

CHAPTER 1

INTRODUCTION

This thesis deals with the vowel devoicing process that has been known in the literature as High Vowel Devoicing (**HVD**) in what will be referred to as Standard Modern Japanese, the dialect of the Eastern Plane region that is defined by the broadcast media. This thesis will attempt to characterize the exact nature of the processes causing loss of voicing, and the variables surrounding the application of those processes.

1.1 ORGANIZATION OF CHAPTER 1

This chapter serves first as an introduction to the thesis. First, §1.2 presents the goals of this thesis. §1.3 describes the organization of the thesis, and then §1.4 gives a summary of the pertinent theoretical assumptions that later chapters rest on since these are by no means settled in the field. §1.5 presents the segmental inventory of the dialect, including discussion of the status of the palatalized series of consonants. Finally, §1.6 gives the allophonic variation that is seen in the area.

1.2 GOALS OF THE THESIS

This thesis has 2 main experimental goals:

- 1) to determine the effects SR and other variables in the study design had on the frequency of vowel devoicing; and
- 2) to determine the effects the variables in the study design had on the voicing duration observed with those vowels that were voiced.

Since the computer program used to elicit data in this study has no history in the literature, it is also necessary to determine whether or not its use resulted in usable data; i.e. to determine whether or not 3 distinct data sets corresponding to the targeted 3 SRs were elicited. In addition, background statistical discussion generally not included in phonetically oriented papers has been included in the relevant chapters; while perhaps tedious for those from phonetics backgrounds, the

information is hopefully useful to those (like the author) from phonological backgrounds.

The thesis also has 4 ancillary goals:

- 1) to clarify the terminology and characterizations of the various stages of vowel devoicing seen in Japanese;
- 2) to provide phonological representations for these various stages within the framework of Feature Geometry;
- 3) to support Tsuchida's (1997) claim that both phonological devoicing due to feature change and phonetic devoicing due to gestural overlap are at work in Japanese; and
- 4) to note the various strategies utilized by the participants of the study in dealing with the conflict between pitch accent placement and vowel devoicing within the analysis of Japanese pitch accent assignment by Pierrehumbert & Beckman (1988).

1.3 ORGANIZATION OF THE THESIS

Ch. 2 provides description and literature review of HVD. It also contains discussion of the fricativization that routinely accompanies devoicing, and an attempt to clarify the terminology surrounding vowel devoicing and fricativization. In addition, it provides preliminary geometric representation of the various types of vowels encountered in this study.

Ch. 3 focuses on the interaction between pitch accent placement and HVD. It both describes the interaction and provides examples of one of the strategies utilized by speakers to avoid devoicing an accented vowel.

Ch. 4 presents the experimental design of the study testing the main research goals. Since the data elicitation program was used for the first time, Ch. 5 subjects the generated data to statistical checks to ensure that the data is suitable for further statistical analysis. The data was judged to be usable. Ch. 6 gives the details of statistical checks for the effects of variables on the rate of vowel devoicing. Ch. 7 gives the details of statistical checks for the effects of variables on the duration of

voicing found in the vowels that were not devoiced. Finally, Ch. 8 contains an overview of the thesis as a whole.

1.4 THEORETICAL ASSUMPTIONS

In general, the geometric representation of features provided in this work will follow the Sageyan articulator model of feature geometry (Sagey 1986, 1988; Halle 1992—cf. Lahiri & Evers 1991, Odden 1991; Clements & Hume 1995). However, the following modifications will be taken as correct and will not be elaborated on in the body of this thesis.

1.4.1 FRONT VOWELS ARE CORONAL

Following Hume (1992), front vowels will be subordinated to the Coronal Place node, as opposed the Dorsal node in other models (e.g. the Sageyan model). This representation is based on x-ray evidence from several languages showing a raising of the front of the tongue toward the hard palate. It also provides the explanatory power necessary to handle the alveolar to palato-alveolar assimilation that occurs in many languages, including Japanese, where alveolars become palato-alveolar in front of front vowels.

A rough outline of this characterization of the front vowel [i] based on Clements & Hume (1995: 277) is given below, although for simplicity sake I will label the Oral Cavity (Clements & Hume 1995) or Oral Place node (McCarthy 1988; Sagey 1988) as simply the Place node.

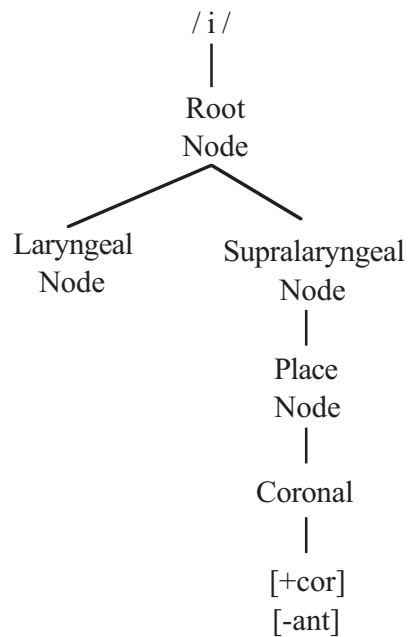


Figure 1.1 Front vowels as coronals.

1.4.2 [CONSONANTAL] IS A DAUGHTER OF THE ROOT NODE

In addition, following Kaisse (1992), the feature [consonantal] will be assumed to be a daughter of the Root Node rather than an inherent feature of it (cf. McCarthy 1988: 97; Clements & Hume 1995: 292). [consonantal] thereby joins the manner features [continuant], [lateral], and [nasal] as daughters of the Root node. (The feature [sonorant] is thought to remain an inherent feature of the Root node, since no instances of it spreading autonomously have been attested.) This can be seen in the following representation.

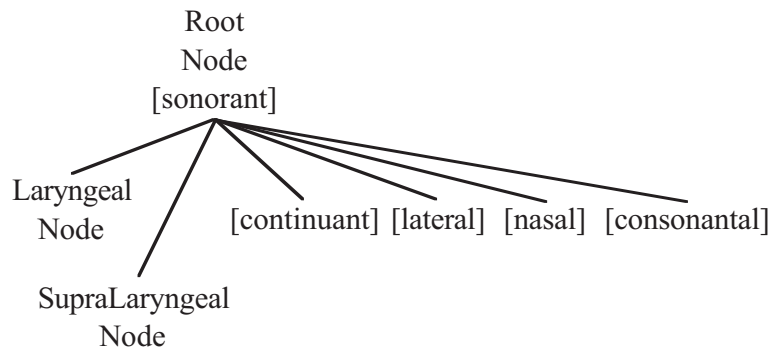


Figure 1.2 [consonantal] as a daughter of the Root node.

Characterizing [consonantal] as a daughter of the Root node is mandated by the spread of this feature in the examples discussed in Kaisse (1992) and other works. Odden & Hume provided an alternative account of the data in Kaisse (1992) that does not require the feature [consonantal], but their account does not appear to be able to handle the gradient fricativization of vowels that accompanies devoicing in Japanese and possibly Uyghur as well (see §2.3 for details on fricativization in Japanese).

1.4.3 JAPANESE VOICELESS OBSTRUENTS ARE UNDERLYINGLY [+SPREAD GLOTTIS]

There are at least two analyses in the literature supporting the position that voiceless obstruents in Japanese are underlyingly specified as [+spread glottis], not redundantly as [-voice] as is usually assumed. These are the phonetic analysis of voiceless fricatives found in several works, notably in Tsuchida (1994, 1997), and the phonological analysis of aspiration in Germanic languages found in Iverson & Salmons (1995).

Tsuchida's (1994, 1997) analysis of voiceless fricatives is based on both direct observation of glottal spread during production, and the muscle activations responsible for that spreading. Tsuchida directly observed glottal spreading via a nasally inserted fiber optic cable. These were then coordinated with electromyographical (**EMG**) recordings of activations of the muscles controlling the glottis. (See Tsuchida 1997 Ch. 4 for discussion.)

Supporting previous studies (e.g. Hirose 1971), Tsuchida found only one glottal spreading and associated activation of the muscles controlling spreading when a vowel was devoiced in most environments.¹ This indicates a sharing of the feature [+spread glottis] by the preceding voiceless obstruent, assumed to be due to a phonological process.

On the phonological side, based on previous work by Kim (1970) and Kingston (1990), Iverson & Salmons (1995) provides convincing evidence that Germanic voiceless obstruents² are best specified as [+spread glottis], not redundantly specified for [-voice] as is generally assumed. This is consistent with the observations about the alignment of the frication caused by glottal spreading that has been reported in the literature (e.g. Kim 1970; Kingston 1990; Tsuchida 1997). The degree of observed aspiration is then attributed to the prosodic strengthening of segments that necessarily occurs independently (Nespor & Vogel 1986; Halle & Vergnaud 1987; Kingston & Diehl 1994).

Since the analysis in Iverson & Salmons (1995) also closely describes the observed aspiration in the data of this study, it will be assumed that Japanese voiceless obstruents are also underlyingly specified for [+spread glottis], and that the differences between aspiration in English and Japanese can be attributed to different prosodic strengthening strategies in the two languages.

The geometric representations that will be given in Ch. 2 will therefore specify the voiceless obstruents as [+spread glottis]. The evidence justifying this specification of Japanese voiceless obstruents will be described more fully in §2.2.4.

¹In contrast, in that study high vowels usually did not devoice between voiceless fricatives, where a separate glottal spreading gesture was associated with each voiceless fricative.

²Dutch is not included with the other Germanic languages here, since its aspiration distribution pattern does not match theirs. Yiddish is also not included for the same reason despite the overwhelming influence of IE languages on it.

1.4.4 SEGMENTAL REPRESENTATIONS ARE SHAPED BY LINGUISTIC EXPERIENCE

Following Schmidt (1994) and contrary to Clements & Hume (1995), this work will not assume a universal feature geometry. Instead, it will be assumed that the geometric representations that adults use in organizing the sounds of their language or languages are shaped by their linguistic experience. This assumption parallels the way that experience shapes both the construction of the phonemic contrasts of language(s) and the ability to categorically perceive those contrasts (e.g. Miyakawa et al. 1975; Werker & Tees 1984; Nathan 1987; Best et al. 1988; Burnham et al. 1991; Kuhl et al. 1992; Major 1992; Willerman & Kuhl 1996 and many, many others). Certainly many processes are necessarily constrained by the physical limitations of human articulatory equipment (see Maddieson 1997 for discussion), but differences in the hierarchical organization of features are to be expected for various languages since the segment inventories and phonological processes of languages vary to such a great extent. The representations presented in this work are purported to describe Japanese then, and may or may not be applicable to other languages.

1.5 THE SEGMENTAL INVENTORY OF STANDARD MODERN JAPANESE

The following segments may be considered to be the phonemic inventory of the Standard dialect (cf. Bloch 1950: 116; Martin 1987: 76):

consonant phonemes:

plain series				palatalized series		
p	t		k	p^y	t^y	k^y
b	d		g	b^y	d^y	g^y
	s				s^y	
	z				z^y	
m	n			m^y	n^y	
	r	y	w	h	r^y	h^y

vowel phonemes:³

i		u
e		o
	a	

Figure 1.3 The segmental inventory of Modern Standard Japanese.

The segmental inventory can be thought to contain two series of consonants: a plain, unpalatalized series that occurs before all vowels, and a palatalized series that occurs only before the vowels [a u o]. The palatalized series will now be briefly discussed, as their status bears on the application of HVD to them.

The palatalized series is thought to have entered the Japanese phonemic inventory either through the onslaught of Chinese borrowings that occurred in the history of Japanese (Martin 1987: 72), or through the derivation of palatalized consonant allophones after the neutralization of the Old Japanese vowel that triggered the palatalization—when the vowel was lost, the allophonic palatalization was preserved in the form of a phonemic palatal consonant (Miller 1967: 226-227; Lange 1973 as cited by Unger 1993: 7). In contrast, however, the palatalized series is analyzed as a sequence of consonants in Bloch (1950: 152), an analysis maintained in Vance (1987: 28-29).

A full analysis of the most appropriate synchronic analysis for this series based on detailed phonetic and phonological evidence is beyond the scope of this dissertation. However, some evidence of the status of this series is provided by whether or not

³Throughout this thesis, I will utilize the broad transcriptions **i** and **u** for the high vowels rather than the close transcriptions **ɨ** and **ɯ** that are often used.

the sounds listed above allow the application of HVD. Briefly, the high vowels /i/ and /u/ can devoice between voiceless obstruents. If each member of this palatalized series of consonants consisted of an obstruent followed by a palatal glide (e.g. /k/ + /y/) as posited by Bloch (1950), the voicing of the glide should block the application of HVD.⁴ On the other hand, if the correct representation of the palatalized series is that they are complex segments with an off-glide release (e.g. /kʲ/), phonemically the members of this series would be voiceless obstruents (see Lahiri & Evans 1991 §4) and hence they would not block HVD.

In general the members of the palatalized series do not occur within the HVD environment due to the nature of morphemes they are found in, Sino-Japanese morphemes that have come into Japanese from Chinese in several successive waves of borrowing (Miller 1967 Ch. 1). The majority of these morphemes contain long vowels, such as /tʲu:/ *chuu* ‘during; in the process of; in the middle of; in the center’. Because of the long vowel, no devoicing is possible. And while many morphemes do contain a short vowel, they are so archaic as to preclude native speaker judgments about their pronunciation.

There are some common morphemes that contain the mora /sʲu/, however, and these vowels can be devoiced when they are followed by an unvoiced consonant. In the following, [ɕ]⁵ is the allophonic variant of /sʲ/ after the optional deletion of the off-glide and [∅] is the allophone of /h/ occurring before /u/.

⁴Sonorants block the application of HVD. HVD therefore must apply at a level of the grammar where all sonorants have been specified for voice by whatever mechanism.

⁵The reader’s tolerance is begged for the non-IPA use of [ɕ] in place of [ʃ] due to typographical considerations.

shukufuku [š̥ukuɸ̥uku] ‘blessing’⁶
 shukan [š̥ukan] ‘subjectivity’
 shutai [š̥utai] ‘main constituent’
 shutoku [š̥utoku] ‘acquisition’
 shuppansha [š̥uppanša] ‘publisher’

Figure 1.4 Participation of palatalized segment / sʏ / in HVD.

The fact that the palatalized segment / sʏ / also allows the application of HVD indicates that it is an unvoiced consonant, specified for [-voice] at the surface level of the grammar, as opposed to a voiceless fricative/voiced glide sequence. Since / sʏ / is a regular part of the palatalized series, this analysis of it will be extended to all of the palatalized series. The voiceless sounds of the palatalized series, then, will be treated as voiceless obstruents in any discussion of HVD that follows; i.e. all discussion of the simplex voiceless obstruents will be considered applicable to the palatalized voiceless obstruents as well.

1.6 ALLOPHONY IN THE STANDARD MODERN JAPANESE INVENTORY

There are several virtually exceptionless rules of allophony occurring in the Tokyo dialect. These can be seen in the following syllabary chart which lists the possible morae of the dialect. They are presented here in broad phonetic transcription; morae containing allophonic variants of the initial consonant are in bold (cf. Vance 1987 Ch. 4; Kondo 1997 §3.5.1).

⁶As noted in Vance (1987), most speakers prefer not to devoice more than 2 vowels in a row. When there are alternate patterns available, as in the work *shukufuku*, many speakers prefer to alternate voiced and devoiced vowels.

a	ka	sa	ta	na	ha	ma	ra	ya	wa	n
i	ki	ši	tši	ni	çi	mi	ri	(i)	(i)	
u	ku	su	tšu	nu	øu	mu	ru	yu	(u)	
e	ke	se	te	ne	he	me	re	(e)	(e)	
o	ko	so	to	no	ho	mo	ro	yo	wo/o	
	k ^y a	ša	tša	n ^y a	ç ^y a	m ^y a	r ^y a			
	k ^y u	šu	tšu	n ^y u	ç ^y u	m ^y u	r ^y u			
	k ^y o	šo	tšo	n ^y o	ç ^y o	m ^y o	r ^y o			
	ga	za	da		pa	ba				
	gi	dzi	dzi		pi	bi				
	gu	dzu	dzu		pu	bu				
	ge	ze	de		pe	be				
	go	zo	do		po	bo				
	g ^y a	d3a	d3a		p ^y a	b ^y a				
	g ^y u	d3u	d3u		p ^y u	b ^y u				
	g ^y o	d3o	d3o		p ^y o	b ^y o				

Figure 1.5 Consonantal allophony in Standard Modern Japanese.

These variations are thought to be true allophony due to their persistent application even at the slowest speech rates, and by most speakers to foreign loanwords and in second language learning—the so-called ‘katakana pronunciation’⁷ well-known to foreign language teachers in Japan.

The allophony pertinent to this thesis are the allophones of the voiceless coronal that occur before the high vowels. In addition, the variant of the phonemic /k/ that occurs before [i] is also affected: /ki/ → [kxi]. This variation is perhaps best characterized as a phonetic effect rather than a phonological variation (see Keating 1993 for discussion).

⁷The few exceptions to their application are the most recent borrowings of loanwords for some speakers, e.g. [tu] ‘two’ (cf. [tsušotto] lit. ‘two shot’; a photograph of two people together). *Katakana* is one syllabary used to write loanwords or for emphasis; ‘katakana pronunciation’ is the modification of a target pronunciation to fit this syllabary system (e.g. ‘strike’ is pronounced as [sutoraiku]).

The aforementioned allophonic variations are important to this work because they occur in the same contexts as HVD, and therefore will bear on the geometric representations of HVD that will follow.

Recalling that front vowels are being specified under the Coronal node per Hume (1992), the geometric derivation of the allophones pertinent to the discussion of HVD will be held to be the following.⁸

⁸In this and all geometric representations: Rt = Root Node; SL = Supralaryngeal Node; Place = Place Node; Lab = Labial Place Node; Cor = Coronal Place Node; Dors = Dorsal Place Node.

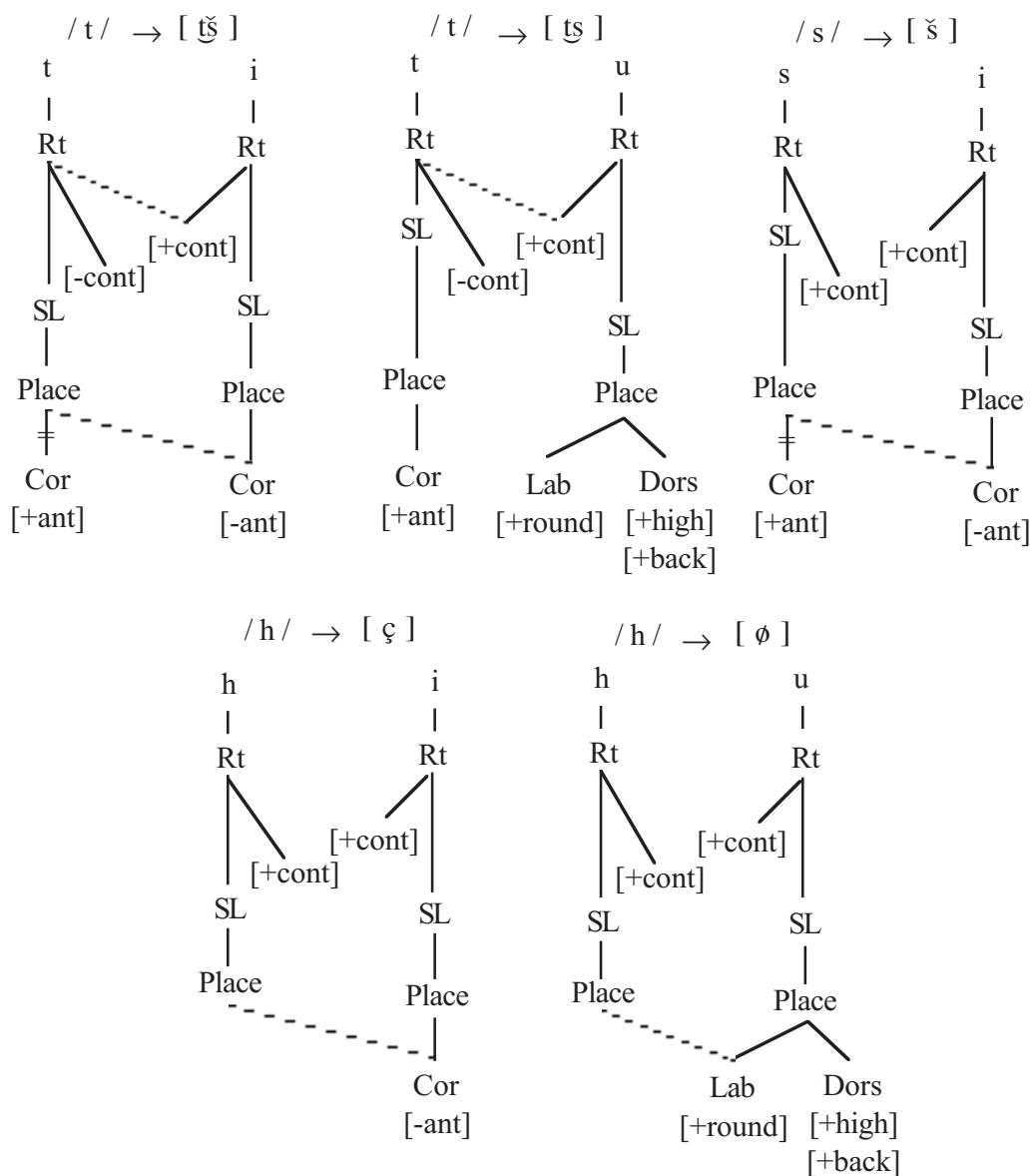


Figure 1.6 Geometric representations of the allophonic variations.

The following notes about these representations are in order.

- As noted in §1.3, specifying the front vowel /i/ as a coronal vowel as per Hume (1992) is motivated by exactly the universally common coronal palatalization found here in Japanese: a voiceless alveolar obstruent becomes palato-alveolar before a front high vowel or a palatal off-glide (i.e. specification for the feature [-anterior]).

This direction of palatalization (i.e. alveolar to palato-alveolar) cannot be handled directly in the Sageyan model (Sagey 1986; Halle 1992). In that model /i/ is specified as a daughter of the Dorsal Node, and is specified for the features [+high] and [-back]; there is no feature [-anterior] available to associate to the preceding [+anterior] coronal through delinking/association. The specification of front vowels as coronal provides a way to directly handle this type of palatalization as well as palatalization of velars.

- All allophony is assumed to apply after all features have been fully specified.
- The segment [h] is assumed to have no Place Node of its own, taking its surface place specification from the following vowel as indicated by the double linking (Iverson 1989).
- The dual specification for [continuant] of the [tʃ] and [tʂ] is assumed to be due to the sharing of the [+cont] of the following vowel as per Sagey (1986).
- As noted previously, the palatalization caused by the high front vowel is also triggered by the off-glide of the palatalized series of consonants; e.g. /sʏ/ → [ʃ]. This is due to the coronal specification of the palatal portion of the complex articulation; the geometric derivations would be the same as those given with the additional specification of the palatal component.⁹

The configurations created by these allophonic processes will be considered the input to the possible application of the rule of HVD, discussion of which will be taken up in the next chapter.

⁹Keating (1988: 89), referring to x-ray evidence of palatal articulations, maintains that palatals are complex articulations that contain both a coronal and a dorsal component.