East Asian Studies (60EC) Master Thesis

Japanese Intonation

L1 transfer in Japanese intonation by Dutch L1- learners

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Contents

1. Introduction

In the small country of the Netherlands, multiple institutions offer Japanese as a subject to students. Leiden University's BA Japanstudies is arguably the most know and also the one I graduated from. This program alone already attracts over a hundred new Dutch students every year. And since the program does not include a class about Japanese pitch accent, which is the case almost everywhere (Tsurutani, 2009, p. 1).

According to Tsurutani (2009, p. 1), correct intonation has more impact on a persons' intangibility as perceived by the native speaker than segmental elements. If this is true, why then do institutions not implement Japanese intonation in the curriculum?

With this thesis we will attempt to make the step towards doing so easier. As we will soon learn, pitch perception and acquisition is something that is very much influenced by L1 and a program teaching this pitch should be designed specifically per L1. This requires a lot of research, which in this thesis we will be doing for the institution so that they can more easily decide to incorporate pitch accent in their curricula.

2. Japanese Accent

In this chapter, we are going to look at Japanese pitch accent, divided into two parts: word level pitch and sentence level pitch. More specifically: the pitch accent of Tokyo Japanese, which is regarded as "Standard Japanese". Since there are many dialects in Japan, which also tend to have different pitch accent, it is very important to set this boundary. See for example Figure 1[1], without going into what exactly is different; it is obvious that there is a difference in pitch accent (the lines go up and down at different places) between 'ohayō' in the Tokyo dialect and the for example the Kansai dialect.

The main aim of this chapter is to explain the overall elements and characteristics of Japanese pitch accent. It will be regarded as complete when a learner of Japanese who has no prior knowledge of Japanese pitch accent, will after reading this chapter will know what defines proper and improper intonation and will therefore also know what to listen for when comparing two different peoples' intonation of Japanese.

This chapter is going to be divided into two sub-chapters: word- and sentence-level pitch accent.

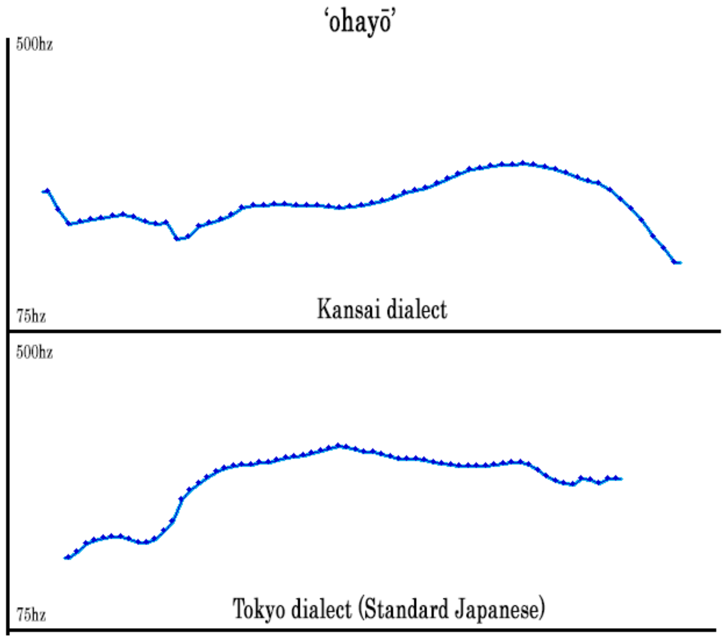

Figure 1

2.1 Pitch-accent

Unlike most Germanic languages, which have stress accent, Japanese is a pitch accent language. In both types of accents are syllables made more prominent as a means to contrast lexical items, however, the means of doing so are different. With stress accent, not only is pitch utilized to make a syllable more prominent, but also do for example variables like the

[1] Audio files from http://static.kansaibenkyou.net/node/391 (2018/05/02).

intensity and length of the uttered syllable change when stressing a syllable. In Figure 2[2] we can see that the Dutch minimal stress pair 'voornaam' with stress on the first syllable ("voor-') on the left, and 'voornaam' with stress on the second syllable ('-naam') on the right, differ in pitch, length and intensity. With pitch accent, however, the only important variable that is changing is the pitch of a syllable.

Interestingly, even though Japanese is not a stress-accent language, this does not mean that the syllable length and intensity cannot change when a lexical item is uttered (Table 1). The length of the accented and unaccented syllables are indeed almost identical in length, however, it seems like intensity is actually higher on the accented syllable in most cases. As a counter argument, we could look at Beckman (1986, p. 133), who notes that loudness is also drastically affected by other physical attributes of a signal. She explains how tones of different frequency have different natural loudness. However, it could also be the case that because of the setting, the person recorded also did her best to accentuate more prominently than is done in natural conversation, which has led to the seemingly contradicting data. This could also clarify as to why in some cases (saKE and iSHI), intensity of both syllable were almost identical. In any case, the intensity variable needs to be handled with in our research.

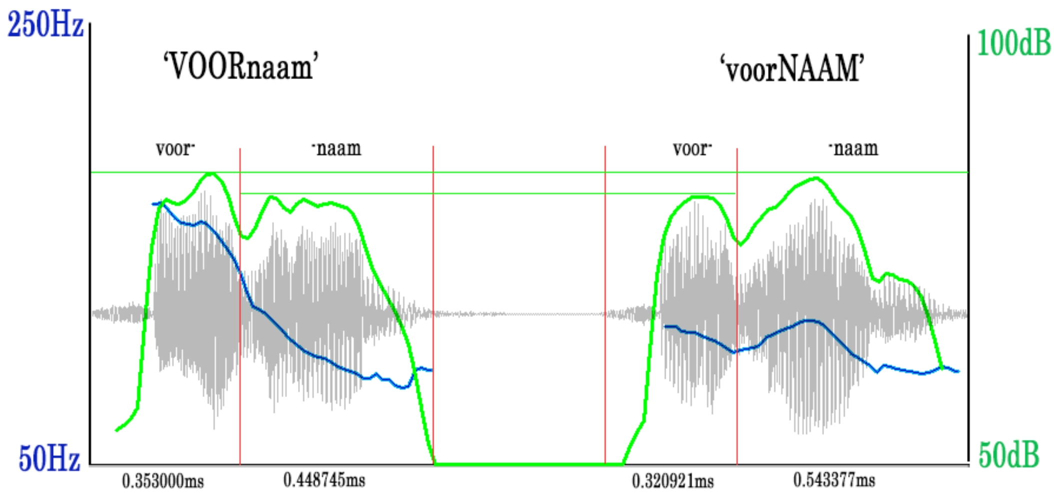

Figure 2

Words (accent is caps)	Accented Syllable (dB)	Other Syllable (dB)
haSHI	75.92	73.66
HAshi	79.51	69.67
Ame	80.25	75.85
aME	74.81	78.13

[2] Recorded by author.

Ishi	75.41	70
iSHI	74.14	73.66
SAke	78.82	73.17
saKE	75.18	74.48

Table 1

2.2 Syllables and Moras

Before continuing, it is necessary to explain the difference between a mora and a syllable. Mora, or *haku* 拍 in Japanese, can be said to be units of timing (Vance, 2008, p. 117). In Japanese, syllables can be long or short: the 'o' in Tokyo are long and the 'a' in *sakana* are short. However, while Tokyo has two syllables and *sakana* only two, Tokyo has four mora (to・o・kyo・o), while *sakana* (sa・ka・na) has three. The "small tsu っ", in words like *zettai* 絶対 is also counted as one mora.

2.3 Boundaries of Japanese word level pitch accent

In Japanese, words can be accented or unaccented. And since in Japanese, the pitch can only rise and drop once within a prosodic word (which is a lexical item + particle). (Vance, 2008, p. 155) This means that for every lexical item, there are *n*+1 possibilities (n = amount of syllables) as to where (if at all) in a word accent can fall. For example: *makura* 枕 (pillow) has three syllables: *ma, ku* and *ra*. Either one of the syllables can in theory be accented. +1 is for the unaccented option, which means there are four possible points of accent for the word *makura*. Important to note is that the difference between an unaccented word and word with accent on the final mora can only be heard in a phrase (Vance, 2008, p. 144). See for example Figure 3.[3] The Japanese words for 'fish' and 'treasure': *takara* 宝 with accent on the last syllable and the unaccented *sakana* 魚, both show no accent drastic fall in pitch. However, if we put, for example, nominative marker *ga* behind both words, de difference becomes prominent.

Strictly speaking Japanese has only two tones: low and high, which are in most sources indicated as L and H respectively. With the exception of one mora lexical items and most particles, there are no Japanese lexical items that do not have at least one low and one high tone. And since pitch can only go up and down once per prosodic word, there are only three possible patterns a Japanese prosodic word can have: from low to high (LH), high to low (HL), or low to high and back to low again (LHL). Depending on the amount of syllables, these patterns can of course be extended. For example, the LHL pattern can also be LHHL, however, the fundamental pattern, starting low, going directly to high and then back to low before the last syllable, does not change.

Depending on where in the word the accent is put, it is either called *atamadaka* 頭高 (accent

[3] Recorded by author.

on the first syllable), *nakadaka* 中高 (accent on a syllable anywhere but the first or last syllable), *odaka* 尾高 (accent on the last syllable) or *heiban* 平板 (unaccented). According to Tanaka & Kubozono (1999, p. 58-62), around half of all nouns of Japanese are *heiban* (unaccented) type nouns. Those that are accented mostly have the default accent, which means accent is on the syllable containing the third or second mora from the end, depending on if the word has only two mora or more.

The *n*+1 rule shows the theoretical upper limit of accent patterns. However, Kubozono (2006, p. 13-15), goes as far as saying that in practice, the choice is between accented or unaccented and that the accented words with accent not on the default syllable can be regarded as and should be memorized as exceptions, these exceptions are however often frequently used words, therefore should not be disregarded as less important (Vance, 2008, p155).

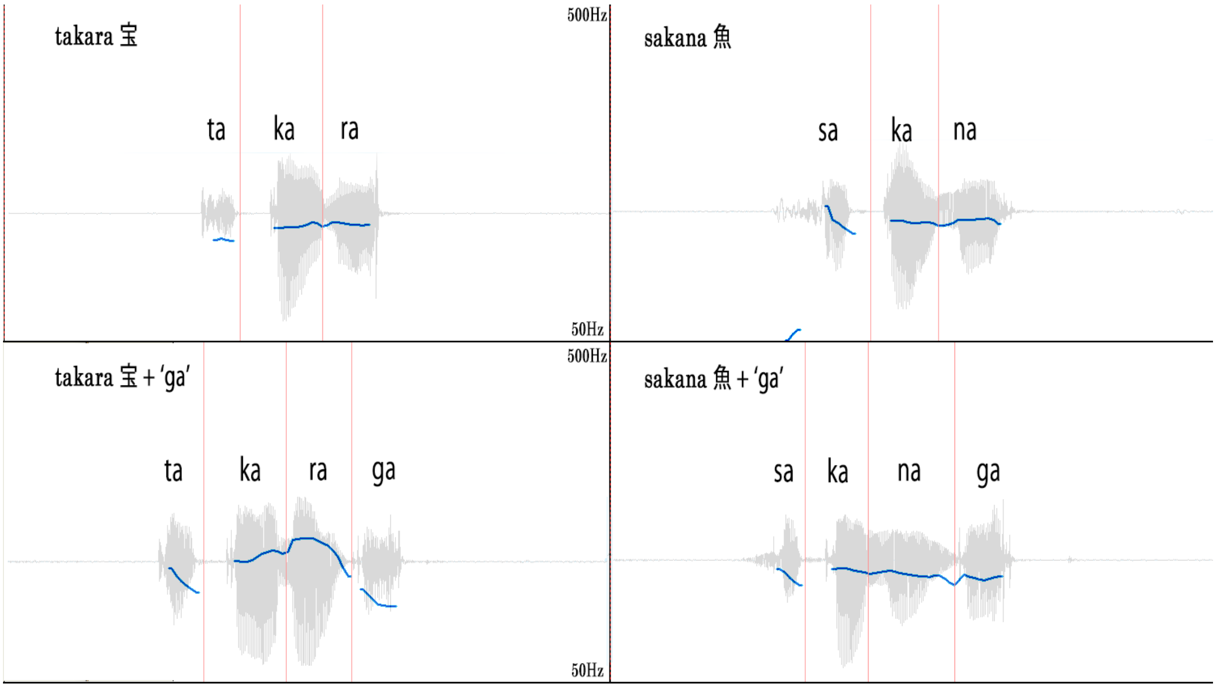

Figure 3:

2.4 Downstep

We have been discussing accent and low and high tones; however, for the rest of this thesis, it is necessary to define what we mean by "accent" in Japanese. As earlier explained, Japanese is a pitch accent language, which means the accent is marked by a change in pitch. In Japanese, this specifically means a change from high to low, which is called a downstep. This is also the reason as to why the *heiban* pattern is unaccented, even though it starts low and ends high. No downstep occurs, therefore it does not have an accent.

2.1.5 Indicating accent

There are many ways in which accent is indicated in literature. However, having learned that *heiban* and *odaka* words both have a high final syllable, we are not able to indicate the difference if we would just use the H/L method for indicating accent. To clarify, the *odaka* word *takara* and *heiban* word *sakana* would in combination with a particle both become 'LHHH'. Therefore, in this thesis we are mainly going to us '[' and ']' to indicate a rise or fall in pitch on word level. Below are some examples for all four accent patterns:

- *Atamadaka* (HL): *mi]ru* 見る, *ne]ko* 猫, *mi]dori* 緑, ...
- *Nakadaka* (LHL): *mi[zuu]mi* 湖, *no[mi]mono* 飲み物, ...
- *Odaka* (LH): *o[toko]* 男, *i[mouto]* 妹, ...
- *Heiban* (LH): *sa[kura* 桜, *mi[zu* 水, *su[nahama* 砂浜,...

Do note that the ']' indicates the downstep, which means that if we say the accent falls on the second syllable, the ']' should be in between the second and third syllable. However, for *odaka* words, which do not actually have a downstep occurring within the word, it means that, together with *heiban*, *odaka* words are unaccented. (Tsurutani, 2009 , p. 3)

2.1.7 Summary

Japanese is a pitch accent language, which means that the only important variable in contrasting lexical items is the pitch of a word. However, we have also learned that the intensity might also change for accented syllables.

In Japanese only two tones exist: low (L) and high (H) and within a prosodic word, with the exception of one mora words and most particles, the pitch can only go up once and can only come down once. In this thesis we will be indicating the rise and fall of pitch with '[' and ']' respectively and applying the just mentioned rule, we know a prosodic word can only have one '[' and one '] '.

The actual accent of a word in Japanese is the place where a downstep occurs, which is exactly what the ']' indicates. Words without a ']' or words with a ']' at the very end are regarded as unaccented and the rise in pitch is less prominent than the fall in pitch.

Depending on where, if at all, the pitch of a word occurs, it is called *atamadaka* (downstep on first syllable, accented), *nakadaka* (downstep somewhere after the first and before the last syllable, accented), *odaka* (downstep on last syllable, unaccented) or *heiban* (no downstep, unaccented). There is no difference in *odaka* and *heiban* as long as it is not used in combination with other lexical items, as shown in Figure 3.

3. L2 accent acquisition and L1 transfer

3.1 Markedness

Now that we have a good general understanding of how the Japanese accent system works, the next step would be to look at the Dutch accent system in order to see where the differences lie. Based on those differences we design our experiments and based on what we find we conclude this thesis. However, doing so means we are assuming L2 accent acquisition is at all influenced by L1 and that what is influenced in said acquisition is that what is different between L1 and L2. Therefore, before diving into the subject of Dutch accent, we first need to look at prior research done on L1 transfer on L2 accent.

L1 transfer on second language acquisition is a very extensively researched subject. There is of course the Contrastive Analysis Hypothesis (CAH) proposed by Lado (1957), which states that the more different an element of a language is from ones native language, the more difficult it will be to master. In other words, this implies that errors in L2 are made by interference of L1 habits. CAH was a highly discussed subject in especially the 1970's and has also been criticized by many scholars (Aarts, 1982, p. 54).

Eckman (1977) proposes a revision of the CAH, called the Markedness Differential Hypothesis (MDH). This hypothesis is based on the following three rules:

> Rule 1: Those areas of the target language which differ from the native language and are more marked than the native language will be difficult.
>
> Rule 2: The relative degree of difficulty of the areas of the target language which are more marked than the native language will correspond to the relative degree of markedness.
>
> Rule 3: Those areas of the target language which are different from the native language, but are not more marked than the native language will not be difficult.
>
> (Eckman, 1977, p. 321)

Markedness is defined by Eckman a phenomenon A in some language is more marked than B if the presence of A in a language implies the presence of B; but the presence of B does not imply the presence of A (as Cited in Rasier & Hiligsmann 2007, p. 53).

An example of a research on L1 prosodic transfer with MDH as theoretical framework is done by Rasier & Hiligsmann (2007). Rasier & Hiligsmann (2007) look at accent acquisition on the sentence level of L1 Dutch learners of French and L1 French learners of Dutch. According to their paper, although almost all languages rely on pragmatic, as well as structural factors in their accent placement, the French sentence level accent is more structurally determined (non-plastic), as opposed to Dutch, which is more pragmatically determined (plastic) (Rasier & Hiligsmann, 2007, p. 52). In practice, for example, in Dutch new information in a sentence is almost always accented, whereas for French, constraints in regards to structure outweigh pragmatic influence on accentuation. Therefore Rasier & Hiligsmann's hypothesis is, given Rule 1 and because pragmatic accentuation (A) is more marked than structural accentuation (B) (A implies B, but B does not imply A), Dutch L1 should have less trouble with the French accent, as opposed to French learners of Dutch (Rasier & Hiligsmann, 2007, p. 53). This hypothesis is proven to be true in their paper.

3.2 Stress- and Pitch-accent

Rasier & Hiligsmann (2007) only looks at the ability to produce correct accent; it does not address the ability to perceive intonation of the L2. Even though it seems logical to assume that if one can produce, one can perceive, the reverse would not be necessarily true. This means that before we do any predictions with regards to in what extent (if at all) Dutch L1 learners are able to produce and perceive Japanese pitch-accent on a lexical level, we cannot ignore the difference in accent systems of Dutch and Japanese.

Dutch and Japanese both use positional marking to signal lexical items. As explained in the chapter on Japanese accent, Japanese is a pitch accent language, meaning lexical contrast is signaled by changing pith. Dutch on the other hand is a stress-accent language, meaning lexical contrast is signaled by stress, which is a combination of change in pitch, intensity and duration. However, according to (Sluijter & van Heuven, 1996) duration is the most salient marker of stress. In other words, a stressed syllable in Dutch is automatically pronounced louder, higher in pitch and longer compared to non-stressed syllables. (See Figure 3) In essence this means that even if the pitch and intensity would not change over the course of the whole utterance, syllable length would be enough to signal stress in Dutch. This poses an interesting question: if pitch is not important to signaling lexical contrast in Dutch, will Dutch L1 learners of Japanese be able to perceive the position of the accent in Japanese words?

The Markedness Differential Hypothesis should help us predict the markedness of the production of pitch-accent in similar fashion to how Rasier & Hiligsmann (2007) compare Dutch and French. Stress-accent implies change in pitch (just like a pragmatic constrains imply structural ones) therefore the production of pitch accent should not be marked and therefore not be difficult. However, since pitch is in essence only a byproduct of stress and as earlier mentioned the length of a syllable is the determining factor, we cannot assume that Dutch L1 are able to recognize Japanese pitch accent, since the length of Japanese syllables do not differ (of course given they have the same amount of mora).

Wu (2015) looks at if Dutch L1 are able to perceive pitch position by performing two experiments. One experiment is an ABX task, where participants presented with two made up words (A and B) of which only the only difference was the position of pitch. X was the third given word, which was identical to either A or B. The participants had to decide which word (A or B) matched the X. The words where presented in a sentence and bi-, tri- and quadrisyllabic words of all four Japanese pitch patterns were used.

The second experiment was a sequence recall task, inspired by Dupoux et al. (2001). Two buttons were assigned one bisyllabic nonword each (A and B). A and B were minimal pairs and the participants were familiarized with which version (A or B) was represented by which button by repeated listening. After the participants had remembered which button represented which minimal pair, sequences constructed with all possible combinations of A and B were presented to the participants. This was done three times, which means all possible contrasts of Japanese pitch position were tested. (H]L vs L[H], H]L vs LH and L[H] vs L[H) This was done for sequences with two, three and four times A or B in all possible combinations. Words were not presented in sentences.

For both experiments, the same group of participants was used, which consisted of 15 L1 Japanese speakers of the Tokyo-dialect and 43 L1 Dutch, which were not learners of Japanese. (Hu, 2015, p. 24)

Hu (2015, p. 38) concludes Dutch L1 are partially deaf to pitch, since they failed to discriminate between L[H] and L[H, while not having problems with the other possible contrasts (H]L vs LH] and H]L vs L[H) in the sequence task. Dutch L1 showed no notable difference compared to Japanese L1 with regards to the ability to discrimination pitch in the first experiment (ABX). Hu (2015, p. 32) does note that Dutch did respond slower to the questions, which could suggest reliance on acoustic residual in echoing memory.

What we are particularly interested in for our research is if Dutch L1 are able to correctly perceive the position of the accent of Japanese lexical items (the position where the pitch drops). However, Hu (2015) only looks at the ability to perceive difference in pitch of minimal pairs. The alleged partial deafness was only found after the reliance on alternative acoustic strategies was tried to be eliminated by using the sequence task. The issue with the applied procedure is that a) since the minimal pairs were presented in a void, in theory the L[H] and L[H are both unaccented, the applicability of this comparison is arguable. b) The sequence task as designed by Dupoux et al. (2001) was made to study deafness to stress and was used to compare Spanish and French, respectively a language with positional markings to contrast lexical items, and one without. However, Japanese and Dutch both use positional markings to contrast accent, which one could argue might affect the effectiveness of this experiment. Therefore, the argument presented by Hu (2015), that is: Dutch L1 are deaf to pitch accent on the ultimate syllable is questionable.

Another factor we have to address is the difference in intensity and length of a stressed syllable. We have seen that in Japanese, the intensity of syllables is subject to change within a lexical item. However, the length of syllables is not. We have however not come across any argument that suggest the possible difference in length of a by L1 stress-accent language uttered Japanese syllable interferes with the perception of the pitch of that uttered syllable by a native speaker of Japanese. In Tsurutani (2009), who looks at sentence level intonation, this factor is also not given special attention. In other words, we will regard the means of signaling lexical contrast in Dutch to be transferable to Japanese, which in practical terms could be explained as a word with stress on the first syllable in Dutch is perceived as *atamadaka* by a native Japanese.

In summary, based on the Markedness Differential Hypothesis, we argued that for Dutch L1, producing pitch-accent is not marked. However, we concluded that MDH was not applicable to do predictions about the ability of Dutch L1 to recognize pitch at all and the ability to recognize exact pitch position of Japanese lexical items. For this we referred to Hu (2015), who shows Dutch L1 perform well at perceiving pitch difference. However, we have not been able to predictions about the ability of Dutch L1 to perceive the exact position of pitch. In addition, we will consider the change in pitch that is a byproduct of stress to be enough to signal lexical contrast in Japanese.

4. Dutch accent

Now that we have a good understanding of how Japanese intonation works and have looked at previous research on pitch perception and pitch production by languages with different accent systems, we will have a look at the Dutch accent system. There is no need to describe the Dutch system in its entirety, what we will be doing instead is look at specific elements of the Dutch system in order to make us able to define which elements of the Japanese system are expected to be affected by Dutch for Dutch L1 learners of Japanese.

The Dutch stress system is said to be not very different from other west-Germanic languages like German, English and Frisian (van Oostendorp, 2018, p. 343). Lexical items can be split up into syllables and at least one and only one syllable of a particular word is stressed. This means that there are no non-stressed words. As earlier explained, stress is recognized by a combination of higher pitch, higher volume and difference in length of the syllable, as opposed to a steep drop in pitch like in Japanese. Length however is the most determining factor. Dutch stress is only partly lexical (van Oostendorp, 2016, p. 2). There exist a few minimal pairs, like the example of 'voorNAAM' and 'VOORnaam' shown in Figure 2. However, according to Cutler (1986), there are only 13 in the Dutch lexicon.

Apart from the above described characteristics of the Dutch stress system, van Oostendorp & Kohnlein (2018, p. 347) argue there are three main generalizations about the Dutch stress system on which there is a wide consensus. These are:

- Dutch has a three-syllable window at the end of the word.
- Default stress is on the next to last syllable, given that:
    - Stress is (partially) quantity-sensitive.

In their paper, van Oostendorp & Kohnlein (2018) argue that these generalizations are mainly based on research that uses existing words to test the above mentioned consensuses. Lists of actual words contain historical contingencies that may not be part of what the speaker knows about a given language, and therefore do not provide reliable enough data to base conclusions on. Therefore, in their research van Oostendorp & Kohnlein (2018) use carefully constructed nonwords to test the above mentioned generalizations of the Dutch stress system in an attempt to provide new insights.

What they find is that there is no clear evidence for the three-syllable window, which, as the name suggests, means that in Dutch stress only occurs on the ultimate (last), penultimate (first to last) or antepenultimate (second to last) syllable. However, their data of quadrisyllabic words shows that in 10% of the cases stress occurs on the preantepenultimate (third to last) syllable, which suggests there is no three-syllable window in Dutch (van Oostendorp & Kohnlein, 2018, p. 350).

The notion that when the ultimate syllable is closed and the penultimate syllable is open, the antepenultimate syllable should be stressed finds no real support as there is only a very weak tendency (the red line is only slightly higher than the blue line on x=3 in Figure 8. However, the percentage of stress on the antepenultimate still is close to 20%, but no clear explanation for stress occurring on the antepenultimate syllable is found.

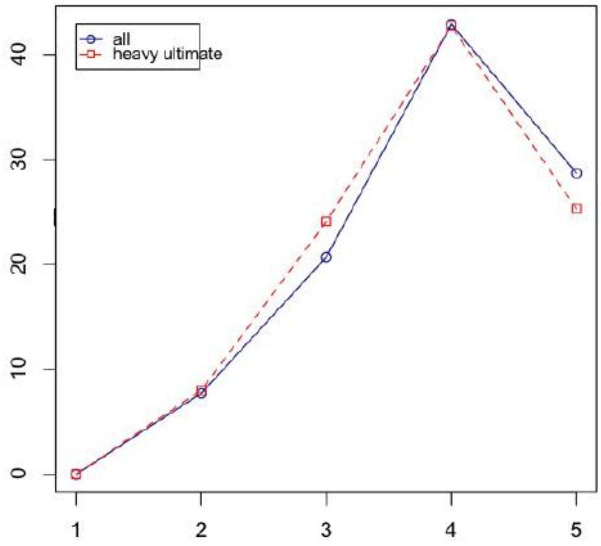

Figure 8 (van Oostendorp & Kohnlein, 2016, p. 12)

The second generalization: stress is on the penultimate syllable, does find strong support in the data (van Oostendrop & Kohnlein, 2018, p. 352). However, only when the ultimate syllable is light (van Oostendrop & Kohnlein, 2018, p. 354). For bisyllabic words, when the ultimate syllable is heavy, the ultimate syllable is stressed 42.5% of the time and the penultimate 57.5% of the time. For superheavy this is 45.4% and 54.6% respectively. When the ultimate syllable is light, however, the ultimate syllable is only stressed 5.9% of the time, as opposed to 94.1% stress on the penultimate syllable (van Oostendrop & Kohnlein, 2018, p. 345). For trisyllabic words only consisting of light syllables, the tendency is still very strong. (4 on the x-axis in Figure 9)

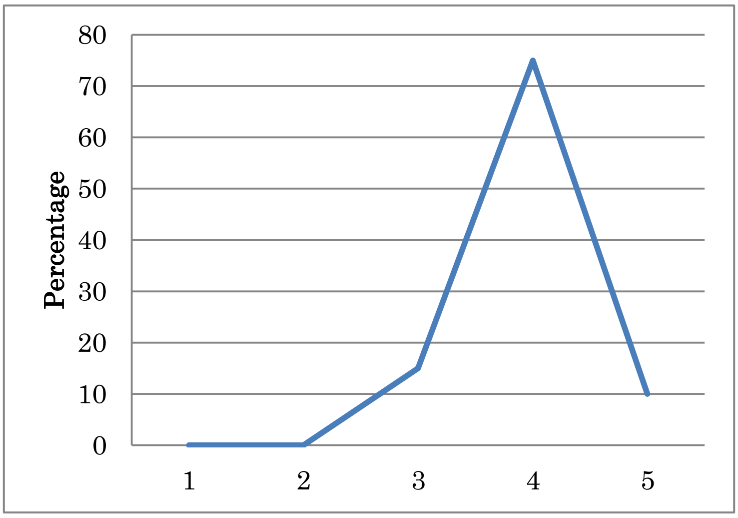

Figure 9 (van Oostendrop & Kohnlein, 2018, p.352)

In order to be able to argue L1 accent transfer, we need to be able to predict when and where in Dutch the accent should occur. Based on van Oostendorp & Kohnlein (2016, 2018) the only predictable position of stress is that on the penultimate in case of a light ultimate syllable. This is still not a guarantee, but Dutch L1 show a very strong preference to put stress on the penultimate stress in such words.

5. Hypothesis

Japanese has four pitch patterns (*atamadaka, nakadaka, odaka* and *heiban*). In combination with a particle (e.g. the topic marker) one is unaccented (*heiban*) and in void both *heiban* and *odaka* are unaccented. These patterns are visualized in Figure 10.

	1	2	3	particle
atamadaka	H	L	L	L
nakadaka	L	H	L	L
odaka	L	H	H	L
heiban	L	H	H	H

Figure 10

We have already argued that pitch change in stress is applicable to pitch accent in Japanese. Therefore, if we would notate the possible positions of pitch change in Dutch using the same H/L method as in Figure 10, we notice that *odaka* and *heiban* do not occur in Dutch. (Figure 11) To clarify, comparing Dutch and Japanese acoustically, Japanese has multiple accentuated (i.e. syllables that are higher in pitch than others), whereas Dutch only has one per lexical item. Next to the differences, we can also find similarities: the H/L pattern of *atamadaka* and preantepenultimate stress and *nakadaka* and antepenultimate stress is the same.

	1	2	3	4
Preantepenultimate stress	H	L	L	L
Antepenultimate stress	L	H	L	L
Penultimate stress	L	L	H	L
Ultimate stress	L	L	L	H

Figure 41

The question remains then if Dutch L1 should be able to produce two or more high pitched syllables in sequence. We will assume the lifelong use of stress-accent has not caused the inability to produce two consecutive H-syllables. Especially because two L-syllables in succession *is* possible. However, it is very likely that even though in theory Dutch L1 learners of Japanese are able to produce to consecutive H-syllables, they will in practice not do so because of L1 interference.

On the other hand, since in Dutch the accent is signaled by a rise in pitch, intensity and increase in length, which with regards to pitch is the exact opposite as Japanese, it is questionable whether Dutch L1 learners of Japanese are able to recognize the fall in pitch as the accent. If we want to test this ability, we have no choice but to explain this rule. This will be further discussed in the next chapter.

Another possible critical point is that the particle is not taught to be perceived as part of the word it is stuck to, but to be a stand-alone lexical item that marks the function of other lexical items within a sentence. Therefore, we could expect Dutch L1 learners of Japanese to produce patterns where the intonation of the particle does not fit the particular accent pattern.

Accordingly, our hypothesis is as follows: we expect Dutch L1 learners of Japanese's intonation to be influenced by the Dutch accent system. However, we do not foresee any problems with recognizing the position of the accent. If our hypothesis proves to be valid, we will have shown how L1 accent transfers to L2 on the word level. However, since recognition of accent poses no problems, this transfer is not necessarily due to markedness of the target language's accent-system, but is likely due to a lack of knowledge of the accent system of the target language. This will also hopefully make institutions teaching Japanese aware accent is not automatically acquired and should have its place within the curriculum.

6. Methodology

To test our hypothesis, we will perform two experiments: a listening test, where we will test the ability of learners to recognize pitch position, and a speaking test, where we will examine the transfer of the Dutch accent system. The test subjects will all be first year students of the Japanstudies program of Leiden University. These students have all concluded the first year language classes of the Japanstudies bachelor program of Leiden University, called "Teksten 1a" and "Teksten 1b" with a passing grade. In this first year, students are studying basic grammar and vocabulary using the みんなの日本語：初級Ⅰ and みんなの日本語：初級Ⅱ (Minna no Nihongo: elementary 1 and 2) textbooks, of which the combined knowledge is equivalent to Japanese Language Proficiency Test (JLPT) N4. Pitch accent is not part of the curriculum.

The reason we are focusing only on students of the Japanstudies program of Leiden University, and not Dutch L1 learners in general is because only this way can we make sure all participants have went through the same program. There is no doubt there will be individual differences regarding proficiency, however the only way to keep this as small as possible is to confine ourselves to students that belong to this group. For the same reason we will only use students at the end of their first year. Based on anecdotal evidence of the author, who has done the same program, the proficiency level of individual students grows apart more in the second year and even more in the third year of the program.

Each participant will also be asked to fill in a survey after the experiments. We will ask if the student has studied pitch-accent outside of class and if he or she has been to Japan already and for how long and where. The participants will also be asked to fill in their grade for the language classes. In a case of some students performing better than others, this information will be used to see if there is a correlation between their pitch-accent and having a higher grade for the classes, or having been to Japan for a longer period of time already. This is because we assume a higher grade for the language class generally means a student is more proficient, but also has put in more time studying the language. There is also of course the chance that a student who has been to Japan before has already developed an ear for pitch accent, since in relative terms, the amount of exposure to Japanese spoken of a L1 Japanese on a Dutch university is course very low.

6.1 Speaking test

In the speaking test we will ask the participants to pronounce 40 nouns of the Japanese lexicon, 10 of each pitch pattern, together with the topic marker particle は '*wa*' because the difference between *odaka* and *heiban* words become prominent this way, and because then the words form a prosodic word of four syllable. Participants were of course not notified of the correct pitch patterns. (Appendix I)

Since we are not out to test the ability to guess correct pitch accent, having participants utter words they have never heard before would yield useless results. In order to really test the ability of participants' reproduction of all four pitch-patterns, the list of words we present them must exist completely of words that are studied in the above mentioned textbooks and we may assume student have studied before.

Upon selecting the words in question, effort was made into assuring the list consisted of as much frequently used as possible vocabulary, minimalizing the chance the list would consists of words from the used textbook that are not often used and therefore might be forgotten by the participants. To induce this even more, the Dutch meaning was also given next to the Japanese word. Students were told the Dutch would not have to be pronounced. Japanese words were printed in *hiragana*.

Since this is the only case in which we can predict the placement of accent, we will only use 3 syllabic words, of which the ultimate is light. By only using tri-syllabic words with a light ultimate syllable, we know that around 75% of the time, the stress should be on the penultimate syllable. This also enables us to explain correctly reproduced pitch-accent being due to acquisition, or only due to L1 interference that incidentally resulted in correct Japanese accent.

The reason why we will not be using shorter words is because we want to give the students the room to be able to produce each accent-pattern. In words, with two syllables, *nakadaka* cannot occur. One syllable words can only be *heiban*, *odaka* or *atamadaka,* the latter two being the same in this case. Longer words are avoided because the textbook vocabulary lists contain almost no longer words that also have a light ultimate syllable. Another reason these are avoided is to prevent any other factors from distorting the data, like for example that in Dutch monomorphemic words longer than three syllables are very rare, and could be analyzed as morphologically complex, possibly resulting on stress placement that is not very well explainable (van Oostendorp & Kohnlein, 2018, p. 351).

Whereas in theory the pitch of Japanese lexical items moves like a one-step staircase, by examining the movement of pitch of different L1 Japanese, we notice that the sharp fall that marks the accent is not a uniform number of hertz. However, there does need to be some threshold that triggers accent, meaning, if the pitch falls with a certain amount compared to the previous syllable, it is perceived as accent. Measuring the average intonation of all the four pitch-patterns of the audio used for the listening test, we notice the following patterns (See Figures 12 to 15):

- *Atamadaka:* The second syllable is lower than the first (-47 Hz) and the third syllable is lower than the second (-35 Hz). The ultimate syllable is almost the same compared to the penultimate syllable (-2 Hz).

- *Nakadaka:* The second syllable is higher than the first syllable (+43 Hz). The penultimate is lower than the second and also the first syllable (-20 Hz compared to the first syllable, -64 Hz compared to the antepenultimate). The ultimate is again around the same pitch as the third (-1.4 Hz).
- *Odaka:* The antepenultimate syllable is higher than the first syllable (+44 Hz). The penultimate is higher than the antepenultimate (+13 Hz) and the ultimate syllable is lower than all the other syllables (-82 Hz).
- *Heiban:* in comparison to the other patterns, all the syllables are at the same pitch. However, the prepenultimate tends to be a little higher than the first syllable (+10 Hz) and the ultimate syllable tends to be a little lower than the penultimate (-6.7 Hz). The antepenultimate and penultimate syllable are almost the same. (-1 Hz)

Comparing these averages with each other, we notice that for *Nakadaka, Odaka* and *Heiban*, the pitch of the first syllable is the same in relative terms: a little less than 200 Hz. On average, the first syllable in *atamadaka* words is at 256 Hz. The ultimate syllable does not go lower than 157 Hz, averaging at 165 Hz. If we would take the unaccented first syllable (all but *atamadaka*) as a base (190 Hz) we learn that for this particular person, there is a range of around 85 Hz above (highest measured pitch was 274 Hz) and 33 Hz below this base pitch.

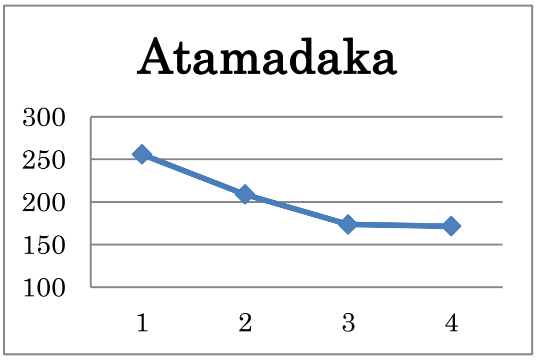

Figure 12 Atamadaka

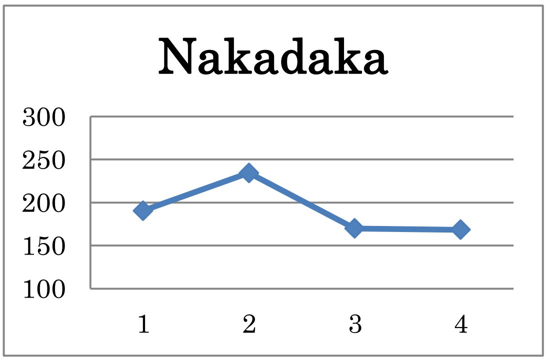

Figure 13 Nakadaka

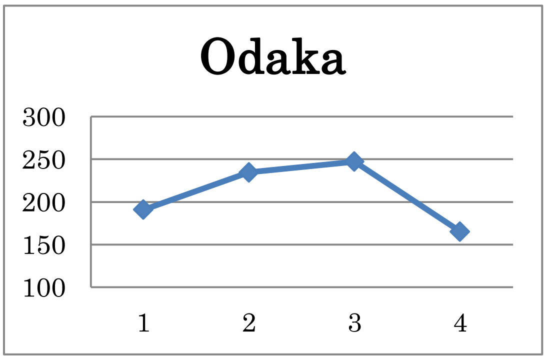

Figure 14 Odaka

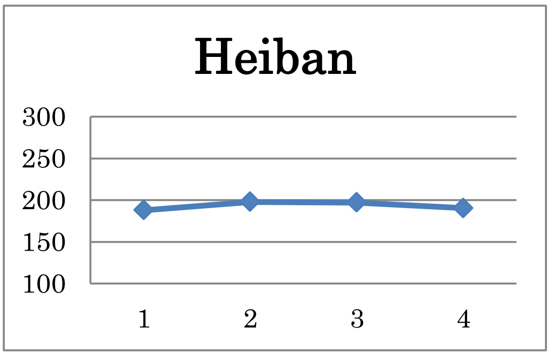

Figure 15 Heiban

However, human hearing works logarithmically, meaning that we are more sensitive to a difference in pitch when a sound is low then when it is high. In other words, the difference between 50 Hz and 55 Hz is more easily perceived than the difference between 250 Hz and 255 Hz.

What this boils down to is: we cannot compare the pitch of different people's utterances so easy. In Tsurutani (2009) we learn that the range (the lowest and highest measured pitch of all the utterances combined) of the average male speaker is much less than that of the female speaker. Logically this means that the differences in hertz between a high and low syllable uttered by two different persons cannot be assumed to be equal. Meaning: if the difference between a high syllable and low syllable for female speakers is on average 40 Hz, it does not mean that if the same syllable uttered by someone with a smaller range is only different with 20 Hz this should be regarded as unaccented. For this reason we need to in some way normalize the pitch of the participants in order to be able to compare them.

We cannot normalize based on the pitch range of each participant, like Tsurutani (2009) does, since this method assumes the participants already utters utilizing pitch accent, which for sentence level analysis works, but will *force* the occurrence of pitch patterns on word level. Therefore we will normalize the data by dividing the measured hertz of a syllable by the measured hertz of the preceding syllable. This will show how much a pitch rises or falls compared to the previous syllable, but in percent as opposed to hertz. This way we can compare utterances of different participants.

However, even though we normalize the pitch of all the participants, we still need to decide on how much percent two syllables need to be different in pitch before we can regard it as accented or not. For this we need to actually define a threshold that helps us determine how much percent higher or lower a syllable has to be compared to the other syllables in order to fit one of four pitch patterns. For this we will analyze the pitch of native speakers of Japanese (Tokyo Dialect), and see where the boundaries of each pattern lie. These results are shown in Table 3 below. The bottom row shows how much, according to the measurements, the difference between syllables has to at least be higher or lower for that specific syllable for that specific pattern (> for higher and < for lower). We will use the extremes and not the mean, since we are assuming all utterances are correctly intonated.

Unfortunately we were not able to find enough native Japanese speakers of the Tokyo dialect whom we could measure the pitch from in person. For this reason we had to rely on recordings found online on Forvo, a database with recordings of native speakers of among other languages also Japanese. Entries include information about the dialect of the recorded person, which are rated by other native speakers. The only problem with this was that all these recordings left out the particle, meaning we were not able to incorporate the accent of the *odaka* pattern in determining our threshold. However, looking at Figure 19, we see that the pitch fall for this particular pattern is the steepest of all patterns, which means this is actually not a problem.

Table 2

	Words compared	Speakers	Recordings
Atamadaka	3	9	11
Nakdaka	3	8	10
Heiban	3	8	13

Table 3

atama	**S2/S1**	**S3/S2**	***Naka***	**S2/S1**	**S3/S2**	***heiban***	**S2/S1**	**S3/S2**
1	0.90	0.82	1	1.22	0.61	1	1.23	1.02
2	0.92	0.62	2	1.29	0.69	2	1.07	0.97
3	0.92	0.59	3	1.21	0.69	3	1.21	0.99
4	0.83	0.71	4	1.31	0.57	4	0.98	0.97
5	0.83	0.85	5	1.37	0.65	5	1.10	1.02
6	0.82	0.81	6	1.15	0.79	6	1.01	0.97
7	0.80	0.76	7	1.27	0.67	7	1.07	0.97
8	0.87	0.69	8	1.19	0.73	8	1.31	0.97
9	0.66	0.76	9	1.19	0.66	9	1.00	0.96
10	0.87	0.75	10	1.19	0.78	10	1.12	1.01
11	0.91	0.72				11	1.14	0.99
						12	1.06	0.95
						13	1.18	0.98
min	**0.92 or <**	**0.85 or <**	**min**	**1.15 or >**	**0.78 or <**	**min**	**0.98 or >**	**0.95 or >**

Using the data from Table 3, we will determine the uttered pitch pattern of our participants based on the logic explained below.

1. If none of the differences between syllables fall below 0.95, the word is *heiban*.
2. If the difference between S2 and S1 is lower than 0.95, the word is *atamadaka*.
3. If S3 divided by S2 is less than 0.95, and S2 divided by S1 is more than or equal to 0.95, the word is *nakadaka.*
4. If S2 divided by S1 and S3 divided by S2 are higher than or equal to 0.95, and S4 divided by S3 is lower than 0.95, the word is *odaka*.

Since the accent in Japanese is divined by a sharp fall in pitch, we will not look at how perfectly the pitch patterns are mimicked, but if the largest fall in pitch should be considered to be enough or to be in the range of the inter-syllable pitch difference of the *heiban* pattern. For example, as shown in Table 3, the least amount of difference between S1 and S2 measured, is 1.15, meaning that S2 in this example is 15% higher than S1. However, as long as the sharp fall between S2 and S3 is enough, and S2 is not lower than S1 so that the fall crosses the threshold, we will consider the word to be *nakadaka*.

Likewise for *atamadaka*, looking at the utterances of the native speakers, we see that in all cases, S2 divided by S1 and S3 divided by S2 both fall rather sharply. However, for our participants, even if S3 and S2 are the same (S3 divided by S2 = 1), as long as S2 divided by S1 is lower than 0.95, we will consider it to be *atamadaka*.

6.2 Listening test

Whereas for the speaking experiment we are doing everything in order to invite the use of prior knowledge, may it be subconscious or not, we want to rule out the chance of interference by what participants think should be correct pitch accent, and want instead participants to focusing only on what they hear. For this reason we will also use carefully constructed nonwords. This list will also be 40 words long, 10 of each Japanese pitch pattern, followed by the topic marker particle in order to be able to distinguish between unaccented and accent on the ultimate syllable (Appendix II).

The students are presented with a recording of a native speaker of Japanese, which was instructed which words to pronounce using witch pitch-pattern. They will then be asked to notate where they think the accent is located. They will not be informed about the fact the words are not real Japanese words. Since accent in Dutch is signaled by a rise in pitch, intensity and lengthening of the stressed syllable, and in Japanese the opposite is true (i.e. not where the pitch rises, but falls) we have to give some instruction to the students in order to get data we can actually use. For example, if we do not specify the accent is where the pitch falls, there is a good chance students will focus on listening where the pitch rises. If we take *nakadaka* as an example, which looks like this: L[H]LL, even though the student might be perectly capable to notice the pitch fall after the H, he or she might answer the pitch to be in between the first L and H, since that is where the pitch rises.

Another piece of information that has to be given is the existence of non-accented words and the possibility for the pitch to occur everywhere in or around the word. This is because there is a good chance students will assume all words have accent somewhere which is not true for *heiban* words. Why we need to specify pitch can occur anywhere is because the previously mentioned possibility students will not recognize the particle as part of the word. Specifically mentioning pitch can occur between the particle and the final syllables would insinuate some of the asked words to have pitch at that spot, which will influence our data. However, without an attempt to hint at the possibility, there is a good chance students will automatically rule out accent before the particle (*odaka),* since having accent outside of a word makes no logical sense. With this and the above in mind, the following information was given to the students prior to the listening test:

- Japanese is a pitch-accent language, accent is signaled by a fall in pitch, and

- Pith can occur between any syllable, but does not have to occur.

Students were asked to notate where they think they here the accent with a line at the spot they think the accent is, or leave it blank if they think the word is unaccented.

6.3 Procedure

Participants will perform the speaking test first and the listening test right after. Participants were presented with the same words and audiofiles for both tests, however, the order of the words and audiofiles were randomized for each participant. For both the speaking test participants could pronounce every word as frequent as they liked, in which case the participant was told to have the right to choose which recording would be analyzed. This however did not occur once. In cases where a word was misread or not clearly audible, the author would make note of this. Participants were then asked to pronounce it again after finishing the whole list once. Recordings were analyzed using Praat. For each syllable the vowel's mean pitch was measured.

For the listening test participants were able to freely browse through the audio files and replay them as frequent as they would want. Audio files were numbered 1 to 40, corresponding to a transcription of each word in *hiragana* on paper. Participants were asked to mark the accent on that paper.

6.4 Possible outcomes

In theory these are the possible outcomes when we combine the data of both experiments:

1. Students are able to recognize pitch position and are overall producing correct pitch
2. Students are able to recognize pitch but not able to produce correct pitch,
    a. The produced pitch is influenced by the Dutch system, meaning there is a strong preference for penultimate stress.
    b. The produced is not correct Japanese, but also is not seemingly influenced by the penultimate default in Dutch.
3. Students are unable to overall recognize correct pitch position and also unable to produce correct pitch.
    a. The produced pitch is influenced by the Dutch system, meaning there is a strong preference for penultimate stress.
    b. The produced is not correct Japanese, but also is not seemingly influenced by the penultimate default in Dutch.
4. Students are unable to recognize correct pitch, but are able to produce correct pitch.

Outcome 4 seems very unlikely. It seems logical that in order to produce correct pitch without being trained to do so one would have to be able to recognize correct pitch first, in order to then mimic it. Option 3 would suggest deafness to pitch-position. Option 2 implies half of our hypothesis is true, and that Dutch L1 are not deaf to pitch. 2a would completely confirm our hypothesis. 3a would confirm L1 transfer, but the deafness to pitch would suggest acquiring correct pitch accent is very difficult. With regards to production 2b and 3b would suggest some form of interlanguage. Option 1 means students have no problem with either production or recognition.

7. Results

In this chapter we will show and discuss the results of both experiments in separate subchapters.

7.1 Participants

A total of eight students were willing to cooperate with our research. It was made sure the students all passed the language classes of the first year program of Leiden University's Japanstudies. Students with Japanese backgrounds, even though Dutch was their main language, were excluded, so were students who did not pass the language tests.

Of the eight participants, two were male (S4 and S6), the remaining six female. All participants were in their early twenties. Students were asked how much they listened and spoke Japanese on average per week over the course of the first year, combining time outside of university and in class. On average, they listened 2.4 hours and spoke 2.8 hours per week (Table 4).

Two of all the participants had never been to Japan. Five students have been to Japan for vacation before starting to study Japanese. Only one person had been to Japan on exchange for five months, where she studied Japanese, this person also had the highest grades, between 9 and 10 out of 10. Half of the students had grades between a 6 and 7 out of ten. The remaining three students had grades between 7 and 8 and 8 and 9. There seems to be no real correlation between grade and hours spent listening and speaking Japanese (Table 4).

Table 4

Person	Grade	Speaking (h/pw)	Listening (h/pw)
1 (F)	6~7	1	3
2 (F)	6~7	3	3
3 (F)	6~7	3	5
4 (M)	6~7	2	3
5 (F)	7~8	2	2
6 (M)	7~8	1	1
7 (F)	8~9	5	2
8 (F)	9~10	2	3
	avg	**2.4**	**2.8**

Students were also asked whether they had spent time studying Japanese accent. Students could pick a to d, where (a) was they had never thought about it, (b) that they had looked at it before, but not in detail, (c) that they had studied it in detail, but are not doing so anymore and (d) have and are still studying accent. All participants answered (b), which after a follow up question became clear went as far as having knowledge about the existence of minimal pairs in Japanese and how pitch rises at the end of a sentence to mark a question.

Finally, participants were asked about their language background. English proficiency is a given and German and French are taught in middle and high school. Because of this, three people answered they could speak and understand basic German. One student mentioned she had studied a little bit of Chinese before (S1). However, apart from one person, everyone was raised with Dutch as the language they speak at home. One did mention she speaks in dialect (Groningen) at home (S7). The one person who does not speak Dutch at home was raised speaking French with her family.

7.2 Listening test results

In this subchapter and the next we will refer to the different positions of where the accent could occur in the following manner:

Position 1 (P1): Between de first and second syllable, *atamadaka*
Position 2 (P2): Between de second and third syllable, *nakadaka*
Position 3 (P3): Between de third and the topic marker syllable, *odaka*
Position 4 (P4): blank, *heiban*

The students will be referred to as S followed by a number from 1 to 8.

Let us first look at how much each student answered correctly. Since for each position we have 10 words, the numbers in Table 5 are the amount of questions answer right out of 10.

Table 5

Pattern/Student	S1	S2	S3	S4	S5	S6	S7	S8
Atamadaka (P1)	5	10	9	5	8	3	9	7
Nakadaka (P2)	9	10	8	7	9	8	10	9
Odaka (P3)	5	10	0	0	0	0	4	6
Heiban (P4)	5	10	10	3	10	8	9	10
Total	24 (60%)	40 (100%)	27 (67.5%)	15 (37.5%)	27 (67.5%)	19 (47.5%)	32 (80%)	32 (80%)

What is immediately striking is that out of eight students, only half of the students got correct answers for P3. However, if we look at the amount each position was answered by each student, we see that the students with zero correctly answered P3 questions have also not once given a P3 answer for any of the other positions (Table 6). The numbers represent how many times the student has answered a position over the course of the whole listening test, which since there were 40 questions, all add up to 40 in total.

Table 6

Pattern/Student	S1	S2	S3	S4	S5	S6	S7	S8
Atamadaka (P1)	9	10	10	14	9	5	9	8
Nakadaka (P2)	17	10	18	19	21	15	16	13
Odaka (P3)	6	10	0	0	0	0	6	7
Heiban (P4)	8	10	12	7	10	20	9	12
TOTAL	40	40	40	40	40	40	40	40

After a short interview with the students after both tests, it became clear that most students did not think the accent could fall between the end of the word and the topic marker. Therefore, even though they might have correctly heard the change in pitch on P3, there is a good chance they chose a different answer based on that they thought it would not make sense to have an accent behind a word. Looking at Table 4, we notice that not only did the students who did not answer P3 once, S1 and S7, also mistook P2 for P3 in most questions. Two out of four students who did answer P3 in the test asked the author if it is possible to have accent on that position in the midst of the test, to which he answered yes. Only one of the students of these three (S7) did not ask, but on own accord answered P3 multiple times.

Table 7

odaka word	S1	S2	S3	S4	S5	S6	S7	S8
tekade	3	3	2	2	2	4	2	3
techigu	3	3	2	2	2	4	3	2
tsumike	2	3	2	2	2	2	2	2
kudoya	3	3	2	1	2	4	2	3
numara	3	3	2	2	2	4	2	3
akisa	4	3	1	2	2	2	2	4
okota	2	3	2	4	2	4	3	4
akase	2	3	2	2	2	4	3	3
kakuma	3	3	2	1	2	2	3	3
kedake	2	3	2	2	2	2	2	3
P2 out of wrong answers	4 out of 5 (80%)	0	9 out of 10 (90%)	7 out of 10 (70%)	10 out of 10 (100%)	4 out of 10 (40%)	6 out of 6 (100%)	2 out of 4 (50%)

Therefore, even though there seems to be a strong preference for P2 in the listening test, this might on one hand be because of the participants picking P2 over P3 because P3 seemed illogical.

For the above mentioned reasons, Table 3 raises the assumption the participants did not achieve very convincing results. Six out of eight scored over 60%, of only three with very convincing results (100%, 80% and 80%), 2 scored below 50%. However, if we take out the *odaka* words out of the equation, the scores are more convincing. No participant scored below 50%, five above 85%, of which four 90% and higher.

Table 8

Pattern/Student	S1	S2	S3	S4	S5	S6	S7	S8
Atamadaka (P1)	5	10	9	5	8	3	9	7
Nakadaka (P2)	9	10	8	7	9	8	10	9
Heiban (P4)	5	10	10	3	10	8	9	10
Total	19 (63%)	30 (100%)	27 (90%)	15 (50%)	27 (90%)	19 (63%)	28 (93%)	26 (86%)

Figures 17, 18 and 20 also show how overall the participants do not have any difficulty with a specific pattern. The overall scores for *atamadaka* words are not as high as the scores for *nakadaka* and *heiban* words, with 16% for the *nakadaka* pattern. This might suggest distinguishing *atamadaka* from *nakadaka* is harder than other patterns, however, also because *nakadaka* words were not very much mistaken for *atamadaka* words the support for this interpretation is not very strong.

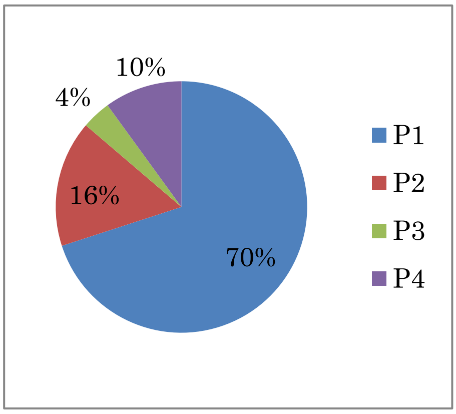

Figure 5 P1 words

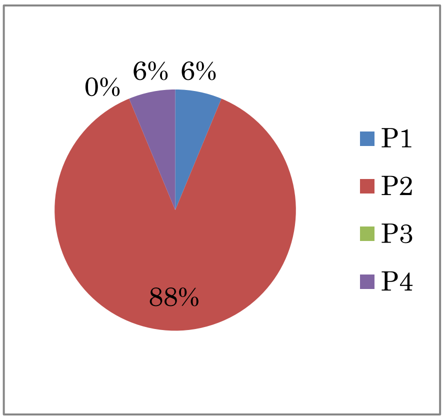

Figure 6 P2 words

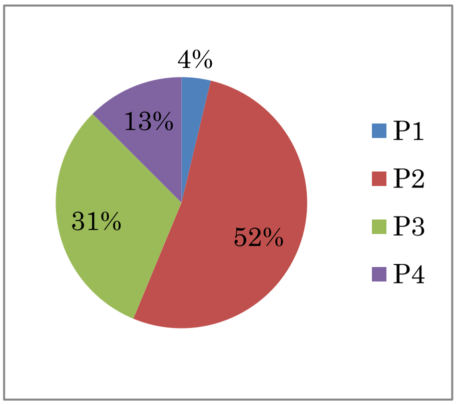

Figure 7 P3 words

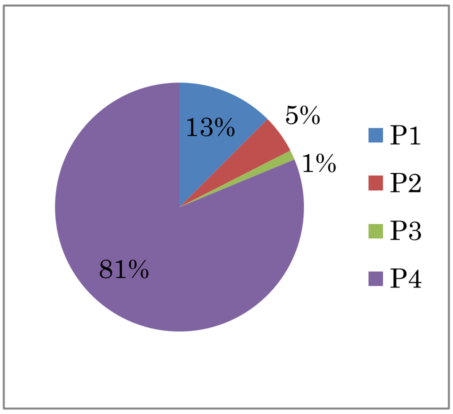

Figure 8 P4 words

We can also not just ignore the four participants who did answer P3 on multiple occasions. They even asked the author if it was possible to have accent at that position, suggesting that logic tells them to doubt this possibility, but clearly hearing the pitch drop there. If we then look at what percentage these four participants, we see that they overall scored 63%. This is considerably lower than P1 words (70% correct), but it is also rather far over 50%.

Table 9

Pattern/Student	S1	S2	S7	S8	Overall
Odaka (P3)	5	10	4	6	25
Total Correct	50%	100%	40%	60%	63%

7.3 Speaking test results

For the speaking test we ended up with close to 1,280 data entries (40 words with each 4 syllables for 8 participants). However, since what we are eventually interested in, and are, as argued earlier, only able to actually compare are the normalized pitches (i.e. syllable divided by preceding syllable). This should leave us with 960 entries. Something we bumped into, which should have been foreseen however, is the devoicing of the vowel of *chi* in *chikara* and *shi* in *keshiki,* resulting in *chkara* and *keshki*. This happened 5 out of 8 and 6 out of 8 times respectively. For this reason, these two words (*chikara* being *odaka* and *keshiki* being *atamadaka*) will be removed from our data. The same happened with the vowel of *fu* in *fukuro*, however, this only occurred twice. For this reason we will keep this data. There were also a few other occasions where the pitch could not be correctly analyzed. However, this had to do with the audio files, and could not be explained by any linguistic phenomenon. The results are presented in Table 10. The words that could not be analyzed are shown as an X.

Table 10

	S1	F		S2	F		S3	F		S4	M		S5	F		S6	M		S7	F		S8	F	
	2/1	3/2	4/3	2/1	3/2	4/4	2/1	3/2	4/4	2/1	3/2	4/4	2/1	3/2	4/4	2/1	3/2	4/4	2/1	3/2	4/4	2/1	3/2	4/4
P1																								
megane	1.04	0.82	1.20	0.92	0.93	0.97	0.94	0.94	1.16	0.94	0.90	0.48	1.00	0.93	0.53	1.21	0.96	1.01	0.86	0.89	1.02	1.00	0.87	1.20
hanabi	1.00	0.72	1.16	0.98	0.91	1.02	0.93	0.92	1.32	1.06	0.87	0.58	1.04	0.62	1.39	1.07	0.81	1.08	1.08	0.86	1.03	0.97	0.92	1.16
midori	0.94	0.85	1.18	0.94	0.94	1.24	0.96	0.81	1.32	1.02	0.91	0.92	1.06	0.92	0.00	1.14	1.00	0.98	0.96	0.83	0.97	1.04	0.95	1.06
deguchi	1.01	0.77	1.40	0.97	0.86	1.12	1.05	0.89	1.19	1.12	0.58	0.59	1.04	0.88	0.93	1.13	0.80	1.11	1.09	0.84	1.00	1.03	0.92	1.08
namida	1.06	0.61	1.32	0.91	0.90	1.02	0.99	0.62	2.03	1.03	0.88	0.50	1.08	0.91	0.93	1.08	0.98	1.00	0.95	0.82	1.04	1.00	0.99	1.23
kazoku	0.99	0.86	1.08	0.92	0.68	0.87	0.92	0.89	0.69	1.00	0.89	0.90	1.03	0.89	0.98	1.06	0.96	1.03	0.92	0.86	1.05	0.93	0.99	1.18
karera	0.96	0.74	1.19	0.88	0.60	1.28	0.88	0.83	1.28	1.17	0.84	0.46	1.08	0.92	0.92	1.04	1.12	1.08	1.15	0.79	0.95	0.92	0.94	1.38
hatachi	1.12	0.84	0.82	1.02	1.00	0.93	1.09	0.93	1.25	0.99	0.00	-	1.01	1.02	0.87	0.94	0.00	-	1.21	0.78	0.91	1.01	0.96	0.98
keshiki	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
ongaku	0.93	1.00	0.89	0.93	1.02	0.89	0.89	0.91	1.27	0.80	0.88	0.75	0.91	1.01	0.95	1.00	0.00	-	0.78	0.96	1.22	0.90	1.00	0.97
P2																								
okashi	1.11	0.89	1.21	1.06	0.91	0.78	1.02	0.94	1.13	-	-	-	1.03	0.97	0.93	1.02	1.10	1.12	1.04	0.97	1.01	1.10	0.94	1.22
kotae	0.98	0.77	1.30	1.01	0.83	1.06	1.00	0.92	1.44	2.29	1.00	0.80	1.01	0.92	0.95	0.91	0.96	0.97	-	0.83	1.06	0.97	0.95	1.08
bengoshi	1.07	0.98	1.07	1.06	0.94	1.00	0.98	0.95	1.39	0.89	0.98	0.53	1.12	0.91	0.58	1.08	0.97	1.02	1.20	0.78	0.93	1.04	0.00	-
biyōshi	1.19	0.80	1.15	0.99	0.98	0.86	1.07	0.92	1.21	0.95	0.88	0.94	1.06	1.01	0.89	1.01	0.52	2.13	1.13	0.87	0.92	1.02	1.02	1.03
reizōko	1.12	0.79	1.23	0.97	0.67	1.35	1.04	0.89	1.42	1.04	0.76	0.47	1.01	0.91	0.59	1.02	1.02	1.03	0.81	0.95	1.06	0.96	0.92	1.21
tanjōbi	1.10	0.78	1.16	0.91	0.34	0.68	0.99	0.89	1.04	1.48	0.87	0.41	0.95	0.93	0.97	1.03	1.04	1.04	0.94	0.84	1.03	0.89	0.92	1.16
anata	1.14	0.92	1.18	0.99	0.95	1.04	0.98	0.41	1.20	1.04	0.84	0.49	0.96	0.96	0.96	1.04	1.12	0.97	1.06	0.84	0.94	0.98	0.91	0.92
tamago	0.99	0.80	1.03	0.84	0.88	0.98	0.96	0.90	1.13	1.06	0.96	0.63	1.03	0.61	0.77	1.09	0.84	1.19	1.09	0.84	1.01	1.09	0.92	1.11
hikōki	1.29	0.76	1.04	0.92	0.84	0.49	1.02	0.86	0.95	0.95	0.38	0.94	1.01	1.00	0.89	1.01	0.97	1.02	-	0.40	0.99	1.09	0.92	1.10
midori	-	0.82	0.78	0.99	0.91	0.91	0.87	0.89	1.19	1.21	0.88	0.79	1.08	0.92	0.87	0.96	1.11	1.04	-	0.93	1.05	0.94	1.00	1.06
P3																								
sashimi	0.97	0.80	1.10	0.97	0.90	1.01	1.14	0.85	1.07	1.15	0.91	0.40	1.10	0.86	0.96	1.19	0.97	1.09	1.15	0.87	1.00	1.03	0.93	1.00
chikara	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
otoko	1.04	0.95	1.06	0.99	0.91	0.89	0.98	0.94	1.37	1.09	0.36	1.88	1.03	0.93	0.48	0.92	0.88	1.14	0.95	0.88	1.07	0.94	0.98	1.14

fukuro	-	0.76	1.34	-	0.81	0.99	0.96	0.60	1.80	0.84	0.72	1.02	0.97	0.90	0.49	0.81	0.90	1.12	1.04	0.85	1.03	0.96	0.82	0.94
musume	1.05	0.87	1.06	-	-	-	1.05	0.84	1.12	1.24	0.85	0.44	1.05	0.88	0.95	1.17	0.93	1.03	1.03	0.84	1.03	1.01	0.91	1.20
yasumi	0.95	0.84	1.07	1.05	0.90	0.91	1.66	0.88	1.38	0.82	0.88	0.59	1.27	0.88	0.89	1.04	1.06	1.01	1.23	0.85	0.86	-	-	-
tokoro	0.98	0.84	1.27	1.00	0.90	0.93	0.92	0.71	0.61	0.95	0.80	0.79	0.99	0.89	0.56	1.10	0.96	1.04	0.88	0.89	1.05	-	-	-
ichido	1.03	0.86	1.33	1.02	0.89	0.91	0.93	0.92	1.45	2.83	0.80	0.47	1.04	0.86	0.95	1.07	0.94	1.00	0.83	0.89	0.95	0.97	0.94	1.07
hiruma	0.88	0.81	1.32	1.00	0.92	1.06	0.95	0.94	0.43	1.04	0.77	0.49	0.99	0.87	1.01	1.02	1.06	1.33	0.98	0.85	1.08	1.03	0.87	1.14
otōto	1.33	0.65	1.11	1.03	0.62	1.44	1.08	0.65	1.59	1.06	0.50	0.65	0.97	0.91	0.63	1.01	1.02	1.04	1.07	0.87	0.89	1.02	0.91	1.05
P4																								
katachi	1.03	0.84	1.05	1.00	0.96	0.92	0.98	0.97	1.16	0.84	1.08	0.95	1.00	1.02	0.93	1.10	0.81	1.06	1.22	0.82	0.89	1.04	0.93	0.94
kimono	0.91	0.83	1.09	0.91	0.93	1.03	1.11	0.74	1.27	1.18	0.93	0.91	1.00	0.86	0.89	1.05	0.86	1.04	1.07	0.79	0.96	0.97	0.93	1.05
owari	1.02	0.99	1.20	1.00	0.98	0.95	0.64	0.57	2.29	0.99	0.93	0.85	0.96	1.02	0.99	0.98	1.16	1.09	1.09	0.84	1.01	1.03	1.01	0.89
ushiro	1.13	0.84	0.97	1.03	0.82	1.07	1.13	0.81	1.13	-	0.87	0.45	0.94	0.83	0.56	1.22	0.94	1.05	1.05	0.74	0.96	1.05	0.90	1.00
hidari	0.96	0.94	1.03	0.98	0.93	0.71	0.94	0.98	0.98	0.97	0.92	0.90	1.04	0.89	0.96	0.84	0.98	1.05	1.08	0.86	0.92	0.96	0.96	1.22
sakana	0.99	0.90	1.15	1.00	0.90	0.93	0.99	0.73	0.65	1.07	0.83	0.45	1.01	0.92	0.00	1.09	1.01	1.06	1.12	0.82	0.93	0.95	0.90	1.12
ichigo	1.03	0.77	1.22	1.00	0.83	0.95	0.99	0.89	1.24	-	0.92	0.00	1.06	0.91	0.95	0.89	0.90	1.03	0.85	0.86	0.96	0.90	0.88	1.48
watashi	1.15	0.95	1.10	0.95	1.09	0.80	1.03	1.05	0.87	1.11	0.94	0.88	1.05	1.00	0.92	1.02	1.04	1.05	1.13	0.79	0.94	0.96	1.00	1.05
sakura	0.97	0.89	1.06	1.00	0.44	1.93	1.01	0.78	1.02	0.91	0.83	0.43	1.07	0.82	0.88	1.07	0.94	1.11	0.66	1.14	1.15	0.95	0.93	1.09
tonari	0.83	0.93	1.22	0.89	0.55	1.67	0.91	0.88	1.33	0.99	0.86	0.47	0.95	0.97	0.96	1.01	0.84	1.14	0.87	0.83	1.07	0.93	0.94	0.99

A '1' in Table 6 means the syllables do not change in pitch, a value higher than 1 (>1) means the second syllable is higher than the previous syllable. Lastly, values lower than 1 (<1) means the preceding syllable is higher than the second syllable (Figure 21).

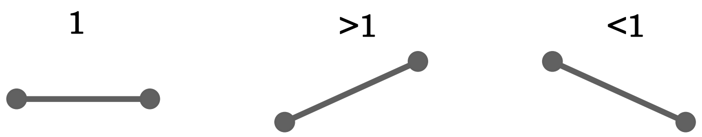

Figure 9

Using our previously stated threshold to determine pitch accent, we get the following results per word per participant (Table 11). In this table, 1, 2, 3 and 4 represent *atamadaka, nakadaka, heiban* and *odaka* respectively. The amount of correctly intonated tokens is given per person, per pitch pattern. It is given in total too at the bottom of the table, but this will be given in percentages. Lastly, the patterns division for that pattern is given per participant in grey per pitch pattern and overall. Tokens that were not analyzable are marked as X and in calculating the percentage of each position these were left out of the equation, as well as *chikara* and *keshiki.* The eventual amount of analyzed tokens in the equation per participant is given below in the tokens column (40 minus amount of X's, *chikara and keshiki*).

Table 11

P	Word	S1	S2	S3	S4	S5	S6	S7	S8
atamaaaaa	*megane*	2	1	1	1	2	4	1	2
	hanabi	2	2	1	2	2	2	2	2
	midori	1	1	2	2	2	4	2	2
	deguchi	2	2	2	2	2	2	2	2
	namida	2	1	2	2	2	4	2	4
	kazoku	2	1	1	2	2	4	1	1
	karera	2	1	1	2	2	4	2	1
	hatachi	2	3	2	2	3	1	2	4
	keshiki	-	–	–	–	–	–	–	-
	ongaku	1	1	1	1	1	2	1	1
	correct	2	6	5	2	1	1	3	3
	P1%	22%	67%	56%	22%	11%	11%	33%	33%
	P2%	78%	22%	44%	78%	78%	33%	67%	44%
	P3%	0%	11%	0%	0%	11%	0%	0%	0%
	P4%	0%	0%	0%	0%	0%	56%	0%	22%
nakadaka	*okashi*	2	2	2	X	3	4	4	2
	kotae	2	2	2	3	2	1	X	2
	bengoshi	4	2	2	1	2	4	2	2
	biyōshi	2	3	2	2	3	2	2	4
	reizōko	2	2	2	2	2	4	1	2
	tanjōbi	2	1	2	2	1	4	1	1
	anata	2	2	2	2	4	4	2	2
	tamago	2	1	2	3	2	2	2	2
	hikōki	2	1	2	1	3	4	X	2
	midori	X	2	1	2	2	4	X	1
	Correct	8	6	9	5	5	2	4	7
	P1%	0%	30%	10%	22%	10%	10%	29%	20%
	P2%	89%	60%	90%	56%	50%	20%	57%	70%
	P3%	0%	10%	0%	22%	30%	0%	0%	0%
	P4%	11%	0%	0%	0%	10%	70%	14%	10%
odak	*sashimi*	2	2	2	2	2	4	2	2
	chikara	-	–	–	–	–	–	–	-
	otoko	2	2	2	2	2	1	1	1

	fukuro	X	X	2	1	2	1	2	2
	musume	2	X	2	2	2	2	2	2
	yasumi	1	2	2	1	2	4	2	X
	tokoro	2	2	1	2	2	4	1	X
	ichido	2	2	1	2	2	2	1	2
	hiruma	1	2	1	2	2	4	2	2
	otōto	2	2	2	2	2	4	2	2
	correct	0	0	0	0	0	0	0	0
	P1%	25%	0%	33%	22%	0%	22%	33%	14%
	P2%	75%	100%	67%	78%	100%	22%	67%	86%
	P3%	0%	0%	0%	0%	0%	0%	0%	0%
	P4%	0%	0%	0%	0%	0%	56%	0%	0%
heiban	*katachi*	2	3	4	1	3	2	2	2
	kimono	1	1	2	2	2	2	2	2
	owari	4	3	1	2	4	4	2	3
	ushiro	2	2	2	X	1	2	2	2
	hidari	2	2	1	2	2	1	2	4
	sakana	2	2	2	2	2	4	2	2
	ichigo	2	2	2	X	2	1	1	1
	watashi	4	1	3	2	3	4	2	4
	sakura	2	2	2	1	2	2	1	2
	tonari	1	1	1	2	4	2	1	1
	Correct	2	0	1	0	2	3	0	2
	P1%	20%	30%	30%	25%	10%	20%	30%	20%
	P2%	60%	50%	50%	75%	50%	50%	70%	50%
	P3%	0%	20%	10%	0%	20%	0%	0%	10%
	P4%	20%	0%	10%	0%	20%	30%	0%	20%
total		S1	S2	S3	S4	S5	S6	S7	S8
	Tokens	36	36	38	35	38	38	35	36
	Correct	33%	33%	39%	20%	21%	16%	20%	33%
	P1%	17%	33%	32%	23%	8%	16%	31%	22%
	P2%	75%	56%	63%	71%	68%	32%	66%	61%
	P3%	0%	11%	3%	6%	16%	0%	0%	3%
	P4%	8%	0%	3%	0%	8%	53%	3%	14%

Table 12 is the data of all participants combined, with the amount each pattern (top column) has been uttered per pitch-pattern (left column). Figure 22 shows the overall division of uttered pitch patterns.

Table 12

	P1	P2	P3	P4
Atamadaka	32%	56%	3%	10%
Nakadaka	16%	61%	8%	15%
Odaka	19%	73%	0%	7%
Heiban	23%	56%	8%	13%

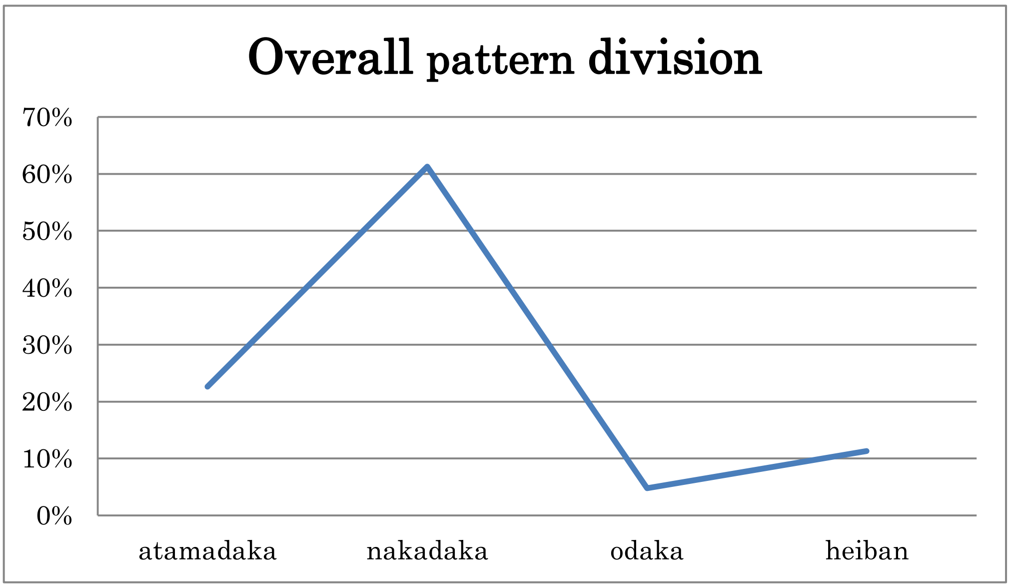

Figure 10

If we look at 4/3 column of each participant in Table 7, we notice that six out of 8 participants tend to stress the topic marking particle (values considerably higher than 1). Given the speaking test was done before the listening test, where three out of four students who answered P3 first asked if accent could occur at that spot, we can assume that at the point of the speaking test, students were not aware the particle and the lexical item form a prosodic-word. This leads us to argue that, at least at the time of the speaking test, students did not consider "lexical item+particle" to be a quadrisyllabic word, but rather to be a trisyllabic word combined with a particle, which can form its own accent pattern. This means that the *nakadaka* pattern (L[H]L) is in essence the same as penultimate stress in Dutch and *atamadaka* (H]LL) to be akin to antepenultimate stress.

We also immediately notice that overall participants performed considerably poor in the speaking test, 39% being the highest score. Additionally, out of eight participants, seven show strong tendencies towards *nakadaka*, which we have argued is equivalent to Dutch penultimate stress, hinting at strong L1 interference. This tendency seems unaffected by the actual pitch-pattern of the words, since in Table 12 the P2 column shows P2 is over 50% for all pitch-patterns. The tendency is strongest for *nakadaka* and *odaka* words (61% and 73%), but less strong for *atamadaka* and *heiban*, (both 56%) Only one participant (S6) seems to deviate from this tendency, showing preference for mostly *heiban*. This will be discussed later in this chapter.

Analyzing the *atamadaka* row in Table 11, we notice something peculiar. Namely, all students show an unwavering tendency towards *nakadaka* (penultimate stress), except for S2 and S3. Both S2 (67% P1 vs 22% P2) and S3 (56% P1 vs 44% S2) show tendencies not different from the other students for other pitch patterns, but only for *atamadaka* words do they seem to utter with mostly proper accent. Referring to the survey, we learn that S3 has, based on the participant's personal estimate, spent the longest time listening to Japanese (5 hours per week). Speaking time per week was estimated to be 3 hours per week, which is a little above average. S2 has filled in 3 hours weekly for speaking, as well as listening. S2 mentioned she is raised bilingual, speaking French at home, but French has fixed word final stress, so this should not have any impact on the results.

Both S2 and S3 scored very high in the listening test. S2 scored 100%, including *odaka* words. S3 scored 90%, without *odaka*. However, other students also scored as well as S3 or even better. In other words, all we can say is that for unknown reasons S2 and S3 outperformed other students when it comes to *atamadaka* words, but since they did as poor at the other patterns, it does not seem to suggest they have acquired correct Japanese pitch-accent better than the other participants.

Let us now turn to the values of the tokens we have determined to be *heiban* and *odaka.* Table 11 shows in what category the tokens belong based on where the pitch falls. However, we have already argued the participants treat the particle (syllable 4) as not part of the word, which means that the tokens that are shown to be *odaka* (3 in the Table) should actually be treated as coincidences, which makes them *heiban*. In addition, it is possible that, some of these *heiban* tokens would be perceived as a word with ultimate stress based on the Dutch stress accent system. In Figure 23 is shown which tokens in our data pool fall into the *heiban* category (after arguing *odaka* is coincidental and is actually *heiban*) based on Japanese accent theory and have ultimate stress in Dutch theory.

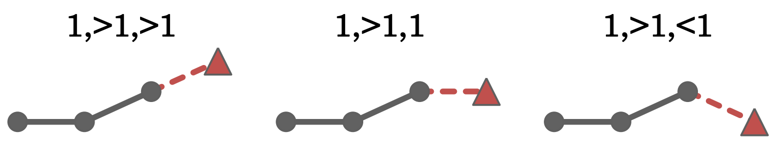

Figure 11

Together with the patterns shown in Figure 24, which are also *heiban* in our table, but do not have ultimate stress according to Dutch rules, these all the ten possible patterns the tokens assigned to be *heiban* can have in Table 11. Note the triangle represents the particle, which we consider to not be assumed to be part of the word by the participants.

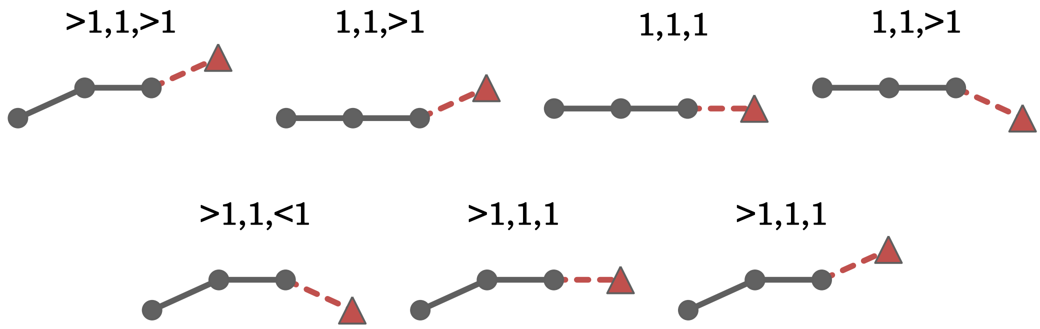

Figure 12

In order to determine to what extent participants show a tendency towards ultimate stress, we will have to count to what extent the patterns in Figure 23 occur in Table 11. with 3/2 being considerably higher than 1. What we find is that this only happens six times, five times by S6 (*karera, okashi, anata, midor* and *owari*) and once by S7 (*sakura*). Overall this this is 2% of all tokens, which shows virtually no tendency towards ultimate stress in our data pool.

With *odaka* out of the equation, let us again look at the distribution of the (now 3) Japanese pitch patterns of our data pool (Table 13 and Figure 25). We have previously stated the seemingly overall stronger tendency to *atamadaka* for *atamadaka* words was due to S2 and S3, for which we could not find any logical explanation. What we then notice is that for some reason the tendency towards *nakadaka* (and low tendency towards *heiban*) is higher for *odaka* words (73%). The logical explanation would be that the selection of our *odaka* words accidentally is composed of words that according to Dutch rules are even more often likely to get penultimate accent. There are multiple factors that could cause this if we refer to Oostendorp en Kohnlein (2016, p. 9-10).

1. If the penultimate is heavy, stress cannot be on the antepenultimate,
2. If the penult is closed, it will be stressed,
3. If the ultimate and penult are both open, the penult will be stressed,

or the opposite is happening: the selection of words of the other three patterns draw the tendency away from the penultimate which could be explained by:

4. If the ultimate is closed and the penult is open, the antepenultimate will have stress, which in our case would show up as *odaka* (P1). (van Oostendorp en Kohnlein 2016, p. 10)

However, only one word in the *odaka* list has a heavy penultimate, as opposed to four words in the *nakadaka* list, which are also together the only five words of 40 that have a heavy penult, which rules out option 1. In addition, none of all 40 words have a closed penultimate or ultimate syllable, which rules out 2, 3 and 4. In other words, we cannot explain the proportionally high tendency towards *nakadaka* for the *odaka* words, nor can we explain the higher tendency towards *atamadaka* for *heiban* words.

Table 13

	P1	P2	P3	P4
Atamadaka	32%	56%	0	13%
Nakadaka	16%	61%	0	23%
Odaka	19%	73%	0	7%
Heiban	23%	56%	0	21%

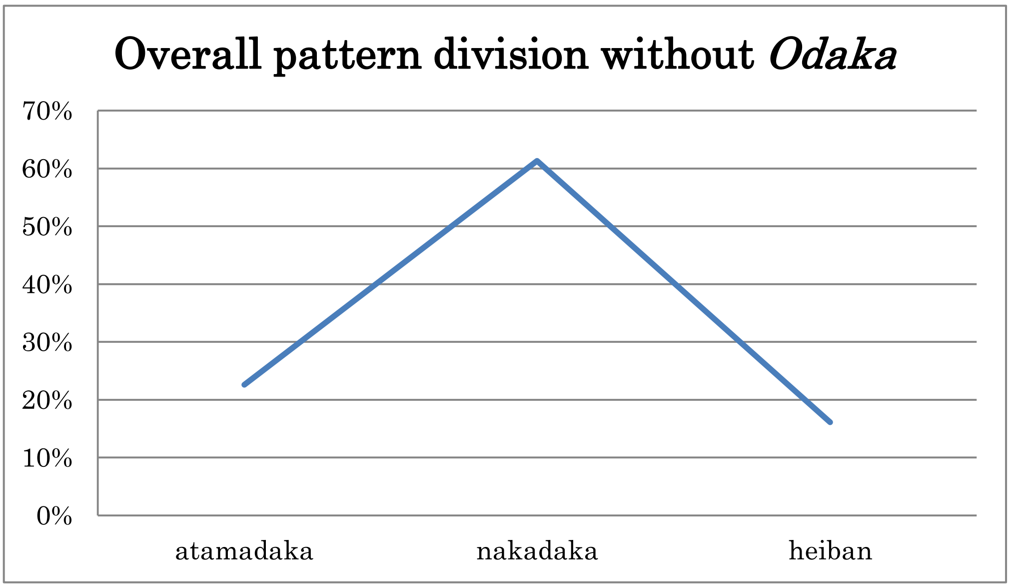

Figure 13

Since Oostendorp en Kohnlein (2018) found around the same percentage for antepenultimate stress in trisyllabic words, this still very much shows strong interference of Dutch in Japanese intonation. Therefore, all we have left to explain is the frequent occurrence of *heiban* words. This was especially the case for S6, of whom the preferred pattern was *heiban* (overall 56%) and has cause the overall percentage of *heiban* to go up by 7%. However, other participants also produced *heiban* patterns on a few occasions. We have previously mentioned that this is not influenced by ultimate stress in Dutch, which are also placed in the *heiban* category. The percentage of words that would be considered to have ultimate stress in our data according to Dutch rules is only 2%. Obviously, this can also not be explained by L1 interference then, since Dutch does not know unaccented words. Nor does this tendency seem influenced by lexical structure, since apart from *watashi* and *owari,* (5 out of 8 of the participants produce *heiban* intonation for both of these words) the words which are uttered with *heiban* intonation seem random. Tsurutani (2009) found the same thing in her research, looking at prosodic transfer on the sentence level by English L1 learners of Japanese. She argues this is a strategy to deal with uncertainty of where to put the accent, since Japanese tends to be perceived as monotonous compared with English. (Tsurutani, 2009) It is possible S6, who also scored comparatively low in the listening test, could out of uncertainty chosen for this tactic for the course of the whole speaking test, and the other students might have done so as well, but only for those few occasions.

8. Conclusion

We have argued Hu (2015) only shows the ability to recognize two utterances' pitch. Based on our findings it is safe to say Dutch L1 learners are able to do even more, which is correctly determine where exactly the pitch falls in a Japanese word. We have also been able to, to some extent, find evidence that the deafness for pitch on the final syllable as argued by Hu (2015) is not true. However, more research is needed to indefinitely show this. Reason being, we were very careful not to insinuate anything with the explanation of the listening task. The information we did gave away with regards to the possible positions for pitch in Japanese showed to be not enough to suggest pitch to be possible in between the particle and the final syllable of the word. The other half did score above 50%, but this is only for people, which is too small of a group.

Some possible reasons for the good performance of Dutch L1 are given by Hu (2015 p. 40-41). The partial lexicality, as mentioned also by van Oostendrop & Kohnlein (2016) has as an effect for minimal pairs like voorNAAM and VOORnaam that stress on either syllable only activates that particular lexical item, and not the other. (VOORnaam, does not activate voorNAAM). Another reason given by Hu (2015) is that Dutch L1 might relate the pitch patterns of Japanese to the nuclear pitch accent countours in the Dutch intonation system.

For the speaking test we have found sufficient support to argue strong influence of the Dutch accent system on the production of Japanese words. However, we also found that two of eight students for unknown reasons were considerably accurate with *atamadaka* words. Furthermore, we found that participants showed words stronger preference for the *nakadaka* pattern (which we have argued is the same as Dutch penultimate stress in our results) with *odaka* words, for which we ruled out all logical explanations. Finally we saw some preference for *heiban*, which is cannot be due to influence from Dutch, but is possible due to uncertainty and the believe Japanese is relatively monotonous. For this argument we referred to Tsurutani (2009)

L1 transfer for accent is not a new discovery, however, in our research we have not come across literature that looks at the ability to recognize and produce at the same time. Referring back to the possible outcomes of our experiments in chapter 5, we have shown that Dutch L1 are able to recognize pitch but not able to produce correct pitch, the produced pitch is influenced by the Dutch system, meaning there is a strong preference for penultimate stress. This confirms our hypothesis. This being said, we have to ask ourselves: is the L1 transfer on accent on the lexical level not just due to lack of knowledge of the accent system of the target language, which in this case is Japanese.

Sadly, we do have to acknowledge the amount of data we have been able to gather is relatively little. According to the participants, there were around 70 first year students at the start of the year, of which surely a large percentage did not meet the requirements for being able to take part in our experiments (passing grade for the language courses), this assumption is based on anecdotal evidence of the author, as well as the participants. In addition, by the time we starting collecting data, classes were over, which as a result meant we could not visit a language class and invite students directly, but had to approach people through the internet. However, overall we did not succeed in gathering enough people that fit the requirements, despite participants trying to persuade their fellow students and a notification on the online learning environment, Blackboard, directed to all first year students.

Bibliography

Aarts, F. (1982). The Contrastive Analysis Debate: Problems and Solutions. *Studia Anglica Posnaniensia, 14,* 47-68.

Beckman, M. (1986). *Stress and Non-Stress Accents.* Dordrecht, the Netherlands: Foris Publications. http://dx.doi.org/10.1515/9783110874020

Cutler, A. (1986). Forbear is a homophone: Lexical prosody does not constrain lexical access. *Language and Speech, 29,* 201-220.

Dupoux, E., Peperkamp, S., Sebastián-Gallés, N. (2001). A robust method to study stress 'deafness': *Journal of Acoustical Society of America, 89,* 412-424. https://doi.org/10.1121/1.1380437

Eckman, F. (1977). Markedness and the contrastive analysis hypothesis. *Language Learning, 4,* 18-30.

Hu, S. (2015). *Cross-linguistic perception of Pitch Position* (Master's thesis, University of

Utrecht, Utrecht, the Netherlands). Retrieved from https://dspace.library.uu.nl/handle/1874/320440

Kubozono, H. (2006). *Akusento no Hōsoku* [The principles of accent]. Tokyo: Iwanami Shoten.

Lado, R. (1957). *Linguistics Across Cultures: Applied Linguistics for Language Teachers.* Ann Arbor: University of Michigan Press.

Rasier, L., P. HIligsmann (2007). Prosodic transfer from L1 to L2. Theoretical and methodological issues. *Nouveaux cahiers de linguistique francaise 20,* 41-66.

Sluijter, A., & van Heuven, V. (1996). Acoustic correlates of linguistic stress and accent in Dutch and American English. *Proceeding of Fourth International Conference on Spoken Language Processing. ICSLP '96.* (pp. 630-633). Philadelphia, USA: IEEE. 10.1109/ICSLP.1996.607440

Tanaka, S. & Kubozono, H. (1999). *Nihongo no hatsuon-kyōshitsu: Riron to renshū* [Introduction to Japanese pronounciation: Theory and practice]. Tokyo: Kuroshio Shuppan.

Tsurutani, C. (2009). *Intonation of Japanese sentences spoken by English speakers.* Retrieved from https://www.researchgate.net/publication/45109430_Intonation_of_Japanese_sentences_spoken_by_English_speakers

Vance, T. (2008). *the Sound of Japanese.* Cambdrige: Cambridge University Press.

Van Oostendorp, M. Köhnlein, B. (2018). *Where is the Dutch Stress System? Some New Data.* Unpublished article.

Van Oostendorp, M. Köhnlein, B. (2016). *Where is the Dutch Stress System?* Retrieved from http://ling.auf.net/lingbuzz/003061

Appendix I

Words used for the speaking test

1. MEGANE
2. HANABI
3. MIDORI
4. DEGUCHI
5. NAMIDA
6. KAZOKU
7. KARERA
8. HATACHI
9. KESHIKI
10. ONGAKU
11. OKASHI
12. KOTAE
13. BENGOSHI
14. BIYOUSHI
15. REIZOUKO
16. TANJOUBI
17. ANATA
18. TAMAGO
19. HIKOUKI
20. MIDAORI
21. SASHIMI
22. CHIKARA
23. OTOKO
24. FUKURO
25. MUSUME
26. YASUMI
27. TOKORO
28. ICHIDO
29. HIRUMA
30. OTOUTO
31. KATACHI
32. KIMONO
33. OWARI
34. USHIRO
35. HIDARI

35. SAKANA
36. ICHIGO
37. WATASHI
38. SAKURA
39. TONARI

Appendix II

Words used in the listening test, together with what pitch pattern they were recorded.

atamadaka	SAKADO
	SHIMISA
	OROKO
	KARISSA
	KADARA
	UWARA
	OKOTA
	KARUKA
	IKADA
	OTAKA
nakadaka	AMEDO
	TANASU
	SUREDE
	TSURUJI
	RUSAJI
	KATERA
	TASHIWA
	ZOKUDA
	METARE
	MADARE
odaka	TEKADE
	TECHIGU
	TSUMIKE
	KUDOYA
	NUMARA
	AKISA
	OKOTA
	OKASE
	KAKUMA
	KEDAKE
heiban	ROKAMA
	RAKUSE
	SEKARE
	KAREMA
	SERIMA
	KAJIRA
	OKAJI
	OJIMA
	OKISE
	MASERA