su[PEi]n	“Spain”	j.	[O-fu]	“off”
e.	baa-[BE-kyu]u	“barbecue”	k.	[KAa]	“car”
f.	bi-[TA-mi]n	“vitamin”	l.	[Do]	the musical note C

3.2 Analysis of the AAP

The constraints that play a role in our analysis are listed in (8) (for convenience, we are assuming that the accentual complex HL is part of the input of every accented item).

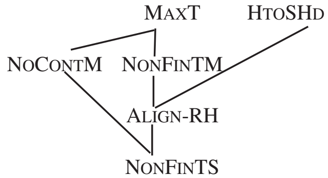
(8) Constraints

MaxT	Max-Tone	One violation for every tone in the input that is not in the output.
HtoSHd	High-to-SyllableHead	H is linked to the head (first) mora of a syllable. One violation for every H linked to a nonhead (non-initial) mora of a syllable.
NonFinTM	NonFinality-Tone/Mora	T is not linked to a weak final mora (weak = not head of a foot) of a maximal ω. One violation for every tone linked to a weak final mora.[6]
NonFinTS	NonFinality-Tone/Syllable	T is not linked to a weak final syllable (weak = not head of a foot) of a maximal ω. One violation for every tone linked to a weak final syllable.
Align-RH	Align-Right/High, ω	Align HighTone to the right edge of a maximal ω. One violation for every mora separating the right edge of H and the right edge of ω.
NoContM	NoContour-Mora	A mora carries no more than one tone. Assign *n*-1 violations for *n* tones on a mora.

Their ranking, worked out with the help of OTWorkplace (see Prince et al. 2015), is given in (9), and the tableau for *po'teto* appears in (10).

6 The reference to the maximal ω, and to weak moras, in the definition of the NonFinality constraints will play a role in section 4 below.

(9)



(10) Tableau for *po'teto*

	input	output	opt	HToSHd	MaxT	NonFinTM	NoContM	Align-RH	NonFinTS
a.	poteto	[PO-te]-to	WINS					2	
b.		po-[Te]-to					1		
c.		po-[TE-to]				1		1	1
d.		po-te-[To]				2	1		2
e.		po-te-[TO]			1	1			1
f.		[PO]-te-to			1			2	

The winner (10a) *[PO-te]-to* violates the right-alignment constraint Align-RH twice, but has no other violations. The close contender (10b) *po-[Te]-to* has both H and L docked on the penultimate syllable, running afoul of the constraint against tonal contours on a single mora NoContM. In (10c), *po-[TE-to]* violates both the syllable and mora versions of NonFinality, and here the higher-ranking mora-version NonFinTM is decisive because L appears on the final mora *to*. Given our assumption that the accentual complex HL is part of the input, the candidate (10f) *[PO]-te-to* violates MaxT, and is harmonically bounded by the winner (10a) *[PO-te]-to*. The two candidates (10a) and (10f) both have H-tones in the same position, but the phonetic outcome is different, according to Pierrehumbert and Beckman's (1988, 124–125) arguments, in that there is a steep fall in (10a) which is absent in (10f). Candidates (10d) *po-te-[TO]*, and (10e) *po-te-[To]* fulfill Align-RH, but violate higher-ranking MaxT and NoContM respectively.

One constraint did not play a role in the candidate evaluation of *po-te-to*, namely, the high-ranking H-to-SyllableHead. In (11d,e,f,l,r), we see HtoSHead in action, ruling out the candidates with H on a nonhead mora. The competition between candidates (11a) and (b) is determined solely by Align-RH as is the competition (11 m~n).

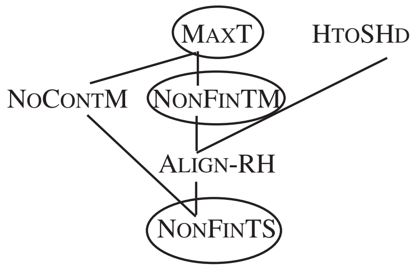
(11) Effects of H-To-SyllableHead

	input	output	opt	HtoSHd	MaxT	NonFinTM	NoContM	Align-RH	NonFinTS
a.	konpyuutaa	kon-[PYUu]-taa	WINS					3	
b.		[KOn]-pyuu-taa						5	
c.		kon-pyuu-[TAa]				1		1	2
d.		kon-pyu[U-ta]a		1				2	1
e.		ko[N-pyu]u-taa		1				4	
f.		kon-pyu[U]-taa		1	1			2	
g.	biinasu	[BIi]-na-su	WINS					3	
h.		bi-[I-na]-su						2	
i.		bii-[NA-su]				1		1	1
j.		bii-na-[Su]				2	1		2
k.		bii-na-[SU]			1	1			1
l.		bi[I-na]-su		1				2	
m.	biniiru	bi-[NIi]-ru	WINS					2	
n.		[BI-ni]i-ru						3	
o.		bi-nii-[Ru]				2	1		2
p.		bi-[NI]i-ru			1			2	
q.		bi-nii-[RU]			1	1			1
r.		bi-ni[I-ru]		1		1		1	1

3.3 Short words

For short forms (13), the competition revolves around the circled parts of the constraint diagram (12), with Max-Tone forcing violations of NonFinality-Tone/Mora and NoContour-Mora.

(12)



(13) Effects of MAX-TONE in short words

	input	output	opt	HTOSHD	MAXT	NONFINTM	NOCONTM	ALIGN-RH	NONFINTS
a.	do	[Do]	WINS			2	1		2
b.		[DO]			1	1			1
c.	kaa	[KAa]	WINS			1		1	2
d.		[KA]a			1			1	1
e.	ofu	[O-fu]	WINS			1		1	1
f.		o-[Fu]				2	1		2
g.		[O]-fu			1			1	
h.		o-[FU]			1	1			1

The winner of *do'* ‘the note C’ is given with a falling tone HL (13a), distinct from unaccented *do*$^{-}$ ‘degree’, which is H. Even though such minimal pairs of words with final accent and unaccented segmental homonyms are not reliably distinguished in ordinary life when they do not carry suffixes, experimental evidence shows that subjects can discriminate between the two at a rate above chance, see Figure 1 for contrasting pitch tracks of *hi* “sun” versus “fire” (from Gussenhoven 2004: 191).

A variety of Japanese in which the contrast between the two is neutralized in favor of a simple H is produced by a grammar in which NOCONTOUR-MORA > > MAX-TONE.

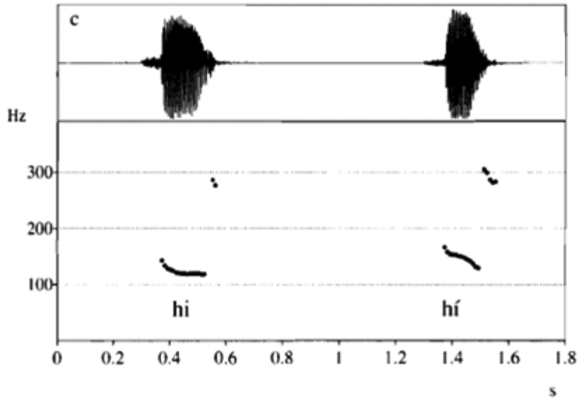


Figure 1: *Contrasting pitch tracks of hi "sun" versus "fire" (from* Gussenhoven 2004*: 191)*.

3.4 Variation

Regarding the finer details of the AAP, the constraint ranking (12) produces the older strict mora antepenultimacy pattern, where the weight of the final syllable matters, in a way reminiscent of Ancient Greek recessive accent (Ito and Mester 2017): Heavy **Light'** Heavy *baabe'kyuu* (14a) and Light **Light'** Heavy *bita'min* (14f) contrast with **Heavy'** Light Light (11g) *bi'inasu* and **Light'** Light Light (10a) *po'teto*.

(14) Analysis of conservative accent

	input	output	opt	HToSHd	MaxT	NonFinTM	NoContM	Align-RH	NonFinTS
a.	baabekyuu	baa-[BE-kyu]u	WINS					2	1
b.		[BAa]-be-kyuu						4	
c.		baa-be-[KYUu]				1		1	2
d.		baa-[BE]-kyuu			1			2	
e.		ba[A-be]-kyuu		1				3	
f.	bitamin	bi-[TA-mi]n	WINS					2	1
g.		[BI-ta]-min						3	
h.		bi-[Ta]-min					1	2	
i.		bi-ta-[MIn]				1		1	2
j.		bi-ta-[MI]n			1			1	1
h.		bi-[TA]-min			1			2	

In contemporary Japanese, this pattern coexists with a more modern, Latin-style syllable extrametricality pattern with **Light'** Light Heavy *bi'ginaa* 'beginner' and **Heavy'** Light Heavy *myu'uzisyan* 'musician'.[7] In our data collection, the innovative accent is still significantly less frequent in the second situation, as shown in Figure 2.

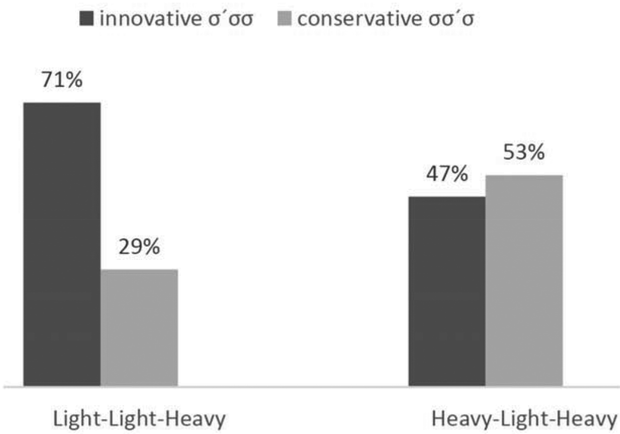
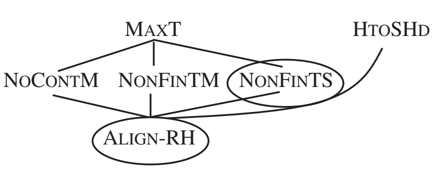


Figure 2: Innovative vs. conservative accent.

For the grammar, this means that syllable extrametricality has become more important (Kubozono 2009: 172–173). More precisely, Align-Right/High>> NonFinality-Tone/Syllable has been replaced by NonFinality-Tone/Syllable>>Align-Right/High, as in (15). The analysis appears in (16).

(15)



7 These are two of the few truly probative examples of this pattern—most others, such as *fa'mirii* 'family', have the accent in the same position as in English (unsurprisingly, given the English stress rule). They have an obvious alternative account as faithfulness to the source accent, which is known to play a significant role in other cases, such as the word *a'kusento* 'accent' itself.

(16) Analysis of innovative accent: NONFIN-TONE/SYLLABLE > > ALIGN-RIGHT/H

	input	output	opt	HTOSHD	MAXT	NONFINTM	NOCONTM	**ALIGN-RH**	**NONFINTS**
a.	myuuzisyan	[MYUu]-zi-syan	WINS						4
b.		myuu-[ZI-sya]n						1	2
c.		myuu-zi-[SYAn]				1		1	1
d.		myuu-[ZI]-syan			1				2
e.		myu[U-zi]-syan		1					3
f.	biginaa	[BI-gi]-naa	WINS						3
g.		bi-[GI-na]a						1	2
h.		bi-gi-[NAa]				1		2	1
i.		bi-gi-[NA]a			1				1
j.		bi-[GI]-naa			1				2

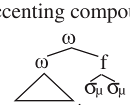
4 Preaccentuation

4.1 The prosodic structure of compounds with short N2

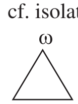
It might come as a surprise to the reader that the analysis of the AAP as it stands already accounts for the preaccentuation that is the hallmark of compounds with short N2, where the accent falls on the last syllable of N1. This is so because of a confluence of two factors. The first is that these compounds have the overall prosodic structure in (17) (for further examples, see (3)-(5) above): Here N2 is a foot, a sub-word constituent, resulting in a suffixation-like structure overall.

(17) Preaccenting compound structure — cf. isolation form

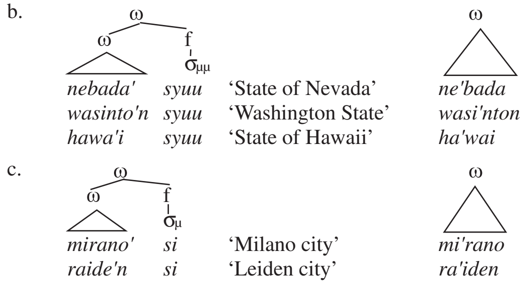
a.



temuzu' gawa 'River Thames'
meko'n gawa 'Mekong River'
rai'n gawa 'River Rhine'



te'muzu
me'kon
ra'in



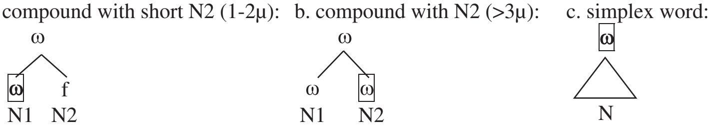
In (17c), N2 is parsed as a monomoraic foot, violating FTBIN, to fulfill higher-ranked LEXFT (Ito and Mester 2016: 551), which requires every lexical morpheme to minimally project its own foot.[8]

The second factor is our analysis of the AAP itself, which does not literally amount to an antepenultimate accent rule—it is rather a final accent rule aligning the accentual H with the end of the word, modulo NONFINALITY (syllable and mora, as well as nondeletion of tones, including L). The unwary might dismiss this as a piece of OT-sophistry, but it will soon show its force. It is essentially only NONFINALITY that pushes the accent away from its ideal final-edge location—if there are situations where for some reason NONFINALITY becomes irrelevant, final accent will result.

4.2 Preaccentuation and the AAP

In the recursive ω-structures that are characteristic of compounds, one of the daughter ω's serves as the head of the overall compound. The prosodic head is N1 in ω + f compounds with short N2 (18a) and N2 in ω + ω-compounds (18b). The isolation form of a simplex word is, trivially, its own head (18c).

(18) a. compound with short N2 (1-2μ): b. compound with N2 (>3μ): c. simplex word:



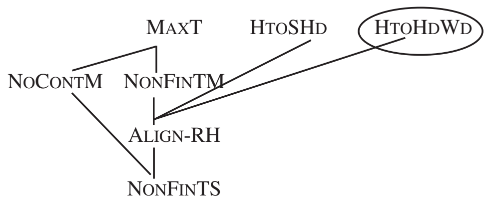
We have argued in previous work (Ito and Mester 2007: 100; and 2013: 30) that the Japanese pitch accent is a head feature, in the sense that it must be the head of a minimal phonological phrase (among other things, this ensures culminativity). In (19), we extend this idea to the word level.

8 See the work cited for detailed justification for these constraints and rankings, and Poser (1984: 140, note 52) for further discussion.

(19) HtoHdWd H-To-HeadWord H is linked to the head word.

In the revised grammar, HtoHdWd dominates Align-Right/H, as shown in (20).

(20)



As a result, H is linked to the sole daughter ω N1 in (18a), and to the rightmost ω N2 in word-word compounds (18b). Tableau (21) shows how preaccenting compounds and regular antepenultimate accent on related simplex words are correctly derived by the same OT grammar ("+" indicates the compound boundary).

(21) Preaccenting compounds and regular antepenultimate accent on related simplex words

	input	output	opt	HtoSHd	MaxT	HtoHdWd	NonFinTM	NoContM	Align-RH	NonFinTS
a.	mirano + si	mi-ra-[NO + (si)]	WINS						1	
b.		mi-[RA-no] + (si)							2	
c.		mi-ra-[No] + (si)						1	1	
d.		mi-ra-no + [(Si)]				1		1		
e.		mi-ra-[NO] + (si)			1				1	
f.	mirano	[MI-ra]-no	WINS						2	
g.		mi-[RA-no]					1		1	1
h.		mi-ra-[No]					2	1		2
i.		[MI]-ra-no			1				2	
j.		mi-ra-[NO]			1		1			1
k.	mekon + gawa	me-[KOn] + (ga-wa)	WINS						3	
l.		me-koN + [(GA-wa)]				1			1	
m.		me-ko[N + (ga]-wa)		1					2	
n.		me-ko[Nn] + (ga-wa)		1				1	2	

	input	output	opt	HtoSHd	MaxT	HtoHdWd	NonFinTM	NoContM	Align-RH	NonFinTS
o.		me-ko[N] + (ga-wa)		1	1				2	
p.	mekon	[ME-ko]n	WINS						2	1
q.		[ME]-kon						1	2	
r.		me-[KOn]					1		1	2
s.		me-[KO]n			1				1	1
t.		[ME]-kon			1				2	
u.	nebada + syuu	ne-ba-[DA + (syu]u)	WINS						2	
v.		ne-[BA-da] + (syuu)							3	
w.		ne-ba-[Da] + (syuu)						1	2	
x.		ne-ba-da + [(SYUu)]				1	1		1	
y.		ne-ba-[DA] + (syuu)			1				2	

The difference between a simplex word like *mi'rano* (21f) and a compound with short N2 like *mirano' + si* (21a) is that the last syllable of the second, as a full lexical word N2, is the head of a foot of its own [as indicated by "( )"], and hence not prosodically weak [see (8) above]. The L of the accent can associate to *si* without violating any kind of NonFinality. N1 is not a maximal ω, and its last syllable is not word-final in the relevant sense. Align-R/High is therefore in full force and pushes the H as far to the right as possible in N1, and it falls on *no*, the penult of the maximal ω. On the other hand, *mi'rano* (21f) is a simplex (and therefore maximal) word, so both Align-R/High and NonFinality operate in the normal way and produce antepenultimacy, as discussed in the previous section. The examples *meko'n-gawa* and *me'kon* (21 kp) are explained in a parallel way. N2 in (21u) is a bimoraic heavy syllable. Since NonFinality-Tone/Syllable does not apply to a fully footed N2, ranking it above Align-Right/H does not derive a different winner such as **neba'-da + syuu* (21v) (compare Section 3.4 above), so no variation between penult and antepenult accent is predicted, and none is found.

With a proper understanding of the constraints and prosodic structures involved, we now have a full OT analysis explaining both antepenultimacy and preaccentuation in compounds, as envisioned by Kubozono (2009).

4.3 Superheavy syllables under preaccentuation

In isolation, words ending with a superheavy (trimoraic) syllable, such as *ra'in* and *supe'in* (22), are accented, unsurprisingly, on their antepenultimate mora (**μ'**μμ). But when they appear as N1 in a preaccenting compound, the accent appears not on their antepenultimate mora, but rather on the penultimate mora (μ**μ'**μ) (22).[9]

(22) Final superheavy syllable in N1

In isolation		In preaccenting compounds			
μ'μμ		μ**μ'**μ	***μ'**μμ	*μμ**μ'**	
ra'in	'Rhine'	rai'n + gawa	*ra'in + gawa	*rain' + gawa	'River Rhine'
supe'in	'Spain'	supei'n + zin	*supe'in + zin	*supein' + zin	'Spaniard'

If *rai'n* in *rai'n + gawa* were in fact a single superheavy syllable, we would be faced with a violation of the constraint H-TO-SYLLABLEHEAD. However, Kubozono (2015: 13–16; see also Vance 2008: 125–127) argues that we are dealing not with a single superheavy CVVC-syllable, but rather with two syllables: a CV-syllable followed by a VC-syllable. With H falling on the initial mora of this VC syllable, H-TO-SYLLABLEHEAD is in fact fulfilled. A first idea, which will turn out incorrect, would be to add the constraint ONSET to our analysis and rank it below ALIGN-RIGHT/H. This derives the correct syllable-splitting winner (23a) simply because its H is better aligned to the right word edge. At the same time, the simplex word is predicted to come out as the superheavy *ra'in* (23d) because syllable-splitting *ra'-in* (23f) violates NONFINTONE/MORA in addition, and there is so far no constraint against trimoraic syllables per se.

(23) Incorrect analysis: syllable-splitting due to ALIGN-RIGHT/H>>ONSET

	input	output	opt	HTOSHD	MAXT	ACCTOHDWD	NONFINTM	NOCONTM	ALIGN-RH	ONSET	NONFINTS
a.	rain + gawa	ra-[In] + ga-wa	WINS						3	1	
b.		[RAi]n + ga-wa							4		
c.		ra[In] + ga-wa		1					3		
d.	rain	[RAi]n	WINS						2		2

9 Morita (2013) further cites *burisubee'n + gawa* 'Brisbane river', *burunfontee'n + si* 'Bloemfontein City', and *kameruu'n + zin* 'Cameroonian'.

	input	output	opt	HtoSHd	MaxT	AccToHdWd	NonFinTM	NoContM	Align-RH	Onset	NonFinTS
e.		[RA-i]n							2	1	1
f.		ra-[In]					1		1	1	2
g.		ra[In]		1					1		2

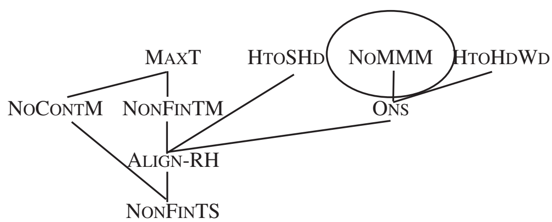
While there is some evidence that CVVC sequences in Japanese are parsed in a non-uniform way, in some context as trimoraic -CVVC- and in others as -CV-VC-, probably with some fluctuation and variability, the analysis as it stands cannot be correct since it predicts not only that CVVC will split into -CV-VC- to achieve better alignment in preaccentuation environments, but also, incorrectly, that CVV will split into -CV-V-. For example, **ka-sa-i'+gawa* 'the river Kasai' (Angola, Congo) (24a) would be accented just like *temuzu'+gawa* (21a), instead of the correct *ka-sa'i+gawa* (24b). Worse yet, rampant splitting of long vowels and diphthongs (such as **bi-i'-na-su* 'Venus' instead of *bi'i-na-su*) is predicted as long as NonFinality-Tone/Mora is not involved (24g).

(24) Incorrect syllable-splitting due Align-Right/H>>Onset

	input	output	opt	HtoSHd	MaxT	AccToHdWd	NonFinTM	NoContM	Align-RH	Onset	NonFinTS
a.	kasai + gawa	ka-sa-[I + ga]-wa	WINS (wrong winner)						2	1	
b.		ka-[SAi] + ga-wa							3		
c.		[KA-sa]i + ga-wa							4		
d.	kasai	[KA-sa]i	WINS						2		1
e.		ka-[SAi]					1		1		2
f.		ka-sa-[I]			1		1				1
g.	biinasu	bi-[I-na]-su	WINS (wrong winner)						2	1	
h.		[BIi]-na-su							3		
i.		bii-[NA-su]					1		1		1

The lesson this teaches us is that ALIGN-R/HIGH by itself cannot force syllable splitting, with a violation of ONSET; rather, a constraint against superheavies (NOMMM) must be involved. Various syllable-related constraints (long-vowel integrity, diphthong integrity, nucleus sonority, onset) are violated when syllable splitting occurs. Here we show only ONSET, which is ranked below NOMMM, but above ALIGN-RIGHT/HIGH. This produces the correct outcomes in all cases (26).[10]

(25)



(26) Correct analysis with NOMMM>>ONSET

	input	output	opt	HTOSHD	MAXT	NOMMM	HTOHDWD	NONFINTM	ONS	NOCONTM	ALIGN-RH	NONFINTS
a.	rain + gawa	ra-[In] + (ga-wa)	WINS						1		3	
b.		raiN + [(GA-wa)]					1				1	1
c.		[RAi]n + (ga-wa)				1					4	
d.		rai[N + (ga]-wa)		1		1					2	
e.		ra[In] + (ga-wa)		1		1					3	
f.		rai[N] + (ga-wa)		1	1	1					2	
g.	rain	[RA-i]n	WINS						1		2	1
h.		ra-[In]						1	1		1	2
i.		[RAi]n				1					2	2
j.		ra[In]		1		1		1			1	2
k.	kasai + gawa	ka-[SAi] + (ga-wa)	WINS								3	
l.		[KA-sa]i + (ga-wa)									4	

10 When the final superheavy syllable has a long vowel, both μμ'μ and μ'μμ are in fact often possible in the preaccentuation environment: *yuutaa'n + ritu ~yuuta'an + ritu* 'U-turn percentage', *makurii'n + kan ~ makuri'in + kan* 'McLean Building', *guri'in + sya~gurii'n + sya* 'green (1st class) carriage (on trains)', indicating that VINTEG is variably ranked with respect to NOMMM.

	input	output	opt	HtoSHd	MaxT	NoMMM	HtoHdWd	NonFinTM	Ons	NoContM	Align-RH	NonFinTS
m.		ka-sa-[I] + (ga-wa)			1				1		2	
n.	kasai	[KA-sa]i	WINS								2	1
o.		[Ka]-sai								1	2	
p.		ka-[SAi]						1			1	2
q.		ka-[SA]i			1						1	1
r.	biinasu	[BIi]-na-su	WINS								3	
s.		bi-[I-na]-su							1		2	
t.		bii-[NA-su]						1			1	1
u.		bii-na-[Su]						2		1		2
v.		bii-na-[SU]			1			1				1
w.		bi[I-na]-su		1							2	

Trimoraic syllables are now ruled out across the board—(26*g*) *ra'-in* wins over (26i) *ra'in* even as a simplex word. This might be throwing the baby out with the bathwater since there is some evidence that in Japanese superheavies are admitted at least in some contexts.[11] One possibility is that NoMMM alone cannot command syllable spitting, but that we are dealing with a ganging-up effect involving H-tone alignment in addition.

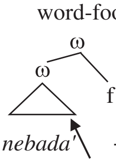
11 Takashi Morita (personal email communication) points out some interesting evidence against a split syllable analysis: The word-initial mora in a word like *koon + su'upu* 'corn soup' does not carry the boundary %L on *ko* found in *koko'ro* 'heart', whose first syllable *ko* is fully L-toned. It rather behaves tonally like the first mora of an unquestionably heavy syllable, such as *koo-hi'i* 'coffee'. This indicates that the syllabification is *koon + su'upu*, not **ko-on + su'upu*. Morita cites in addition *baan + a'uto* "burnout", *miin + ga'a-ruzu* 'mean girls', *muun + ra'ito* 'moonlight', and *reen + ki'ipingu + asisuto + si'sutemu* 'lane keeping assistance system'. This contrasts with *i-an + so'opu* 'Ian Thorpe', whose initial mora is fully L-toned because /ia/ cannot be a diphthong and must be heterosyllabic. The question is how this applies to preaccenting compounds such as *koon + mame* 'corn beans' or *koon + pan* 'corn bread'. Informal judgments seem to vary: *ko'on + pan* (no initial rise because H is on the first mora, superheavy syllable), *ko-o'n + pan* (initial rise on *ko*, split syllables), or even *koo'n + pan* (no initial rise indicating no syllable break between the first two moras, but a violation of H-to-SyllableHead). A thorough instrumental study is needed to verify these findings before further analysis can be done.

By adding some of the relevant universal markedness constraints (here, NoMMM and Onset) to our initial constraint system, the analysis has become more precise and comprehensive, and OTWorkplace makes it possible to verify that there are no contradictions in an analysis of this degree of complexity.

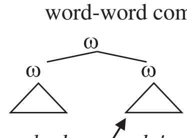
5 Further consequences and explorations

In this final section, we briefly return to the overall compound typology, including the non-preaccenting cases, and assess further consequences for the approach that we have taken. The analysis unifying the AAP and preaccentuation crucially refers to the prosodic structures of compounds. Preaccenting occurs in cases where N2 comprises no more than a foot that is sister to a full prosodic word as N1, which is therefore the head (27a). As initially presented in (2) in Section 2, there are other types of compounds, with members of different sizes, that are not preaccenting. In fact, in what one might consider “normal compounds” both N1 and N2 are prosodic words, with accent falling on the initial syllable of N2 (27b).

(27) a. Preaccentuation: word-foot compound



b. N2-initial accent: word-word compound



cf. accent in isolation

a.		b.		cf.
nebada'	*+si* ‘city’	*nebada*	*+do'ori* ‘street’	*ne'bada, toori', si'*
wasinto'n	*+syuu* ‘state’	*wasinton*	*+da'igaku* ‘university’	*wasi'nton, daigaku¯, syu'u*
rai'n	*+gawa* ‘river’	*rain*	*+ti'hoo* ‘district’	*ra'in, tiho'o, kawa'*

It is beyond the scope of this paper to fully explicate N2-initial accent, which we intend to take up in future work. Suffice it here to say that foot structure, which already played a role in preaccentuation, is again essential. In addition to the constraint H-to-SyllableHead that is part of the current analysis, several other well-established constraints are operative, such as the H-to-FootHead and WordAccent constraints of Ito and Mester (2016), whose explanation of unaccentedness crucially relies on foot structure. N2-initial accent only emerges when the second member is binary, i.e. no longer than 2 feet—longer (nonbinary) N2 members form phrasal compounds, and N2 retains its original accent in isolation. The optimal footing of 4μ words like *amerika* is a parse into two feet (μμ)(μμ), and high-ranking InitialFoot and NonFinality(Ft') (for the accent-bearing foot), together with low-ranking WordAccent, lead to unaccentedness as the optimal solution for f + f-words. However, if CompoundAccent, a new constraint requiring accent in compounds, ranks higher than InitialFoot and NonFinality(Ft'), this results in the selection of the next-optimal candidate, which has N2-initial accent (since NonFin(Ft') > > Rightmost): The results are *minami + (a'me)(rika)* and *wasinton-(da'i)(gaku)*, fulfilling H-to-FootHead. We reproduce the core of the resulting constraint system in (28).

(28) InitialFoot NonFin(Ft') ***CompoundAccent***

Rightmost

WordAccent

Parse-σ

The only difference with respect to the constraint system of Ito and Mester (2016) is that Rightmost, which was unranked with respect to NonFin(Ft') and InitialFoot, is now dominated by them. CompoundAccent dominates Rightmost, but WordAccent remains dominated by Rightmost, NonFin (Ft'), and InitialFoot. This continues to lead to unaccentedness for f + f-words outside of compound structures. The analysis is illustrated in (29).

(29) Tableaux for *minami-amerika* and *amerika*

	input	output	opt	InitFt	NonFin(Ft')	CompAcc	Rightmost	WdAcc	Parse-σ
a.	minami + amerika	(mi-na)-mi + ([A-me])-(ri-ka)	WINS				1		1
b.		(mi-na)-mi + (a-me)-(ri-ka¯)				1			1
c.		(mi-na)-mi + (a-me)-([RI-ka])			1				1
d.		(mi-na)-mi + a-([ME-ri])-ka		1					3
e.	amerika	(a-me)-(ri-ka¯)	WINS					1	
f.		([A-me])-(ri-ka)					1		
g.		(a-me)-([RI-ka])			1				
h.		a-([ME-ri])-ka		1					2

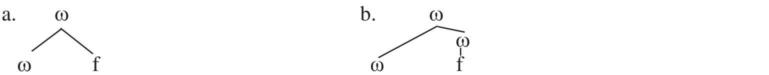
What remains to be done now is to integrate this analysis of unaccentedness, which also derives N2-initial compound accent, with the analysis of the AAP and preaccentuation developed in this paper, a task we cannot undertake here.

There is a well-known systematic exception to the generalization that short N2 results in preaccentuation, which is that short N2 with (lexical) initial accent retain their initial accent. Some examples are listed in (30).[12]

(30)	N1	N2	$_\omega$[$_\omega$[N1] $_\omega$[N2]]		
	ko'omori	*ka'sa*	*koomori + ga'sa*	こうもり傘	'bat umbrella (western umbrella)'
	ma'tuba	*tu'e*	*matuba + zu'e*	松葉杖	'pine needle cane, crutch'
	watasi¯	*fu'ne*	*watasi + bu'ne*	渡し舟	'ferry boat'
	garasu¯	*ma'do*	*garasu + ma'do*	ガラス窓	'glass window'
	abura¯	*a'se*	*abura + a'se*	あぶら汗	'sweat' (also *abura' ase*)
	ni'waka	*a'me*	*niwaka + a'me*	にわか雨	'rain' (also *niwaka' ame*)
	hikiwari¯	*mu'gi*	*hikiwari + mu'gi*	ひきわり麦	'wheat'
	maneki'	*ne'ko*	*maneki + ne'ko*	招き猫	'inviting cat'
	se'nba	*tu'ru*	*senba + zu'ru*	千羽鶴	'thousand cranes' (also *senba' zuru*)

The difference between the (regular) preaccenting short N2 and the non-preaccenting counterparts can be understood as a difference in prosodic structure depicted in (31).

(31) a. b.



a. *uzura'* +*mame* (*mame'*) 'pinto beans'
onaga' +*dori* (*tori¯*) 'long-tailed cock'

b. *perusya* +*ne'ko* (*ne'ko*) 'Persian cat'
matuba +*zu'e* (*tu'e*) 'pine needle cane, crutch'

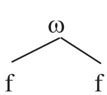
Because the non-preaccenting (31b) projects a ω on N2, we have a word-word compound with the usual N2-initial accent. We hypothesize that the N2 with lexically initial accent behave like full words because they constitute "perfect prosodic words" in Japanese: one binary (accented) trochaic foot. Other cases of perfect prosodic words are found in Uspanteko (Bennett and Henderson 2013, 616–625) and Danish (Ito and Mester 2015a: 10–30). McCawley (1965: 173) points out that N2 consisting of two monomoraic (SJ) morphemes also fall under this generalization: "If the second element of a compound is itself a compound of two Sino-Japanese morphemes, it will receive an accent regardless of how many

12 The N2 items in (4e) are Sino-Japanese morphemes which, if accented, always have initial accent. Such items result in preaccentuation, perhaps because their accent location is not distinctive.

morae it contains, 2, 3, or 4.” In our terms, this means a SJ word (composed of 2 SJ morphemes) always projects a ω, even when the word is overall 2μ (each morpheme consisting only of 1μ).’[13, 14]

Finally, regarding various length combinations of the compound members, we have so far only considered the length of the second member as short, long, and overlong (Section 2), and the special behavior of some short forms (like *ne'ko* ‘cat’) that behave as if they are long, i.e. the second member is analyzed as a ω, leading to second member accent. It would be natural to ask whether there are any consequences for accent when the first member is short. Examples like *bi + i'siki* ‘beauty sense, sense of beauty’, *hatu + mo'ode* ‘first prayers’, *ha + ta'bako* ‘leaf tobacco’, *me + ga'sira* ‘eye lid’, and *kuti + ge'nka* ‘oral quarrel’ show that they receive initial accent on N2. Even if these short words do not project ω, this is expected, because a structure with f adjoined to the left “$[\mathrm{f}\ \omega]_{\omega}$ would be the same as $[\omega\ \omega]_{\omega}$ in terms of application of the compound accent. Thus the length of N1 is immaterial whether or not they are analyzed as ω.

However, there are cases in which the length of N1 does make a difference, namely when both N1 and N2 are short. If neither N1 nor N2 projects a ω, then these compounds are expected to act as a single ω, with no recursion (as was found for Danish compounds in Ito and Mester 2015a).

(32)


kome + gura^{-} ‘rice warehouse’

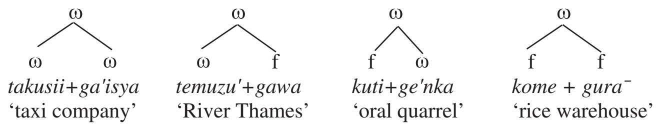
The unaccentedness predicted by Ito and Mester (2016) as the default for such f + f-structures is for the most part corroborated by generalizations stated in accent dictionaries, such as the NHK *Accent Dictionary* (Akinaga 1998): 4μ (2μ + 2μ) cases are unaccented, 3μ (1μ + 2μ, 2μ + 1μ) cases are either unaccented or initially accented. The outlier is the super-short 2μ (1μ + 1μ) compounds, which have initial accent on N1. Although requiring further analysis and investigation, it is unsurprising that such super-short compounds would be analyzed as a single bimoraic

13 There are other exceptional cases retaining the final accent of N2; e.g. *kenkyuu + zyo'* ‘research center’, *keisatu + syo'* ‘police station’, and *bitamin + si'i* ‘Vitamin C’ (McCawley 1965; Tanaka 2001), which can also be assumed to be lexically specified with a ω-structure.

14 There are also a number of deaccenting short N2 morphemes. A possible analysis here is to incorporate these into the N1 ω as a final foot (“amalgamated/internal”) $_{\omega}[(..)...(\mathrm{f})]$: Then NonFinality cannot be fulfilled, leading to unaccentedness. Just as the function word possibilities discussed by Selkirk (1996) and Ito and Mester (2007), N2 can be an independent ω (initial accent), adjoined to the N2-ω (preaccenting), and ω-internal (unaccented).

foot (leading to N1-initial accent) rather than two monomoraic feet (violating FtBin twice in adjacent structures). In fact, this appears to be another "perfect prosodic word" situation, as in (31) above.[15] With the addition of the short-short compound structure in (32), the full set of binary prosodic structures (33) built on {ω,f} is instantiated in Japanese compounds.

(33)



Besides achieving the unification of preaccentuation with the AAP, our primary goal in this paper, we hope to have laid the groundwork for subsuming the rest of compound accentuation in Japanese and perhaps elsewhere.

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15 Recently, Li (2017), focusing on SJ compounds, has uncovered that among the 3μ cases, the majority of 1μ + 2μ compounds is unaccented, whereas the majority of 2μ + 1μ compounds is initially accented. Following Ito and Mester (2016) analysis of loanwords, Li proposes two additional constraints, NonFinality-LightSyllable and Morpheme = Ft, that account for this distribution.

Unaccented: $\mu\mu + \mu\mu \rightarrow (f_{\mu\mu}\ f_{\mu\mu})$ Initial accent: $\mu\mu + \mu \rightarrow (f_{\mu\mu}\ \sigma_{\mu})$

$\mu + \mu\mu \rightarrow (f_{\mu}\ f_{\mu\mu})$ $\mu + \mu \rightarrow (f_{\mu}\ \sigma_{\mu})$

Li's analysis forces N1 to be footed by Morpheme = Ft whether 2μ or 1μ, but N2 is only footed when it is 2μ because of higher-ranking NonFinality-LightSyllable.

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