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# Correlation between Voicing and Nasalization of Japanese Obstruents \*

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## Abstract

In this paper I clarify how voicing and nasalization correlate with each other in Japanese obstruents in an effort to reconstruct the phonemic system of Old Japanese. Japanese obstruents are phonologically divided into two distinctive categories: seion (清音; lit. 'clear sound') and dakuon (濁音; lit. 'muddy sound'). This phonological distinction is based on voicedness for the most part but also on nasality in some cases. The seion *p*, *s*, *t*, and *k* and the dakuon *b*, *z*, *d*, and *g* are respectively voiced and nasalized immediately after vowels in Modern Japanese dialects spoken in the Northeastern and Southwestern regions (Tōhoku and Kyūshū). Taking these geographic variations of sei-daku opposition into consideration, some researchers argue that both voicing of seion and nasalization of dakuon occur immediately after vowels in Old Japanese. According to this argument, there are two types of sei-daku opposition based on both voicedness and nasality in Old Japanese obstruents. In order to develop the theory about sei-daku opposition in Old Japanese, I elucidate the following two points concerning the geographic variations of sei-daku opposition. First, nasalization of *b* and/or *z* always implies that of *d* and *g*. Second, voicing of postvocalic seion and nasalization of postvocalic dakuon are lost more rapidly in *p:b* and *s:z* oppositions, in which seion are now basically voiceless fricatives, than in *t:d* and *k:g* oppositions, in which seion can be realized as voiced stops.

本論文では、古代日本語の音素体系を再構する仕事の一環として、日本語の阻害音において有声化と鼻音化がどのように相関しているかを解明する。日本語の阻害音は「清音」と「濁音」から成る。両者の対立は、多くの場合、有声性の有無に拠るが、鼻音性に拠ることも有る。日本の東北部および南西部に分布する方言においては、母音の直後で清音 *p*, *s*, *t*, *k* は有声化し、濁音 *b*, *z*, *d*, *g* は鼻音化する。一部の研究者は、こうした清濁対立の地理的変種を踏まえて、古代日本語において清音の有声化と濁音の鼻音化が起こっていたと見做している。この説を発展させるため、本論文では、清濁対立の地理的変種に関して、次に挙げるふたつの事実を指摘する。第一に、*b* および/ないし *z* の鼻音化は、*d*, *g* のそれを常に含意する。第二に、清音の有声化と濁音

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の鼻音化は、ほとんどの方言において清音が無声摩擦音化している、p:b・s:z 対立におけるものの方が、一部の方言において清音が有声閉鎖音で実現する、t:d・k:g 対立におけるそれより早く失われる。

**Key Words:** phonology, Japanese dialects, historical change, phonological distinctions, postvocalic position

## 1. Introduction

The Northeastern and Southwestern dialects of Modern Japanese (hereafter “MJ”) are well known as dialects in which obstruents are voiced or nasalized immediately after vowels unlike Modern Standard Japanese (hereafter “MSJ”). Little, however, is known about the relationship between these phonetic phenomena. In this paper I clarify how voicing and nasalization correlate with each other, in an effort to reconstruct the phonemic system of Old Japanese (hereafter “OJ”). Through this analysis, I also attempt to answer the following questions:

- (1) a. What types of phonological oppositions can exist between obstruents (not limited to Japanese) in features other than point of articulation and manner of articulation?
- b. How do these phonological oppositions change historically?

## 2. Phonological opposition between seion and dakuon

In MJ, voiceless obstruents at the beginnings of stems are commonly voiced when the stems follow another component in a compound. This phenomenon is known as *rendaku* (連濁), or “sequential voicing,” in Japanese linguistics. For example, we can see it in MSJ as follows:

### (2) Sequential voicing in MSJ

- |               |               |                                        |
|---------------|---------------|----------------------------------------|
| a. [o.↑to.çi] | + [φ̥.↑t̥e]   | → [o.↑to.çi.↓b̥ɥ̥t̥e]                  |
| ‘dropping’    | ‘lid; cap’    | ‘lid placed directly on food in a pan’ |
| b. [kɥ̥.↓ro]  | + [s̥e.↑to↓:] | → [kɥ̥.↑lo.z̥e.↓to:]                   |
| ‘black’       | ‘sugar’       | ‘muscovado’                            |
| c. [ke]       | + [t̥e.↑m̥e]  | → [ke.↑d̥e.m̥e]                        |
| ‘hair/fur’    | ‘ball’        | ‘lint’                                 |
| d. [çi.↑b̥ɥ̥] | + [k̥e.↑k̥i]  | → [çi.↑b̥ɥ̥.↓ŋ̥g̥e.k̥i]                |
| ‘astringent’  | ‘persimmon’   | ‘astringent persimmon’                 |

Voiceless and voiced obstruents in MSJ are phonologically opposed to each other as demonstrated through the following perfect minimal pairs, in which words of the same pitch accent pattern vary only in the obstruents concerned:

- (3) Phonological oppositions between voiceless and voiced obstruents in MSJ
- |    |                      |             |              |                      |               |              |
|----|----------------------|-------------|--------------|----------------------|---------------|--------------|
| a. | <i>pa</i> <u>t</u> i | [h̥e.↑t̥ei] | ‘bee’        | <i>po</i> <u>p</u> o | [ho.↓ho]      | ‘cheek’      |
|    | <i>ba</i> <u>t</u> i | [b̥e.↑t̥ei] | ‘punishment’ | <i>po</i> <u>b</u> o | [ho.↓bo]      | ‘almost’     |
| b. | <i>ta</i> <u>n</u> i | [t̥e.↑ɲi]   | ‘valley’     | <i>pu</i> <u>t</u> a | [ɸ̥u̇.t̥e]    | ‘lid/cap’    |
|    | <i>da</i> <u>n</u> i | [d̥e.↑ɲi]   | ‘tick’       | <i>pu</i> <u>d</u> a | [ɸ̥u̇.d̥e]    | ‘label/tag’  |
| c. | <i>sa</i> <u>r</u> a | [s̥e.↑ɽe]   | ‘dish’       | <i>ki</i> <u>s</u> i | [k̥i̇.↑t̥ei]  | ‘bank/coast’ |
|    | <i>za</i> <u>r</u> a | [d̥ze.↑ɽe]  | ‘common’     | <i>ki</i> <u>z</u> i | [k̥i̇.↑z̥i]   | ‘pheasant’   |
| d. | <i>ka</i>            | [k̥e]       | ‘mosquito’   | <i>ka</i> <u>k</u> i | [k̥e.↑k̥i]    | ‘persimmon’  |
|    | <i>ga</i>            | [g̥e]       | ‘moth’       | <i>ka</i> <u>g</u> i | [k̥e.↑ŋ̥/g̥i] | ‘key’        |

[Notes]

- i. In MJ (not limited to MSJ) consonants are palatalized just before the high front vowel *i* (e.g. *pa*ti [h̥e.↑t̥ei] ‘bee’, *ta*ni [t̥e.↑ɲi] ‘valley’, *ka*gi [k̥e.↑ŋ̥/g̥i] ‘key’).
- ii. Non-postconsonantal *p* is now realized primarily as [h] as a result of lenition and debuccalization which are considered to have occurred sometime during the Late Middle to Early Modern Japanese period. *p* preceding *u*, however, is realized as [ɸ], retaining its phonetic value from an earlier stage predating its debuccalization. This retention of its [ɸ] before *u* is most likely due to the roundness of *u* (e.g. *pu*ne [ɸ̥u̇.ne] ‘ship’, *pu*rui [ɸ̥u̇.r̥ui] ‘old:NPST’).
- iii. [b] and [ŋ/g], the phonetic forms of postvocalic *b* and *g*, are sometimes lenited to [β] and [ɣ], respectively.

In this paper these two types of obstruents, which vary in voicedness in MSJ, are symbolically (almost phonologically but not entirely) represented respectively by the letters *p*, *s*, *t*, and *k* and *b*, *z*, *d*, and *g* in italics. In Japanese linguistics the former and the latter are respectively called “seion (清音; lit. clear sound)” and “dakuon (濁音; lit. muddy sound)<sup>1</sup>,” and the phonological opposition between them is called the “sei-daku opposition.”

### 3. Two types of sei-daku opposition

#### 3.1 Non-nasal sei-daku opposition

Sei-daku opposition based only on voicedness as in (3) (hereafter “non-nasal sei-daku opposition”) is recently seen in a wide range of MJ dialects due to Japanese monolingualization. We can see sei-daku opposition of this type also in Nagahama dialect<sup>2</sup>, in which postvocalic *z* and *d* have turned into [ɭ ~ ɽ] (or [ɽ]), differing from MSJ<sup>3</sup>, as follows (for further information of the phonology of Nagahama dialect, see Kamimura 1971):

- (4) The representative phonetic values of postvocalic seion and dakuon in Nagahama dialect (hereafter, voiced seion and nasalized dakuon are shaded)

p	b	s	z	t	d	k	g
h	b	s, h	ɭ	t	ɽ	k	ŋ > g

<sup>1</sup>According to European terminology, the former and the latter can be translated as “tenues” and “mediae,” respectively.

<sup>2</sup>A Southwestern dialect spoken on Shimo-Koshiki Island, which lies about 40 kilometers west of the main land of Kagoshima Prefecture.

<sup>3</sup>Some *z* and *d* are recently realized as [z] and [d] respectively as in MSJ.

## [Notes]

- i. A, B (as “s, h” above): The sound [A] or [B] corresponds to the phonemic category *X* (as *p, b, s, ...* above) irregularly. A > B (as “η > g” above): [A] has shifted or been shifting to [B].
- ii. All postvocalic *p* and some postvocalic *s* which precede *u* are realized as [ϕ].
- iii. Postvocalic *z* and *d* correspond to [r] just before high vowels causing lateral stricture (e.g. *zako* [ɹ̥.ɤ.ko] ‘silver-stripe round herring’, *kazu* [ka.ɹ̥.ɥ] ‘number’, *didai* [ɹ̥.i.ɹ̥.e:] ‘ground’, *kado* [kɤ.ɹ̥.o] ‘corner’).

### 3.2 Nasal sei-daku opposition

In the Northeastern and Southwestern dialects of MJ, we can see sei-daku opposition of another type, which is based also on nasality under certain phonetic conditions (hereafter “nasal sei-daku opposition”). For example, the following sei-daku opposition in Tsugaru<sup>4</sup> and Segami<sup>5</sup> dialect is based on nasality immediately after vowels (and nasals as well in Segami dialect) and on voicedness elsewhere (on the heads of words and just after moraic obstruents) (for further information on the phonology of Tsugaru dialect, see Kobayashi 1983, and for further information on that of Segami dialect, see Kamimura 1965, Minami 1967, and Ogata 1987a–88b):

- (5) The representative phonetic values of postvocalic seion and dakuon in Tsugaru dialect

p	b	s	z	t	d	k	g
h	(m)b	s	(n)dz	d	(n)d	g	(ŋ)ŋ

- (6) The representative phonetic values of postvocalic seion and dakuon in Segami dialect

p	b	s	z	t	d	k	g
ϕ > h	b	s	ɲ > z	ɹ	n	g	ŋ

### 3.3 Geographic variations of sei-daku opposition in MJ

By combining the phonetic values of postvocalic seion and dakuon obtained for various dialects of MJ in previous studies and the results of interviews which I carried out to native speakers of Northeastern and Southwestern dialects<sup>6</sup> from 2009 to 2016, I arrived at the data in (7).

The dialects in (7) are listed in descending order from the highest number of seion to be voiced and dakuon to be nasalized to the lowest. We can see a larger number of seion and dakuon in Northeastern and Southwestern dialects than in the other dialects.

Taking these geographic variations of sei-daku opposition into consideration, as well as the phonetic values of man’yōgana (Chinese characters used as phonograms in OJ literature) in Middle Chinese, a number of researchers (cf. Wenck 1954, Takayama 1992, Miyake 2003) have argued that both voicing of seion and nasalization of dakuon occurred immediately after vowels in OJ. According to this argument, there were two types of sei-daku opposition based on both voicedness and nasality in OJ obstruents.

<sup>4</sup>A Northeastern dialect spoken in the Western part of Aomori Prefecture.

<sup>5</sup>A Southwestern dialect spoken on Kami-Koshiki Island in Kagoshima Prefecture, which forms Koshiki Islands together with Naka- and Shimo-Koshiki Island.

<sup>6</sup>Those who were born in 1950 or before. They have passed the critical period for language acquisition and have lived long enough to speak their mother tongue fluently in their hometown.

- (7) The representative phonetic values of postvocalic seion and dakuon in MJ (seion and dakuon the phonetic values of which do not vary are written in bold)

	<i>p</i>	<i>b</i>	<i>s</i>	<i>z</i>	<i>t</i>	<i>d</i>	<i>k</i>	<i>g</i>
a. Tsugaru, Akita, and Murakami	h	<b>m</b> <b>b</b>	s	<b>n</b> <b>dz̄</b>	d	<b>n</b> <b>d</b>	g	<b>ŋ</b> <b>ŋ</b>
b. Segami	ϕ > h	<b>b</b>	s	<b>ɲ</b> > z	ɭ	<b>d</b>	<b>g</b>	<b>ŋ</b>
c. Shizukuishi and Yamagata Pref.	h	<b>m</b> <b>b</b>	s	z	d	<b>n</b> <b>d</b>	g	<b>ŋ</b>
d. Kahoku	h	<b>b</b>	s	z	d	<b>n</b> <b>d</b>	g	<b>ŋ</b>
e. S. Tōhoku, NE. Kantō, and S. Satsuma	h	<b>b</b>	s	z	<b>d</b>	<b>d</b>	<b>g</b>	<b>ŋ</b>
f. Kashima	h	<b>b</b>	s	z	<b>d</b>	<b>d</b>	<b>g</b>	<b>∅</b>
g. Tosa	h	<b>b</b>	ts̄; θ	<b>dz̄</b> ; ð	t	<b>n</b> <b>d</b>	k	<b>ŋ</b> <b>g</b>
h. Tōkyō	h	<b>b</b>	s	z	t	<b>d</b>	k	<b>ŋ</b>
i. Nagahama	h	<b>b</b>	s, h	ɭ	t	<b>ɭ</b>	k	<b>ŋ</b> > <b>g</b>
j. MSJ	h	<b>b</b>	s	z	t	<b>d</b>	k	<b>ŋ</b> > <b>g</b>
k. Most Western dialects	h	<b>b</b>	s	z	t	<b>d</b>	k	<b>g</b>

[Notes]

- i. A; B (as “ts̄; θ”): [A] or [B] corresponds to X depending on speaker’s age and/or hometown.
- ii. Northeastern dialects: Tsugaru (Aomori Pref.), Akita, Shizukuishi (Iwate Pref.), Yamagata Prefecture, Kahoku (Yamagata Pref.), Southern Tōhoku, Murakami (Nīgata Pref.), and Northeastern Kantō.
- iii. Southwestern dialects: Tosa, Segami, Kashima (Kagoshima Pref.), Nagahama, and Southern Satsuma.
- iv. The data of “Yamagata Pref.” is based on that of Gotō (1960). We, however, are unable to know what kind of speakers use the dialect where because he refers to the name of the region simply as “Yamagata,” which may either be the prefecture or the city.

#### 4. Correlation between voicing of seion and nasalization of dakuon

In order to further develop the theory of sei-daku opposition in OJ, I will attempt to elucidate the following two points concerning the geographic variations of the sei-daku oppositions listed above:

- (8) a. Nasalization of *b* and/or *z* always implies that of *d* and *g*.
- b. Voicing of postvocalic seion and nasalization of postvocalic dakuon are lost more rapidly in *p:b* and *s:z* opposition than in *t:d* and *k:g* opposition.

##### 4.1 Implication of nasalization of dakuon

As seen in (7), there are five types of assortment of nasalization in dakuon as follows:

## (9) Assortment of nasalization in dakuon

	4/4	3/4-A	3/4-B	2/4	1/4
<i>b</i>	✓	✓			
<i>z</i>	✓		✓		
<i>d</i>	✓	✓	✓	✓	
<i>g</i>	✓	✓	✓	✓	✓

We should take notice that nasalization of *b* and/or *z* always implies that of *d* and *g*, but the opposite is not true. There is a difference between *b-z* and *d-g* in terms of the nasality of dakuon.

Interestingly, we can see a similar difference between the seion *p-s* and *t-k*, respectively opposed to *b-z* and *d-g*. As for the phonetic values of seion, *p* and *s* are now basically voiceless fricatives; on the other hand, *t* and *k* can also be realized as voiced stops as in (7).

#### 4.2 Loss of voicing in seion and nasalization in dakuon

The voicing of postvocalic seion and the nasalization of postvocalic dakuon seem to correlate with each other. This is because, as seen in (7), they are lost earlier in *p:b* and *s:z* oppositions, in which seion are now voiceless fricatives, than in *t:d* and *k:g* oppositions, in which seion can also be realized as voiced stops. For example, in Segami dialect, postvocalic *z* was originally [ɲ] as pointed out by Kamimura (1965), whereas it is now pronounced as [z] as follows:

(10) The phonetic forms of words including *z* in Segami dialect

	Classical	Modern	
a. <i>kaz̄i</i> ‘fire’:	[ kw̄a:ɲi	ke:ɲi	]
b. <i>miz̄u</i> ‘water’:	[ m̄i:ɲju	m̄i:ɲu	]
c. <i>maz̄eta</i> ‘mixed’:	[ ma.ɲje.ra	m̄e.ɲe.l̄e	]
d. <i>kaz̄ari</i> ‘decoration’:	[ ka.ɲjai	ke.ɲ̄ei	]
e. <i>kuroz̄atoo</i> ‘muscovado’:	[ <i>unknown</i>	ku.jo.ɲ̄e.l̄o:	]
f. <i>sakuraz̄ima</i> (a place name):	[ sa.gu.ja.ɲ̄i.ma	s̄e.ku.l̄e.z̄i.m̄e	]
g. <i>niz̄i</i> ‘rainbow’:	[ <i>unknown</i>	n̄i.z̄i	]
h. <i>-z̄joo</i> (a suffix):	[ -ɲjo:	-z̄o:	]
i. <i>koz̄ara</i> ‘small dish’:	[ ko.ɲ̄a.ja	ko.z̄e.l̄e	]
j. <i>kudariz̄aka</i> ‘descent’:	[ <i>unknown</i>	ku.ɲ̄ei.z̄e.ke	]

## [Notes]

- i. Here, “Classical” and “Modern” mean ‘being spoken by native speakers aged 30 or over between the 1930s and the 1980s’ and ‘being spoken by native speakers aged 60 or over in the twenty-first century,’ respectively.
- ii. The phonetic transcription of Classical Segami dialect is based on that of Kamimura (1965) and Ogata (1987a–88b). Incidentally, Japanese does not possess any trills, and hence [r] in these previous studies (e.g. [ma.ɲje.ra]) is presumed to represent [r] or [l]. In addition, [j] immediately after [ɲ] in Kamimura (1965) would be redundant because [ɲjV] and ニユ/エ/ヨ/ヤ (instead of ヂニユ/エ/ヨ/ヤ) seem to represent the same sounds in his description.
- iii. *sakuraz̄ima*: Sakurajima Island (桜島; lit. ‘cherry blossom island’), the famous volcanic island in Kagoshima Prefecture.

- iv. *-zjoo* (-嬢): A suffix which is attached to a woman's name to express friendliness.

This historical change in the phonetic value of postvocalic *z* implies that it was no longer necessary for postvocalic *z* as in (10f–j) to retain its nasality with postvocalic *s* being realized as a voiceless alveolar fricative.

If nasalization of postvocalic dakuon were to be lost more rapidly than voicing of postvocalic seion, then *t:d* and *k:g* oppositions would be lost immediately after vowels as well. Therefore, the postvocalic voicing can be considered to have disappeared earlier than the postvocalic nasalization in most Japanese dialects. Since there was no need to maintain the postvocalic nasalization after the loss of the postvocalic voicing, the postvocalic nasalization became difficult to maintain.

## 5. Conclusion

In order to further develop the theory of sei-daku opposition in OJ, I elucidated the following two points concerning the geographic variations of sei-daku oppositions:

- (11) a. Nasalization of *b* and/or *z* always implies that of *d* and *g*.  
 b. Voicing of postvocalic seion and nasalization of postvocalic dakuon are lost more rapidly in *p:b* and *s:z* oppositions than in *t:d* and *k:g* oppositions.

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