Incomplete Neutralization of Japanese Vowel Length in Monomoraic Nouns

Aaron Braver and Shigeto Kawahara

RUTGERS THE STATE UNIVERSITY OF NEW JERSEY 1766

Introduction

Incomplete neutralization is known to target feature- and segment-level phenomena such as final devoicing (e.g. Dinnsen and Charles-Luce 1984, Port and O'Dell 1985).

We show that when Japanese monomoraic nouns lengthen, the short/long vowel length contrast is incompletely neutralized—adding suprasegmental contrasts to the typology of incomplete neutralization.

We also show that lengthening in Japanese number recitation results in *complete* neutralization.

We conclude that two processes of the same type can result in complete *and* incomplete neutralization in a single language.

Background: Japanese and Bimoraicity

Japanese requires Prosodic Words (PWds) to have at least two moras (Itô 1990, Poser 1990).

Monomoraic nouns, when alone in a PWd, lengthen to meet this bimoraicity requirement (Mori 2002).

PrWd
Foot
μ   μ
ki   ga
'tree' nom

PrWd
Foot
μ   μ
ki
'tree'
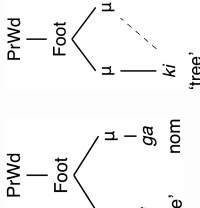
Experiment I: Monomoraic Nouns

Are the lengthened vowels of monomoraic nouns as long as underlyingly long vowels?

15 sets of minimal triplet sentences: short noun with a particle, short noun without a particle, and underlyingly long noun.

| Condition	Stimulus	Transcription	Gloss
short/prt	木も〈したよ。	ki mo nakushita yo	tree ALSO lost DISC
short/Ø	木な〈したよ。	ki nakushita yo	tree lost DISC
long	キーな〈したよ。	kii nakushita yo	key lost DISC

12 Japanese speakers x 7 repetitions per stimulus item.

Lengthening is expected in the *short/Ø* condition since the monomoraic noun *ki* is in a prosodic word with no other content.

If the lengthening results in *complete* neutralization, the lengthened *short/Ø* nouns' vowels will be as long as those of the long nouns. If the lengthening results in *incomplete* neutralization, the *short/Ø* nouns' vowels will be intermediate in length between the *short/prt* and *long* nouns.

Experiment I: Results

Mean Vowel Duration
Averaged over all speakers, items, and repetitions
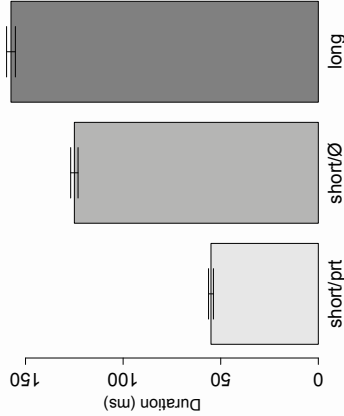
Short/Ø nouns' vowels were longer than *short/prt* nouns' (mean difference: 69.98 ms., *t*=15.692, *p*<0.001).

Short/Ø nouns' vowels were shorter than *long* nouns' (mean difference: 32.47 ms., *t*=7.047, *p*<0.001).

This three-way distinction, indicative of incomplete neutralization of vowel length, holds for all speakers and all items.

Experiment II: Number Recitation

Do all bimoraicity-driven cases of lengthening in Japanese result in incomplete neutralization?

In number recitation (e.g., phone numbers) in Japanese, each digit stands as its own PWd—and is therefore subject to the bimoraicity requirement. Monomoraic digits lengthen, unless they have a bimoraic allomorph, which is then used (Itô 1990).

| Condition	Stimulus	Transcription	Gloss
teens	15番から	ju-go ban kara	ten-five NUM from
recitation	1578	ichi go nana hachi	one five seven eight
long	あの豪く〈んたち	ano gou kun tachi	those (name) SFX PL

Ni '2' and *go* '5' are monomoraic. Lengthening is expected in the *recitation* condition since it contains only one mora in a PWd —but will the lengthened digits' vowels be as long as those in underlyingly long words?

For comparison, we also tested the bimoraic digit *san* '3' in the *teens* and *recitation* contexts to examine any effects not due to bimoraicity-related lengthening.

'4' and '9' have both monomoraic and bimoraic allomorphs. We recorded these digits in the *recitation* context to ensure that the bimoraicity requirement is active in this environment.

Experiment II: Results

Mean Vowel Duration
Averaged over all speakers, items, and repetitions
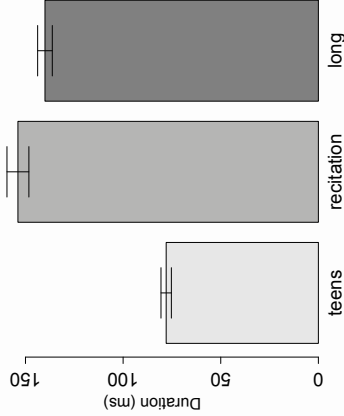
Recitation vowels were longer than *teens* vowels (mean difference: 75.92 ms., *t*=10.586, *p*<0.001).

The difference between *recitation* vowels and *long* vowels was not significant (mean difference: 13.85 ms., *t*=1.90, *n.s.*).

For those digits with both bimoraic and monomoraic allomorphs, all speakers used only the bimoraic allomorphs in the *recitation* condition on all items and repetitions.

The insignificant, but measurable, difference between *recitation* and *long* vowels may be due to factors unrelated to the bimoraicity requirement, since the bimoraic digit *san* '3' lengthened by 15.92 ms. in the recitation condition on average.

Discussion

The typology of incomplete neutralization must be expanded to include processes affecting length or prosodic structure (Exp. I).

The short/long vowel length distinction in Japanese is incompletely neutralized in the context of monomoraic noun lengthening (Exp. I), but is completely neutralized in number recitation (Exp. II).

A given phonological contrast can be completely neutralized by one process (Exp. II), while being incompletely neutralized by another in the same language (Exp. I).

What causes the difference? One explanation: lexical-level processes must be completely neutralized, while post-lexical processes can be incompletely neutralized—a modified version of Structure Preservation (Kiparsky 1985).

Braver, A. and S. Kawahara. Under review. *Complete and Incomplete Neutralization in Japanese Monomoraic Lengthening.*

Itô, J. 1990. *Prosodic Minimality in Japanese.* CLS 26, pp. 213-239.

Kiparsky, P. 1985. *Some Consequences of Lexical Phonology.* Phonology Yearbook v. 2, pp. 85-138.

Mori, Y. 2002. *Lengthening of Japanese Monomoraic Nouns.* JPhon 30(4), pp.689-708.

Stimuli from Experiment I (Monomoraic Nouns)

- 15 sets of minimal triplet sentences, differing in whether they have:

    (a) a monomoraic noun followed by the particle *mo* 'also' ('short/prt' condition)

    (b) a monomoraic noun without a particle ('short/Ø' condition)

    (c) an underlyingly long noun without a particle ('long' condition)

- Segmental content was identical within each set, with the exception of vowel length in the long condition, and the presence of the particle in the short/prt condition.

- Nouns' onsets (where present) were non-approximant consonants, for clearer segmentation

- We use the commitative particle *mo* in the short/prt condition. In our previous study (Braver and Kawahara 2013), the [g] in the nominative particle *ga* sometimes spirantized, making segmentation difficult.

- The long condition does not include a particle, since the target comparison for the long condition is the short/Ø condition, which has no particle. (Additionally, Mori (2002) has shown that the presence/absence of particles hardly affects long noun duration).

- The predicate was the same for all three items within a given set, to control for any sentence-level duration compensation effects.

- A sentence final discourse particle, *yo*, was attached to the end of each sentence to make them feel more colloquial, which further makes the absence of case particles more natural.

Japanese orthography	Transcription	Gloss	Cond.
木もなくしたよ。	**ki'** mo nakushita yo	tree ALSO lost DISC	short/prt
木なくしたよ。	**ki'** nakushita yo	tree lost DISC	short/Ø
キーなくしたよ。	**ki'i** nakushita yo	key lost DISC	long
酢も見つけたよ。	**su'** mo mitsuketa yo	vinegar ALSO found DISC	short/prt
酢見つけたよ。	**su'** mitsuketa yo	vinegar found DISC	short/Ø
スー見つけたよ。	**su'u** mitsuketa yo	Sue found DISC	long
麩も残したよ。	**fu** mo nokoshita yo	gluten ALSO left DISC	short/prt
麩残したよ。	**fu** nokoshita yo	gluten left DISC	short/Ø
封残したよ。	**fu'u** nokoshita yo	seal left DISC	long
血も捧げたよ。	**chi** mo sasageta yo	blood ALSO dedicated DISC	short/prt
血捧げたよ。	**chi** sasageta yo	blood dedicated DISC	short/Ø
地位捧げたよ。	**chi'i** sasageta yo	social.status dedicated DISC	long
具も出したよ。	**gu** mo dashita yo	ingredients ALSO served DISC	short/prt
具出したよ。	**gu** dashita yo	ingredients served DISC	short/Ø
グー出したよ。	**gu'u** dashita yo	fist served DISC	long

(continued...)

Japanese orthography	Transcription	Gloss	Cond.
ソも確かめたよ。	**so'** mo tashikameta yo	so ALSO confirmed DISC	short/prt
ソ確かめたよ。	**so'** tashikameta yo	so confirmed DISC	short/∅
層確かめたよ。	**so'u** tashikameta yo	layer confirmed DISC	long
手も測ったよ。	**te'** mo hakatta yo	hand ALSO measured DISC	short/prt
手測ったよ。	**te'** hakatta yo	hand measured DISC	short/∅
低測ったよ。	**te'i** hakatta yo	base measured DISC	long
背も違うよ。	**se'** mo chigau yo	height ALSO is-different DISC	short/prt
背違うよ。	**se'** chigau yo	height is-different DISC	short/∅
性違うよ。	**se'i** chigau yo	gender is-different DISC	long
野も持ってるよ。	**no'** mo motteru yo	field ALSO have DISC	short/prt
野持ってるよ。	**no'** motteru yo	field have DISC	short/∅
脳持ってるよ。	**no'u** motteru yo	brain have DISC	long
尾も出てきたよ。	**o'** mo detekita yo	tail ALSO appeared DISC	short/prt
尾出てきたよ。	**o'** detekita yo	tail appeared DISC	short/∅
王出てきたよ。	**o'u** detekita yo	king appeared DISC	long
津も買収したよ	**tsu'** mo baishuushita yo	Tsu ALSO bought/bought.off DISC	short/prt
津買収したよ	**tsu'** baishuushita yo	Tsu bought/bought.off DISC	short/∅
通買収したよ。	**tsu'u** baishuushita yo	expert bought/bought.off DISC	long
帆も叩いたよ。	**ho'** mo tataita yo	sail ALSO hit DISC	short/prt
帆叩いたよ。	**ho'** tataita yo	sail hit DISC	short/∅
ほおも叩いたよ。	**ho'o** tataita yo	cheek hit DISC	long
都も独占したよ。	**to'** mo dokusenshita yo	city ALSO monopolized DISC	short/prt
都独占したよ。	**to'** dokusenshita yo	city monopolized DISC	short/∅
塔独占したよ。	**to'u** dokusenshita yo	tower monopolized DISC	long
書も独占したよ。	**sho'** mo dokusenshita yo	book ALSO monopolized DISC	short/prt
書独占したよ。	**sho'** dokusenshita yo	book monopolized DISC	short/∅
章独占したよ。	**sho'u** dokusenshita yo	chapter monopolized DISC	long
字も公開したよ。	**ji'** mo koukaishita yo	letter ALSO publicized DISC	short/prt
字公開したよ。	**ji'** koukaishita yo	letter publicized DISC	short/∅
爺公開したよ。	**ji'i** koukaishita yo	grandpa publicized DISC	long

Stimuli from Experiment II (Number Recitation)

- The two 'main' sets consist of three sentence types:

   (a) an underlyingly monomoraic (target) digit, preceded by '10' [dʒu], forming a teen (e.g. [dʒu-go] = 'ten-five' = 'fifteen'). 'Teens' condition; no lengthening expected.

   (b) an underlyingly monomoraic (target) digit in the second position of a four-digit hotel room number (where each digit is read individually). 'Recitation' condition; lengthening expected.

   (c) an underlyingly long noun in a frame sentence. 'Long' condition.

- The 'bimoraic' set used the underlyingly bimoraic *san* '3' in the teens and recitation contexts

- The 'alternator' set used '4' (*shi* or *yon*) and '9' (*ku* or *kyuu*), both in the recitation context.

- Target words within a set shared identical segmental content, with the exception of vowel length in the long condition

- Within each set, the frames surrounding the target words in the recitation and long contexts had the same total number of moras to control for potential phrase-level length effects.

- Across all stimulus sets, the target was always the second morpheme

Set	Japanese orthography	Transcription	Gloss	Cond.
Main (*ni*)	１２番から	ju-**ni** ban kara	ten-two NUMBER from	Teens
	１２３６	ichi **ni** san roku	one two three six	Recit.
	あのにいさんたち	ano **nii**-san tachi	those older brother-HON PL	Long
Main (*go*)	１５番から	ju-**go** ban kara	ten-five NUMBER from	Teens
	１５７８	ichi **go** nana hachi	one five seven eight	Recit.
	あの豪くんたち	ano **gou** kun tachi	those (name) NAME.SUFFIX PL	Long
Bimoraic (*san*)	１３番から	ju-**san** ban kara	ten-three NUMBER from	Teens
	１３６４	ichi **san** roku shi/yon	one three six four	Recit.
Alternators	１４３２	ichi **shi/yon** san ni	one four three two	Recit.
	１９８０	ichi **ku/kyuu** hachi zero	one nine eight zero	Recit.

Braver, Aaron and Kawahara, Shigeto (2013). *Incomplete Vowel Lengthening: Japanese Monomoraic Lengthening as Incomplete Neutralization*. Paper presented at WCCFL 31.

Braver, Aaron and Kawahara, Shigeto (Under review). *Complete and Incomplete Neutralization in Japanese Monomoraic Lengthening*.

Dinnsen, Daniel and Charles-Luce, Jan (1984). *Phonological Neutralization, Phonetic Implementation and Individual Differences*. Journal of Phonetics 12:49–60.

Itô, Junko (1990). *Prosodic Minimality in Japanese*. In Michael Ziolkowski, Manual Noske, and Karen Deaton (eds.) *Proceedings of Chicago Linguistic Society 26: Parasession on the Syllable in Phonetics and Phonology*, pp. 213–239. Chicago Linguistic Society, Chicago.

Kiparsky, Paul (1985). *Some consequences of Lexical Phonology*. Phonology Yearbook 2:85–138.

Mori, Yoko (2002). *Lengthening of Japanese Monomoraic Nouns*. Journal of Phonetics 30(4):689–708.

Port, Robert and O'Dell, Michael (1985). *Neutralization and Syllable-Final Voicing in German*. Journal of Phonetics 13:455–471.

Poser, William (1990). *Evidence for Foot Structure in Japanese*. Language 66:78–105.