Vowel Coalescence in Colloquial Japanese: Phonological and Non-phonological Factors

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1 Introduction

Japanese has a group of adjectives that are formed with the suffix -*i* (e.g., ama-i 'sweet'; hoso-i 'thin'). In colloquial usage, these so-called *i*-adjectives may undergo vowel coalescence (see Hasegawa 1979; Tsujimura 1996:102; Kubozono 1999:96–104, 2015; Kawahara 2002; Kawai 2006; Inada 2008; Vance 2008:90–91; Ono 2009; Ota and Ujihira 2014; Tanaka 2022, among others), as shown in (1).

(1) Vowel coalescence in *i*-adjectives in casual speech

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jab<u>a-i</u> → jabe: やべえ 'awful; awesome' sug<u>o-i</u> → suge: すげえ 'terrific' daru-i → dari: だりい 'weary'
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The vowel sequences /...a-i/, /...o-i/, and /...u-i/, which are faithfully realized in normal speech, are each coalesced into a single long vowel in casual speech. In principle, /a-i/ and /o-i/ become [e:], whereas /u-i/ becomes [i:] based on a simple rule format, as described in (2) (see, e.g., Kubozono 1999:96–104, 2015; Inada 2008; Tanaka 2022 for more formal analyses).

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(2) Basic patterns of vowel coalescence

$$\left\{ \begin{matrix} ...a\text{-}\mathrm{i} \\ ...o\text{-}\mathrm{i} \end{matrix} \right\} \quad \rightarrow \quad ...\mathbf{er} \qquad \quad ...\mathbf{u}\text{-}\mathrm{i} \quad \rightarrow \quad ...\mathbf{ir}$$

Though the phenomenon itself has long been studied in Japanese linguistics (see the references cited above), its variability has yet to be thoroughly investigated. The alternation does not happen across the board, with some items resisting coalescence, as illustrated in (3).

(3) Lexical variation in vowel coalescence

taka-i
$$\rightarrow$$
 take: たけえ 'expensive' cf. jasu-i \rightarrow 'jaçi: 'やしい 'cheap' aka-i \rightarrow ake: あけえ 'red' cf. ao-i \rightarrow 'ae: 'あええ 'blue'

It is also reported that coalesced forms are somewhat stigmatized and not equally acceptable to all speakers. Some researchers associate the occurrence of vowel coalescence to young male or "tough guy" speech (see, e.g., Hasegawa 1979; Tsujimura 1996:102; Vance 2008:90–91).

This study addresses the issue of word- and speaker-based variability in the vowel coalescence phenomenon in colloquial Japanese. More specifically, a large-scale judgment experiment was conducted to examine whether and how phonological (grammatical) factors, such as input vowel quality (/...a-i/, /...o-i/, or /...u-i/) and the avoidance of consonant change (e.g., $/s/\rightarrow$ [g] caused by following [i:], as in $/jagu-i/\rightarrow$?[jagi:] 'cheap'), as well as non-phonological (socio-linguistic) factors, such as speech context and the speaker's age and gender, affect the acceptability of vowel coalescence.

2 Methods

I designed and ran a web-based judgement experiment, where Japanese speakers from various age and gender groups rated the naturalness of coalesced forms. The details of the experiment are as follows.

2.1 Participants

721 native Japanese speakers (371 females, 335 males, 15 others or no answers; mean age: 40.31, SD: 10.01) took part and completed the experiment. They were recruited through a crowd sourcing service *CrowdWorks*. They received 220 Japanese yen as a reward for their participation.

When analyzing the results, I excluded the data of one participant who had not answered any of the questions on demographics, as well as those of three participants whose completion ID did not match what had been reported on CrowdWorks. The data of 717 participants were thus entered into the final analysis. To analyze the gender factor discussed in the literature (male vs.

female speakers), the 15 participants who had responded "others" or provided no response to the gender question were considered "NA (Not Applicable);" their data were considered valid with respect to other factors (see Section 2.4 for more details).

2.2 Materials

The experimental stimuli consisted of 342 common *i*-adjectives (e.g., ama-i 'sweet'; karu-i 'light') taken from an on-line dictionary (OJAD; Hirose and Minematsu Lab 2016), three speech corpora (CSJ, NUCC, CEJC; NINJAL 2012a,b, 2022; Fujimura et al. 2012), and a web article listing slang expressions often used by young speakers (e.g., uza-i 'pesky; vexing'; emo-i 'emo-y; emotional'; Coto World 2021). From the base adjectives, forms that have undergone vowel coalescence (e.g., ame: 'sweet $\langle casual \rangle$ '; kari: 'light $\langle casual \rangle$ ') were created. Each participant was presented with randomly selected 57 adjectives and their casual (coalesced) forms. A full list of the base adjectives is given in the Appendix.

For orthographic presentation, the base adjectives were primarily written in the phonographic hiragana script (e.g., あまい amai 'sweet'; えろい eroi 'erotic'); however, for the ease of understanding, they were additionally written in the script commonly used for each adjective (e.g., kanji-hiragana combination: 甘い AMAi 'sweet'; katakana-hiragana combination: エロい EROi 'erotic'), except for those usually written in hiragana alone (e.g., でかい dekai 'huge'). The casual forms were always written in hiragana (e.g., あめえ amee; えれえ eree: でけえ dekee).

In addition, two kinds of speech context were created to be provided along with the main stimulus items: one context informed participants that "they themselves" would utter the coalesced adjective form before a close friend half-jokingly ("Self Context"), and the other informed them that "a close friend of theirs" would use the coalesced adjective form before them half-jokingly ("Friend Context"). Each participant was assigned either one of the contexts. The original instructions in Japanese are given in the Appendix.

2.3 Procedure

The study was implemented on the web-based experiment platform *lab.js* (Henninger et al. 2022). The participants were directed to a website hosting the experiment system through a link posted on CrowdWorks. After agreeing to a consent form, they were provided with some basic instructions. They were informed that they would be presented with a word and its pronunciation (a particular way of saying the word), and were asked to rate its naturalness of use in a given context. They were instructed to put in their ratings on a scale of 0 to 100 using a continuous slider. As a sample task, they were presented with the noun *omae* (*oMAE*) お前 (おまえ) 'you ⟨impolite⟩' and its casual

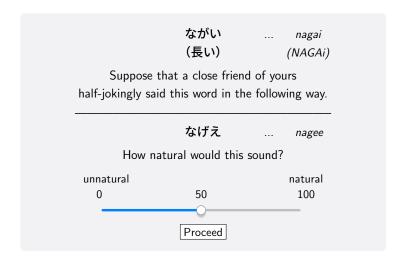


FIGURE 1 An image of the judgment task

form with a coalesced vowel *omee* 3b $\dot{\lambda}$ 'you (impolite; casual)', and were asked to rate its naturalness.

Once they were ready, they proceeded to the main session, where they rated the naturalness of adjective forms in the same manner. Figure 1 is an image of the main task, which is reproduced with the original instructions translated into English and stimulus items annotated in the Roman alphabet. As stated above, each participant received 57 randomly selected adjective items, with the order of presentation shuffled. They were also assigned to one of the two contexts (Self or Friend); the context for an individual participant remained the same for the entire experiment.

2.4 Statistical Analysis

A linear mixed-effects model was constructed using the *lmer()* function (Bates et al. 2015; Kuznetsova et al. 2017) on R (R Core Team 2022) and fitted to the naturalness rating data. The main predictors of the model to be examined as fixed effects included the grammatical (phonological and morphological) factors and non-grammatical (socio-linguistic) factors listed in (4) below.

(4) Mixed-effects model predictors

VowelType The vowel sequence type: /ai/, /oi/, or /ui/ ConsAlternation Coalescence involves a consonant alternation

(e.g., $u\underline{s}u\text{-}i \to u\mathbf{c}i$: 'thin; light (of color)')

ConsDeletion Coalescence involves a consonant deletion

(e.g., kijo-i \rightarrow ki e: 'pure')

Denominal The adjective is formed from a noun

(e.g., maru-i 'round' +-- maru + i 'circle-y')

Loan The adjective is formed from a loanword

(e.g., guro-i 'grotesque')

Mimetic The adjective is formed from a mimetic word

(e.g., boro-i 'worn-out')

Hiatus The output continues to have a vowel sequence

(e.g., ao-i \rightarrow ae: 'blue')

Gender The participant's gender: Female or Male
Age The participant's age (in numeral; e.g., 25, 43)
Context The context of utterance: Self or Friend

Based on previous studies, it could be predicted that younger male speakers (i.e., Gender: Male and lower Age) will have higher ratings. The details of the other predictors, including predictions and theoretical implications, are discussed in the results and discussion sections (Sections 3 and 4).

The mixed-effects model also included random intercepts for participants and items, which was confirmed to be the best random structure without the issues of convergence and overfitting. (Models with random slopes did converge with an optimizer but gave warning of potential overfitting.)

3 Results

Let us first examine one of the main phonological factors, namely, vowel quality. Figure 2 shows a violin plot of item-based mean rating scores by vowel type. Lines (—) and dots (•) represent quartiles and grand means, respectively, and width indicates the sample size (i.e., the number of adjective items in each condition).

It can be seen that adjectives with /ai/ have higher ratings than those with /oi/ and /ui/. The mixed-effects model fitted to the data indicates that, with /oi/ as its baseline (β = 47.63, t = 14.70), /ai/ significantly raises the rating (β = 11.74, t = 4.66, p < 0.001), whereas /ui/ has no effect (β = -1.78, t = -0.54, p = 0.593). This suggests that in casual speech, /ai/-adjectives in general are more likely to show vowel coalescence (i.e., ai \rightarrow e:) than /oi/-adjectives (oi \rightarrow e:) or /ui/-adjectives (ui \rightarrow i:).

Other grammatical (phonological as well as morphological) factors that significantly affect the rating scores include the following. ConsAlternation

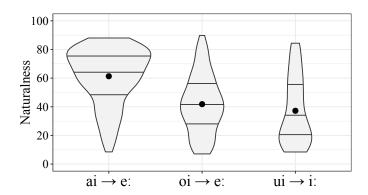


FIGURE 2 Naturalness ratings by vowel type

lowers the rating (β = -10.85, t = -2.34, p = 0.020), and so does ConsDeletion (β = -9.78, t = -2.89, p = 0.004). This suggests that vowel coalescence tends to be avoided when it affects the preceding consonant (e.g., ugu-i \rightarrow ²ugi: 'thin; light' with palatalization driven by *si(:); kijo-i \rightarrow ²ki e: 'pure' with [j]-deletion driven by *je). The ratings are also lowered by Denominal (β = -20.42, t = -5.61, p < 0.001), Loan (β = -14.21, t = -2.14, p = 0.033), and Mimetic (β = -13.14, t = -2.07, p = 0.040), indicating that a change in a noun, loanword, or mimetic base is disfavored (e.g., maru + i 'circle-y' - \rightarrow maru-i \rightarrow ²mari: 'round'; ero-i \rightarrow ²ere: 'erotic'; tçara-i \rightarrow ²tçare: 'flirty'). The negative effect of Hiatus (β = -33.80, t = -5.73, p < 0.001) further shows that vowel coalescence is unlikely to occur in an onsetless syllable, nonetheless resulting in a vowel sequence in the output (e.g., ao-i \rightarrow ²ae: 'blue'; ajau-i \rightarrow ²ajai: 'dangerous'). Section 4 provides the theoretical interpretations of these results.

Turning to non-grammatical factors, I present in Figure 3 a violin plot of participant-based mean rating scores, broken down by age (grouped by generation) as well as gender (F: Female or M: Male). The gender differences look small but consistent across generations. The mixed-effects model's prediction indicates that Male significantly raises the rating (β = 7.53, t = 6.68, p < 0.001). In contrast, there was no effect of Age (β = 0.01, t = 0.25, p = 0.799; note that Age is a continuous variable in the analysis). This indicates that male speakers, but not particularly young speakers, are associated with vowel coalescence. The effect of Context (Self or Friend) was also tested; although Self lowers the rating numerically, the effect is not significant at the 0.05 level (β = -1.90, t = -1.68, p = 0.094). Thus, the ratings were unaffected, irrespective of whether the coalesced form was used by participants themselves or someone else (but see Section 4 for further discussion).

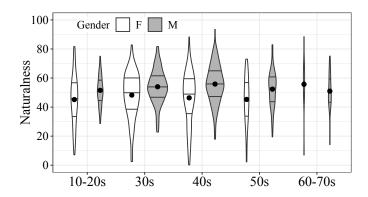


FIGURE 3 Naturalness ratings by gender and generation

The effects of Age and Context were further examined through model comparisons using the anova() function. The results of likelihood ratio tests as well as AIC scores indicate that the fit to the rating data is actually not significantly different between the full model discussed here (AIC: 363290) and a model without Age ($\chi^2(1) = 0.065$, p = 0.799; AIC: 363288) or Context ($\chi^2(1) = 2.813$, p = 0.093; AIC: 363291). In other words, these factors do not play important roles in capturing the data of vowel coalescence in Japanese (but see issues discussed at the end of this section and in Section 4).

There are also other grammatical factors that have been tested and proven ineffective. It was hypothesized that vowel coalescence would be less acceptable when the stem of the adjective was a truncated word (e.g., mendo-i \leftarrow -- mendo(:kusa)-i 'tedious') or a one-mora morpheme (e.g., ko-i 'strong (of tea)'). However, the goodness of fit did not improve significantly by further including them as predictors: Truncated ($\chi^2(1) = 1.546$, p = 0.214; AIC: 363291) or OneMora ($\chi^2(1) = 1.105$, p = 0.293; AIC: 363291). They were thus dropped from the model.

The results of the final model are summarized in Table 1. Note that the model presented here is a hypothesis-based model originally proposed in (4) and not the best-fitting model with the fewest predictors. For example, some factors such as Age and Context did not contribute to the model's better fit to the data (see above), but they were nonetheless included. This was intended to examine and show the effects (or lack thereof) of the factors especially relevant for the purpose of this study using a single model. It should also be noted that although these factors (and even those that are not shown here such as OneMora) may not have significant effects on vowel coalescence, they do play important roles in other linguistic phenomena, and are thus relevant for a Japanese language model.

	β	SE	df	t	p
(Intercept)	47.63	3.24	967.66	14.70	< 0.001 ***
VowelType: /ai/	11.74	2.52	332.96	4.66	< 0.001 ***
VowelType: /ui/	-1.78	3.33	333.01	-0.54	0.593
ConsAlternation	-10.85	4.63	333.06	-2.34	0.020 *
ConsDeletion	-9.78	3.38	332.96	-2.89	0.004 **
Denominal	-20.42	3.64	333.26	-5.61	< 0.001 ***
Loan	-14.21	6.65	333.03	-2.14	0.033 *
Mimetic	-13.14	6.35	332.86	-2.07	0.040 *
Hiatus	-33.80	5.90	333.26	-5.73	< 0.001 ***
Gender: Male	7.53	1.14	699.06	6.68	< 0.001 ***
Age	0.01	0.06	699.02	0.25	0.799
Context: Self	-1.90	1.13	698.98	-1.68	0.094 .

TABLE 1 Mixed-effects model results

4 Discussion

The results presented above give rise to several theoretical implications and issues. First, the effect of vowel quality, specifically the high rating of /ai/-co-alescence, may be a general tendency in Japanese or even across languages. In some dialects of Japanese, /ai/ undergoes coalescence even stem-internally (e.g., [daikon]~[de:kon] 'radish'; see Kindaichi 1976:161; Kubozono 2015). Such an alternation is rare, if any, with /oi/ and /ui/. Similar vowel coalescence phenomena have been attested across languages both synchronically and diachronically (e.g., French, Indonesian, Korean, and Sanskrit, to name but a few). It is worth examining whether the preference for /ai/-coalescence is a cross-linguistic pattern. If true, it would further show that the phenomenon discussed here is driven not by factors specifically at work in colloquial Japanese, but by general phonological principles.

Second, other grammatical factors are also relevant to the theoretical proposals made by previous studies. Research shows that loanwords, mimetic words, and nouns are especially resistant to alternations due to stronger faithfulness effects associated with them (see, e.g., Ito and Mester 1995, 1999; Smith 2011). It has also been shown that an alternation with a perceptually less salient change (e.g., no consonantal change) is preferred (see Steriade 2008). The results shown here are compatible with these proposals.

This research has also addressed several non-phonological factors. Vowel coalescence has been considered to be the characteristic of vulgar, young male speech (see Hasegawa 1979; Tsujimura 1996:102; Vance 2008:90–91). Indeed, there is a tendency among male speakers to accept coalesced forms

more than female speakers. However, no effect of age was found in the current experiment. Given that the phenomenon has been around for a long time across different dialects, it may be that speakers do not associate it with a particular generation (any longer). That said, further investigation is needed to settle the issue, as discussed below.

This study also has a few limitations. Due to the design of the experiment, the effects of Age and Gender discussed above are all about the age and gender of the participants. Thus, they do not properly reflect the characteristics of the "speakers" in the case of Friend Context; what age and gender the participants assumed with respect to their close friends is actually unknown. This may not be a big issue given that Context was not a significant factor anyway. (That is, the results did not differ from those of Self Context, in which Age and Gender reflected the properties of the speakers, namely, the participants themselves). However, it is still unclear how this experimental flaw has affected the results. For future research, one can possibly use pictures of persons from various age and gender groups and have participants perform rating tasks, assuming that coalesced forms are used by them.

The experimental stimuli (as well as the original data of adjectives) contain distributional skews, and it is unclear how much this has affected the results. For example, the high acceptance of /ai/-coalescence may have been partially affected by the high frequency of /ai/-ending adjectives in the stimuli (or even in the original data). Other factors were difficult to address due to a small sample size. The effects of Truncated and OneMora discussed above could not be fully assessed because there were relatively few adjectives with a truncated or one-mora stem, and moreover, they were also correlated with other factors. Conducting a nonce-word experiment with a better-balanced stimulus set could solve some (though not all) of these issues.

One can also use audio stimuli instead of orthographic stimuli. Although it is not uncommon to see coalesced adjectives in writing (e.g., $\forall \, \vec{\mathcal{T}} \, \vec{\mathcal{Z}} \, sugee$ 'terrific'), it may still be more natural to hear them. Furthermore, the actual pronunciation of a coalesced form may even affect its acceptability. In casual speech, some speakers retain a consonant as is in an environment where it should change or delete (e.g., kowa-i \rightarrow kowe: 'scary' despite *we; see Vance 2008:90–92), although it is not necessarily reflected in the orthography.

Finally, there may be other factors affecting the acceptability of vowel coalescence. One such factor is the meaning of the base adjective. Impressionistically, adjectives that describe feelings and sensations are more likely to undergo coalescence. For example, the homophonous adjectives /atsu-i/ 'hot' and /atsu-i/ 'thick' could both be [atci:] in theory; however, it seems to occur more often in the former. Though this study does not address this effect, it can nonetheless be done even with the current results, once the base adjectives are classified in terms of their semantic properties.

5 Conclusion

This study reexamines the phenomenon of vowel coalescence in adjectives observed in colloquial Japanese. The results of a large-scale judgement experiment and their statistical analysis demonstrate the effects of several grammatical and non-grammatical factors in a quantitative manner. The findings not only contribute to a better description of the long-studied phenomenon, but also provide theoretical implications and point toward novel issues for further research.

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Appendix

Contexts

Self:

あなたご自身が、仲の良いお友だちとの会話の中で、この単語を冗談っぱく次のように言うと想定してください。

Suppose that in a conversation with a close friend of yours, you yourself say this word half-jokingly in the following way.

Friend:

仲の良いお友だちが、あなたとの会話の中で、この単語を冗談っぽく次のように 言ったと想定してください。

Suppose that in a conversation with a close friend of yours, your friend said this word half-jokingly in the following way.

Question:

このような言い方は、どれぐらい自然だと思いますか。

How natural do you think this would sound?

List of Base Adjectives

No.	IPA	Japanese	No.	IPA	Japanese
1	aenai	敢えない	171	suppakarai	酸っぱ辛い
2	aoi	青い	172	subaçikkoi	すばしっこい
3	aokusai	青臭い・青くさい	173	subajai	素早い
4	aoziroi	青白い	174	zubutoi	図太い
5	akai	赤い	175	zurui	狡い
6	akaguroi	赤黒い	176	zurugaçikoi	狡賢い
7	akarui	明るい	177	surudoi	鋭い
8	akudoi	あくどい	178	sekoi	せこい
9	asai	浅い	179	setsunai	切ない
10	asaguroi	浅黒い	180	semai	狭い
11	azatoi	あざとい	181	sewaçinai	忙しない
12	azikenai	味気ない	182	so:inai	相違ない
13	asekusai	汗くさい	183	sokkenai	素っ気ない
14	atatakai	暖かい・温かい	184	takai	高い
15	atsui	厚い	185	dasai	ダサい
16	atsui	熱い・暑い	186	dadappiroi	だだっ広い
17	akkenai	呆気ない	187	tajasui	容易い
18	atsubottai	厚ぼったい	188	tajorinai	頼りない
19	adokenai	あどけない	189	daraçinai	だらしない
20	abunai	危ない	190	tarui	怠い
21	aburakusai	油臭い	191	darui	ダルい・怠い
22	aburakkoi	油っこい・	192	tawainai	たわいない
		脂っこい	193	tçi:sai	小さい

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甘い
                                194 tçixtçai
                                                小ちゃい
23 amai
                甘辛い
24 amakarai
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