Rendaku acquisition at Leiden University

A study of rendaku proficiency and improvement based on Lyman's Law and lexical strata

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1. Introduction

For a long time now, rendaku has enjoyed some popularity in the field of Japanese linguistic research. In this thesis, I will be examining rendaku in the context of second language acquisition. Specifically, I will focus on students attending Japanese language classes at Leiden University and examine how they acquire rendaku proficiency. Earlier research has been done on rendaku acquisition in second language speakers of Japanese, but it is limited and mostly restricted to areas that are either in or close to Japan. For instance, the projects that this thesis draws inspiration from have focused on students whose first language was Chinese or Korean. The present study uses questionnaires targeted at participants with a very different first language: Dutch, which has different etymological roots and shares fewer typological features with Japanese. Not only should this add some more data to the relatively sparse existing pool, but it should also provide a different angle to which existing research can be compared. It is my hope that this will help give a clearer picture of rendaku acquisition in second language speakers as a whole.

The broader question I have set out to answer with this thesis is "how does experience studying at Leiden University affect rendaku proficiency?" In order to do this, I will be using a questionnaire to test them on two of the most commonly occurring rules concerning rendaku: the blocking of rendaku because of lexical strata and Lyman's Law.

I will start by giving an outline of how rendaku works and a brief explanation of the operations of it that will be relevant to this thesis in chapter 2. Then, in chapter 3, I will be examining two articles, one by Tamaoka et al. and one by Nakazawa et al., which serve as inspiration for this thesis and, perhaps more importantly, as two major points of reference to compare the results of the questionnaire to. In chapter 4, I will explain how I obtained my data and at what points my questions and methods differ from Tamaoka et al.'s, on whose questionnaire I have based my own. In chapter 5, I will analyse my data based on the differences between the two types of rendaku proficiency I have tested my participants for, as well as the impact that the amount of years the average participant studied has on these proficiencies. Finally, in chapter 6, I will discuss these results and compare them to those of Tamaoka et al. and Nakazawa et al. before moving on to my conclusion.

2. On rendaku

Rendaku, commonly translated as "sequential voicing," is a phenomenon in the Japanese language that occurs when two or more words form a compound word. When rendaku occurs, the first consonant in the second word of the compound becomes voiced. For example, the compound of *ura* 'back' and *kiru* 'to cut' becomes *uragiru* 'to betray'. Aside from the obvious requirement of the second component of the compound starting with a voiceless obstruent, several general rules have been identified for when rendaku is (not) applied to a compound over the years. Some of these rules, such as Lyman's Law (explained below), are applicable enough to be widely agreed upon by linguists. Notably, however, there are exceptions to almost every rule that can be ascribed to rendaku. This elusiveness very likely contributes to rendaku's popularity as a subject of linguistic research.

Lyman's Law (sometimes referred to as Motoori-Lyman's Law) refers to a rule stating that rendaku is blocked in a compound if the second component of that compound already contains a non-initial voiced obstruent. These blocking obstruents can affect rendaku despite occurring later on and despite existing in a different morpheme from the one they affect.[1]

(1) /yaki+**s**oba/ → [yaki**s**o**b**a], *[yaki**z**o**b**a] 'fried noodles'

(2) /hito+koto/ → [hito**k**oto], *[hito**g**oto] 'single word'

As you can see in example (1), combining the components *yaki* 'fry' and *soba* 'noodles' does not result in the compound *yakizoba*, but rather in *yakisoba*. This is an example of Lyman's Law: the voiced obstruent "b" in *soba* prevents rendaku from occurring. As shown in example (2), however, Lyman's Law cannot explain every instance of rendaku being blocked: *hito* 'one' and *koto* 'word' do not form the compound *hitogoto,* even though there is no voiced obstruent anywhere in the second component.

Another general rule that can be applied to rendaku is based on the etymology of the component word involved in a compound. When it comes to etymology, words in the Japanese language can be divided into three broad categories called "lexical strata". First, there are native Japanese words, which are called *wago*. Then, there are loan words from China, which are called *kango*. The last stratum is known as *gairaigo,* a generic term used to describe loan words of non-Chinese origin. G*airaigo* are typically associated with English, but the category also includes loan words from Portuguese, French, Dutch, German and a variety of other languages. Although rendaku components can come from any of these categories, they are far from equal, and this is where the

[1] Asai Atsushi, *The Productivity of Rendaku*, 27

rule originates: *wago* compounds undergo rendaku very often, while for *kango* compounds, it is uncommon. *Gairaigo* compounds can undergo rendaku, but only in a small handful of cases[2].

Although it is not common, sometimes a compound is made up of component words from two different strata. In these cases, according to Ito and Mester, the compound can be "filed" under whatever stratum that second compound belongs to, regardless of what stratum the other components come from. It should be noted, however, that the first component in these compounds can still have influence on whether or not the compound undergoes rendaku, as is demonstrated by Tamaoka et al.'s research (something I will elaborate on in section 3.2: Tamaoka et al.)

Finally, there is the right-branch rule. This rule can be used to determine which component(s) in a compound are eligible to undergo rendaku. Essentially, it determines whether or not a component is the "second" one in a compound, which means that the right-branch rule is also what is used to determine what stratum a compound falls under, as was just discussed.

Figure 1

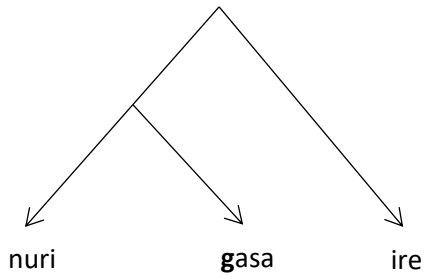
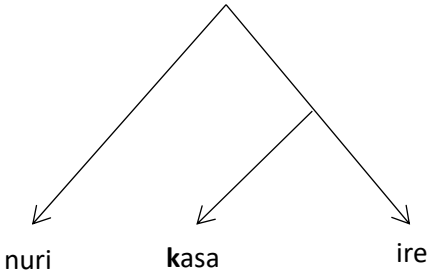


Figure 2



Figures 1 And 2 are a pair of examples used by both Tsujimura[3] and Ito & Mester[4]. In these examples, the words *nuri* 'lacquered', *kasa* 'umbrella' and *ire* 'case' are combined in two different ways. In figure 1, *nuri* applies to *kasa*, and the combined *nurigasa* 'lacquered umbrella' in turn applies to *ire*. Thus, figure 1 results in the compound *nurigasaire*: A case for lacquered umbrellas. In figure 2, the word *nuri* 'lacquered' instead applies to *kasaire* 'umbrella case,' resulting in the compound *nurikasaire*: A lacquered case for umbrellas. As illustrated by these examples, only components that directly apply to one another by this ordering system are eligible to undergo rendaku. Since this also means that the only components that can undergo rendaku come from a branch that moves to the right (like *gasa* in figure 1), the resulting rule is called the "right-branch rule".

[2] Tamaoka et al., *Triple Operations*, 33
[3] Tsujimura, *Japanese Linguistics*, 56
[4] Ito & Mester, *Phonology of Voicing in Japanese*, 50

3. Literature review

3.1 overview

Aside from the work of Ito & Mester, as well as that of Fujimura, which focus mainly on compiling and crystallising the known universal (as far as they can be) truths of rendaku, this thesis will mainly be referencing the works of Tamaoka et al. and Nakazawa et al., which are more experimental in nature. Tamaoka et al.'s article, *Triple operations of rendaku processing: Native Chinese and Korean speakers learning Japanese*, deserves special mention for providing the basis of this thesis' questionnaire, as explained later.

Tamaoka et al.'s and Nakazawa et al.'s texts both look at rendaku specifically in the context of second language acquisition. They each take questionnaires from groups of university students from Chinese- or Korean speaking backgrounds who were at various stages in the process of learning Japanese at the point of answering. In the case of Tamaoka et al., there were 64 of these students, half of whom had Korean and the other half Chinese as their first language. They had already lived in Japan for a relatively long time and were generally further along in their efforts to learn Japanese, averaging around six years in experience.[5] Meanwhile, Nakazawa et al.'s questionnaire participants were more numerous (234 of them, to be exact) and studied outside of Japan (in Taiwan). They were overall the less experienced of the two groups, with the majority of them being in their second, third or fourth year of study[6]. With my own experiments being similar to theirs, the articles written by Tamaoka et al. and Nakazawa et al. shall serve as the primary frames of reference for the purposes of this thesis. The main difference between their participant groups and my own is their first language. Since the native language of my participants shares fewer morphological features, grammatical similarities and etymological roots with Japanese than either Korean or the Chinese languages, the expectation for this thesis was that my participants will be slower in acquiring rendaku than theirs will be (though this only proved partially true). In the next two sections, I will summarise the methods and conclusions of their experiments.

3.2 Tamaoka et al.: Triple operations of rendaku processing

As its title indicates, Tamaoka et al.'s article frames the answers to its questionnaire based on the so-called ''triple operations'' of rendaku processing. This term refers to the assumption that there are three separate ways in which people process information and acquire proficiency with regards to

[5] Tamaoka et al., 39
[6] Nakazawa et al., *Rendaku* Awareness, 58

rendaku: rules-based, etymology-specific and lexical-specific.[7] Earlier research by Kobayashi, Ito and Sugioka, which measured the ERP patterns of people identifying different types of rendaku, has suggested that these three operations are indeed processed differently, and Tamaoka et al. seek to demonstrate them in action by running them by L2 learners of Japanese.[8] In order to do this, Tamaoka et al. have prepared a questionnaire. This questionnaire is divided up into two main sections, one of which can be further divided into three sub-sections. The first part consists of open questions and focuses mainly on confirming who the participants are and what their background is. Tamaoka et al. mention that the inclusion of both Chinese and Korean participants should add an extra factor to the experiment that might influence the outcome of participants' answers.

The second part, the questionnaire proper, contains 19 two-alternative forced choice questions. In each of these questions, the participants are first given two component words, written in kanji. They are then given two compounds, written in hiragana, one of which contains a voiced initial obstruent for the second component (i.e. rendaku occurs in it) and the other does not. For each component pair, the participants are asked to circle the answer they think is the correct one. For an example of how these questions look, see (3) and (4), or look at the full questionnaire in the appendix. The questions in the questionnaire can be divided into three separate categories, which I will refer to as clusters 1, 2 and 3. Each question cluster was designed to test the participants' ability to identify and apply rendaku based on one of three titular "operations" of rendaku processing. The participants were not informed of the fact that there were three separate types of question, and the questions of the three clusters were put together and scrambled for the final questionnaire.

Cluster 1 consists of eight questions, and is designed to test participants for their proficiency in rules-based rendaku, one of the three operations within Tamaoka et al.'s model. Specifically, it tests them for their ability to predict when Lyman's Law will and will not block rendaku in any of the pairings it lists. Of the eight questions, four are ''regular'' compounds: rendaku-sensitive compounds in which neither Lyman's Law nor any other factor block rendaku, and therefore the answer in which rendaku occurs is the correct one. In the other four compounds, Lyman's Law blocks rendaku, making the non-rendaku answer the correct one. An example of both the rendaku-sensitive questions and the questions in which rendaku is blocked are given below, with (3) representing the former and (4) representing the latter.

(3) 生　—　　魚　　⇒　　なまさかな　／　　なまざかな

[7] Tamaoka et al., 31
[8] Tamaoka et al., 34-35

	nama	sakana		namasakana		namazakana
(4)	合い	—	鍵	⇒	あいかぎ	／	あいがぎ
	ai		kagi		aikagi		aigagi

In (3), rendaku is not blocked and hence *namazakana* 'fresh fish' is the correct choice. In (4), the voiced "gi" sound at the end blocks rendaku according to Lyman's Law, making *aikagi* 'duplicate key' the correct choice.[9] The six other questions in cluster 1 can be found in the questionnaire in the appendix.

Cluster 2 consists of six questions, each of which is designed to test participants' knowledge of etymology-based rendaku, another of Tamaoka et al.'s triple operations. The principle here is that, generally speaking, rendaku only occurs in compounds that fall into the *wago* lexical stratum, meaning they are of Japanese origin. Compounds that include *kango* (Chinese origin) words do not usually undergo rendaku, and it is even more rare for *gairaigo* (foreign loanwords). The final word of each the six compounds comes from the Japanese-native *wago* stratum, with three of the compounds ending in *hashigo* 'ladder' and the other three ending in *hasami* 'scissors.' An example of each of the *hasami*-compounds is given below.

(5)	スチール	—	鋏	⇒	スチールはさみ	／	スチールばさみ
	suchiiru		hasami		suchiiruhasami		suchiirubasami
(6)	鉄製	—	鋏	⇒	てつせいはさみ	／	てつせいばさみ
	tetsusei		hasami		tetsuseihasami		tetsuseibasami
(7)	鋼	—	鋏	⇒	はがねはさみ	／	はがねばさみ
	hagane		hasami		haganehasami		haganebasami

As you can see, *hasami* is paired with three separate words. In (5), it is paired with *suchiiru* 'steel.' Because this word comes from the *gairaigo* stratum, it blocks rendaku, making *suchiiruhasami* 'steel scissors' the right answer. In (6), it is paired with *tetsusei* 'iron.' This is a word from the *kango* stratum, which usually blocks rendaku, and (6) is no exception. The correct answer is therefore *tetsuseihasami* 'iron scissors.' In (7), *hasami* is paired with another word for steel, though this time it is a *wago* (Japanese origin) word: *hagane* 'steel.' Since this stratum does not block rendaku, the correct answer in (7) is *haganebasami* 'steel scissors.'

Each of the example compounds follows the general rule that *wago* compounds can result in

[9] Tamaoka et al., 40-41

rendaku while *kango* and *gairaigo* compounds cannot. The sole exception was *nawabashigo* 'rope ladder,' which consists of two *wago* components but ignores lyman's law, resulting in rendaku when, according to established rules, it should not. For the other three questions in this cluster, see the questionnaire in the appendix.

Cluster 3 consists of only five compounds, each of which ends with the component "*shouchuu.*" *Shouchuu* refers to a type of alcoholic beverage that can be made from several different ingredients, each resulting in a different compound name. An example of this is *imo**j**ouchuu* 'sweet potato shouchuu,' one of the compounds on the questionnaire. These questions were included by Tamaoka et al. because *shouchuu* is one of the relatively rare *kango* words to undergo rendaku.[10] This makes the *shouchuu* compounds an example of lexical-specific operations within their triple operations model: they do not fit within any of the known rules and therefore have to be memorised individually.

It should be noted that, in their own article, Tamaoka et al. do not refer to their separate question groups as "clusters." Rather, because they look at each group of questions in the context of the one experiment they run on it, they refer to both the question groups and the way they analyse the results as "experiment 1, 2 and 3". Because this thesis does not share that format, I have instead opted to refer to the question groupings as "clusters" so as to avoid confusion when it comes to analysis. For the sake of consistency and ease of reading, I have extended this choice of terminology into the description and discussion of Tamaoka et al.'s article, even though it does not line up with their own terms.

To sum up: there are 19 two-alternative forced choice questions in the questionnaire proper. Eight of these fall under cluster one, designed to test participants' ability to recognise and apply Lyman's Law. Six fall under cluster 2, designed to test the ability to test the ability to recognise whether a compound contains *kango* or *gairaigo* components that might block rendaku. The final five belong to cluster 3, designed to test for lexical-specific rendaku by using the exceptional case of the final component *shouchuu*.

The results of Tamaoka et al.'s study show that both Chinese and Korean participants reliably (though not perfectly) grasped both the rules-based operation rooted in Lyman's Law and the etymology-specific operation based on the lexical strata of *wago*, *kango* and *gairaigo*. They each had some difficulty with the word *nawabashigo*, an exception to Lyman's Law presented in the experiment that tested for proficiency in etymology-based rendaku. According to Tamaoka et al., the compounds in that experiment were also the only part of the study which showed a significant difference between Chinese and Korean speakers: when the first component was of the *kango*

[10] Tamaoka et al., 46-47

stratum, the L1 Chinese speakers had less trouble identifying them correctly than the L1 Korean speakers did. Tamaoka et al.'s article concludes with the observation that both rules-based rendaku and etymology-based rendaku are acquired at earlier stages of the process of learning Japanese as a second language, while lexicon-based rendaku is only acquired much later, with even the advanced participants of the experiment he and his associates conducted showing relatively low proficiency.[11]

An issue with the notion of triple operations in rendaku processing, especially when it comes to tests such as the questionnaires discussed in this thesis, is the difficulty of isolating each of the operations. When it comes to the first two operations, represented by cluster 1 and cluster 2, this can be solved. For instance, by only using rendaku-sensitive words from the *wago* stratum like in (3) and (4), one can ensure that the lexical strata-based operation will not block rendaku in cluster 1, making those questions a purer test of the rules-based operation by way of Lyman's Law. Conversely, by making sure Lyman's Law blocks no instances of rendaku in (5), (6) and (7), these questions are isolated from that type of rules-based operation and instead test more purely for the lexical strata-based operation. When it comes to cluster 3 and the notion of a lexical-specific operation of rendaku, however, two major problems arise. First, as is also mentioned by Nakazawa et al.'s article[12], it would be essentially impossible to truly separate the lexical operation Tamaoka et al. talk about from the other operations. The lexical operation, as described in their article, refers to words that do not fall under any sort of consistent grammatical ruling and therefore must be learned through rote memorisation. The problem with this notion is that any word can be learned like this, even if it is a compound word that falls under one of the other operations. Second, the specific component they used to test the lexical operation, *shouchuu*, is only used in fairly specific contexts. Because the questions in cluster 3 only use compounds that include *shouchuu*, referring to alcoholic beverages, it arguably tests participants more for their interest in and experience with drinks than it does any linguistic proficiency.

3.3 Nakazawa et al.: Rendaku awareness of Japanese learners in Taiwan

Nakazawa et al.'s article is similar to Tamaoka et al.'s, with some key differences. Where Tamaoka et al. set out to gather data on the triple operations of rendaku in action, Nakazawa et al. focus on only one of these operations: Lyman's Law. Specifically, it seeks to gather data on acquisition of Lyman's Law for students whose first language is not Japanese in order to research the "pedagogical value"

[11] Tamaoka et al., 49-51
[12] Nakazawa et al., 72

of Lyman's Law.[13]

Nakazawa et al. start out by establishing who the participants to their questionnaire were, much like Tamaoka et al. All of these participants studied at the Ming Chuan University in Taiwan, and while not all of them came from a purely Mandarin-speaking background, that was the language the university used. In other words, while their exact L1 goes unrecorded in Nakazawa et al.'s article, they were all sufficiently proficient with Mandarin to use it at a university level, and had all learned Japanese using Mandarin as their jumping-off point.[14] While I have little doubt that there was a practical element involved in using Ming Chuan university and its Mandarin-speaking students for the questionnaire (after all, it is an efficient and convenient way of finding a large concentration of L2 Japanese learners), Nakazawa et al.'s article also stresses that a large amount of Japanese learners come from China. It argues that, as such, questioning a Mandarin-speaking group of participants constitutes a good way to gauge the practical pedagogical value of teaching Lyman's Law.[15]

The questionnaire used by Nakazawa et al. resembles that of Tamaoka et al.'s in some ways and differs from it in others. Like Tamaoka et al.'s, the questionnaires are split into a "main" section and what I will dub a "secondary section". In both cases, the main section consists of binary multiple choice questions where the participant is presented a two-component compound where one component is already fully filled in and they are asked whether the other starts with a voiced initial consonant or not. In each questionnaire, the full compound is given in kanji and the two pronunciations that the participants are asked to choose between are each written in hiragana. Also in both cases, the secondary questions are chiefly concerned with giving context to the main questions. There are some notable features that distinguish Nakazawa et al.'s questionnaire, however.

Unlike Tamaoka et al.'s questionnaire, Nakazawa et al.'s only has one "category" of question, since it was made only to test for rendaku proficiency as it regards to Lyman's Law, rather than the three separate tests Tamaoka et al. were running. Even though its scope was less broad, Nakazawa et al.'s questionnaire was quite a bit larger than Tamaoka et al.'s, with 48 questions rather than 19. These 48 questions can be divided into groups of four that each revolve around one component for which the participant must pick one of two possible pronunciations: one with a voiced initial obstruent and one with an unvoiced initial obstruent. In each of these groups, the participants are given two compounds where the component in question is the initial component, and two compounds where it is the second component. In each case, the non-relevant kanji are

[13] Nakazawa et al., 57
[14] Nakazawa et al., 57-58
[15] Nakazawa et al., 58

marked with *furigana*, small hiragana that accompany the kanji and explain its pronunciation. In example (8) below, the quartet of binary multiple-choice questions that share the component 島 (*shima* 'island') is shown. This is also the example Nakazawa et al. give themselves in the article based on their questionnaire.[16]

(8) 島 [kanji representing shared element]

島国(ぐに) 1 しま [shima] 2 じま [jima]

[first compound (standard pronunciation: shima+guni) 'island country']

島唄(うた) 1 しま [shima] 2 じま [jima]

[second compound (standard pronunciation: shima+uta) 'island song']

大島(おお) 1 しま [shima] 2 じま [jima]

[third compound (standard pronunciation: oo+shima) 'big island']

宝島(たから) 1 しま [shima] 2 じま [jima]

[fourth compound (standard pronunciation: takara+jima) 'treasure island']

The 48 main questions in Nakazawa et al.'s questionnaire were followed up by a different set of questions which asked the students about various details pertaining to the length of their studies so far, their techniques for memorising kanji (if any) and, of course, what they knew with regards to Lyman's Law and how it works.[17] While these questions are without doubt highly relevant to Nakazawa et al.'s own experiment, I will only be going into detail about them when necessary for the purposes of this thesis.

The first step Nakazawa et al. took when analysing the participants' responses was to simply look at the amount of correct versus incorrect responses to the questions in which Lyman's Law should prevent rendaku. Considering the high amount of participants who answered these questions incorrectly (almost all questions were answered incorrectly by over half the participants), they note that it would be tempting to say that the participants simply do not have a grasp of Lyman's Law. [18] However, a second round of analysis proves that this may not be quite true.

[16] Nakazawa et al., 58-59
[17] Nakazawa et al., 59
[18] Nakazawa et al., 64

The first step of this second round is to look at the questions which asked the students if the first component of a compound should be voiced, and if a participant picked the answer indicating that it should on any of these questions, that participant's answers were disregarded. Then, any participants who did not fill out the full questionnaire also had their answers disregarded. This process removed about half of the participants from the pool, and the remaining 114 participants were labelled as 'reliable participants.'[19]

After this, the reliable participants' answers were analysed in a slightly different way: Nakazawa et al. took the questions from the first step of analysis, in which Lyman's Law applies and should block rendaku, and measured the percentage of incorrect answers given, dubbing it the "violator score." After this, they looked at a separate number of questions in which rendaku was also the wrong answer, but not because it was blocked by Lyman's Law. Again, they converted this to a percentage, this time called the "nonviolator score." Measuring the violator score against the nonviolator score indicated that the latter was significantly higher than the former. This demonstrated that, while the majority of participants may not have been able to reliably apply Lyman's Law, they were still aware of it at some level.[20]

Since Nakazawa et al.'s article was mostly focused on the pedagogical applications of Lyman's Law, their conclusions are largely related to how it is clearly a psychologically real phenomenon and how it should be very easy to teach. Their answer to the question of "should we teach L2 Japanese learners about Lyman's Law" essentially comes down to "why not? It is quick and easy to explain."[21] While sensible, this conclusion does not bear much relevance to this thesis.

[19] Nakazawa et al., 76
[20] Nakazawa et al., 64-66
[21] Nakazawa et al., 76

4. Methodology

4.1. Hypotheses

Before going into the experiment proper, there are several hypotheses I shall be working with that were based on general knowledge of rendaku and the results of the earlier experiments I have discussed in the preceding segments. These are the hypotheses, followed by a brief explanation of the reasoning behind them.

Hypothesis A: The average rate of correctly identified rendaku questions will be higher for each subsequent year category of participants due to an unconscious learning effect.

Hypothesis B: The average rate of correctly identified rendaku questions will be higher for cluster 1 than it will be for cluster 2.

Hypothesis C: *Nawabashigo* will have a correct rate that is significantly lower than average.

Hypothesis D: the participants in Tamaoka et al.'s study and Nakazawa et al.'s study will both gain rendaku proficiency more quickly than the participants in my own study due to a similarity effect.

The reasoning behind hypotheses A, B, C and D is as follows: starting with A, as students spend more time learning about and practicing with the Japanese language in general, they should come across more instances of rendaku and piece together a more complete picture of how it works. Even though students at Leiden University are not explicitly taught about rendaku, hypothesis A reflects that I still expect them to learn about it indirectly through exposure to the language. This is what the "unconscious learning effect" refers to. Hypothesis B shows my expectations that Lyman's Law (tested for in cluster 1) should be easier to pick up on than the effects of lexical strata on rendaku (tested in cluster 2). This is primarily because the former is more straight-forward: Lyman's Law is a single rule that can be picked up on without too much outside knowledge. This is made even easier by the fact that the Japanese katakana and hiragana scripts visibly mark characters if they represent a sound that includes a voiced consonant, which makes it very easy for Japanese language learners to pick up on the principle of voiced versus unvoiced consonants in Japanese at an early stage. Whether or not a component of a compound is of Chinese origin is likely more difficult for participants to know. It is possible to develop a feel for what types of sound are related to wago and what types to kango later on in one's studies (gairaigo are likely a separate case, as my participants can recognise them from the English language). However, applying rendaku on the basis of lexical strata still requires an extra step: not only does a participant need to know that rendaku usually only applies to words from the wago stratum, they also need to develop a way to identify and separate these two categories. Hypothesis C relates to *nawabashigo*, a compound that was originally a part of cluster 2 but which I have separated from it because it not only involves lexical strata, but also

represents an exception to Lyman's Law. The hypothesis reflects my expectations that these extra steps in the mental process of identifying whether or not the compound will undergo rendaku will make it easier for participants to make a mistake somewhere, which results in the lower expected correct rate. Hypothesis D shows my expectation that it should be easier for students with a Korean or Chinese first language to learn about the Japanese language in general because they should be able to transfer and apply knowledge of their first language to Japanese. Since their first languages share more grammatical and morphological similarities with the one they are learning (this is what the "similarity effect" in the hypothesis refers to), I expect them to have something of a head start compared to learners with a first language like Dutch, which by comparison has very little in common with Japanese.

4.2 Participants

Part of the aim of this thesis was to investigate differences between Tamaoka et al.'s and Nakazawa et al.'s Chinese and Korean participants and a new group of participants whose first language did not share as many grammatical and morphological similarities with Japanese. Considering my options for reaching participants, this meant university students in Leiden whose first language (with a small handful of exceptions) was Dutch.

While their first language is the main attribute that sets my questionnaire participants apart, there are several other things about them that are worth mentioning. First, while their first language is overwhelmingly Dutch, many of the courses of the Japan Studies BA track, as well as the MA tracks following it, are given in English, a language in which both students and teachers are expected (and often required) to be proficient. This makes English a second language in which essentially all of the participants share a high degree of proficiency. Second is their overall degree of experience: most participants had, at time of answering, been studying Japanese for one to four years. Additionally, unlike Tamaoka et al.'s participants, they had not lived in Japan for extended amounts of time, though many of them had stayed there for a few months as part of the university's Japan Stay Program. In terms both practical and classroom experience with the Japanese language, this puts them closer to Nakazawa et al.'s participants than Tamaoka et al.'s. Third, I should mention that learning the Japanese language at Leiden University is a front-loaded experience, with the Japan Studies BA track focusing strongly on language acquisition in the early years and opening up more room for non-language subjects (culture, history, economics etc.) later on, when students are expected to pick specialisations. By the time students have acquired their BA degree, they are expected to have a proficiency level that is roughly equivalent to the N2 level of the official Japanese Language Proficiency Test, the second highest of five levels. Of course, actual proficiency will still vary from student to student. As a final note, while learning the Japanese language is a vital part of

the Japanese Studies track, the curriculum does not cover rendaku specifically. Since it is still a common phenomenon in the Japanese language, however, I nonetheless expect students to gradually, indirectly learn about it as they interact with the language. A distribution of participants based on their amount of experience is given in chapter 5, in table 1.

4.3 Questionnaire

Starting out with Tamaoka et al.'s article as a basis, I contacted Dr. Tamaoka and obtained a copy of the original questionnaire that was used for it. In addition to the 19 binary multiple-choice questions, designed to test for three different rendaku "operations," Tamaoka et al.'s original questionnaire contained several open questions about the participants' first language and other languages they knew. Since his participants were studying in Japan, there was also a set of questions about the length of their stay thus far, as well as the extent to which they used each of the languages they spoke during that stay. A full copy of the version of the questionnaire used for this thesis can be found in the appendix section.

As explained in the last paragraph, there are some differences between the participants of Tamaoka et al.'s questionnaire and those of my own. Since these differences apply across the board, I have altered the open questions (which the questionnaire referred to as "preliminary questions" because they preceded the main portion) to focus on years of Japan Studies experience and an optional, more limited stay in Japan, rather than expecting them to have all lived there for several years like the original version does. My version of the questionnaire ended up having 6 of these preliminary open questions. Taking the open and multiple choice questions together, this makes for a total of 25 questions, which all participants were expected to be able to fill in within 15 minutes (an expectation that was met, as explained in section 4.3).

In keeping with the original questionnaire, my revised version included fillable sections for general personal details (name, date of birth, gender etc.). After the first rounds of handing out and gathering questionnaires, however, I decided to inform students that they should feel free to fill their questionnaires in anonymously. In the end, I opted not to record the personal details sections for my evaluations of the data. My reasons for doing so were twofold: first, several participants appeared somewhat uncomfortable with these questions, with some of them opting not to fill them in. Second, I could not think of any good reason for gender or precise age to be particularly relevant to the experiment, nor could I find any mention of this being the case anywhere in Tamaoka et al.'s article (or Nakazawa et al.'s, for that matter). Having personally handed out the questionnaires and seen the participants in doing so, I already had a guarantee that they all fell into the same age range, so these questions were not necessary to keep track of outliers in that regard, either.

As for the two-alternative forced choice questions that make up the main portion of the

questionnaire, as said, they are divided into three categories, to provide data for three separate groups, one for each operation of Tamaoka et al.'s triple operations model. For the purposes of this thesis, I will refer to these as clusters 1, 2 and 3. The third of these clusters is much less important than the first two, but is still discussed in this section for completion's sake.

The first eight questions, consisting of the four "regular" word pairings in which rendaku should occur and the four in which it is blocked by a straight-forward instance of Lyman's Law, served essentially the same purpose as they did in Tamaoka et al.'s experiment: to give a baseline impression of the participants' rendaku proficiency when it comes to this rule. This group of questions will be referred to as "cluster 1" in analysis. Some example questions (examples 5 and 6) from this list have already been given in section 3.2.

The second group consisted of six questions, designed to test the participants' proficiency in lexical strata-based rendaku. It will be referred to as "Cluster 2." These are the questions that all ended in *hashigo* 'ladder' or *hasami* 'scissors', with the etymology of the preceding compound determining whether or not rendaku should occur (yes if it is *wago*, no if it is not). Cluster 2 included one question, that of the compound *nawabashigo* 'rope ladder,' that could be considered counterproductive to testing a participant's skill in etymology-based rendaku for two reasons. First, it is a compound that includes a voiced consonant after the first consonant of the second component, but that still undergoes rendaku. This makes it an exception to Lyman's Law. Second, it is the only compound on the questionnaire that includes such an exception. Its inclusion can be viewed in one of two ways: on the one hand, one could say that the question still fits in with the other etymology-based questions, and simply throws the participant an additional curveball by also including the Lyman's Law exception. Alternatively, one could say that it does not fit in with the rest since it introduces outside elements that take away from the purity of the rest of the test by introducing a knowledge-based Lyman's Law exception element to a set of skill-based etymology questions. Since *nawabashigo* essentially falls into a separate category from the rest of cluster 2 in both Tamaoka et al.'s article and this thesis, I have chosen to isolate the word from the rest of cluster 2 for most analysis purposes. In the analysis section to follow, I will be using a version of cluster 2 that only includes the other 7 questions, in the interest of keeping the focus of that cluster's analysis on the participants' proficiency with lexical strata-based rendaku that it is supposed to test them for. That said, I will also be looking at the results of the *nawabashigo* question on their own, because they present some potentially interesting data.

There was also a third cluster, which consisted of five compounds designed to test for lexicon-based rendaku proficiency. However, I did not deem these questions relevant to this thesis. The reasons for this are twofold: first, cluster 3 does not fit into a model that tests for correctness as

well as experiments 1 and 2 do. Second, as mentioned in section 3.2, the idea of a lexicon-based operation for rendaku brings some issues with it when it comes to testing. One could make a good argument that the compounds in cluster 3 are more likely to require individual memorisation than those in 1 and 2, but even if that is the case, memorisation also works for those other clusters. In other words, while I have little doubt that every question in cluster 3 does fall under lexicon-based rendaku, there is no way to confirm that the other questions do not fall under that category. In the end, I did include the questions in cluster 3 on the questionnaire, but only as dummy questions.

4.4 Method of Data Collection

I handed out prints of the questionnaire to students at Leiden University who took Japanese language classes. In order to make sure the questionnaires would reach the intended participants, I handed them out to students participating in Japanese language classes for the second and third year of the BA Japanese Studies track and to first year students of several MA tracks who had graduated from said BA track. Since these classes were spread out over different dates, it took roughly two weeks to gather the information, meaning that there is a slight difference in how far participants had gotten in their study tracks compared to others reporting the same amount of years studied. Given the scope of these tracks, however, this difference is not expected to have a meaningful impact.

I worked with the teachers of Japanese Language classes, contacting them for permission and cooperation before handing out the questionnaires. Since I only visited specifically Japanese *language* classes, there was a guarantee that none of the participants were students from outside a Japan Studies track whose courses happened to partially overlap with those who did study Japanese language. Classes at Leiden University are given in two-hour blocks with a 15-minute break in the middle. It was during these breaks that students filled in the questionnaires, which in most cases I observed took them 5 to 10 minutes. Generally, I visited at the start of the break in order to hand out the questionnaires and stayed until I had collected that of the student who finished last, usually at or near the end of the break. I did not personally observe any cheating or conferring between participants, though it should be noted that I was not personally there for all of the questionnaires that were taken. Some teachers preferred that I give them the questionnaires beforehand, after which they handed them out themselves, with my only other involvement being at the end of their classes, when I came by in order to collect the filled-out questionnaires. Presumably this was to minimise the extent to which their classes were disturbed.

In total, I have gathered 72 questionnaires, 2 of which I have discarded because the participants shared a native language with those of Tamaoka et al.'s participants. I later discarded

another three for different reasons, as explained in the next section. Using Microsoft Excel, I recorded all of the answers participants' answers before running several analyses on them, also explained in the section to follow. In order to allow for a unified format, I simplified some of the answers to the open questions. For example, this included converting all answers to the question "how much time, if any, have you spent staying in Japan?" to be expressed in months.

5. Data and Analysis

The main points of emphasis in the questionnaires handed out to the participants were their amount of years of experience and their ability to correctly apply rendaku to a compound based on both Lyman's Law and lexical strata. Several questions related to the component *shouchuu* and the amount of time participants had spent in Japan were also part of the questionnaire, but these did not end up being points of focus for the current thesis. Before diving too deeply into analysis, I shall first present an overview of the data I have gathered based on these criteria.

To start with the first point of focus, years of experience, I have divided the participants into groups based on their answer to the first preliminary open question, which asks the students how many years they have been studying at Leiden University. The resulting table is table 1.

Table 1: Participants divided by years of experience

Years of experience	Amount of participants	% of participants
1	18	26.18%
2	27	39.13%
3	13	18.84%
4	9	13.04%
5	1	1.45%
6	1	1.45%

Because rendaku is not officially taught in any specific year of the bachelor or master programmes that the participants took, I have opted to ask them for years of experience in general, rather than ask for the specific position they occupied on their BA or MA progress tracks. To give a general impression, however, assuming that the participants never had to repeat years, 1 year of experience should translate to BA2, 2 years to BA3, 3 years to MA1 and four years to MA2. All participants took the same BA course, though their MA courses (where applicable) differed. Of course, as a participant's amount of years of experience increases, so does the chance that they will have had to repeat at least one year. As can be seen in table 1, the 5-year and 6-year categories only have 1 participant each to represent them. This makes these categories too small to be reliable for statistical analysis, so I decided to only count years one through four in the analyses to follow. Accounting for other participants who I have had to leave out, this effectively leaves 67 participants out of the 72 who originally filled in the questionnaire.

Next are the participants' correctness rates. Table 2 gives an overview of the participants' ratio of correct answers to each question. They have been divided into groups based on their years

of experience. Only the questions from clusters 1 and 2 have been taken into account and percentages have been rounded to the nearest two decimals.

Table 2: Correctness rate by cluster and years of experience

Years of experience	Correct rate cluster 1	Correct rate cluster 2	Average for this year
1	63.19%	51.11%	57.15%
2	72.69%	47.41%	60.05%
3	67.31%	53.85%	60.58%
4	72.22%	58.86%	65.54%
Average for this cluster	69.03%	52.24%	-

Looking broadly at the average correct rates across years and clusters, they seem to confirm two of this thesis' main hypotheses. First, the average correct rates across cluster 1 and cluster 2 grows a little for each additional year of experience. Second, the average correct rate across all years indicates that participants perform better across all year categories when it comes to cluster 1 (rendaku based on Lyman's Law) and less well when it comes to cluster 2 (rendaku based on lexical strata).

While each year category in table 2 has a higher average ratio of correct answers than the one before it, there is a notable caveat to this finding when it comes to the results of the second year. While the average correct rate for this year does fit into the pattern of steady year-to-year improvement, it is distinct from the other year categories because this average is made up of two extremes. When it comes to cluster 1, the 2-year group presents a peak with 72.69%, the highest in the cluster. Cluster 2 is the exact opposite, with the 2-year group achieving an average correct rate of 47.41%, the lowest of any year in any cluster.

As mentioned before, there was one compound word, *nawabashigo*, that I have left out of cluster 2. This was because it includes an exception to Lyman's Law, with the first consonant of "bashigo" becoming voiced despite the fact that the component on its own already has a voiced consonant in the "go" syllable. The main reason I have chosen not to include *nawabashigo* is because it involves a factor that cluster 2 was not meant to test for, namely Lyman's Law. I also thought that the question would be disproportionately difficult compared to the rest of cluster 2, because it involves two rules rather than the usual one. Not only that, but it presents an exception to one of those rules, knowledge of which should be more advanced than a basic grasp on the rule itself. I still had a look at the results of the *nawabashigo* question on its own, resulting in table 3

Table 3: Correct rate of 'nawabashigo' by years of experience

Years of experience	Correct rate
1	100%
2	62.96%
3	53.85%
4	88.89%
Average across all years	74.63%

While my initial assumption was that the compound *Nawabashigo* would be disproportionately difficult for participants to guess correctly, the opposite turned out to be true. The average correct rate for this question, 74.63%, is considerably higher than that of cluster 2 as a whole (52.24%). With regards to years of experience, *nawabashigo* does not follow the trend of gradual growth that table 2 seems to indicate. Rather, it starts exceedingly high with a perfect correct rate in year one, then dips to a much lower rate in year 2, reaches a nadir in year 3 and ends up high again in year 4. Year one in particular is noteworthy, with all 18 of the least experienced participants providing a correct answer to what should in several respects be one of the most difficult questions on the questionnaire.

6. Discussion

6.1 General findings and their implications

There are several points to the findings of the previous section that warrant closer examination. This section will explore those points further, in addition to making some comparisons to the findings of Tamaoka et al. and Nakazawa et al.'s respective articles.

The first and most obvious point is the gradual growth in average correct rate across years. This can be explained in several ways, the first and most straight-forward explanation is that students gradually learn about rendaku and its workings through exposure to the Japanese language, even if they are not explicitly taught about rendaku. This was predicted earlier as hypothesis A and the data seems to corroborate it. However, it is not the only possible explanation. There are other factors that could have also influenced the correctness rate across years.

For example, each year of advancement in Leiden university sees a number of students dropping out or switching study tracks. This could mean that some of the increasing correct rates may be attributable not to growth in rendaku proficiency for each individual student, but to less proficient students being "filtered out" over time. That being said, it should also be mentioned that, in the author's experience, this sort of dropping out happens overwhelmingly in the first year and participants for this thesis' questionnaire are all in their second year or beyond. Another factor that should be considered is that participants' overall vocabularies grow over the years. This means that they may have simply picked up the compound words through rote memorisation at some point in their studies without necessarily learning about the underlying principles, an issue which was touched upon earlier in section 3.2.

This brings us to the second point of interest: the difference in correct rates between the first and second clusters. The idea that students may have simply improved their vocabulary without picking up on the principles of rendaku is called into question by the fact that they reliably gave more correct answers when it comes to one general rule of rendaku than when it comes to another. While it is very likely that participants' overall vocabulary improvements have an impact on their growing correct rates over the years, this cannot explain the much higher rate at which they correctly identified rendaku based on Lyman's Law compared to rendaku based on lexical strata.

Not only is the correct rate for Lyman's Law comparatively high in general, it also notably starts out at 63.19% for the participants who had only 1 year of experience. This is well above the 50% correctness rate that one would expect from someone with no knowledge of rendaku picking answers at random. This "head start" of sorts could be explained in several ways. For one, the first year of Leiden University's Japan Studies track has a strong focus on language and, as mentioned, a high dropout rate. This could mean that those with a good intuition for rules like Lyman's Law would

be more likely to have made it through the process. Conversely, it could mean that students who made it through the first year were exposed to relatively intense training and have picked up on several general rules like Lyman's Law along the way. While these theories might help understand the high correct rate of cluster 1 from the start, neither would explain the comparative lack of correct answers in cluster 2, which hangs around 50% for the first three years, giving no clear statistical indication that the participants are not simply guessing until the very last year that is tested.

As mentioned in hypothesis B, I suspect that Lyman's Law is an easier concept for students to quickly get a grip on, because unless they are dealing with an exception (of which there are none in cluster 1), they do not need context that lies outside of the compound they are applying it to. They only need to see if the word already contains a voiced consonant, which is made easier by the way in which the Japanese syllabaries visibly differentiate between unvoiced consonants and their voiced counterparts.

Finally, there is the question of *nawabashigo*. As mentioned, its status as an exception to Lyman's Law places it in an odd position with regards to the rest of cluster 2, which is why I did not count it alongside the rest of that cluster. I expected that reliably identifying the compound as one that undergoes rendaku should require more advanced rendaku knowledge and therefore be more difficult for participants to get right. However, it has a much higher correct rate than is average for any year or cluster in table 2. While this is curious in and of itself, what makes it truly noteworthy is that participants with only one year of experience, the category which I expected to get the lowest correct rates in general, achieved a 100% correct rate for this question, with all 18 of them correctly identifying that *nawa* and *hashigo* form the compound *nawa**b**ashigo*.

To speculate for a moment, I suspect that the 100% success rate of participants with 1 year of experience and the ensuing sharp drop-off in the following years may be explained as a U-shaped learning curve, owing to negative side effects of present-but-incomplete rendaku experience. I suspect that there is something about *nawa**b**ashigo* that makes it a more intuitive pronunciation than the alternative, *nawa**h**ashigo*, at least to Dutch speakers. Considering my participants' first language, it is unlikely that *nawa**h**ashigo* is blocked outright. After all, H-sounds can occur in the middle of Dutch words (such as mee**h**elpen 'to assist' or be**h**alve 'except'). Still, exceptions are exceptions for a reason, and with a perfect correct rate across the board in the earliest measured year, it is likely that *nawa**b**ashigo* is naturally more appealing. Following from their perfect start, let us assume that later students start picking up on some of the underlying principles of rendaku and therefore have an advantage when it comes to identifying the rules when they apply. Once they hit this more advanced stage, they start being able to use these rules more often, but at this point

compounds such as *nawabashigo* would prove more of a pitfall for them until they learn which specific exceptions to avoid when applying rendaku. This could explain the drop-off and subsequent rise of correctness rate for *nawabashigo* over the years: participants with 1 year of experience have little to go on beyond intuition, and since *nawabashigo* sounds better, they will pick it over the alternative. 2-year and 3-year participants have learned more about Lyman's Law but many of them do not yet know about the exceptions to this rule, so many of them try to apply it where they should not, resulting in a much lower correct rate. By year 4, participants have learned about Lyman's Law and most of them have also picked up a wider vocabulary, allowing them to recognise exceptions such as *nawabashigo* and bringing the correct rate back up somewhat.

6.2 Comparison to the other articles

Both Tamaoka et al. and Nakazawa et al. ran similar experiments to the one used for this thesis, so they represent possible points of comparison. Tamaoka et al.'s article uses a questionnaire that the one used for this thesis is based on, which makes it a more direct comparison in that respect. That said, Tamaoka et al.'s participants were all very advanced second language learners of Japanese whose experience averaged out at 5 to 6 years. Not only does this put them on a different level with regards to amount of experience, it is also likely that they have an additional advantage due to the fact that they spent an average of over two years of that time living in Japan,[22] much longer than my own participants.

The students at Ming Chuan University who participated in Nakazawa et al.'s questionnaire are much closer to those of this thesis in terms of experience, with most of them being in their second to fourth year. Direct comparison between Nakazawa et al.'s participants and my own has its own issues, however. The questionnaire they used provided different sample compounds in a similar but different format (as explained in section 3.3). There are hardly any compounds the two questionnaires have in common, the one exception being *ai* + *kagi* 合鍵 'duplicate key.'[23]

While it would be irresponsible to draw direct statistical comparisons between my questionnaire results and those of the other articles, there are some broad strokes similarities and differences that are worth mentioning. A consistent thread between Nakazawa et al.'s results and my own is the strong indication that students of Japanese as a second language will pick up on rendaku over time, especially Lyman's Law, even if they are not specifically taught about rendaku in their curriculum. Interestingly, while my participants immediately showed statistically significant signs of proficiency with Lyman's Law, Nakazawa et al. note that their participants did not show such

[22] Tamaoka et al.,9
[23] Nakazawa et al., 71

signs reliably until the last years of their study[24]. It is possible that this is in some capacity due to their first language: Nakazawa et al. cite Mandarin as the common language that all of their participants had to master before learning Japanese. They note a common hurdle that many Mandarin-speaking Japanese learners have with learning certain instances of rendaku because of their native language, namely that "Mandarin distinguishes aspirated vs. unaspirated stops and affricates, and usually the unaspirated consonants are voiceless word-initially but allophonically voiced word-medially[25]." Nakazawa et al. note how this can transfer from their L1 to their Japanese. This can make it harder for many Mandarin native speakers to avoid voicing certain word-medial terms when rendaku is blocked: the transfer effect would get in the way until the students have taken the extra step of learning when to avoid applying it. With all that said, it bears repeating that Nakazawa et al.'s questionnaire consisted of different compound words and was analysed differently, so these observations remain largely in the realm of conjecture until further research is done.

As for Tamaoka et al., the aforementioned experience gap makes it difficult to draw direct lines between the results of their experiments and my own, but there are still a few points they touch upon that are relevant to this thesis For example, when it comes to rendaku based on lexical strata, Tamaoka et al.'s participants consistently show a statistically significant ability to differentiate the rendaku-sensitive *wago* components from the large non-rendaku-sensitive *kango* and *gairaigo* components[26]. It could be argued that this is consistent with my own participants' capability to apply rendaku based on lexical strata in the 4-year experience category, but since that category is the cut-off point for those participants, there is no statistical proof that the rise in correct rate for cluster 2 at that point represents a growth pattern and not just a spike. Tamaoka's Chinese participants, specifically, showed signs of positive transfer, being more easily able to differentiate *kango* components, which they attribute to a similarity effect with the Chinese language. As is to be expected, there is no indication that my own participants have a similar advantage in this regard. To tie this back briefly to Nakazawa et al.'s experiment, this is presumably also true for their participants, which would make for another notable difference between rendaku learners with Dutch and Chinese as their L1. However, because Nakazawa et al. do not focus on the etymological aspects of rendaku, we have no way of drawing clear comparisons in that regard at present.

Despite their high amount of experience and proficiency with rendaku compared to my participants, there is one notable respect in which Tamaoka et al.'s participants were less able to correctly identify when rendaku should occur: the compound *nawabashigo*. Tamaoka et al.'s

[24] Nakazawa et al., 75
[25] Nakazawa et al., 75
[26] Tamaoka et al., 45-46

participants showed no statistically significant ability to correctly predict whether or not this compound should undergo rendaku. This provides a contrast with my own participants, who showcase more of a U-shaped learning curve according to the data gathered. This difference could be explained in several ways: first, Having Dutch as a first language could result in a positive transfer effect that makes *nawa**b**ashigo* more appealing than *nawa**h**ashigo*. Conversely, having Korean or a Chinese language as a first language could result in a negative transfer effect such as the one Nakazawa noted, that gets in the way of mastering rendaku terms like *nawabashigo* through general experience alone. Given that Tamaoka et al.'s Chinese participants applied rendaku at a notably lower rate than the Korean participants did for this compound[27], this is especially likely for the former.

As a final point, Tamaoka et al. conclude their article by saying that participants seem to learn about both Lyman's Law and etymological strata early on and about exceptions and "lexical-specific" instances of Lyman's Law later[28]. They do not seem to differentiate between those first two rules here, but my own data strongly implies that Lyman's Law comes before etymological strata. Whether this and the *nawabashigo* issue are because I have focused on earlier stages of learning, because of the native languages of my participants as opposed to Tamaoka et al.'s or because of something else entirely is not entirely clear at this point, but the difference between their findings and mine in these areas is notable either way.

[27] Tamaoka et al., 50
[28] Tamaoka et al., 51

7. Summary and Conclusions

When it comes to the effect that experience studying at Leiden University has on rendaku proficiency, the experiment performed for this thesis has both provided some insight and raised some questions. As shown in chapter 5, the overall rate at which students can identify rendaku correctly across the two tested-for clusters of the questionnaire grows with each year category. This indicates that, as predicted in hypothesis A, there is some measure of unconscious learning effect by which participants are gaining rendaku proficiency even without explicitly being taught about it as a linguistic phenomenon. This lines up with Nakazawa et al.'s findings that Ming Chuan students develop a measure of awareness of rendaku over the course of their studies despite also not learning about it in their curriculum.

Looking more closely at this overall trend of rendaku proficiency growth, Leiden University students reliably achieve a higher correct rate with cluster 1 than with cluster 2. This serves as an indication that, as per hypothesis B, they pick up on Lyman's Law more quickly than they do lexical strata when it comes to rendaku. In fact, there is not even statistically significant proof that they are not simply guessing for the lexical strata-focused cluster 2 questions until the final year category that was tested. The results for cluster 1 show an average trend of year-to-year improvement for Lyman's Law proficiency, albeit with a spike in correctness rate in the second year category that this thesis can provide no definitive explanation for.

Hypothesis C, which stated that the rendaku-sensitive compound *nawabashigo* would have a lower than usual average correct rate due to its nature as the questionnaire's only exception to Lyman's Law, turned out to be incorrect for this thesis' participants. In fact, *nawabashigo* was correctly identified at a much higher rate than the average compound. Perhaps even more notably, students in the lowest experience category have a 100% correct rate for it while Tamaoka et al.'s much more advanced participants show no consistent ability to correctly identify it. The high starting correct rate and subsequent U-shaped learning curve for starting Japanese learners from Leiden University gives some indication that choosing *nawabashigo* over *nawahashigo* is, at some level, an intuitive decision that can get muddled by partial but incomplete knowledge of rendaku.

The findings on *nawabashigo* also give some insight into a possible outcome for hypothesis D, which stated that Tamaoka et al. and Nakazawa et al.'s participants would gain rendaku proficiency more quickly than my own due to a similarity effect, with their native languages having features in common with Japanese that Dutch does not. Because Tamaoka et al.'s participants are much more advanced learners than my own, and because Nakazawa et al. use a different questionnaire than I did, there is no clear and direct comparison to be drawn between these groups. As a result, hypothesis D can neither be clearly proven nor disproven by placing the results of this

thesis' experiment next to either of these two preceding ones. However, a broader comparison can still provide some insight into how these different L1 backgrounds can affect rendaku learning. The Dutch L1 participants of this thesis' questionnaire showed more proficiency for and more consistent growth in the Lyman's Law-based rendaku questions than they did in the etymology-based rendaku questions. They also showcased the aforementioned U-shaped learning curve when it comes to *nawabashigo*, something that Tamaoka et al's participants show no signs of sharing with them (although admittedly we can only compare the tail end of that curve with Tamaoka et al.'s results). Another notable point about the Dutch L1 students tested for this thesis is that a sizeable amount of their improvement seems to have already been made at some point before the second year of their study, which was the minimum cut-off point for participant experience in this thesis.

My participants do not show as much proficiency as those of Tamaoka et al.'s questionnaire overall. It is likely that this is mostly due to the differences in experience and the fact that Tamaoka et al.'s participants have lived in Japan for a much longer time, although the outcome of this thesis' experiment suggest that raw experience is not the only factor. The experience gap is much less prevalent when it comes to comparing Nakazawa et al.'s participants to mine, but there are some crucial differences when it comes to the questionnaires and division of participants into different groups that muddy some comparisons that could otherwise be made. The outcome of this thesis' experiment certainly indicates that a difference in L1 has an impact on the rate and manner of rendaku proficiency obtainment, though follow-up research would be necessary to pinpoint these differences and gain more insight into what exactly causes them.

To round out the findings of this thesis, I would like to propose a course of action, should such a follow-up experiment be performed with another questionnaire. There are several points that should be addressed in this case. First off, two or more groups of participants with different L1 languages should be gathered and given the same questionnaire from the start, similar to what Tamaoka et al. did for their Chinese and Korean L1 groups, but with at least one group that has an L1 with a low probability of transfer (such as my own participants) and at least one group with one that has a high probability (such as Tamaoka et al.'s and Nakazawa et al.'s participant groups). This would allow for easier and more direct drawing of comparisons. The results of the current questionnaire indicate that rendaku based on Lyman's Law and lexical strata are obtained at a significantly different rate for Dutch L1 speakers. A follow-up experiment should test the extent to which this is (or is not) unique to that group of Japanese learners. The same goes for *nawabashigo*, which is an exceptional case for which Tamaoka et al.'s advanced Chinese and Korean L1 participants had a correct rate that did not stray significantly from the 50% baseline while my less experienced Dutch L1 participants had a very high correct rate in year 1. The question that this brings to a follow-up

experiment is whether this difference is due to experience or due to L1, the U-shaped learning curve indicated by the current experiment points to the latter being a bigger factor, but the data on the issue is limited. The questionnaire for this follow-up experiment should also include compounds that include components phonetically similar to *nawabashigo*'s but which are not exceptions to Lyman's Law, to test what it is about this compound that is intuitive to new Japanese learners (at least those with a Dutch background). Of the more unique features relating to L1 that are indicated by the results of the current experiment, many are found in the earlier years. Because of this, it would be preferable for the participants of a follow-up experiment to be closer in experience range to my and Nakazawa et al.'s participants than to Tamaoka et al.'s. In the end, the experiment performed for this thesis has yielded some interesting results that carry meaningful implications for second language rendaku acquisition and how first language may affect it, but the lack of possibility for direct comparison between different first language groups of equivalent experience levels limits the amount of insight that these results can provide on the matter at present.

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Appendix

Name: Date of birth: Sex:

Preliminary questions

1) How long have you been studying Japanese? (university years only)

_____

2) Have you had any experience with the Japanese language before you started studying it in an official capacity? If so, what?

_____

_____

3) Please write down your native language (or languages, if you were raised bilingually)

_____

4) Please write down any other languages you speak, starting with the one you are most proficient with and going in descending order.

_____

5) How much time have you spent in Japan? (if inapplicable, simply answer “none”)

_____

6) If you have spent time in Japan, how much of each language you know would you say you used during your stay? Please answer by writing down each language you used, followed by a percentage estimate of how much of the time you spoke it (example answer: Dutch 50%, Japanese 30%, English 20%)

Questionnaire

In the following segment, each question will provide you with two words (in kanji), as well as two possible ways in which these words could form a compound (in hiragana). Please circle the compound that you think is correct for each word pair.

1) 黒 ― 羊 ⇒ くろひつじ ／ くろびつじ
2) 蕎麦 ― 焼酎 ⇒ そばしょうちゅう ／ そばじょうちゅう
3) スチール ― 鋏 ⇒ スチールはさみ ／ スチールばさみ
4) 芋 ― 焼酎 ⇒ いもしょうちゅう ／ いもじょうちゅう
5) 古 ― 狸 ⇒ ふるたぬき ／ ふるだぬき
6) 鉄製 ― 梯子 ⇒ てっせいはしご ／ てっせいばしご
7) 歯 ― 車 ⇒ はくるま ／ はぐるま
8) 黒糖 ― 焼酎 ⇒ こくとうしょうちゅう／ こくとうじょうちゅう
9) 親 ― 雀 ⇒ おやすずめ ／ おやずずめ

10) 生　—　魚　⇒　なまさかな　／　なまざかな

11) 米　—　焼酎　⇒　こめしょうちゅう　／　こめじょうちゅう

12) 縄　—　梯子　⇒　なわはしご　／　なわばしご

13) 鉄製　—　鋏　⇒　てつせいはさみ　／　てつせいばさみ

14) 鉄　—　釘　⇒　てつくぎ　／　てつぐぎ

15) 麦　—　焼酎　⇒　むぎしょうちゅう　／　むぎじょうちゅう

16) 蜜　—　蜂　⇒　みつはち　／　みつばち

17) スチール　—　梯子　⇒　スチールはしご　／　スチールばしご

18) 合い　—　鍵　⇒　あいかぎ　／　あいがぎ

19) 鋼　—　鋏　⇒　はがねはさみ　／　はがねばさみ