

AN APPEARANCE OF MENTAL LEXICON AND PHONOLOGICAL PROPERTIES IN CONCATENATION- INDUCED OBSTRUENT VOICING

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Abstract

The present study¹ attempts to draw a pattern for concatenation-induced obstruent voicing in Japanese. In a judgment test, 220 participants answered whether or not voiceless obstruents at the onset of the final morpheme of nominal compounds would be voiced. As a result, the degrees of voicing in the provisionally concatenated compounds comprising real morphemes corresponded to those in the real words. Second, the degrees of voicing in those compounds whose final element is a pseudo-morpheme reached a mean level of voicing overall. Thus, those patterns of voicing or not voicing had been a product of learning and had been internalized as the speakers' meta-knowledge. Next, post-nasal voicing applied differently to the different consonants in the final morpheme onset position; for instance in the test, /h/ received a high degree of post-nasal voicing. On the other hand, the boundary-preceding vowel originating from the velar nasal did not enhance the degree of voicing.

1 Introduction to obstruent voicing phenomenon in Japanese

In Japanese, when two morphemes are concatenated into one compound, the first consonant of the final morpheme, if the consonant is a voiceless obstruent, can alter to its voiced counterpart. That morphophonological phenomenon, called *rendaku* in Japanese or sequential voicing (Kubozono, 1999; Itō & Mester, 1995; Vance, 1987, 2015), involves many determining factors such as syntax, semantics, and lexical strata as summarily listed in Table 1. Note that the ratio of such voicing for a compound can be promoted to some degree if the compound is frequently used. Many factors bearing influence on that kind of voicing have been discussed, and some linguists insist that the voicing alternation is determined lexically, which means that it applies word by word. In fact, there are exceptions even if we set ramified rules for the voicing (Vance & Asai, 2016).

Concatenation-induced obstruent voicing, or abbreviated henceforth CIOV, is productive in contemporary Tokyo Japanese, and applies to new words. Linguistic researchers and the educators of Japanese would like to know further how much Japanese speakers employ CIOV and in what kinds of phonological conditions.

Table 1. Possible factors to promote or demote CIOV on nominal compounds

¹ Portion of the present study is the work of the NINJAL *rendaku* Project. An earlier version of this paper was presented at the April meeting of the Tokyo Circle of Phonologists in 2016. The author thanks the participants for their insightful comments. The author is solely responsible for any oversights or errors which may remain.

Factors	Item	Unvoiced	likely unvoiced	likely voiced
Lexicology	Lexical strata	Foreign, mimetic	Sino-Japanese	Native
	Noun category	Proper noun (first name)	Proper noun (surname)	Common noun
	Hierarchical relation	Coordinate reference		Subordinate reference
Morphology	Morpheme length		2 moras long	1 mora or 3-or-more moras long
Syntax	Compound structure	Right branch		Left branch
	Modification relation	Dvandva	Objective	Adnominal, genitive
	Word formation			Reduplication
	Prefix	Courteous / honorific “o”	Emphatic “ma”, etc.	
	Postfix		Applicable (counting)	
	Abbreviation	Acronym	Clipped word	
Semantics	Semantic domain		Applicable	Applicable
	Homonymic distinction		Applicable	Applicable
	Referential symbolism		Imaginary (naming)	Existent (naming)
Psycho-linguistics	Association of image		Clean, fine, respectful	Dirty, heavy, disrespectful
Socio-linguistics	Individual variation		Applicable	Applicable
	Visual reading		Applicable (food name in leaflet)	
Pragmatics	Typicality oriented		Applicable	Applicable (analogy)
Phonology	Lyman’s Law OCP(voi)	Applied		
	Dialectal [ŋ] from /g/	Applied		
	Extended Lyman’s Law OCP(voi)		Weak in Modern Japanese	Strong in Old Japanese
	/m/ mutating from /b/		Applicable	
	Following the /r/-onset		Applicable	
	OCL(Place)		Within the final morpheme	Across the boundary
	Following the moraic obstruent	Applied		
Following the uvular nasal			Under specific conditions	
Following a vowel originating from /ŋ/			Applied in Middle Japanese	
Phoneme dependency			/s/ ([s], [ɕ]), [ç]	
Palatalization			Weakly applicable	
Vowel devoicing				Weakly applicable
Accentuation			Accented	Unaccented

2 Survey design

When a morpheme used as an individual real word is concatenated as the final morpheme with another morpheme, the likelihood of CIOV was questioned in the present study. Specific phonological conditions were set for both the first morphemes and the final ones. Table 2 lists

the twelve kinds of first morpheme, all of which have different Kanji characters. The right-hand column titled ‘N’ indicates the CVN morphemes,² such as /kan/ ‘perfect.’ The central column includes the CVV but originally CV[ŋ] at the time when the words were borrowed from Chinese, such as /kou/ ‘smell, scent.’ The left-hand column titled ‘u’ lists the other vocables, such as /kou/ ‘think.’ English glosses are noted in parentheses. An example of compounds is /tou+tama/ ‘bean+ball.’³

Table 2. First morphemes

Final phoneme		
/u/	/u/([ŋ])	/N/
/tou/ (‘bean’)	/tou/ (‘unify, whole’)	/tan/ (‘single’)
/tou/ (‘answer’)	/tou/ (‘hit, just’)	/tan/ (‘red’)
/kou/ (‘think’)	/kou/ (‘lucky’)	/kan/ (‘perfect’)
/kou/ (‘instep’)	/kou/ (‘smell, scent’)	/kan/ (‘official’)

Next, the final morphemes are shown in Table 3. Sixteen of them are real words of the native lexical stratum. Six of them are pseudo-words, and have virtual Kanji characters.

Table 3. Final morphemes

Second mora onset	First mora onset		
	/t/	/k/	/h/
/m/	/tama/ (‘ball, bead’)	/kama/ (‘pot, kettle’)	/hama/ (‘beach’)
/n/	/tana/ (‘shelf, rack’)		/hana/ (‘flower’)
	/tana/ (<i>pseudo</i>)	/kana/ (<i>pseudo</i>)	/hana/ (<i>pseudo</i>)
/w/		/kawa/ (‘river’)	
/t/		/kata/ (‘shape, form’)	/hata/ (‘field, croft’)
		/kata/ (‘type, model’)	/hata/ (‘flag’)
		/kata/ (‘side, style’)	
		/kata/ (‘shoulder’)	
/r/	/tara/ (‘codfish’)	/kara/ (‘shell, hull’)	/hara/ (‘field, plain’)
	/tara/ (<i>pseudo</i>)	/kara/ (<i>pseudo</i>)	/hara/ (<i>pseudo</i>)

The participants looked at the two readings in paper, and judged which of the unvoiced or voiced sound would be appropriate on the basis of a 4-point scale.

3 Survey results

The ratios of CIOV obtained from the participants’ answers are shown in Table 4. In comparison with those provisional compounds, the data for common nouns appearing in general magazines (NINJAL, 2006) and dictionary entries (Yamada et al., 2012) are added on the right-hand-side columns. Those text data agree with the speakers’ cognition (Asai, 2016).

²C, V, and N stand for consonant, vowel, and uvular nasal, respectively.

³The + mark shows the morpheme boundary in a compound.

The number of decimal places indicates the degree of accuracy of the data. The cell with dashes are not applicable conditions.

Table 4. Ratios of CIOV

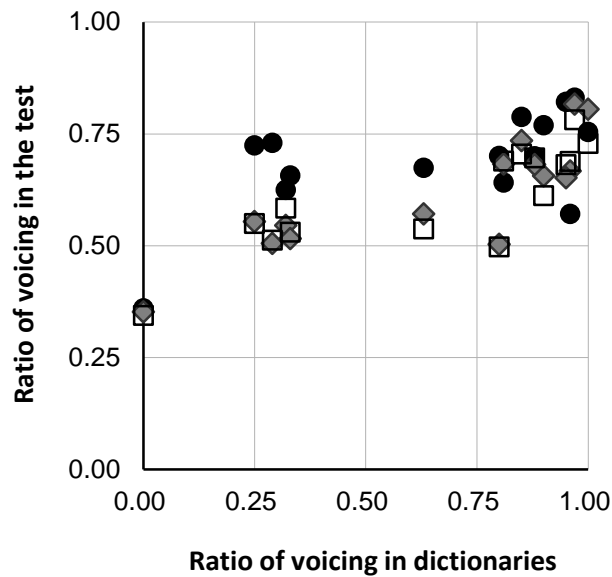
Final morpheme (Real morpheme)	Provisional compound			Real compound	
	/u/	/u/([ŋ])	/N/	Magazine	Dictionary
/tama/ ('ball, bead')	0.69	0.68	0.64	0.82	0.74 ⁴
/tana/ ('shelf, rack')	0.78	0.82	0.83	1.0	1.00
/tara/ ('codfish')	0.69	0.72	0.72	–	–
/kama/ ('pot, kettle')	0.70	0.68	0.70	1.0	0.82
/kawa/ ('river')	0.54	0.57	0.67	0.8	0.6
/kata/ ('shape, form')	0.61	0.66	0.77	0.88	0.90
/kata/ ('type, model')	0.73	0.81	0.75	1.00	1.00
/kata/ ('side, style')	0.55	0.55	0.72	0.38	0.25
/kata/ ('shoulder')	0.58	0.55	0.62	0.0	0.7
/kara/ ('shell, hull')	0.69	0.67	0.57	1.0	1.00
/hama/ ('beach')	0.34	0.35	0.36	0.0	0.0
/hana/ ('flower')	0.68	0.65	0.82	1.00	0.95
/hana/ ('nose')	0.70	0.73	0.79	0.5	0.82
/hata/ ('field')	0.53	0.52	0.66	0.0	0.3
/hata/ ('flag')	0.50	0.50	0.70	0.0	0.3
/hara/ ('field, plain')	0.51	0.51	0.73	0.3	0.29
Pseudo-morpheme	Pseudo-compound				
/tana/ (<i>pseudo</i>)	0.73	0.72	0.78	–	–
/kana/ (<i>pseudo</i>)	0.58	0.60	0.57	–	–
/hana/ (<i>pseudo</i>)	0.73	0.73	0.65	–	–
/tara/ (<i>pseudo</i>)	0.68	0.75	0.62	–	–
/kara/ (<i>pseudo</i>)	0.61	0.68	0.60	–	–
/hara/ (<i>pseudo</i>)	0.69	0.50	0.82	–	–

4 Discussions

4.1 General discussions

The higher the ratios of CIOV for the final morphemes, for example /tana/ 'shelf, rack' and /kata/ 'type, model', in the real compounds, the higher those for the same morphemes in the provisional compounds as shown in Table 4 and Fig. 1. That correspondence suggests that the sound forms are fundamentally internalized in the speakers' mental lexicon (Aitchison, 2003; Foster, 1976). Next, the ratios of CIOV for the pseudo-morphemes composing the pseudo-compounds exhibited the moderate values except for the /N+/hara/ condition.

⁴ The ratio of post-nasal voicing is 0.75, and that of non-nasal conditions is 0.88. In larger dictionaries which include old terms, those ratios are 0.80 and 0.81, respectively.



(Closed circles: post-nasal voicing; diamonds: following [ŋ]; open squares: other conditions)

Fig. 1. Ratios of voicing in phonotactic conditions

4.2 Psychological interpretations

For pseudo-words, in other words unknown words, speakers will first apply a central scheme of CIOV on the noun category. That holistic employment appeared in a voicing ratio of about 0.70, which nearly equals a mean value on nominal compounds. At the next stage, speakers will apply a scheme of CIOV on the known final morpheme. That orientation emerged in the voicing ratios from 0.34 to 0.83 in the test format as shown in Table 4.

As widely observed, once an infant notices the voicing in question, he or she often starts to overuse the voicing. In the course of time, the young child understands which words should receive the voicing. As a speaker builds a vocabulary and develops the meta-knowledge of CIOV, the speaker refines the voicing to known words and may apply his or her style to new words (Asai, 2015).

Some real morphemes are asymptotically saturated to a high or low ratio of voicing. In this case, phonological factors will not appear accordingly. In contrast, for a new compound whose final element is a productive morpheme, the ratio of voicing will unlikely converge into a high or low value (Zamma & Asai, 2015).

4.3 Phonological accounts

Some morphemes starting mainly in /h/ and employing a relatively low or mid ratio of voicing showed higher ratios of voicing when following the uvular nasal.⁵ This suggests a phonological similarity and tight connection between /m/ that mutates from /N/ by retrogressive place assimilation and /b/ at the identical labial place with a small degree of

⁵ For another particular instance, the surnames whose final morpheme is /hara/ ‘field, plain’ exhibits a ratio of post-nasal voicing of 0.93. In contrast, the ratio of voicing is 0.21 when the final morpheme onset is followed by the velar-nasal-originating vowel. It is 0.09 when the onset is followed by the other vowels.

freedom of articulation (Asai, 2014). Such a variant sequence appears extensively word-internally in the lexicon, for example /to(m)bi/ ‘black kite,’ /ka(m)ba/ ‘birch tree,’ /go(m)bo/ ‘burdock root,’ and /ko(m)bu/ ‘kelp.’ Likewise, that stable sequence can attract the occurrence of CIOV. On the other hand, the latter part of a double vowel originating from the velar nasal did not enhance the degree of voicing when the vowel was located before the boundary because of the phonologically unstable velar nasal. Simulations modeled with genetic algorithm, where voice feature crossover and mutation probabilities, compound creations, and occurrence frequencies were empirically set, supported a strong effect on the post-nasal voicing.

5 Concluding remarks and pedagogical implications

The present study presented one pattern that post-nasal voicing likely applies to some morphemes starting in /h/ and possessing a relatively low degree of voicing. Educators will derive a benefit in knowing about what words likely receive the voicing, how phonological properties work with voicing in forming compound terms, and how readings are extracted from the speakers’ mental lexicon.

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