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Rendaku and Identity Avoidance

Consonantal Identity and moraic Identity

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Recent experimental studies of rendaku show that when rendaku results in adjacent identical CV moras, rendaku is inhibited. However, these experiments have only tested the Identity Avoidance effect at the CV moraic level. The current study tests whether Identity Avoidance at the consonantal level affects the applicability of rendaku. This paper shows that Japanese speakers avoid creating identical consonants in adjacent moras, although this effect is weaker than moraic Identity Avoidance. In addition to this new discovery, this paper has several theoretical implications: (1) a restriction that is operative in many other languages is also operative in Japanese, revealing an intriguing cross-linguistic parallel, (2) Identity Avoidance at different phonological levels can coexist within a single language, and (3) the strength of the avoidance effect positively correlates with the degree of similarity.

4.1 Introduction

4.1.1 Synopsis

The preceding paper in this book (Kawahara ℙ4) provides an overview of previous experiments on rendaku, but no experimental details are included. To complement that paper, as a case study, this paper reports a new experiment on rendaku in full detail.

Recent experimental studies of rendaku have identified a hitherto unnoticed factor that inhibits rendaku (Kawahara & Sano 2014a, 2014b): when rendaku results in adjacent identical CV moras, rendaku applicability is reduced. For example, a nonce compound consisting of the elements *iga* and *kaniro* resists rendaku: **iga+ganiro*. However, these previous experiments have only tested Identity Avoidance at the CV moraic level.

The current study therefore tests whether Identity Avoidance at the consonantal level (i.e., $*/C_i\ldots C_i/$) affects the applicability of rendaku. The current study provides evidence for such a consonantal Identity Avoidance effect. Although it is weaker than the moraic Identity Avoidance effect, Japanese speakers do avoid creating identical consonants in adjacent moras (e.g., *iga+gomoke* from *iga* and *komoke*). The current study overall offers the following new understanding about Japanese phonology. First, rendaku is subject to the consonantal Identity Avoidance effect, which is a new descriptive discovery. Second, a restriction that is operative in many other languages is also operative in Japanese, revealing an intriguing cross-linguistic parallel. Third, Identity Avoidance at different phonological levels can coexist within a single language. Fourth, the strength of the avoidance effect positively correlates with the degree of similarity.

4.1.2   Background and the current study

Rendaku is a well-known and well-studied phenomenon, but it is in no way an exceptionless, "automatic" phonological rule, and many factors affect its applicability (Vance 2015a; IRWIN: §6.1.2). One factor that blocks rendaku is Lyman's Law (VANCE: §1.4), according to which if a second element already contains a voiced obstruent, rendaku is almost categorically blocked, as in *oo+tokage* 'big lizard' (cf. *tokage* 'lizard'). Rendaku is also said to be blocked when the target element is on a left branch in constituent structure, as in [*nise*+[*tanuki*+*ziru*] '[fake [raccoon soup]]' (Otsu 1980; KAWAHARA & ZAMMA: §2.4; KAWAHARA: §3.3.3). A research program initiated by the seminal work of Vance (1980b) has experimentally investigated whether these rendaku inhibiting factors, including Lyman's Law, are psychologically real (see KAWAHARA ℙ3).

Until recently, the experimental research focused on the factors that are already known to affect rendaku applicability in the existing patterns of Japanese phonology. For example, several works have investigated the psychological nature of Lyman's Law (Vance 1980b; Ihara et al. 2009; Kawahara 2012) and have confirmed that Lyman's Law is active in the minds of contemporary Japanese speakers. Some experiments have also confirmed the psychological reality of other factors (e.g., Vance 1980b, 2014b; Nakamura & Vance 2002), but some experiments have not. For example, neither Kozman (1998) nor Kumagai (2014) succeeded in obtaining results that corroborate the hypothesis proposed by Otsu (1980) that only the elements on the right branch of a compound undergo rendaku (but see Ihara & Murata 2006).

One research question that emerged from this tradition is whether hitherto unknown phonological factors can affect the applicability of rendaku in experimental settings. For example, many languages show evidence for Identity

Avoidance (Yip 1998), whereby adjacent identical elements are avoided. Recent experimental studies have shown that this Identity Avoidance effect does reduce the applicability of rendaku. Japanese speakers are less likely to apply rendaku when it results in adjacent identical CV moras than when it does not. That is, rendaku is less likely when it would violate moraic CV Identity Avoidance (as in *iga+ganiro* from *iga* and *kaniro*) and more likely when it would not (as in *iga+daniro* from *iga* and *taniro*) (Kawahara and Sano 2014a, 2014b). What is particularly interesting about this finding is that, in terms of the statistical patterns in the Japanese lexicon, there is no evidence for such an Identity Avoidance effect in relation to rendaku. Although Satō (1989) and Labrune (2012) point out some suggestive examples, according to a study by Irwin (2014b), based on a large database of compounds (Irwin & Miyashita 2013), the existing vocabulary does not show the proposed pattern of moraic identity avoidance. A general lesson that is emerging from these studies is that experimentation can teach us something new about a phonological pattern that would be difficult to detect just by looking at patterns in the lexicon.

Although this finding by Kawahara and Sano (2014a, 2014b) is interesting, one limitation of these studies is that they tested only the CV moraic identity effect. This choice was not unreasonable, since CV moraic sequences constitute an important phonological unit in Japanese (Kubozono 1989; Labrune 2012: 143–147). Nevertheless, it remains to be seen whether the Identity Avoidance effect at the consonantal level is also operative in the phonology of Japanese. It is important to address this question, because consonantal Identity Avoidance effects are observed in many different languages, most famously in various Semitic languages (Greenberg 1950; Frisch et al. 2004), but also in languages such as English (Raffelsiefen 1999), French (Zuraw 2015), Mandarin (Yip 1998), and others (Yip 1998; Alderete & Frisch 2007; Zuraw & Lu 2009). This paper takes up this task of addressing whether Identity Avoidance exists at the consonantal level in the phonology of Japanese.

4.2   Method

4.2.1   Task

The current experiment used a two-way forced-choice wug-test (Berko 1958). Within each trial, the participants were given two elements (E1 and E2), and were provided with two compound forms, one with rendaku and one without. They were then asked to choose the better resulting compounding form. For example, they were asked, "Given *iga* 'burr' and *kaniro* (a nonce form), which would be the

better outcome, *igakaniro* or *igaganiro*? Please choose the one that sounds more natural to you." The stimuli were presented in Japanese orthography, although the participants were encouraged to subvocalize the stimuli before answering each question.

Our previous experiments showed that using nonce words for both E1 and E2 can impose too much psycholinguistic burden on native speakers, at least during wug-tests about rendaku. Therefore, real words were used for E1 and nonce words were used for E2 in the current experiment. The participants were told to treat the E2s as old names of animals that used to inhabit in Japan. This procedure was used because rendaku applies mostly to native words and not to loanwords (Vance 2015: 414–416; Irwin: §6.1.2), and this technique allows the participants to conceive the nonce word stimuli as (old) native words (Vance 1980b; Zuraw 2000; Kawahara 2012). The stimuli were written in *hiragana* (Vance: §1.3) in order to encourage the participants to treat the stimuli as native words.

4.2.2   Stimuli

The stimuli consisted of two sets. Set 1 tested the effect of Identity Avoidance at the mora level, and Set 2 tested the effect of Identity Avoidance at the consonant level. Set 1 and Set 2 used the same set of E1s and a similar set of E2s, the E2s beginning with all the consonants that can potentially undergo rendaku: /t k s h/. Three different nonce E2s were created for each of these four consonants, and the E2s in each of these three sets were identical except for the initial consonant, yielding 12 (4×3) E2s. All the stimuli had only CV (light) syllables, where one CV syllable coincides with one mora in the phonology of Japanese (Kubozono 1989; Labrune 2012: 144).

In both sets of stimuli, all the combinations of E1 and E2 were included in order to test the effect of different combinations of moras and consonants at the morphological juncture while controlling for potential specific effects of any E1 or E2. Some of the combinations involved a violation of Identity Avoidance, while others did not.

The experimental items for Set 1 are shown in Table 1. In one condition, the two moras across the morpheme boundary were identical except for voicing of the onset consonant (e.g., *iga*+*kaniro*). In this condition, rendaku would result in two adjacent identical CV moras (i.e., *iga*+*ganiro*). In the other condition, the first obstruent in E2 differed in place and/or manner from the voiced obstruent in E1 (e.g., *iga*+*taniro*). In this condition, rendaku would not result in two identical moras or consonants (i.e., *iga*+*daniro*). E1 always contained a voiced obstruent

in its final syllable, thereby controlling for the potential effect of the presence of a voiced obstruent in E1 (Ito & Mester 2003a; Kawahara & Sano 2014c).[1] All 48 (4×12) combinations of E1 and E2 were tested.

Table 1. Stimuli in Set 1

E1	E2		
iga 'burr'	*kaniro*	*kamoke*	*karimo*
aza 'bruise'	*saniro*	*samoke*	*sarimo*
kuda 'pipe'	*taniro*	*tamoke*	*tarimo*
kaba 'hippopotamus'	*haniro*	*hamoke*	*harimo*

The stimuli in Set 2 are shown in Table 2. The basic structure of the items is the same as in Set 1, but in this set, rendaku in some combinations produces identical consonants in adjacent moras (e.g., *iga*+*geniro*) but not identical CV moras adjacent to each other. In other combinations, rendaku does not violate either consonantal Identity Avoidance or moraic Identity Avoidance (e.g., *iga*+*zeniro*). Once again, all 48 (4×12) combinations of E1 and E2 were tested.

Table 2. Stimuli in Set 2

E1	E2		
iga 'burr'	*keniro*	*komoke*	*korimo*
aza 'bruise'	*seniro*	*somoke*	*sorimo*
kuda 'pipe'	*teniro*	*tomoke*	*torimo*
kaba 'hippopotamus'	*heniro*	*homoke*	*horimo*

4.2.3   Procedure and participants

The participants were undergraduate students at Okayama Prefectural University.[2] The experiment was run online using Surveymonkey. (For the reliability of

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1.   An inhibiting effect of a voiced obstruent in either E1 or E2 is known as the "strong version" of Lyman's Law (VANCE & ASAI: §8.3.2).

2.   The majority of the participants were therefore from the areas around Okayama. This limitation was motivated by practical rather than theoretical considerations, and we realize that we cannot necessarily generalize our finding to speakers of Tokyo Japanese (or to speakers of other dialects of Japanese). Dialectal differences in rendaku are in fact an understudied, although

online experimentation in psychological and linguistic research, see Reips 2002; Sprouse 2011; and Yu & Lee 2014.) The participants were first told what rendaku is and were then asked to go through three practice questions (using *nise* 'fake' as E1 and real words as E2) in order to familiarize themselves with rendaku and with the task of the experiment. Although the stimuli were presented online in Japanese orthography, the participants were reminded for each question that they should choose the more natural *sounding* choice.[3]

The Set 1 and Set 2 stimuli were mixed together in one block, for a total of 96 stimulus items. The order of the stimuli was randomized for each participant by Surveymonkey. There were no time limits for responding. Forty-three native speakers of Japanese completed this study. They received extra credit for participation.

4.2.4   Statistics

Since the responses were binary (a form with rendaku or a form without rendaku), logistic linear mixed model analyses (Baayen 2008) were run to analyze the results. Subjects and items (both E1 and E2) were encoded as random factors. Both slopes and intercepts of random effects were included in the models to have the maximal random structure (Barr et al. 2013).

4.3   Results

Figure 1 shows the proportions of rendaku application for each condition calculated over all the participants, with error bars representing 95% confidence intervals. The leftmost bar is the first condition, that is, the items in which rendaku violates moraic Identity Avoidance. The second bar is the control condition for Set 1; the items involve the same E2s as the first condition, but rendaku does violate moraic Identity Avoidance. The third bar is the test condition for Set 2,

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there is some recent work on this topic (Vance et al. 2014; Irwin & Vance 2015). At any rate, we believe that it suffices, for the current purpose, to show that both moraic Identity Avoidance and consonantal Identity Avoidance hold in *some* dialect of Japanese. A follow-up experiment using Tokyo Japanese speakers would be interesting and informative.

3.   It would be interesting to replicate the experiment with auditory stimuli. Most experiments on rendaku use written forms for stimulus presentation, however, and future experiments should use auditory stimuli more often (Kawahara: §3.5). See Kawahara (2013) for a set of experiments addressing this issue, focusing on the geminate devoicing found in Japanese loanwords.

in which rendaku violates consonantal Identity Avoidance. The fourth bar is the control condition for Set 2; the items involve the same E2s as the third condition, but rendaku does not violate consonantal Identity Avoidance.
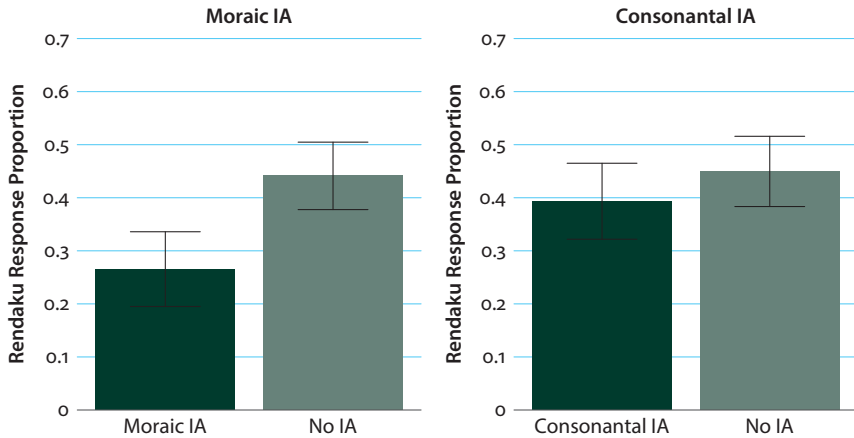

Figure 1. Proportion of rendaku application in each condition

The statistical results show, first of all, that moraic Identity Avoidance is a strong effect: there is a significant difference between the first and the second bars (0.27 vs. 0.44; $z = 5.32$, $p < .001$). There is also a significant difference between the third and fourth bars, showing that consonantal Identity Avoidance has an effect (0.39 vs. 0.45; $z = 2.23$, $p < .05$). The effect of Identity Avoidance is stronger at the moraic level (the first bar) than at the consonantal level (the third bar), since the difference is statistically significant ($z = 4.55$; $p < .001$).

4.4 Discussion

4.4.1 The effect of moraic Identity Avoidance

The current study has identified a strong rendaku blocking effect due to moraic Identity Avoidance – a difference between the first and second bars in Figure 1 of about 17%. This effect was already shown by our previous experiments (Kawahara & Sano 2014a, 2014b), but it is good to have a replication, given that no moraic Identity Avoidance effect was detected by Irwin (2014) in the existing vocabulary, as explained above in §4.1.2.

The fact that we were able to replicate this effect in slightly different experimental settings with different sets of stimuli and different sets of speakers indicates

that moraic Identity Avoidance may hold generally among contemporary Japanese speakers. Taken together with Irwin's (2014) conclusion that there is no evidence for such Identity Avoidance in the contemporary Japanese lexicon, the results may instantiate a case of a grammatical effect that goes beyond lexical patterns but emerges in experimental settings. Other studies showing this kind of emergence of grammatical effects include Moreton (2002) and Berent et al. (2007).[4]

4.4.2   The effect of Consonantal Identity Avoidance

Rendaku has been studied in great detail both in traditional studies of Japanese and in the theoretical literature (see the annotated bibliography at the end of this book). Despite this research tradition, however, to the best of our knowledge the effect of consonantal Identity Avoidance has gone unnoticed. Our results therefore offer a new descriptive discovery in the study of rendaku. We can further conclude that linguistic experimentation is a useful methodology that complements the traditional approach to phonology based on dictionaries and introspection. Experiments can reveal aspects of phonological knowledge that are difficult to access otherwise.

It is also interesting that a consonantal Identity Avoidance effect like the one we identified in this experiment is found in many other languages (Greenberg 1950; Frisch et al. 2004; Zuraw & Lu 2009). In Arabic and many other languages, Identity Avoidance functions as phonotactic restrictions, and in other languages, it causes dissimilation. Our results show that a similar constraint can block rendaku in Japanese. Our study thus reveals an intriguing cross-linguistic parallel between Japanese and other, genetically unrelated languages. It is possible that similarity avoidance has its roots in speech processing (Frisch et al. 2004; Alderete & Frisch 2007) and is therefore shared by speakers of different languages.

This finding also highlights a related, and perhaps equally important, point: the need for cross-linguistic examination of phonological patterns. Traditional Japanese linguists would probably not have looked for consonantal Identity Avoidance effects because of the strong tendency to think in terms of moras rather than in terms of segments (for which see Labrune 2012: 143–147). Therefore, a cross-linguistic study, in which we attempted to determine whether effects observed in

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4.   This conclusion is based on the assumption that the database used by Irwin (2014) – Irwin & Miyashita (2013) – is comparable to the dataset that the participants in the current experiment were exposed to through the course of language acquisition. This assumption may not strictly hold, however.

other languages also exist in Japanese, was crucial in helping us identify this effect at the submoraic, consonantal level.

4.4.3   Coexistence and granularity of Identity Avoidance Effects

The current experiment shows that Identity Avoidance at different phonological levels can coexist within a single language, and the strength of the avoidance effect positively correlates with the degree of similarity. It may be that moraic Identity Avoidance is stronger than consonantal Identity Avoidance because the former involves a larger phonological unit or involves more segments: moraic Identity Avoidance involves two segments, whereas consonantal Identity Avoidance involves only one. This correlation between degree of similarity and extent of avoidance is in line with the findings of some recent work on the effect of similarity avoidance (Frisch et al. 2004). The current experiment, however, shows that the degree of similarity of strings of segments matters, whereas previous studies were about the degree of similarity between individual segments.

4.5   Summary

The current study has used rendaku to reveal two Identity Avoidance effects within a single language. In addition to this new descriptive discovery, the current study has identified an intriguing cross-linguistic parallel between Japanese and other languages.

Acknowledgements