Japanese Vowel Deletion Occurs in Words in Citation Form

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Abstract

Japanese vowels have allophonic reduced variants, including shortened, devoiced and deleted instances.

This kind of linguistic behaviour is commonly associated with rapid or casual speech. However, we demonstrates that **vowel deletion also occurs in Japanese words in citation form**.

We propose that deletion is more likely to occur in high-frequency lexical items, specifically in three regularly occurring suffixes.

Introduction

Cross-linguistically, segmental reduction is associated with fast speech.

In Japanese, however, vowel reduction—shortening, devoicing, and occurs regularly for high vowels, /i/ and /u/, even at a normal speaking rate (Fujimoto, 2015).

Japanese vowel devoicing, and deletion behaviours are generally regarded as features of a single phenomenon referred to as 'vowel devoicing' by scholars of Japanese.

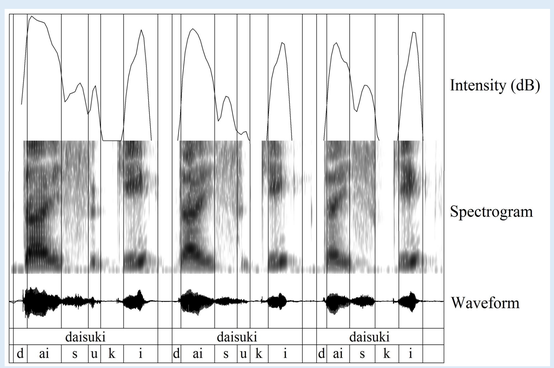

Figure 1: Voiced, devoiced and deleted examples of the /u/ in the Japanese word, *daisuki*.

We present a study of the production of Japanese words in citation form.

We argue that deletion is a feature of citation form and is more likely to be elicited by specific suffixes that occur in high frequency in Japanese discourse:

- /i/ in the imperative verb suffix して /ʃite/
- /i/ in the past tense verb suffix した /ʃita/
- /u/ in the non-past tense verb suffix ます/masu/

Participants

Twelve native Japanese speakers (10 female; 2 male) living in Melbourne, Australia:

- Seven were expatriates, who had lived in Australia for five+ years (Age 27-42 yo).
- Five were international students who had lived in Australia for less than a year and were studying English as a Foreign Language at University. (Age 18-20 yo).

Data collection

Participants read from a pseudo-randomised list of 30 words in Hiragana script.

Recordings were conducted in quiet rooms in Melbourne, using a Zoom H4n recording device with a sampling depth of 24kb/sec and a sample rate of 44.1kHz.

Analysis

Elicitations were categorised (voiced, devoiced, deleted) on the basis of visual inspection of spectrograms in the following way:

Voiced vowels are characterised by voicing bars—which are indicative of vocal fold vibration—and formant resonance in spectrograms. Unvoiced vowels do not yield voicing bars but otherwise appear vowel-like. Deleted vowels simply do not appear to be articulated. There is no transition within the preceding fricative and no increase in intensity.

Figures 2 and 3 provided examples of devoiced and deleted allophones respectively. In figure 2 (moku), we observe an unvoiced word-final vowel (the release after the stop appears vowel like in terms of F2 frequency but lacks voicing bars which are indicative of vocal fold vibration). Figure 3 (masu) on the other hand shows a deleted vowel.

Deleted vowels only occur after fricatives and exhibit little evidence of vowel-like behaviour..

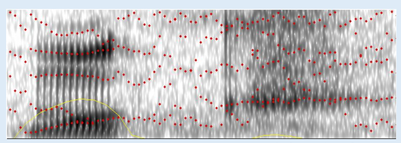

Figure 2: Spectrogram of /moku/

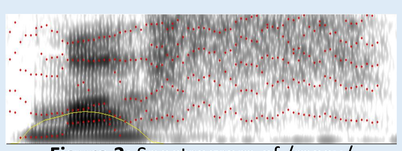

Figure 3: Spectrogram of /masu/

Results

/i/ Words	Environment	Deletion	Devoicing
shiteru	ʃ_t	89%	--
tabemashita	ʃ_t	92%	--
hanashite	ʃ_t	92%	--
ashita	ʃ_t	83%	--
shita	ʃ_t	67%	--
shite	ʃ_t	83%	--
shida	ʃ_d	--	--
shide	ʃ_d	--	--
mashi	ʃ_#	17%	--
nichi	C_#	25%	--
/u/ Words	**Environment**	**Deletion**	**Devoicing**
shuten	ʃ_t	33%	--
shute	ʃ_t	19%	--
suki	s_k	63%	--
daisuki	s_k	78%	3%
imasu	mas_#	67%	--
tabemasu	mas_#	83%	--
hanashimasu	mas_#	83%	--
karasu	s_#	17%	--
masu	mas_#	56%	--
moku	C_#	--	41%
/o/ Words	**Environment**	**Deletion**	**Devoicing**
kokoro	C_CV	3%	6%
hokori	C_CV	--	8%
/a/ Word	**Environment**	**Deletion**	**Devoicing**
haka	C_CV	--	--
Foils	**Environment**	**Deletion**	**Devoicing**
ima	--	--	--
ichiban	--	--	--
kasa	--	--	--
kaze	--	--	--
mizu	--	--	--
yasha	--	--	--
tusbasa	--	--	--

Table 1. Deletion and devoicing results. Words are presented in Hepburn Romanisation and environment indicates the environment of the vowel being monitored.

The results show that **vowel devoicing and vowel deletion are frequently occurring phenomena** even in words in citation form, in Japanese.

Devoicing and deletion are appear to be used at similar rates across a wide age-range: We found no significant difference between expatriate participants and international students: all produced reduced vowels at a **similar rate**.

Results, cont.

An item-based analysis revealed differences in the rate of deletion in the tested suffix environments: して /ʃite/ underwent deletion most frequently (M = 88%), followed by した /ʃita/ (M = 81%), and finally ます /masu/ (M = 78%).

We suggest these differences may reflect differences in frequency of occurrence of these suffixes: In a balanced corpus of contemporary written Japanese (NINJAL, 2009), して /ʃite/ occurred most frequently, followed by した /ʃita/ and lastly ます /masu/, indicating that **high-frequency items are more likely to exhibit vowel deletion**.

Discussion

We argue that vowel deletion and vowel devoicing are likely separate, although related, phenomena. Both behaviours occur in similar environments, however deletion occurs after fricatives while devoicing occurs after plosives.

Another point of distinction is likely the relative frequency at which vowel devoicing and vowel deletion occur. Our results would suggest that vowel deletion occurs more frequently in citation form although further investigation is required.

We also argue that word (or morpheme) frequency in Japanese discourse appears to be related to the frequency of vowel deletion. This parallels reports on target undershoot in high-frequency words (e.g., Van Bergem, 1993) and can be framed within the principle of least effort, which proposes that languages will move towards requiring less energy from the speaker.

However, this tendency of course has to be balanced against the need for listeners to be able to differentiate between words/morphemes, and we suggest that vowel deletion is functional in Japanese suffixes because deletion does not lead to homophony: The vowels have low informativeness—they are predictable and have a near-zero entropy.

Bibliography

Fujimoto, M. (2015). Vowel Devoicing. In H. Kubozono (Ed.), *Handbook of Japanese Phonetics and Phonology* (pp. 167-215). Berlin: De Gruyter Mouton.

National Institute for Japanese Language and Linguistics (2009). *Balanced Corpus of Contemporary Written Japanese*. Retrieved from www.kotonoha.gr.jp/shonagon

Van Bergem, D. R. (1993). Acoustic vowel reduction as a function of sentence accent, word stress, and word class. *Speech communication, 12*(1), 1-23.

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