April 2009 To appear in *Phonology*

Japanese mimetic palatalization revisited: implications for conflicting directionality*

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Abstract. This report reexamines 'conflicting directionality' in Japanese mimetic words, a distributional pattern in which palatalization is preferentially realized on the rightmost of two coronal consonants, but on the leftmost consonant in a word without coronals. Analysis of the original dictionary evidence given in support of this generalization and an exhaustive search of the Japanese mimetic stratum reveals both several counterexamples to conflicting directionality and the fact that the datasets are far too small to support linguistic generalization. The theoretical assumptions employed to account for Japanese mimetic palatalization are thus reexamined, with a focus on clarifying the predictions for future valid examples of conflicting directionality.

Keywords: palatalization, coronals, conflicting directionality, default-to-opposite stress, featural alignment

1. Introduction

Since its original discovery in (Hamano, 1986/1998) and subsequent analysis in (Mester and Itô, 1989), palatalization in Japanese mimetic words has fascinated many a phonologist. Though we revise this description below, the four-layered pattern as originally described in this work is illustrated in (1). In polysyllabic CVCV roots, palatalization affects only one consonant. Given a root with a coronal and a noncoronal consonant, the coronal is systematically palatalized (1a). When this choice is not forced, however, two distinct edge effects are observed. The leftmost of two noncoronal consonants is palatalized (1b), but with two coronals, the rightmost one is palatalized (1c). The coronal liquid /r/ complicates this system because it acts like a noncoronal. It does not obey the rightmost coronal generalization in the second C position (1di), nor does it exhibit a preference for palatalization over a noncoronal (1dii).

(1) Japanese mimetic palatalization in CVCV roots (Hamano, 1986/1998)

a. Coronal + noncoronal, palatalize coronal: *kača-kača*, **k^{y}ata-k^{y}ata*; *šaka-šaka, *sak^{y}a-sak^{y}a*

b. Leftmost of two noncoronals: *p^{y}oko-p^{y}oko, *pok^{y}o-pok^{y}o*

c. Rightmost of two coronals: *doša-doša, * ǰosa-ǰosa*

d. Avoid /r^{y}/: (i) *ɲoro-ɲoro, *nor^{y}o-nor^{y}o* (ii) *h^{y}oro-h^{y}oro, *hor^{y}o-hor^{y}o*

* We would like to thank Brett Baker, Gunnar Hannson, Graham Horwood, Ellen Kaisse, Shigeto Kawahara, three anonymous Phonology reviewers, and the audiences of a graduate seminar at the University of British Columbia, a University of Alberta colloquium, the 2008 Phonofest held at Simon Fraser University, and the 2008 annual meeting of the Linguistic Society of America for valuable comments and advice. Thanks also to Manami Hirayama, Yumiko Gondaira, Miwako Nogimori, Kenji Oda, Kanako Yonenami, and particularly to Maho Kobayashi for assistance with data collection. This work was supported in part by the Social Sciences and Humanities Research Council of Canada (SSHRC 410-2005-1175 and SSHRC 410-2006-1006). Any errors that remain are the responsibility of the authors alone.

As discussions in linguistics textbooks emphasize ((Kenstowicz, 1994), (Tsujimura, 1996)), this system has been tremendously important to the development of feature theory. The first complete autosegmental analysis, (Mester and Itô, 1989), focused on its implications for feature specification, arguing that (1d) constitutes evidence for a restricted theory of feature underspecification in which only redundant features are underspecified. (Mester and Itô, 1989)'s analysis also accounts for (1a-c) by assuming two principles of mapping palatal feature structure to the CV tier: a right-to-left mapping principle for coronals, and, in the absence of a coronal consonant, a default left-to-right association principle for all other consonants (cf. (Archangeli and Pulleyblank, 1994).

With the advent of theories of feature alignment ((McCarthy and Prince, 1993), (Itô and Mester, 1994)), an alternative analysis of (1) emerged that sees the opposite edge orientations of these patterns as the satisfaction of two conflicting constraints that require palatal feature structure to appear at opposite edges of a word (Zoll, 1997). To avoid some of the implications of the alignment-based analysis, however, additional alternative analyses have been proposed that treat the position of palatal feature structure as a combination of categorical alignment and feature affixation constraints (McCarthy, 2002), or the prosodic integration of featural morphemes controlled by constraints on linear precedence (Horwood, 2004).

The purpose of this report is to reexamine the evidence supporting Japanese mimetic palatalization and call into question the evidence supporting the two edge orientation patterns in (1b-c). After some prerequisite background information is given in section 2, two kinds of evidence are examined in section 3: evidence of actual words from mimetic word dictionaries, including the same words studied in (Hamano, 1986/1998), and the results of an exhaustive search of the Japanese mimetic stratum for the crucial data supporting (1b-c) with six native speakers. Both datasets show that there is not an empirical basis for the generalizations in (1b-c). As a result, the theoretical assumptions that have built upon these generalizations, outlined above, are reconsidered in section 4.

2. Background

The data in question are mimetic or iconic words of Japanese traditionally called *giseigo/giongo* (sound-imitating) and *gitaigo* (designating manner or state). Since the mimetic stratum of the Japanese lexicon is characterized by a specific set of linguistic properties, which may differ from other lexical strata, we review the facts of this stratum below that are relevant to our empirical examination, drawing primarily from (Hamano, 1986/1998); see also (McCawley, 1968) and (Itô and Mester, 1995) on the configuration of the mimetic stratum in the Japanese lexicon.

According to (Hamano, 1986/1998), the morphology of these words involves a bimoraic root, to which one or more nonconcatenative processes can be applied, either with specific meanings associated with them or triggered in order to meet certain phonological requirements. C and V positions in roots may have 'phono-semantic associations' in which a particular sound structure correlates strongly with specific meanings. For example, the mimetic adverb *koro-koro* 'rolling on' is formed from reduplication of a basic CVCV root *koro*. The meaning of the root is determined in part from the association of C1 /k/ with 'hard surface' and C2 /r/ with 'rolling fluid movement'. Palatalization of a base consonant likewise appears to have a specific set of semantic associations, as shown by the similar word *k^{y}oro-k^{y}oro* 'looking around inquisitively' in which palatalization of /k/ contributes a meaning of 'unfocused movement'. Other common associations with the occurrence of palatal consonants identified in (Hamano, 1986/1998) are

'childishness, immaturity, instability, unreliability, uncoordinated movement, diversity, excessive energy, noisiness, lack of elegance, cheapness', and 'lack of restraint' (p. 238).[1] The analysis of mimetic palatalization is concerned with the rules governing the distribution of these palatal consonants.[2]

The prosodic morphology of mimetic words restricts their maximal size. Mimetic roots have the canonical CV structure of CVV, CVN, CVQ (N = moraic nasal, Q = moraic obstruent), or CVCV, which supports a bimoraic templatic requirement ((Hamano, 1986/1998), (Itô and Mester, 1995)). Mimetics that undergo morpho-phonological gemination and reduplication are also subject to a prosodic upper bound of four moras, or two prosodic feet, given the bimoraic foot characteristic of Japanese prosody ((Poser, 1990), (Mester and Itô, 1989)). Because of these two constraints, examples given in support of the generalizations in (1) have been mimetic words exclusively formed with CVCV roots. Restrictions on coda consonants in CVN/CVQ roots, and the limited number of suffixes that attach to mimetic roots, preclude the free combination of two consonants in forms based on monosyllabic roots.

The distribution of palatal consonants in mimetic words is also subject to constraints on the following vowel and position within a word. The phonological inventory of Japanese is symmetrical in the sense that there is a palatal consonant for every plain consonant (excluding the glides), as shown below.

(2) Japanese consonants ((Vance, 1987), (Tsujimura, 1996), (Itô and Mester, 2003))[3]

Plain consonants					Palatal consonants				
p b	t d		k g		p^y b^y	č	ǰ/ž	k^y g^y	
	s z			h		š	ǰ/ž		h^y [ç]
m	n				m^y		ɲ		
	r [ɾ]						r^y[$ɾ^y$]		
w								j	

[1] Here and below page numbers for Hamano's dissertation refer to its published version, Hamano 1998.

[2] The generative analysis of (Mester and Itô, 1989) assumes for concreteness that palatalization is a lexical process that results from the realization of a featural morpheme, [+high, -back] 'uncontrolledness'. However, this assumption has been called into question in (Schourup & Tamori, 1992), which points to the lack of clear morphological and semantic correspondence between palatalized forms and nonpalatalized roots. Specifically, they note that more than half of reduplicative mimetic items are nonpalatalized roots that do not have palatalized counterparts, and only one third of the items are paired with respect to palatalization; many of such paired items are semantically unrelated, with relatively few palatalized pairs having a meaning of 'uncontrolledness'. However, whether or not mimetic palatalization is an unproductive morphological process, or simply a fact of a lexical network based on loose associations between phonological types and semantic attributes, is orthogonal to the empirical questions raised here.

[3] A note on typography: to show the different phonetic realizations of palatal sounds, we transcribe the plain/palatal contrast differently for noncoronals and /r/, on the one hand, and nonrhotic coronals. In particular, noncoronal palatals and /r/ are transcribed with a secondary palatalization, but coronals, except /r/, are shown with the different primary place of articulation. For expository reasons, we ignore certain patterns of automatic allophonic variation that are not relevant to our study, including the affricate allophone [t^s] of /t/ and [ɸ] of /h/ before /u/, consistent with prior work (Hamano, 1986/1998) and (Mester and Itô, 1989).

As with other strata in the Japanese lexicon, plain consonants do not occur before the high front vowel /i/, and palatal consonants do not appear before the mid vowel /e/ ((Vance, 1987), (McCawley, 1968), and (Itô and Mester, 1995)). In other words, the plain/palatal distinction is not contrastive before front vowels. This fact is relevant to the placement of palatal consonants in CVCV roots because it is another principle predicting palatalization in C1 or C2 in CVCV roots. An additional fact of /r/ is that it almost exclusively occurs in the mimetic stratum in C2 position. Thus, the analysis of the distribution of /r^{y}/ is a matter of whether or not it can occur in C2.

Finally, it is argued in (Hamano, 1986/1998) that the mimetic stratum is special in that it does not contain words with more than one palatal consonant. This is in contrast to other words of Japanese that may have more than one palatal consonant, e.g., *k^{y}aša* 'to be fragile'. In mimetic words like *p^{y}iča* 'splashing water', however, Hamano treats the phonetically palatal consonants before /i/ as phonologically plain, because they would be inconsistent with two otherwise general patterns of the mimetic stratum (p. 183, ff.; but see (McCawley, 1968)). Since one of these patterns, namely palatalization of leftmost noncoronals, is shown in this report not to be a true fact of the stratum, this assumption may not be valid. However, it does not present an obstacle for our conclusions, because we allow (Hamano, 1986/1998) the assumption that phonetic [C^{y}i] strings are phonologically plain and still find empirical evidence against the generalizations in (1b-c) that do not involve these strings.

3. Reexamining the evidence

3.1 Dictionary evidence

To validate the patterns in (1), a list of CVCV-based manner and sound symbolic adverbs was compiled. The items are drawn from several sources: two published dissertations (Hamano, 1986/1998) and (Tsuji, 2003), and two dictionaries of Japanese mimetic vocabulary, (Asano, 1978) and (Kakehi et al., 1996). Because (Tsuji, 2003) examines both standard and dialectal (the dialect of Iwate) mimetic vocabulary, only mimetic items from the standard were included in our corpus. The list contains 100 items with a palatalized consonant. While some of the palatalized forms are listed in just one source (16 items), there is considerable overlap among the sources. Thus, 49 of these items were listed in all four sources, 19 were listed in at least 3 sources, and 16 were listed in at least 2 sources. In addition, a list of 486 items without palatalization was also compiled from the same sources to investigate certain questions raised below. 60 of these items are paired with palatalized items (cf. (Schourup and Tamori, 1992)). The complete corpus of mimetic words, both with and without palatalized consonants, as well as detailed information about the meanings of particular mimetic words, is available on the authors' websites.

Counts of consonant combinations in our corpus of palatalized items are summarized in Table 1 (cf. Hamano: 180). Over three fourths of all CVCV items consist of a noncoronal (labial, dorsal, or laryngeal) with a coronal consonant, either as C1 (n=24), e.g., *šaka-šaka,* or C2 (n=52), e.g., *kaša-kaša*. All of the consonants in (2) occur in such combinations. As discussed above, /r/ patterns differently from the other coronals, never occurring as C1 in CVCV roots (except in two forms: *rero-rero* and *rori-rori*). It can be preceded by either noncoronals (but there are no examples with labials) or other coronals, as in *k^{y}oro-k^{y}oro* and *ɲuru-ɲuru*. CVCV words that contain either two coronal consonants or two noncoronal consonants are rather rare in the corpus. There are only four items where both consonants are coronal: *doša-doša* (d-s)*, neča-neča* (n-t)*,*

niča-niča (n-t), and *šana-šana* (s-n), and only two items where both consonants are noncoronal: *hʸoko-hʸoko* (h-k) and *pʸoko-pʸoko* (p-k).

Table 1. Consonant combinations for CVCV mimetic words with palatalization (*n* = 100)

C1 \ C2		Lab			Cor						Dor		Lar	
		p	b	m	t	d	s	z	n	r	k	g	h	
Lab	p				4		5				1			*10*
	b				6		6							*12*
	m				1		3	2	3					*9*
Cor	t	2	4							4	6			*16*
	d						1							*1*
	s		2						1	3	3			*9*
	z		2							3	4			*9*
	n				2					3	1			*6*
	r													
Dor	k				4		2		1	2				*9*
	g				4		4	3	2	1				*14*
Lar	h				1				1	2	1			*5*
		2	*8*	*0*	*22*	*0*	*21*	*5*	*8*	*18*	*16*	*0*	*0*	***100***

Counts of vowel combinations in the corpus showed that most items had back vowels only: /a/, /u/, or /o/ (72 items), e.g., *čoku-čoku* and *moǰo-moǰo*. Combinations of front vowels /i/ and /e/ with non-high back vowels in either order are also possible, as shown by *meča-meča* and *ǰoki-ǰoki* (28 items). Notably, all items with back/front vowel combinations have coronals before back vowels, and noncoronals or /r/ before front vowels. (Items where both vowels are front were excluded, since palatalized consonants before /i/ are assumed in (Hamano, 1986/1998) to be phonetically conditioned, and palatalized consonants are not permitted before /e/, as discussed in section 2.)

Since Japanese does not contrast plain and palatalized consonants before front vowels, the items with front vowels are not directly relevant to the investigation of the generalizations in (1). This leaves us with only 72 items with back vowels, given below.

Table 2. A list of roots with palatalized consonants in back vowel contexts (*n* = 72)

C2 / C1		Lab			Cor					Dor		Lar
		p	b	m	t	s	z/d	n	r	k	g	h
Lab	p				pača poča	paša poša pušu				p^{y}oko		
	b				bača boča	baša boša						
	m					moša mošo muša	moǰa moǰo	moɲa moɲo muɲa				
Cor	t	čapo čapu	čabu čobo						čara čoro čuru	čaka čoko čoku čuku		
	s		šabu šobo					šana	šara šuru	šaka		
	z/d		ǰabo ǰabu			doša			ǰara	ǰaka ǰuku		
	n								ɲoro ɲura ɲuru			
	r											
Dor	k				kača kočo kuča k^{y}oto	kaša kuša		kuɲa	k^{y}ara k^{y}oro			
	g				gača goča gočo guča	gaša goša guša gušo	goǰa guǰa guǰo	goɲo guɲa	g^{y}oro			
Lar	h				hoča			huɲa	h^{y}oro h^{y}uru	h^{y}oko		

The dataset above can be used to return to the generalizations in (1) in an effort to confirm the four distinct components of this system. In combinations of noncoronals (labials, dorsals, and laryngeals) with coronals charted above (54 items), coronals are consistently palatalized, confirming the pattern in (1a). There is only one exception to this pattern, *k^{y}oto-k^{y}oto,* possibly formed by analogy to *k^{y}oro-k^{y}oro* (as noted by (Hamano, 1986/1998: 178, fn 4)), or, alternatively, it creates an opposition with another word with a palatalized coronal, namely *kočo-kočo*. There are 14 words with various nonrhotic consonant + /r/ combinations, and /r/ is never palatalized, consistent with (1d).

Of particular interest to the empirical evidence for conflicting directionality is the paucity of mimetic words supporting (1b) or (1c). While it is true that C1 is always palatalized in noncoronal-noncoronal words, there are only two items that exemplify this pattern, *p^{y}oko-p^{y}oko* and *h^{y}oko-h^{y}oko*. Furthermore, there is only one valid example supporting rightmost coronal palatalization (1c) in words with two coronal consonants, *doša-doša*. The only other coronal-coronal item, *šana-šana*, shows the opposite pattern – leftmost palatalization. It is simply not the case that the inventory of actual mimetic words provides a sufficient number of examples to

support the generalizations in (1b-c), and even the small dataset relevant to (1c) contains a counterexample.

It appears that the discrepancy between our findings for (1b-c) and the conclusions of (Hamano, 1986/1998) and (Mester and Itô, 1989) are a matter of interpretation rather than empirical evidence. The discrepancy cannot be due to differences in actual words because our corpus closely corresponds to the corpus used in (Hamano, 1986/1998), the empirical basis for (Mester and Itô, 1989). The original corpus of CVCV-based reduplicated adverbs in Hamano (1986/1998) consisted of 85 forms. The 15 additional items in the current corpus include 7 noncoronal-coronal forms, 5 coronal-noncoronal forms, one noncoronal-r form, one coronal-r form, and one coronal-coronal form. Out of these items, only the latter item, *šana-šana*, is directly relevant to the evaluation of the edge effects in (1b-c).[4] (Mester & Itô, 1989: 270) and (Tsujimura, 1996: 96) (citing the former) provide one more coronal-coronal example, *nošo-nošo* 'slowly', and another noncoronal-noncoronal example, *g^{y}obo-g^{y}obo* 'gurgling', presumably derived from *noso-noso* and *gobo-gobo*. These items were not included in our corpus because they did not occur in our sources, nor were they recognized as meaningful Japanese words by our native speaker informants (see section 3.2). However, even if they are included, these additions do not increase the datasets for (1b) and (1c) to an extent that one could consider (1b-c) generalizations of the mimetic stratum. Generative linguistics does not provide a predetermined number of examples such that this number supports a generalization that is cause for analysis. But even with these additional examples, C1 palatalization in noncoronals (1b) is only observed three out of three times, and C2 palatalization in coronals (1c) is observed two out of three times. Because the choice is between C1 or C2 palatalization, treating for example the noncoronal cases as an important generalization would be like treating three 'heads' in three separate coin tosses as a statistical fact requiring analysis.

Both (Hamano, 1986/1998: p. 178) and (Mester and Itô, 1989: fn 28) acknowledge that there is a small number of examples supporting the rightmost coronal generalization (1c), but nonetheless take the existing examples as significant and suggest the small number derives from a general constraint on the cooccurrence of two coronal consonants. More recent work has shown a statistical tendency against the cooccurrence of homorganic consonants in native Yamato words (Kawahara et al., 2006). Our examination of 422 CVCV-based nonpalatalized mimetic words with the same consonants shows a similar effect in the mimetic stratum: same-place consonants are statistically under-represented in CVCV roots, categorically for some places (labials) and gradiently for other places (coronals and dorsals) (see Table 6 in Appendix; see also Hamano 1986/1998: 42). These two analyses are consistent, and seem to account for the small number of coronal + coronal CVCV words. However, we reject the tacit analytical assumption of (Hamano, 1986/1998) and (Mester and Itô, 1989), namely that the cooccurrence restrictions mask a linguistic generalization about attested words with two coronals. As the dictionary evidence discussed above and investigation below show, there are both counterexamples to the rightmost coronal generalization (1c) and the words identified by Japanese native speakers are just too small in number to support a generalization.

[4] The word *šana-šana* is listed in Tsuji (2003: 513) and defined as "idée de démarche souple et déhanchée; démarche aguichante" (e.g. *šana-šana to yuku* "marcher d'une manière à séduire"). The word has the same root as *šanari-šanari*, also listed in Kakehi et al. (1996: 1088).

3.2 Exhaustive search

It could be the case, however, that (1b-c) constitute linguistic generalizations that are not represented in lexicographic resources. After all, the use of specific mimetic words is subject to interspeaker or dialectal variation and their marginal status as words of Japanese may preclude their inclusion in some dictionaries. Kakehi et al. (1996), for example, did not include in their dictionary mimetic words that are "rare, slangy, used in highly restricted dialect areas", also noting that "[t]he concentrated use of sound-symbolic elements in Japanese lends itself to new creations" (xiii). To overcome the limitations of dictionary evidence, an exhaustive search for the crucial evidence for the patterns in (1b-c) was conducted using the following methods. A questionnaire was created that contained examples of CVCV-based forms in which one of the consonants was palatal. Both vowels were back, because palatalization is predictable before front vowels (section 2). /r/ was excluded because of its special distribution, and it is orthogonal to the generalizations in (1b-c). Since there are five coronal consonants /t d s z n/, six noncoronals /p b m k g h/, and three back vowels /u o a/, there are 450 forms with coronal combinations (= $(5 * 5)_{\text{consonants}} * (3 * 3)_{\text{vowels}} * 2_{C1/C2}$), and 648 noncoronal combinations (= $(6 * 6)_{\text{consonants}} * (3 * 3)_{\text{vowels}} * 2_{C1/C2}$). The questionnaire contained all of these possible coronal + coronal and noncoronal + noncoronal combinations, which was 1098 in total.

These forms were randomized and presented as a list in the *Katakana* orthography. Six native speakers were asked to examine the list carefully and identify actual mimetic words of Japanese. To ensure that native speaker judgments were of mimetic words, and not some other type of word, participants were explicitly instructed to identify mimetic words. This precaution was supported further by the structure of the items in the questionnaire, which were reduplicated CVCV forms, because this structure is almost exclusively mimetic. Participants were asked to identify the items that they had used, heard, or seen used as meaningful words. For identified words, the participants were asked to provide a meaning and a sentence illustrating its usage in Japanese. Completion of the questionnaire was self-paced, and participants could usually finish it in under an hour. All instructions were in Japanese. Three of the speakers were in their twenties and three in their thirties. Four of them were from the Eastern dialect area (Tokyo, Kanagawa, Shizuoka, Sapporo), the other two were from the Western dialect area (Okayama and Shiga), following the dialect areas of (Shibatani, 1990). All participants were residing in Canada at the time of the experiment.[5]

The results reported below confirm that, while there is some variation in speaker responses, the variable patterns are indeed consistent with the above conclusion, namely that both leftmost noncoronal and rightmost coronal palatalization are not systematically represented in Japanese mimetic words. The number of recognized forms ranged from 3 to 35, with an average of approximately 17 forms per speaker; see Table 3 below. Of the 1098 logically possible forms, only 64 forms were recognized at least once, and of these, only 17 forms were recognized by two or more speakers, suggesting that these combinations are indeed underrepresented in the Japanese lexicon. The full list of identified forms, arranged by consonant combination is shown

[5] Three of the participants were non-linguists (1, 5, 6 in Table 4), and three others were linguistics graduate students (2, 3, 4). None of the participants were aware of the specific purpose of the study, and only one of them confirmed some familiarity with the issue of conflicting directionality. Interestingly, this speaker had the lowest number of responses overall.

in Table 3. As with the dictionary forms, the glosses and examples for all elicited forms are given in a spreadsheet made available from the authors' webpages.

Table 3. CVCV-based palatalized mimetic words with two coronals or two noncoronals identified in the exhaustive search. Items marked with * indicate forms that appeared in our dictionary corpus; items in bold were identified as words by at least two speakers. Shaded cells show combinations that are irrelevant to the search.

C2 / C1		Lab			Cor				Dor		Lar
		p	b	m	t	s	z/d	n	k	g	h
Lab	p	pap^{y}u							**p^{y}oko***	pug^{y}a	
									pak^{y}a		
									pok^{y}u		
									p^{y}uku		
	b			bum^{y}u					bak^{y}a		buh^{y}a
									bak^{y}u		buh^{y}o
									b^{y}aku		
	m								muk^{y}a	m^{y}ago	muh^{y}a
									muk^{y}u	mog^{y}a	muh^{y}o
										mug^{y}u	
Cor	t										
	s				suča	saša		šana*			
					šuta						
	z/d				**zuča**	**doša***	zašu	zuɲu			
					zuču	duša					
					ǰota						
	n				**nuča**	ɲoso					
					nučo						
					nuču						
Dor	k	k^{y}upo	k^{y}aba						kok^{y}u		**k^{y}aha**
									k^{y}uko		**k^{y}aho**
											k^{y}oho
	g		g^{y}abu	gom^{y}a					gak^{y}u	**gog^{y}u**	**g^{y}aha**
				gom^{y}o					**gok^{y}u**		g^{y}aho
											g^{y}ahu
											guh^{y}a
											guh^{y}o
Lar	h		h^{y}obo	hum^{y}a					**h^{y}oko***	hag^{y}u	h^{y}aha
				hum^{y}u					hok^{y}o	hog^{y}a	**hah^{y}u**
										hug^{y}a	huh^{y}o
										hug^{y}u	

To focus on commonly accepted forms, we examine first the 17 forms recognized by at least two speakers. There were fewer coronal + coronal forms than noncoronal + noncoronal forms, presumably an effect of an avoidance of the cooccurrence of homorganic consonants. Of the four forms not in the dictionary corpus, three have C2 palatalization and one has C1 palatalization, as shown below.

(3) Coronal + Coronal forms

a. C1 palatalization	b. C2 palatalization
šuta-šuta	doša-doša* (* = in dictionary corpus)
	nučo-nučo
	zuča-zuča
	nuča-nuča

Of the ten additional forms given by only one native speaker, three of them also have initial palatalization: *ǰota-ǰota, ɲoso-ɲoso, šana-šana**. It is difficult to make any conclusions based on such a small dataset, but it is consistent with our findings in dictionaries. Coronal-coronal combinations are vanishingly rare, and there are indeed counterexamples to the generalization of rightmost coronal palatalization.

There are a few more noncoronal-noncoronal forms that did not occur in the dictionary corpus. The eleven identified forms below show that there is no generalization at all about the position of palatalization: six have C1 palatalization and seven have C2 palatalization. Furthermore, for both coronal-coronal and noncoronal-noncoronal roots, items with the same consonant combinations may have different patterns of palatalization, for example, *šuta-šuta* vs. *suča-suča, b^yaku-b^yaku* vs. *bak^{y}u-bak^{y}u,* and *h^{y}aha-h^{y}aha* vs. *hah^{y}u-hah^{y}u*, a point reported by some of the participants.

(4) Noncoronal + noncoronal forms

a. C1 palatalization	b. C2 palatalization
h^{y}oko-h^{y}oko*	mug^{y}u-mug^{y}u
p^{y}oko-p^{y}oko*	gok^{y}u-gok^{y}u
k^{y}aha-k^{y}aha	hug^{y}a-hug^{y}a
g^{y}aha-g^{y}aha	gog^{y}u-gog^{y}u
k^{y}uko-k^{y}uko	hah^{y}u-hah^{y}u
k^{y}aho-k^{y}aho	bak^{y}u-bak^{y}u
	guh^{y}o-guh^{y}o

To further probe the empirical support for (1b-c), the exceptions to the two generalizations are shown below for each individual. Speakers 1-3 represent the thirties age group, and 4-6 the twenties age group. Speakers 1, 2, 4, and 6 are from the Eastern dialect area, while speakers 3 and 5 are from the Western dialect area.

Table 4. Numbers of responses and exceptions to generalizations (1b-c), sorted by speaker

Speaker	Age group, dialect	Number of responses (coronal/noncoronal)	Exceptions to	
			rightmost coronal	leftmost noncoronal
1	30s, Eastern (Shizuoka)	9 (3/6)	2	0
2	30s, Eastern (Tokyo)	3 (0/3)	0	0
3	30s, Western (Okayama)	28 (7/21)	0	15
4	20s, Eastern (Sapporo)	18 (2/16)	1	8
5	20s, Western (Shiga)	35 (7/28)	1	19
6	20s, Eastern (Kanagawa)	11 (4/7)	1	2

As the table above shows, exceptions to the generalizations were found in responses of five of the six speakers; three of these speakers showed both types of exceptions – for coronals and noncoronals. The only speaker who did not have exceptions was speaker 2, who had the lowest number of responses among all the speakers (only 3). Overall, this shows that exceptions are not limited to particular individuals, but are rather representative of the group as a whole. Moreover, patterns of exceptions do not seem to be tied to age or dialect, as exceptions are exhibited by speakers of both age groups and apparently regardless of the dialect region.

At the same time, there appear to be some dialect or age-specific tendencies in overall numbers of responses: on average more items are reported by the speakers from the Western dialect area and by younger speakers from both areas. The age difference can be at least in part attributed to different degrees of exposure to *manga* and *animé* (Japanese comics and animation), where novel mimetic items are commonly used. The increasing use of novel mimetic vocabulary in on-line chat and on *Facebook* has also been noted by one of our younger participants.

4. Discussion

The investigation above has confirmed two of the generalizations in (1), namely (1a) and (1d). However, a comprehensive examination of the original evidence and an exhaustive search of CVCV mimetic roots did not confirm generalizations (1b-c).

(5) Japanese mimetic palatalization reconsidered

a. Coronal and noncoronal, coronal palatalized: **confirmed**

b. Leftmost of two noncoronals: **not confirmed**

c. Rightmost of two coronals: **not confirmed**

d. Avoid /r^{y}/: **confirmed**

These findings raise two important questions, one concerning the correct analysis of Japanese, and another about theoretical implications of theories of edge effects for segmental features. Starting with the first question, part of the interest of prior work on Japanese mimetics, including

early generative works like (Mester and Itô, 1989) and later analyses in OT ((Zoll, 1997), (McCarthy, 2002), (Horwood, 2004)), is that it showed how the same theoretical assumptions that account for (1b-c) can also account for (1a) and (1d) when these generalizations are treated as edge effects. To illustrate with a well-known analysis, (Zoll, 1997) accounts for the preference for palatalization of coronals and avoidance of /r^{y}/ with the same constraint system responsible for the opposite edge effects in (1b-c). Zoll's analysis employs two alignment constraints on palatal feature structure. One constraint, ALIGNLEFT(COMPLEXSEG,PRWD), applies specifically to palatalization in noncoronals and /r/ because they are complex segments, and requires this secondary palatalization to appear in the beginning of the word. A more general constraint, ALIGNRIGHT(-ANT, PRWD), applies to all palatal consonants, both coronal and noncoronal, and requires them to appear at the right of a word. The fact that noncoronals and /r/ are complex segments, while nonrhotic coronals involve a change of place palatalization (from [+anterior] to [-anterior]), makes it possible to collapse the four distinct patterns below into just two patterns: avoidance of palatalization in C2 position when C2 is a complex segment (T5ai, b, d), but preference for C2 palatalization when C2 is a coronal (T5aii, c). The members of the two collapsed patterns have identical violation profiles, shown here in a comparative tableaux (Prince, 2003), because the constraints treat the members of these sets as exactly the same.

Table 5. Conflicting directionality in Japanese (Zoll, 1997)

Generalization	Winner ≻ Loser	ALIGNLEFT(COMPLEXSEG,PRWD)	ALIGNRIGHT(-ANT, PRWD)
Coronal preference	ai. čoko ≻ tok^{y}o	W	L
	aii. kača ≻ k^{y}ata	e	W
Leftmost noncoronal	b. p^{y}oko ≻ pok^{y}o	W	L
Rightmost coronal	c. doša ≻ ǰosa	e	W
Avoid r^{y}	d. k^{y}oro ≻ kor^{y}o	W	L

The problem posed by this type of analysis of Japanese is that it incorrectly predicts conflicting directionality in words with two coronals or two noncoronals. Given two noncoronals, ALIGNLEFT over ALIGNRIGHT predicts the absence of C2 palatalization, but such words exist, e.g., *gok^{y}u-gok^{y}u*. Likewise, this ranking prohibits C1 palatalization in coronal-coronal words, but this prediction is also not borne out, e.g., *šana-šana*. The facts brought to light in this report therefore require a separation of the analysis of (1a) and (1d) from (1b-c), in the case of Japanese at least.

The finding that coronal preference and avoidance of /r^{y}/ in Japanese are not edge effects is actually not at all a surprise when one considers cross-linguistic parallels to these facts. To illustrate one example, in several Ethio-Semitic languages, (Rose, 1997) argues for a palatalization hierarchy that ranks eligible segments as to whether they will receive palatal feature structure in certain morpho-phonological operations. This hierarchy distinguishes among

more classes that are involved here, but the observation directly relevant for Japanese is that palatalization of a noncoronal is marked with respect to coronal palatalization, and palatalization of rhotics is also marked with respect to other coronals. In Harari, for example, marking of 2nd person singular feminine subjects involves both suffixation of /-i/ and morpho-phonological palatalization of a segment closest to the right edge of a stem, as in /kifät+i/→*kifäč-i* 'open!'. However, when the stem ends in a noncoronal and penultimate consonant is coronal, the nonfinal coronal is palatalized, as in /kitäb+i/→*kičäb-i* 'write!'. Furthermore , the preference for coronal palatalization excludes /r/: stem-final /r/ is not palatalized like other coronals, e.g., /birär+i/ → *birär-i* 'fly!' (see (Rose, 1997) for additional details of this system). Similar cases documenting the markedness of coronals with respect to noncoronals and /r/, independent of their edge properties, can also be found in Slavic, Celtic, Finno-Ugric and West Chadic languages, among other languages ((Bateman, 2007), (Bhat, 1978), (Kochetov, 2002), (Schuh, 2002)).

A full analysis of these preferences in Japanese is beyond the scope of this paper, but we simply note here that the markedness of palatalization in noncoronals and /r/, relative to coronals, can be accomplished with well-formedness constraints that do not refer to edges. Rose's (1997) Palatalization Markedness constraint, which encapsulates the palatalization hierarchy discussed above, is sufficient to the task because it establishes within-segment markedness generalizations of the right kind. Likewise, (Akinlabi, 1996) applies the same reasoning to the unmarkedness of coronal palatalization in his discussion of Japanese mimetic palatalization, arguing for a feature coccurrence constraint 'If [-back] then [coronal]' that simply applies to the domain of the segment ([-back] represents palatalization here). Since the preference for coronal palatalization is not an edge effect in Japanese, segment-internal featural markedness constraints such as these can be ranked with respect to faithfulness constraints to account for the salient distributional patterns. In sum, there are cross-linguistic parallels to the coronal preference in Japanese, and a clear approach to these facts as segment-internal markedness effects exists in the literature.

Finally we address the cross-linguistic implications of prior work on Japanese mimetics for segmental edge effects. These analyses, based on (Hamano, 1986/1998)'s original description, assume that Japanese has the two edge effects in (1b-c). Indeed, it is the opposite directions for these edge effects that supports a parallel made explicitly in Zoll 1997 to default-to-opposite stress ((Prince, 1983), (Halle and Vergnaud, 1987), (Gordon, 2000)). As intriguing as this parallel may seem[6], the empirical investigation above has shown that Japanese does not have the edge effects in (1b-c). Since Japanese mimetic palatalization is the only example argued to be a case of segmental conflicting directionality in prior work, it is worth considering the implications of these analyses for future empirical investigation. In particular, what would future valid examples of segmental conflicting directionality tell us about theories of docking and edge effects for feature structure? Furthermore, what if no examples of conflicting directionality are ever found?

[6] But the parallel to default-to-opposite is not perfect in Zoll's (1997) analysis. In default-to-opposite stress, a specified class of syllables, e.g., heavy syllables, takes precedence over the superset class and has a different direction for stress. In Zoll's analysis, palatalization of coronals takes precedence over noncoronals but it is controlled by constraints that refer to the superset class, namely all palatals (see Table 5). This curious inversion of the set-superset relations derives from the fact that the alignment constraints on noncoronals can be vacuously satisfied by simply palatalizing a coronal. A final point is that the gradiently assessed alignment constraints proposed in Zoll (1997) actually do not predict defaulting of palatal feature structure to an opposite edge in words greater than two syllables, as found in default-to-opposite stress.

The chart below illustrates the predictions made by prior analyses of segmental conflicting directionality. For each theory, the operative constraints are repeated from these works and the specific edge effects they predict, if any, are given on the right. For concreteness, the specific constraints listed below refer to palatal feature structure on coronals and noncoronals, but similar patterns could be predicted for other types of features with analogous constraints.

(6) Theories of segmental conflicting directionality

	Rightmost coronal/ leftmost noncoronal	Leftmost coronal/ rightmost noncoronal
a. Zoll 1997, Conflicting directionality ALIGNLEFT(COMPLEXSEG,PRWD) ALIGNRIGHT(-ANT, PRWD)	✓	
b. Extended alignment theory ALIGNLEFT/RIGHT(COMPLEXSEG,PRWD) ALIGNLEFT/RIGHT(-ANT, PRWD)	✓	✓
c. McCarthy 2002, categorical constraints SUFFIX(-ANT), SUFFIX/σ(-ANT) ALIGNLEFT(-ANT, PRWD) & *COMPLEXSEG	✓	(✓)
d. Horwood 2004, Relational Faithfulness LINEARITY (with featural prefix, suffix) (*NONINITIALCOMPLEXSEG)	(✓)	(✓)

As illustrated in Table 5, (Zoll, 1997)'s alignment based theory predicts a rightmost coronal/leftmost noncoronal pattern because of the specific edge settings in the assumed alignment constraints (6a). A more general theory, based on Zoll's idea that alignment constraints drive the analysis, also predicts the opposite pattern (6b). The parallel with stress systems made in (Zoll, 1997) suggests this more general theory, since the alignment constraints standardly employed in default-to-opposite stress (Bakovic, 1998) are likewise symmetric. On the other hand, Zoll motivates constraints like ALIGNLEFT(COMPLEXSEG,PRWD) with the idea that complex segments are positionally licensed at the left edge of a word, so if the cross-linguistic generalizations support this positional licensing approach, then an asymmetric theory of segmental conflicting directionality (6a) is justified.

The coverage of these two theories is also predicted by (McCarthy, 2002)'s theory of feature docking in which the violations of the constraints guiding association of a feature are assessed categorically. Two types of constraints are employed in this analysis: SUFFIX(FEATURE) constraints (and the analogous constraints on prefixes) which are violated in structures where a segment (SUFFIX(-ANT)) or syllable (SUFFIX/σ(-ANT)) intervene between the right edge of the prosodic word and the featural suffix [-anterior]. To get the opposite edge for the subset class, in this case complex segments, McCarthy employs local conjunction of two constraints, as in (Smolensky, 1995), which produces a categorical constraint that in essence prohibits noninitial

complex segments. Because the edge settings for these constraints are not restricted, and the availability of the PREFIX constraints, this theory could also predict a leftmost coronal/rightmost noncoronal pattern. However, it could also appeal to the markedness of noninitial complex segments, as (Zoll, 1997) appears to, to exclude this pattern.

Finally, we note that one theory, (Horwood, 2004), is more expressive in that it can account for both patterns of conflicting directionality, i.e., patterns consistent with positional licensing, or none at all. This approach assumes that floating features are morphemes, and as morphemes, they have an inherent precedence structure with respect to the stems they attach. Therefore, faithfulness constraints like LINEARITY (McCarthy and Prince, 1995) have the ability to control their integration and position in the stem. In particular, LINEARITY predicts that floating features will tend to be as close as possible to their affix position, leftmost if the floater is a prefix, rightmost if it is a suffix. As shown in Horwood's (2004) sketch of Japanese, this theory can employ a positional markedness constraint like *NONINITIALCOMPLEXSEG to produce conflicting directionality of the kind in (1b-c). As nothing in this theory precludes the opposite positional markedness constraint, the Precedence Faithfulness approach could account for either kind of conflicting directionality (6d). Interestingly, the absence of any of these additional constraints predicts the nonexistence of conflicting directionality altogether, which is consistent with the fact that segmental conflicting directionality is at present unattested.

The above discussion has reviewed the ways in which contemporary theories do and do not predict certain patterns of conflicting directionality. We hope that these predictions can help focus future data collection and the interpretation of valid examples of segmental conflicting directionality within theories of feature docking and realization.

Appendix

Table 6.
a. Consonant combinations for CVCV mimetic words *without palatalization* (items with consonants that do not occur in Table 1, /w/ and /y/, and with /r/ as C1 are excluded), $n = 422$

C1	C2	Lab p	Lab b	Lab m	Cor t	Cor d	Cor s	Cor z	Cor n	r	Dor k	Dor g	Lar h	
Lab	p				13		5			11	13			*42*
	b				13		6			13	10			*42*
	m				7	2	8	7		10	5	5		*44*
Cor	t	2	8	1		1		1		8	10	2		*33*
	d		6		1		3			3	6			*19*
	s	3	10	3	3			1	2	5	9	3	3	*42*
	z		6	2	3		1			9	8			*29*
	n		3	3	5	1	4			4	5			*25*
	r													
Dor	k	1	4		13	2	10	1	2	13	2	1	2	*51*
	g		7	2	14	1	9	4	1	11	5		1	*55*
Lar	h			1	11		5		1	10	9	2	1	*40*
		6	*44*	*12*	*83*	*7*	*51*	*14*	*6*	*97*	*82*	*13*	*7*	*422*

b. Counts of observed items (O) and observed/expected ratios (O/E) for each combination category in words without palatalization. A ratio below or above 1.00 indicates that the combination occurs less or more frequently than would be expected based on random distribution (see (Kawahara et al., 2006) for a similar approach to cooccurrence restrictions in the Yamato stock of Japanese). These O/E values show that items with two labials, two coronals, and two dorsals are under-represented in the corpus.

C1 \ C2	Lab	Cor	r	Dor	Lar
Lab	O=0 O/E=0.00	O=61 O/E=1.25	O=34 O/E=1.16	O=33 O/E=1.15	O=0 O/E=0.00
Cor	O=47 O/E=2.16	O=26 O/E=0.46	O=29 O/E=0.85	O=43 O/E=1.29	O=3 O/E=1.22
Dor	O=14 O/E=0.90	O=57 O/E=1.41	O=24 O/E=0.99	O=8 O/E=0.34	O=3 O/E=1.71
Lar	O=1 O/E=0.17	O=17 O/E=1.11	O=10 O/E=1.09	O=11 O/E=1.22	O=1 O/E=1.51

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