Appendix A: Verbal suffix allomorphy in Japanese

In the discussion of verbal suffix allomorphy in Japanese in section 2.3, I simply assumed that /anai/ and /nai/ are lexical allomorphs which are listed in the lexicon. I will defend this assumption including allomorphy with and without *r*, then conduct an analysis of homophony creation to see if lexical allomorphy would provide a more elegant account.

There is a long-standing issue in the Japanese verb paradigm. Under the traditional generative approach assumes, it has been assumed there is one underlying morpheme and the surface allomorphs are computed by a rule (McCawley 1968, Ashworth and Lincoln 1973, de Chene 1981, 1985, Poser 1986, Mester and Itô 1989). An issue arises when we assume that there is one underlying suffix for each inflectional category in Japanese verbs. As we saw in (25), repeated here as (174), it is controversial whether the boldfaced segments described below are epenthesized or deleted.

(174)

Category names	Consonant-final verb	Vowel-final verb	
Negative	kar -**a**nai	kare -nai	kari -nai
Polite Present	kar -**i**masu	kare -masu	kari -masu
Present	kar -u	kare -**r**u	kari -**r**u
Hypothetical	kar -eba	kare -**r**eba	kari –**r**eba
Potential	kar -e	kare -**r**are	kari -**r**are
Passive	kar -are	kare -**r**are	kari -**r**are
Imperative 1	kar -e	kare -**r**o(**y**o)	kari -**r**o(**y**o)
Imperative 2	kar -**i**na	kare -na	kari -na
Polite Imperative	kar -**i**nasai	kare -nasai	kari -nasai
Tentative	kar -oo	kare -**y**oo	kari -**y**oo
Causative	kar -ase	kare -**s**ase	kari -**s**ase
Past	kat -ta	kare -ta	kari -ta
Gerund	kat -te	kare -te	kari -te
	‘clip’	‘wither’	‘borrow’

I will call the suffixes for consonant-final verbs the "vowel-initial suffix" and the suffixes for vowel-final verbs the "consonant-initial suffix." First, I will review past research on this controversy. The table below is a summary of the claims on verbal suffix allomorphy, whether the boldfaced vowels are epenthesized or deleted.

Table 21
Controversy of Japanese verbal suffix allomorphy

	nai/anai 'negative'	masu/imasu 'polite present'	ru/u 'present' reba/eba 'hypothetical' rare/are 'passive'	yoo/oo 'tentative'	sase/ase 'causative'
McCawley (1968)	epenthesis	epenthesis	deletion	deletion	deletion
Ashworth and Lincoln (1973)	deletion (<ra>nai/ <r>anai)	deletion (<ri>masu/ <r>imasu)	deletion	(/roo/ → yoo)	
de Chene (1981)			not deletion		
de Chene (1985)			epenthesis		
Poser (1986)			deletion	epenthesis	deletion
Mester and Itô (1989)			epenthesis	(epenthesis, referral to Poser 1986)	(need further investigation)

As for the negative and polite present, McCawley (1968), who assumes consonant-initial suffixes such as /nai/ and /ru/ are basic, argues that /a/ and /i/ are inserted for consonant-final verbs whereas Ashworth and Lincoln (1973) claim that the underlying form of the negative is /ranai/ and /r/ is deleted when it is attached to consonant-final verbs and /ra/ is

deleted when it is attached to vowel-final verbs. They imply the same analysis for the polite present /masu/ and /imasu/.[55]

As for /r/, McCawley, Ashworth and Lincoln and Poser (1986) argue that there is a deletion rule for /r/. de Chene (1981) questions the *r*-deletion rule because it is highly unnatural to delete a syllable-initial consonant while leaving a syllable-final consonant untouched. de Chene (1985), who claims that vowel-initial suffixes such as /u/ and /eba/ are basic, argues that the allomorphy of the Japanese verbal paradigm with or without *r* (such as the present *ru/u* and the hypothetical *reba/eba*) is a result of *r*-epenthesis (Mester and Itô 1989 simply assume it is *r*-epenthesis without further explanation). de Chene (1985) claims that the *r*-epenthesis rule is motivated by two arguments. One is that *r*-epenthesis is a "natural" outcome of the system of morphological rules that results from the selection of consonant-stem suffixes, such as the present *u* and the hypothetical *eba*, as basic, using a general stem-boundary epenthesis rule of /r/: $\emptyset \rightarrow r$ / $V]_{vs}$ __ [V (for example, $\emptyset \rightarrow r$ / *tabe* __ *eba*, but no *r*-epenthesis for a consonant-final verb *yom -eba*). It is "natural" as *r*-initial vowel-stem suffix alternates in five out of nine cases de Chene introduces. The other is, de Chene claims, that stem-boundary *r*-epenthesis is a natural rule on universal grounds. He provides cross-linguistic support for the idea of a Japanese *r*-epenthesis rule, with some examples where there is an insertion of hiatus-breaking consonants; Sanskrit (*madhunas* /madhu-as/ GEN, SG 'honey'), Ancient Greek (*onomatos* /onoma-os/ GEN, SG 'name'), and Modern Greek (*pansedes* /panse-es/ NOM, PL 'pansy'), to name a few. There is a language-independent tendency to choose coronal consonants as

[55]de Chene (1985) takes a position that vowel-initial suffixes are basic but he is not clear about the status of /nai/ and /masu/ whether these are derived by deletion of /a/ and /i/ respectively.

hiatus breakers. In Japanese, it is /r/ (but see McCarthy 1993 for an argument against insertion of *r* to break hiatus in his discussion on the Eastern Massachusetts dialect).

As for /y/ in the tentative, Poser (1986) argues convincingly that historically /y/ is an insertion, although the synchronic status of this alternation requires further investigation. McCawley clams that /y/ is deleted by a rule. Ashworth and Lincoln (1973) claim that the tentative suffix is underlyingly /roo/ and surfaces as *yoo*, but no rule is articulated.

As for /s/ in the causative, McCawley and Poser assumes that /s/ is deleted.

There are some issues to account for the Japanese verbal suffix allomorphy by epenthesis rules or deletion rules. The issue of the epenthesis rules is that if consonant-initial suffixes are basic, why are two different vowels, *a* and *i*, epenthesized as shown in (175)? We cannot argue that a suffix initializing with /m/ takes *i* and a suffix initializing with /n/ takes *a* as an epenthetic vowel because as shown in (174), *i* is selected before /n/ in Imperative 2 *kar-**i**na* and Polite Imperative *kar-**i**nasai*. Similarly, if vowel-initial suffixes are basic, why are three different consonants, *r*, *y* and *s*, epenthesized, as pointed out by Mester and Itô (1989)?

(175) Phonologically derived allomorphy: Epenthesis rules
Consonant-initial suffixes as basic

a. tabe -nai→ tabenai
eat NEG
tob -nai → tob**a**nai
fly NEG

b. tabe -masu→ tabemasu
eat POL-PRES
tob -masu → tob**i**masu
fly POL-PRES

Vowel-initial suffixes as basic

c. tabe -u → tab**r**u
eat PRES
tob -u → tobu
fly PRES

d. tabe -oo → tabe**y**oo
eat TENT
tob -oo → toboo
fly TENT

e. tabe -ase → tabe**s**ase
eat CAUS
tob -ase → tobase
fly CAUS

In addition, another issue for deletion rules, as well as epenthesis rules, is how to account for the alternation of the imperative suffix /-e/ for a consonant-final verb and /-ro/ (or /yo/) for a vowel-final verb. A phonological rule cannot derive /ro/ to /e/ or vice versa unless we posit an ad-hoc rule.[56]

The deletion rules, on the other hand, seem to work if we delete *a* or *i* if the alternative is a VV sequence and delete *r*, *y* and *s*, if the alternative would be a CC sequence.

(176) Phonologically derived allomorphy: Deletion rules

Deletion in a VV sequence

a. tabe -**a**nai → tabenai
eat NEG
tob -anai → tobanai
fly NEG

b. tabe -**i**masu→ tabemasu
eat POL-PRES
tob -imasu → tobimasu
fly POL-PRES

[56]Ashworth and Lincoln (1973) claim that the imperative suffix is underlyingly /re/ and it surfaces as *yo* when it is attached a vowel-final verb but no explanation is given.

Deletion in a CC sequence

c. tabe -ru → taberu
eat PRES
tob -**r**u → tobu
fly PRES

d. tabe -yoo → tabeyoo
eat TENT
tob -**y**oo → toboo
fly TENT

e. tabe -sase → tabesase
eat CAUS
tob -**s**ase → tobase
fly CAUS

It is possible to choose deletion of suffix material rather than root material using positional faithfulness, namely, the material in the suffix gets deleted in all the cases. However, deletion of only the material in suffix is rather lexically idiosyncratic in hiatus resolution in the Japanese phonology, as some vowels in a vowel-initial suffix are never deleted even when such affixation results in hiatus. In the following compound verbs, for example, /a/ and /i/ in the suffix are not deleted in the same environments as (176a,b).

(177) a. tabe -**a**ruk -u → tabe**a**ruku
eat walk PRES
'eat around'

b. nage -**i**re -ru → nage**i**reru
throw put into PRES
'throw in'

In gerund /te/ affixation to /ok/ and /age/ in (178), hiatus is created in the full-form grammar. /o/ in /ok/ and /a/ in /age/ are not deleted.

(178) a. tabe -te -**o**k -u → tabete**o**ku
eat GER put PRES
'eat in advance'

b. tabe -te -**a**ge -ru → tabete**a**geru
eat GER give PRES
'eat for (somebody's) sake'

In the contraction grammar, /te/ contraction occurs as a resolution of hiatus but /e/ in /te/ is deleted, not /o/ in /ok/ and /a/ in /age/.

(179) a. tabe -t**e** -ok -u → tabetoku (/e/ deletion)
eat GER put PRES
'eat in advance'
b. tabe -t**e** -age -ru → tabetageru (/e/ deletion)
eat GER give PRES
'eat for (somebody's) sake'[57]

Thus, the deletion rules (176) are lexical idiosyncrasy.[58] In addition, an issue for epenthesis rules again is how to account for the alternation of the imperative suffix /-e/ for a consonant-final verb and /-ro/ (or /yo/) for a vowel-final verb.

I hold the view that the negative suffixes /nai/ ~ /anai/ are listed in lexicon, in other words, they are lexical allomorphy, as opposed to allomorphy by phonological deletion or epenthesis rules. I make use of lexical allomorphy to account for this controversial treatment of verbal suffix allomorphy. The selection of the one or another allomorph is accomplished with reference to the phonological context in which the suffix appears.[59] I follow Kager's (2003) discussion on Dutch open syllable lengthening, alternation of a short vowel ~ a long vowel, for example, *slo[ɔ]t ~ sl[o:]ten* 'lock(s)' and *w[ɛ]g ~ w[e:]gen* 'read(s)'. The distribution of short and long vowels is phonologically

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[57] /i/ in /ik/ 'go', on the other hand, is deleted in /te/ contraction as shown in (61a).

(i) tabe -te -**i**k -u → tabeteku (/i/ deletion)
eat GER go PRES
'eat before going'

The mechanism of which vowel gets deleted in hiatus in /te/ contraction is a whole different discussion.

[58] I cannot find a counterexample of the deletion rules of a CC sequence in (176); an example consonant initial suffix, which attaches to a consonant final verb, resulting in a consonant cluster where the consonant is never deleted. It is because a CC sequence is a violation of SYLLSTRUC.

[59] Incidentally, the same approach has been proposed by Itô and Mester (2004b), however, using slightly different constraints.

predictable. A short vowel occurs in a closed syllable and a long vowel occurs in an open syllable. The alternation, however, is exceptional (or a "minor rule," as it occurs in only a few stems) because in Dutch, short vowels and long vowels occur freely in open and closed syllable contexts in many stems: *p[ɔ]t ~ p[ɔ]ten* 'pot(s)', *p[o:]t ~ p[o:]ten* 'paw(s)'. Kager assumes that lexically unpredictable allomorphs, such as minor rules, are encoded in the lexicon by listed allomorphs. As for the alternation in Japanese at hand, the distribution of /masu/ ~ /imasu/ and /nai/ ~ /anai/, for example, is also phonologically predictable. Vowel-final verbs take consonant-initial suffixes, /masu/ and /nai/, and consonant-final verbs take vowel-initial suffixes, /imasu/ and /anai/. This situation resembles the /a/ ~ /an/ alternation in English where /a/ is chosen before a consonant-initial noun and /an/ is chosen before a vowel-initial noun. This alternation in English is 100% phonologically predictable, however, it is generally accepted that this alternation is not based on a phonological rule of *n*-insertion or deletion since such a rule would be rather ad-hoc to only apply to this indefinite article. Similarly, I argue that in the verbal suffix allomorphy, it is a result of phonologically-driven distribution of lexical allomorphy.

Following Kager's (2003) analysis, the tableau below shows analyses of lexical allomorphy of /masu/ ~ /imasu/ and /nai/ ~ /anai/ in the full-form grammar. Each allomorph in the lexicon is independently available as an input to mapping. One of its properties is that it can freely generate any conceivable output candidate for a given input, and therefore, a full set of candidate outputs for each individual lexical allomorph can be generated. There are four output combinations.

Tableau 97
Lexical allomorphy approach: /imasu/ ~ /masu/ in the *full-form* grammar

{/C/ ~ /V/}{/masu/$_1$ ~ /imasu/$_2$}	SYLLSTRUC	MAX-V	INITIAL-C	FINAL-C
a. Cmasu$_1$ ~ Vmasu$_1$	*! ~			~ *
b. Cmasu$_1$ ~ Vimasu$_2$	*! ~		~ *	~ *
c. ☞ Cimasu$_2$ ~ Vmasu$_1$			* ~	~ *
d. Cimasu$_2$ ~ Vimasu$_2$			* ~ *!	~ *

Tableau 98
Lexical allomorphy approach: /anai/ ~ /nai/ in the *full-form* grammar

{/V/ ~ /C/}{/nai/$_1$ ~ /anai/$_2$}	SYLLSTRUC	MAX-V	INITIAL-C	FINAL-C
a. Cnai$_1$ ~ Vanai$_1$	*! ~			~ *
b. Cnai$_1$ ~ Vanai$_2$	*! ~		~ *	~ *
c. ☞ Canai$_2$ ~ Vnai$_1$			* ~	~ *
d. Canai$_2$ ~ Vanai$_2$			* ~ *!	~ *

/masu/ and /imasu/, as well as /nai/ and /anai/, are both listed in the lexicon. {/C/ ~ /V/} in the input indicate that two types of verbs, one ending with a vowel and the other ending with a consonant, are available in the lexicon. Note that in both tableaux, there is no violation of MAX-V. As argued by Kager (2003:28), availability of lexical allomorphy allows each member of the output candidate, *anai* or *nai*, to derive from a lexical counterpart of a matching member of underlying form, either /nai/ or /anai/, as indicated by the index. *nai* in output, for example, is not a result of the deletion of /a/ in /anai/ (see Kager for his argument on this). Lexical allomorphy is invisible to faithfulness constraints and it implies that phonological distribution of allomorphs uniquely depends on markedness constraints (Kager 2003: 26). This invisibility to faithfulness is crucially different from the single underlying morpheme scenario in which the faithfulness

constraint is violated, due to deletion or epenthesis of the vowels *i* or *a*.[60] Nonviolation of MAX-V in these tableaux means that the same results will be obtained by the contraction grammar because the difference between the two grammars is the position of MAX-V (whether INITIAL-C and FINAL-C are ranked – in contraction grammar – , or unranked – in the full-form grammar – , is inconsequential in the tableaux 97 and 98 to determine the optimal candidates). This lexical allomorphy approach adequately accounts for the alternations.

The lexical allomorphy approach can be used to account for the controversial *r*-deletion/epenthesis argument of verbal suffixes, such as the present suffix /ru/ ~ /u/, the hypothetical suffix /reba/ ~ /eba/, the passive suffix /rare/ ~ /are/, and *s*-deletion/epenthesis issue the causative suffix /sase/ ~ /ase/.

Tableau 99
Lexical allomorphy approach: /ru/ ~ /u/ in the *full-form* grammar

{/C/ ~ /V/} {/ru/$_1$ ~ /u/$_2$}	SYLLSTRUC	MAX-V	INITIAL-C	FINAL-C
a. Cru$_1$ ~ Vru$_1$	*! ~			~ *
b. Cru$_1$ ~ Vu$_2$	*! ~		~ *	~ *
c. ☞ Cu$_2$ ~ Vru$_1$			* ~	~ *
d. Cu$_2$ ~ Vu$_2$			* ~ *!	~ *

The pattern of the violations of this tableau is identical to tableaux 97 and 98. The lexical allomorphy approach adequately accounts for the allomorphy of *ru*/*u* as well.

There is another advantage for the lexical allomorphy approach over the phonological rule approach. *r*-epenthesis (de Chene 1985) can only account for a mere alternation of *r* ~ *Ø*, such as *ru* ~ *u* and *reba* ~ *eba*. The lexical allomorphy approach, on

[60]In the case that C is *n*, for example *sin* 'die', the sequence *nn* in *nnai* does not violate SYLLSTRUC as *sin.nai.* does. However, it violates UNIFORMITY [nas] as we discussed in section 3.4.

the other hand, can also account for the potential suffix allomorphy *rare* ~ *e* and the imperative suffix allomorphy *ro* ~ *e*. Those two cases of allomorphy cannot be explained by phonological rules, as pointed out by Shibatani (1990:232). We must assume that the allomorphs of each morpheme are listed separately in the lexicon. The distribution of the attached allomorph is determined by the type of the verb stem. /ro/ is chosen for a vowel-initial verb and /e/ is chosen for a consonant-initial verb. It is obvious that these cases are examples of lexical allomorphy. Therefore, I conclude that it would be straightforward to treat all the allomorphy in the Japanese verb paradigm as lexical allomorphy.[61]

Although I do not expect to come to a final conclusion regarding this controversy on the allomorphy of Japanese verbal paradigm, I have presented several advantages of the lexical allomorphy approach, which gives a more elegant account of this issue.[62]

[61]See Booij (2002) for a similar discussion that the Dutch nominal suffix allomorphs, *-er* and *-aar* '-er', are listed separately in the lexicon rather than being derived from one underlying form.

[62]Paul Hagstrom (personal communication) has suggested another account for this allomorphy. That is, the non-deleting vowel /a/, for example /a/ in (177a), is prelinked to a V slot, while /a/ in the negative /anai/ is either unlinked or is floating, something that would be left unrealized if it is not needed, but it nevertheless has the vowel quality recorded in the lexical item. Deleting /a/ in the negative to satisfy ONSET constraint would violate MAX-V but not, for example, MAXLINKMORA, or something similar, making it cheaper to get rid of.

Appendix B: /rVnai/ verb patterns and blocking of nasal assimilation

Since neither comprehensive data nor a corpus of nasal assimilation in Japanese is available, I created this list based on my own native speaker intuitions along with the cooperation of two other Japanese native speakers. It is possible that other Japanese speakers, who speak a different dialect, or for other individual reasons, may not agree with our judgment on the occurrence of nasal assimilation.[63] Nevertheless, we were still able to capture the tendency of this particular contracted form.

In this appendix, I show several patterns of /rVnai/ verb formation and a comprehensive list of /rVnai/ verbs and their nasal assimilation. The list includes two sets of words and the corresponding nasal assimilation.

(180) a. /CV.rV.nai/
b. /CV.CV.rV.-nai/

C in each syllable is optional since Japanese syllables do not always require onsets and /C^{j}V/ syllables are excluded from this list since verbs with /C^{j}V/ are extremely rare. There are 60 combinations of the CV syllable in Japanese. This means that there are 180 potential patterns for /CV.rV.-nai/ words (60 syllable pattern for /CV/ and three vowels -

[63] One of the useful methods used to judge whether nasal assimilation occurs is to put verbs in a context. For example, occurrence of nasal assimilation of three variation of /karVnai/ can be tested with arguments.

(i) a. kaminoke ka**r** -**a**nai → kaminoke ka**n**nai
hair cut NEG
'does not get a hair-cut'
b. hon ka**ri** -nai →hon *ka**n**nai
book borrow NEG
'does not borrow a book'
c. hana ka**re** -nai → hana *ka**n**nai
flower wither NEG
'the flower does not wither.'

In these examples, case particles, the nominative *ga* and the accusative *o*, are deleted since the omission is more natural with nasal assimilation.

a, *e*, *i* -, for /V/ in /rV/, 60 x 3 = 180) and 10, 800 potential patterns in /CV.CV.rV.-nai/ words (60 syllable pattern for the first /CV/ and the second /CV/ and, three vowels for /V/ in /rV/, 60 x 60 x 3 = 10,800). Obviously, this does not cover the entire /rV/ formation of Japanese verbs. If we add one more syllable, there would be 648,000 potential patterns and it is too much to handle. However, I believe that this list is representative of the tendency in /rVnai/ patterns and nasal assimilation.[64]

First of all, I need to explain several formation patterns for /rVnai/verbs.

(181) Formation patterns

a. /r-anai/ formation – a verb ending with /r/ + negative /-anai/
Simple NEG -C
nur -anai → nu**ranai**
paint, NEG

b. /ri-nai/ formation – vowel-final verb + negative /-nai/
Simple NEG -V
ori- -nai → o**rinai**
get off NEG

c. /re-nai/ formation
Simple NEG -V
kure -nai → ku**renai**
give NEG
/e/- NEG (POTEN)
tor -e -nai → to**renai**
take POTEN NEG
/are/- NEG (PASS)
tor -are -nai → tora**renai**
take PASS NEG

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[64] In Japanese, there is a form known as the indirect passive (or adversative passive) (Tsujimura 1996:238-241). In the indirect passive form, intransitive verbs also take passive forms. For example,

(i) a. Taroo -ga kodomo -ni sin -are -ta (Tsujimura 1996:238)
Taro -NOM child -by die -PASS -PAST
'Taro is adversely affected by his child's death.'

b. Ziroo -ga ame -ni fur -are -ta (Tsujimura 1996:238)
Ziro -NOM rain -by fall -PASS -PAST
'Ziro was rained on.'

I also included indirect passives in the list as long as they were considered to be commonly used forms.

/rare/-NEG (POTEN or PASS)

tome -rare **-**nai → tomera**renai**
stop POTEN NEG
tome -rare **-**nai → tomera**renai**
stop PASS NEG

The allomorphs are listed below.

(182) Allomorphs
- a. /-anai/ and /-nai/ are allomorphs of the negative morpheme which attach to consonant-final verbs/suffixes and vowel-final verb/suffixes respectively.
- b. /-e/ and /-rare/ are allomorphs of the potential morpheme which attach to consonant-final verbs/suffixes and vowel-final verbs/suffixes respectively.
- c. /-are/ and /-rare/ are allomorphs of the passive morpheme which attach to consonant-final verbs/suffixes and vowel-final verbs/suffixes respectively.

Table 22 below shows the summary of /CV.rV.-nai/ words. The second column "Formation pattern" shows /rVnai/ formation patterns explained in (181). The "Number of verbs" column shows how many verbs of each formation pattern were found. "Counterparts" shows the number of counterparts to a specific formulation pattern in a given row. For example, in the second row, there are three /ri-nai/ counterparts (for example, *kari-nai* vs. *kar-anai*) and 20 /re-nai/ counterparts to /CVr-anai/ (for example, *kare-nai* vs. *kar-anai*). Counterparts potentially create homophony if they all underwent nasal assimilation because only the difference is a vowel following *r* besides the difference in the morpheme boundary.

Table 22
/CV**.**rV**.**nai/ words and counterparts

/rVnai/	Formation patterns	Number of verbs	Counterparts		
			/r-anai/	/ri-nai/	/re-nai/
/r-anai/	Simple NEG CVr-anai	29	N/A	3	20
/ri-nai/	Simple NEG CVri-nai	4	**3**	N/A	2
/re-nai/	Simple NEG CVre-nai	12	**4**	2	N/A
	/e/- NEG (POTEN) CVr-e-nai	21	**21**	1	N/A
	/are/- NEG (PASS) C-are-nai	0	**0**	0	N/A
	/rare/- NEG (POTEN/ PASS) rare-nai	0	**0**	0	N/A

Table 23 shows nasal assimilation of all of the patterns in table 22. The first three columns from the left are the same as table 22. “Nasal assimilation” indicates how many of each formation pattern of /CV.rV.nai/ undergoes nasal assimilation. For example, in the forth row, out of 12 Simple NEG /CVr-e-nai/ words, five words are considered to undergo nasal assimilation, and four words are considered not to, because their /r-anai/ counterparts are considered as a full form of nasal assimilation (indicated as “4 /r-anai/” in the boldface). “Questionable” indicates the number of words which we found difficult to judge whether these words clearly undergo nasal assimilation.

Table 23
/CV**.**rV**.**nai/ words and nasal assimilation

/rVnai/	Formation patterns	Number of verbs	Nasal assimilation		
			Yes	No	Questionable
/r-anai/	Simple NEG CVr-anai	29	27	0	2
/ri-nai/	Simple NEG CVri-nai	4	1	**3** /r-anai/	0
/re-nai/	Simple NEG CVre-nai	12	5	**4** /r-anai/	3
	/e/- NEG (POTEN) CVr-e-nai	21	0	**21** /r-anai/	0
	/are/- NEG (PASS) C-are-nai	0	0	**0**	0
	/rare/- NEG (POTEN/ PASS) rare-nai	0	0	**0**	0

Notice that the numbers in the boldface in tables 22 and 23 match. This means that whenever /r-anai/ counterparts to /re-nai/ or /ri-nai/ words exist, nasal assimilation of /ri-nai/ or /re-nai/ is blocked. Notice also that none of /e/-NEG (POTEN) words undergo nasal assimilation. As introduced in section 2.4.2, especially in (45), a /CVr-e-nai/ word always has its non-potential simple negative /CVr-anai/ counterpart, for example, *tor-e-nai* 'take, POT, NEG' vs. *tor-anai* 'take, NEG', and the deletion of /-e/ means a loss of the entire morpheme as discussed in section 3.5, especially in tableau 58. Thus, nasal assimilation of the /CVr-e-nai/ words is blocked.

The proportions of words undergoing nasal assimilation (excluding words which are blocked in nasal assimilation by a counterpart due to anti-homophony) are as follows:

(183) Nasal assimilation of /CV**.** rV**.**nai/ words
/r-anai/: 93.1% (27/29)
/ri-nai/: 100% (1/1)
/re-nai/: 62.5% (5/8)

Obviously, the data point for /ri-nai/ is too small a sample to allow any meaningful conclusion to be drawn. Note that not all words undergo nasal assimilation even without the risk of homophony (see section 2.4.1 for this discussion). The result indicates that /CV**.**rV**.**nai/ words undergo nasal assimilation but the percentage of undergoing nasal assimilation varies depending of the deleted vowel. Nasal assimilation in /re-nai/ and /ri-nai/ words is blocked completely when it becomes homophonous to the nasal assimilation of the counterpart /r-anai/ word. Tables 24 and 25 show the results of /CV**.**CV**.**rV**.**nai/ words.

Table 24
/CV**.**CV**.**rV**.**nai/ words and counterparts

/rVnai/	Formation patterns	Number of verbs	Counterparts		
			/r-anai/	/ri-nai/	/re-nai/
/r-anai/	Simple NEG CVCVr-anai	128	N/A	0	107
/ri-nai/	Simple NEG CVCVri-nai	4	**0**	N/A	1
/re-nai/	Simple NEG CVCVre-nai	31	**2**	0	N/A
	/e/- NEG (POTEN) CVCVr-e-nai	96	**96**	1	N/A
	/are/- NEG (PASS) CVC-are-nai	24	**3**	0	N/A
	/rare/- NEG (POTEN/ PASS) CV-rare-nai	7	**0**	0	N/A

Table 25
/CV.CV.rV.nai/ words and nasal assimilation

/rVnai/	Formation patterns	Number of verbs	Nasal assimilation		
			Yes	No	Questionable
/r-anai/	Simple NEG	128	128	0	0
/ri-nai/	Simple NEG	4	4	**0** /r-anai/	0
/re-nai/	Simple NEG	31	18	**2** /r-anai/	11
	/e/- NEG (POTEN)	96	0	**96** /r-anai/	0
	/are/- NEG (PASS)	24	19	**3** /r-anai/	2
	/rare/- NEG (POTEN/ PASS)	7	7	**0**	0

The proportions of the words undergoing nasal assimilation (excluding words which are blocked in nasal assimilation by a counterpart due to anti-homophony blocking) are as follows:

(184) Nasal assimilation of /CV.CV.rV.nai/ words
/r-anai/: 100% (128/128)
/ri-nai/: 100% (4/4)
/re-nai/: 77.2% (44/57)

Again, nasal assimilation of /ri-nai/ and /re-nai/ words is blocked completely when their counterparts exits. The total percentages of undergoing nasal assimilation of both /CV.rV.nai/ words and /CV.CV.rV.nai/ words are below.

(185) Nasal assimilation of /CV.rV.nai/ and CV.CV.rV.nai/ words
/r-anai/: 98.7% (155/157)
/ri-nai/: 100% (5/5)
/re-nai/: 75.4% (49/65) } Combination of /ri-nai/ and /re-nai/: 77.1%

Compare this result with the occurrence of nasal assimilation of /r-anai/ words (A-1 type verbs: 90.0%) and /ri-nai/ and /re-nai/ words (A-2 type verbs: 35.0%) in the production

experiment in section 5.2.3. The percentage of the occurrence of nasal assimilation in the production experiment is lower than the result in (185). There are several factors causing this difference. First and the most importantly, the result in (185) is potential occurrence of nasal assimilation, in other words, percentage of the words that could undergo nasal assimilation, but the results in the experiment is actual production of nasal assimilation. Second, the people who made judgment of nasal assimilation in the list and the subjects on the experiment are not the same. The individual differences in the acceptance of nasal assimilation may be an influential factor. Third, the length of the words is also different. The list includes words with /CV**.**CV**.**rV**.**nai/ or less, while 1 out of 5 A-1 type verbs and 4 out of 5 A-2 type verbs are longer than /CV**.**CV**.**rV**.**nai/. Examining the relationship between these factors and the occurrence of nasal assimilation is beyond the scope of this dissertation. Conclusions we can draw from the list and the experiment are that nasal assimilation of /ri-nai/ and /re-nai/ words is blocked completely when their counterparts exits (anti-homophony blocking) and that /r-anai/ words are more susceptible to nasal assimilation that /ri-nai/ and /re-nai/ words under no threat of homophony.

Appendix C: Onbin

Onbin (sound euphony) is a historical sound change, which began in the Heian period (A.D. 794-1192) (Okimori 1989). Several patterns of *onbin* are observed when four morphemes, 1) the past morpheme /ta/, 2) the gerund /te/, 3) the conditional morpheme /tara/ and 4) the representative/alternative morpheme /tari/, attached to a verb root, except when the root ends in a vowel or the sibilant *s* (Poser 1986, Itô and Mester 1986). Shibatani (1990) explains this phenomenon using the adverbial ending of the verb root where *i* is attached to consonant-final verbs and no attachment is made to vowel-final verbs. I will review Shibatani's (1990) description of *onbin*.

When the root ends with a vowel or sibilants, *onbin* does not occur.

(186) No onbin (root ending with a vowel and sibilants)
a. mi+Ø -ta [mita]
look PAST
b. kas+i -ta [kasita]
lend PAST
(+ : root inflection boundary, - : morpheme boundary)

When the root ends in a velar, the velar elides due to the historical sound change known as *i-onbin*. The root-final voiced velar *g* has a voicing spread effect to the initial consonant of the past suffix: $t \rightarrow d$ (see Itô and Mester 1986).

(187) *i-onbin* (root ending with a velar)
a. kak+i -ta [kaita]
write PAST
b. kag+i -ta [kaida]
smell PAST

The roots ending in *b*, *m* and *n* elide the inflectional ending, and then assimilate to the suffix-initial consonant, resulting nasal *n*. This is called *hatsu-onbin* or moraic

nasalization (*hatsu-on* is a moraic nasal as in *s.i**n.**do.i.* ‘tired’, *to.**m**.bo.* ‘dragonfly’). Again, the root-final voiced consonants have a voicing effect on the initial consonant of the past suffix.

(188) *hatsu-onbin* (root ending with /b/, /m/, /n/)
- a. tob+i -ta [tonda]
  fly PAST
- b. nom+i -ta [nonda]
  drink PAST
- c. sin+i -ta [sinda]
  die PAST

The last *onbin* pattern is the one introduced in section 4.3.2. The roots endings in *t*, *r*, and *w* elide the inflectional ending, and then assimilate the final consonants to the suffix-initial consonant, resulting geminates *tt*. This process is known as *soku-onbin* (*soku-on* is a moraic obstruent as in *ba•**t**•ta•ri•* ‘come across with someone’).

(189) *soku-onbin* (root ending with /t/, /w/ or /r/)
- a. tat+i -ta [tatta]
  stand PAST
- b. kaw+i -ta [katta]
  buy PAST
- c. kir+i -ta [kitta]
  cut PAST

I agree with Shibatani’s classification of the *onbin* phenomena but not with the treatment of /i/ as adverbial ending of the verb. /i/ does not attach to the root ending with a vowel. There is another verb ending, according to Shibatani, which is the negative ending /a/ such as *wakar-a*. Thus, his position is root allomorphy. I take the position of the suffix allomorphy, over root allomorphy, in which /i/ and /a/ are not root-final vowels, but rather a part of suffix.

(190) a. Root allomorphy:

wakar +**i** -masu	wakar +**a** -nai
understand adv. ending POL-PRES	understand negative ending NEG
mi + Ø -masu	mi + Ø -nai
look POL-PRES	understand NEG

b. Suffix allomorphy:

wakar -**i**masu	wakar -**a**nai
understand POL-PRES	understand NEG
mi -masu	mi -nai
look POL-PRES	understand NEG

In suffix allomorphy, there are several verbal suffixes which begin with /i/ when they attach to all of the consonant-final verbs, for example the polite present morpheme /imasu/ and the desiderative morpheme /itai/. However, it is generally accepted among researchers in this area that the past morpheme /ta/ (and the other three suffixes) is unique compared to other suffixes. That is, /i/ is unavailable before /ta/ and /te/ for most of the suffixes, if not all (Itô and Mester 1986 and Poser 1986 among others). Researchers, however, do not unanimously agree on which root-final consonants /i/ cannot follow. Poser (1986) argues that /ta/ is chosen for roots ending in a vowel, sibilant /s/, voiced obstruents and nasals /b, m, n/ and others /t, r, w/, and /ita/ is chosen for roots ending in velars. Itô and Mester (1986) argue that /i/ is also absent for roots ending with a velar. I take the position that /ita/ is not available for any root ending.

(191) a. Vowel: mi -ta → mita
look PAST

b. Sibilant /s/: ka**s** -ta → kasita
lend PAST

b. Voiced obstruents and nasals /b, m, n/:

to**b** -ta → tonda (*hatsu-onbin*)
fly PAST

yo**m** -ta → yonda (*hatsu-onbin*)
read PAST

si**n** -ta → sinda (*hatsu-onbin*)
die PAST

d. Other /r, w, t/: ka**r** -ta → katta (*soku-onbin*)
clip PAST

ka**w** -ta → katta (*soku-onbin*)
buy PAST

e. Velar /k, g/: ka**k** -ta → kaita (*i-onbin*)
write PAST

ka**g** -ta → kaida[65] (*i-onbin*)
smell PAST

Historically, however, /i/ was present for /ta/ and /te/ after all the consonants like other suffixes as below (Poser 1986, Okimori 1989), but there was loss of /i/ over the centuries.

(192) a. kak -ita → kakita
write PAST

b. tob -ita → tobita
fly PAST

Wenck (1959), cited by Poser (1986), states that the loss of /i/ after each consonant occurred over a period of centuries: the loss of /i/ after /r/ in the late 9th century), the loss of /i/ after /w/ in the first half of 11th century, and the loss of /i/ after /t/ was at first sporadic from the first half of 11th century and became regular at the end of 16th century. As for root-final /s/, Poser claims that there is a rule to insert /i/ after /s/ as *kas-ta* → *kasita*.[66] As for velars, Poser states that /i/ was not lost after velars, but rather, there was a morphologically-governed rule to delete an intervocalic velar before /i/ which was

[65]There is a lexical exception for this pattern. Unlike regular verbs ending in /k/, such as *kak* 'write' which undergo *i-onbin*, verb *ik* 'go' undergoes *soku-onbin* instead, as reviewed in 4.3.3.

[66]This claim concurs with Itô and Mester 's view (see Smolensky 2005 for his communication with Itô and Mester).

applied only to a velar before the tense/aspect suffixes /ta/ and /te/ (and /tari/ and /tara/ as well), beginning in the early 9th century as a sporadic loss. Itô and Mester (1986) assume that there is a velar vocalization process which converts the velar to *i*. Itô and Mester's claims appear to be more straightforward than the special treatment of velars as the loss of /i/ is a unified process for all root-final consonants. This is the position I adopt here.[67]

Thus, /ta/ differs crucially from other suffixes beginning with coronal obstruents, which do not undergoes *onbin* such as the desiderative /tai/-/itai/, or the compound verbs /tasu/-/itasu/ 'add' and /dasu/-/idasu/ 'begin'. In the suffixation of the desiderative /tai/, for example, /itai/ is selected for a verb ending with *r* and *soku-onbin* is not triggered, as opposed to the occurrence of *soku-onbin* in the suffixation of /ta/ and /te/.

(193) kar -itai → kaitai (no *soku-onbin*)
clip DESI
kar -ta → katta (*soku-onbin*)
clip PAST

Synchronically, the alternation between /tai/ and /itai/ is in fact lexical idiosyncrasy, that is, phonologically-conditioned suppletive allomorphy, not by phonology. In other words, the alternation of allomorphs /itai/ and /tai/ is not the result of a phonological rule, but rather there are two lexically listed allomorphs {/itai/ ~ /tai/} (lexical allomorphy, Kager 2003). On the other hand, there was a historical loss of lexical allomorphy, {*/ita/ ~ /ta/}. Only one morpheme /ta/ is listed in the lexicon. As a result, *soku-onbin* occurs in order to

[67]Several researchers offer alternative views in which /i/ is also absent after velars. McCawley (1968) posits a rule to convert velar stop to /h/ before /ta/, then /h/ is converted to /?/. /i/ is then is inserted between the spirant and /ta/, and /?/ is deleted. Anderson and de Chene (1979) assume that there is a phonological rule to convert velar stops to glides before dental stops (velar gliding). Poser (1986) argues velars were lost before /i/. See Poser for a dispute on the views of McCawley and Anderson and de Chene.

avoid a violation of SYLLSTRUC constraint, which is ranked the highest (see section 4.3.2).

(194) kar -ta (*-ita) → katta, *ka.rta., *kart.a, *kar.ta.
clip PAST

This also explains the discrepancy in resolving consonant cluster in the following, pointed out by Mester and Itô (1989):

(195) kar -ta → *ka**rt**a, ka**tt**a, *ka**rr**a
clip PAST
kar -sase → ka**r**ase, *ka**ss**ase, *ka**rs**ase
clip CAUS

The potential creation of consonant clusters by /ta/ affixation is resolved by *soku-onbin*: *ka**tt**a*. However, *soku-onbin* does not apply to the causative affix /sase/, **kassase*, despite the fact that /ss/ is phonotactically well-formed in Japanese, for example when the first /s/ is a coda and the second /s/ is a onset as in *is.sai.* 'nothing at all'. Instead, it looks that /ase/ is derived from /sase/ by a deletion rule. *s*-deletion (McCawley 1968, Poser 1986), however, is not without controversy. As discussed in Appendix A, I argue that this is lexical allomorphy /sase/ ~ /ase/ and one of the listed allomorphs, /sase/ or /ase/, is chosen conditioned by phonology, namely whether the verb-final item is a vowel (/sase/ is chosen) or a consonant (/ase/ is chosen).

(196) kar -ase → karase
clip CAUS

Thus, neither *s*-deletion nor *s*-gemination occurs. As for /ta/, *soku-onbin* occurs as only /ta/ is listed.

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