NEW TYPOLOGY OF JAPANESE COMPOUND ACCENTS AND AN ANALYSIS IN OPTIMALITY THEORY

By

SI CHEN

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By

Si Chen

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Chair: Caroline Wiltshire
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This paper explores a new typology of compound accents in Japanese, containing nine basic structures, and analyzes prefixes and complex compounds containing more than three words using these basic structures. Data of Japanese compound accents were collected from dictionaries and websites. Japanese native speakers were recorded reading all the data. Based on the recorded accent, further analysis has been done in assigning accent markers. After investigating the accent patterns through all different length categories and the various original accent patterns of the component words in isolation, common characteristics involved in word, monophrasal and biphrasal levels are proposed which form the basis of the new typology.

In the later analysis, an OT (optimality theory) approach is provided to account for the assignment of the optimal accent pattern for a given input. Different levels of constraints such as MAXIOω (accent), MAXIOΦ (accent), ACCENTω and ACCENT Φ correspond to distinct levels of the internal structure of compounds. More specifically, three constraints are proposed to account for the deaccentuation phenomenon. Constraints on the phonology-syntax interface are used to account for the difference between left-branching and right-branching compounds. My analysis accounts for the internal structure of compounds and redefines and associates different
levels. More exceptions can be explained by this approach, and the OT analysis is more complete for deaccentuation phenomenon and for compounds with distinct structures.
CHAPTER 1
BACKGROUND

Introduction

The accent patterns of standard Japanese have been an interesting topic since as early as the 1960s. In Japanese, similar to tone languages, accent is assigned to almost every word, but it is not found in tone languages. There are only level tones in Japanese, while tone languages can also have contour tones.

The accents of compounds are not easily predicted by phonological rules because compounds may have different structures influenced by semantic or pragmatic information\(^1\) (Vance, 1997). Previous research by McCawley (1977), Tsujimura (1987), Kubozono (2001) and Oda (2006) dealt well with the accent patterns of compounds at the word level. They agree that the length of N\(_2\) (the second member of a compound) will affect the accent location. Most of them agree that when N\(_2\) is long (three morae and more), the accent will fall on the first mora of N\(_2\) and when N\(_2\) is short (two morae or fewer), the accent will fall on the final mora of N\(_1\) (the first member of a compound). Ito and Mester (2007) made use of this difference in the length of N\(_2\) and proposed the concept of the junctural accent, which is a default position where compound accents will fall. This position is at the boundary of N\(_1\) and N\(_2\), either the final mora of N\(_1\) or the first mora of N\(_2\). Oda (2006) analyzed the structural difference between short and long N\(_2\). Kubozono, Ito and Mester (1997) notice the different levels of compounds: word level and phrasal level. Ito and Mester (2007) have further divided the levels into word, monophrasal and biphrasal compounds, where junctural accent is the only standard to distinguish word and phrasal levels. The length of N\(_2\) determines if the compound is in the word or phrasal level.

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\(^1\) In Vance’s (1997) review of Kubozono’s (1993) book, biphrasal compounds are described as more likely to be used by speakers in careful speech. If a speaker has a “pragmatic focus” on the compound, then the whole compound or part of it are more likely to be biphrasal.
This thesis further investigates accent patterns in Japanese compounds and explores nine basic structures of compounds which may affect accent patterns. A more complex standard is set up based on characteristics of the three levels (word, monophrasal and biphrasal levels). As this standard reflects the internal association between these levels and through the change of accent location, the change across these levels is also demonstrated, such as the change from a monophrasal compound to a word compound. This standard can account for the exceptions such as *kuda’mono* “fruit” which does not have a junctural accent but is predicted to have one according to the standard in Ito and Mester (2007). Also, compounds containing N2 of more than four morae are predicted to have no junctural accent by Ito and Mester (2007) while *taimingu* “timing” and *akusento* “accent” are exceptions to this prediction, which can be handled using my standard. My analysis also provides a new typology and accounts for the difference between left-branching and right-branching compounds. More complex structures and prefixes which have never been analyzed for different levels are analyzed based on basic structures within the typology.

For the OT analysis, constraints from different levels are proposed to deal with cases of junctural accent and accent retention. As for deaccentuation phenomenon, in which the whole compound loses its compound, I propose a new constraint IDENT O-Iω (accent) which explains why final accented N2 will trigger deaccentuation. Previous research on this topic will be mentioned later in this chapter. I also proposed two constraints in Chapter 4 to account for the structure of data in “2+2” phenomenon proposed by Oda (2006).

In Chapter 1, the basic facts of Japanese accent are introduced, with a summary of previous analyses and an overview of the proposed analysis of compound accents. Chapter 1 also summarizes previous research on the difference between word and phrasal accents and a special
phenomenon called deaccentuation, as well as previous analyses done in OT (Prince and Smolensky, 1993).

Chapter 2 deals with the typology of compound accents and proposes nine basic structures for word, phrasal and biphrasal structures. Data are presented after each type. Some of the data were collected through the two dictionaries “Shinmeikai Nihongo Akusento Ziten (2001)” and “NHK Nihongo Hatuon Akusento Ziten (1998)”. Other compound data were collected through the Internet and read by four Japanese native speakers. I confirmed some of the data from the dictionary with the native speakers. They were asked to judge the appropriateness of the compounds, and inappropriate compounds were deleted. I detected the location of the pitch-fall throughout the data and confirmed some locations with the native speakers. The accent markers on single words and some compounds are written in the dictionaries. Some of the Rendaku (sequential voicing in compounds) changes can be found in the dictionary and others were confirmed with the native speakers. Based on the nine basic structures, some complex structures can be built to predict the placement of the accent marker. In the following chapters, data from other researchers will be cited, and the rest of the data are all collected by the author and can be founded in Appendix A.

Chapter 3 analyzes every typical structural pattern mentioned in Chapter 2 using an OT approach, and Chapter 4 discusses the advantages of the new typology and some remaining issues for further research.

Background

Basic Facts of Japanese Accent

While syllables can account for phonological structures in English, the notion of mora plays an important role in analyzing Japanese phonological structure. A mora can be a vowel or a CV. It can also be the first part of a long consonant, a geminate, and the syllable-final nasal /n/.
For example, in the word *ansin* “not worried”, there are four morae *a, n, si, n.* A long vowel such as *oo* contains two morae. (Tsujimura 2007).

Japanese is a pitch-accent language which bears a tone on each mora. Unlike tone languages, the tonal pattern can be predicted given the location of an accent. The accent marker “*” generally indicates a pitch fall in different analyses. In this paper, the “ ’ ” will be used for convenience to indicate the accent marker. For example, in the word *so’ra* “sky”, the accent is located at the first syllable on the vowel *o*, and the word has a tonal pattern of high-low. If the accent is located at the second mora, as is in *koko’ro* “heart”, the tonal pattern is low-high-low. If the accent is on the third mora, the tonal pattern would be low-high-high. Moreover, if there is no accent, the whole word would be low-high-high. All these types can be predicted by rules found in the analyses of McCawley (1968, 1977), Haraguchi (1977) and Bennett (1981).

While tones are assigned to morae, a syllable bears an accent, so pitch-fall will not occur after a coda: N(nasal),Q(a long consonant) or a long vowel, and any rule that tries to assign an accent to the coda will fail. The accent will move to the vowel before the nasal or to the middle of a long vowel (Iwasaki 2002). For example, in the word *tenki* “weather”, the accent is assigned as in *te’nki* instead of *ten’ki*.

McCawley, Haraguchi and Bennett have slightly different rules for the association of tones. McCawley’s pitch assignment rules initially make every mora high pitched. Then he assigns low tones after the accented mora, and finally he assigns a low tone to the first mora if the second one is high pitched (McCawley, 1977).

Haraguchi generated the placement of tone through four steps involving four rules. The basic tone HL is associated with the CV tier according to the rules in order: Tone Associate Rule (TA), Universal Tone Association Convention (UTAC), Initial Lowering (IL) and Tone
simplification (TS). Haraguchi argued that the first step is to associate the high tone to a vowel with an accent mark or to the rightmost vowel in cases where there is no accent mark. After the application of UTAC, the initial lowering rule is applied to assign a low tone to the first mora with no underlying accent. The last step is to eliminate contour tones by delinking the second tone associated with the same vowel Haraguchi (1977).

Unlike Haraguchi, Bennett (1981) analyzed Japanese accents on two levels: accent foot (@) in a phonological word and an accent marker (*) in one morpheme. As shown in Figure 1-1, she uses a left-branching tree to derive accent patterns. She argued that within @, H is assigned to the right node, otherwise L is associated with the right node.

![Figure 1-1. Bennett’s analysis of accent markers and tone assignment](image)

Haraguchi (1991) analyzed the accent patterns on single words including nouns, verbs and adjectives. The accent of nouns is usually assigned to the antepenultimate mora by rules. Loanwords and compound nouns also have this tendency. Adjectives and verbs can either have an accent or not. The accent will fall in “the final vowel of the stem”. He also specified his analysis based on the length of nouns. The accent of short nouns cannot be predicted while long accented noun words tend to have the accent in the antepenultimate mora. When a high vowel is
devoiced because it appears between two voiceless consonants or word finally after a voiceless consonant, the accent will be shifted to the left. For example, the word on gaku’ kai “music concert” will become onga’kUkai; however, the accent on the initial mora will shift to the right from hu’kaku to hUka’kU “deep”.

An Overview of Compound Accents

The formation of compound nouns has been investigated intensively. In McCawley’s (1968) analysis, the second noun in a compound (N2) has a dominant role in determining the accent of the whole compound regardless of the first noun (N1). Most later analyses also follow this approach. Long compounds and short compounds are divided based on the length of N2. A word is considered short if it is only made of one or two morae, and it is considered long when it has three or more morae (McCawley, 1968).

Though analyses of compound rules vary, they basically accounted for unaccented compounds and similar accent positions in compounds: the first syllable of N2, the last syllable of N1, the accent position retained in N2. Different analyses for these cases are shown by the following.

I. The accent of the whole compound will be assigned on the first syllable of N2:

McCawley (1977) when:

• N2 is long (having at least three morae)
• N2 is a Sino-Japanese word
• N2 is final accented or completely unaccented;

Tsujimura (1987) when:

• A long N2 is unaccented or has an accent on the penultimate or final mora;

Oda (2006) when:

• N2 is long.
II. The accent will be on the final syllable of N1

Kubozono (2001) when:

• If N2 is short and has an accent on the final syllable or is unaccented.

Oda (2006) when:

• N2 is short.

III. The whole compound has the accent at the same position as N2:

McCawley (1977)

• In other cases except for I and IV;

Kubozono (2001)

• In other cases except for I and II.

IV. The whole compound would be unaccented:

McCawley (1977) when:

• N2 is short and the final mora is accented

Oda (2006)

• In other cases except for I and II.

A more detailed summary of the different analyses mentioned above is provided below.

McCawley (1968) proposed three cases of noun compound formation. In the first case, the whole compound has the accent in the same position as in isolation, N2 such as in genzi “genzi (name)” + monoga’tari “story” = genzi-monoga’tari ‘Tale of Genzi’. Kubozono proposed some exceptions to this rule including certain morphemes such as hi’mé, which do not follow the rule above: sirayuki “white snow”+hi’me “princess”=sirayuki’hime “Princess Snow White” (Kubozono, 2001). In McCawley’s second case, when long N2 is a Sino-Japanese word or has at least three morae and is final accented or unaccented, the accent of the whole compound will be
assigned to the first syllable of N2. He gives some examples: *no’ogyoo* “agriculture” + *kumiai* “union” = *noogyo-ku’miai* “agriculture union”, *inaka* “country” + *musume’* “daughter” = *inakamu’sume* “country girl”. In McCawley’s third case, when N2 is short and final accented, the whole compound loses its accent.

In order to explain some exceptions such as *ka’buto* “helmet” + *musi* “bug” = *kabuto’musi* “a beetle”, which bears an accent on the last syllable of N1 instead of being unaccented, he proposes an underlying preaccented ‘musi so that the accent of the whole compound is dominated by the accent of N2 as in the first case (McCawley 1977). However, to assume an underlying preaccented N2 may not explain other cases. Higurashi (1983) gave some examples: *sato* “hometown” + *’koko’ro* “heart” = **sato’gokoro** “homesickness”, correct: *satogo’koro*; *yude’ (ru)* “boiled” + *tama’go* “eggs” = **yudetama’go** “boiled eggs’ correct: *yudeta’mago* Higurashi (1983).

Tsujimura (1987) also analyzed long compound formation rules:

1. For a compound whose second member has an accent in the penultimate or the final mora, the accent of the whole compound is assigned to the first mora of N2.

2. For a compound whose N2 is not assigned an accent, the accent of the whole compound is assigned to the first mora of N2 such as *ni* “load” + *kuruma* “car” = *ni gu’ruma* “cart”.

Kubozono (2001) divided compounds into long and short ones. For long compounds, the accent of the whole compound will be the same as the original accent of N2 unless N2 has its accent in the final syllable. If the accent of N2 is in the final syllable or N2 is unaccented, the whole compound will be assigned a new accent on the final syllable of N1. Also in short compounds, the accent will appear in the final syllable of N1 such as *ka’.bu.to* “helmet” + *mu.si* “bug” = *ka.bu.to’.mu.si* “a beetle”.

Oda (2006) proposed that there are three patterns of compound accent placement. The first is that N2 retains its accent. The second is that if N2 is long, the original accent will be at the left
edge of N2, otherwise, it will move to the end of N1. The third possible case is for the compound to be unaccented. He did not specify the condition for N2 to retain its accent or shift.

Oda distinguishes between word compounds and extended-word compounds to avoid the arbitrary difference between short and long compounds. He based his analysis on the five following assumptions and gave the internal structure of short and long N2: short N2 can only form a single foot while long N2 will always form more than one foot.

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<tbody>
<tr>
<td><img src="image.png" alt="Diagram of Short N2 structure" /></td>
<td><img src="image.png" alt="Diagram of Long N2 structure" /></td>
</tr>
</tbody>
</table>

Figure 1-2. Oda’s analysis of short and long N2 structures

1. **Assumption 1** Prosodic constituents should be parsed in the leftward direction and the unit of parsing should be a mora.

2. **Assumption 2** Parsing has to follow the Strict Layering Hypothesis (Selkirk, 1984), which prohibits a prosodic level that is not dominated by a unit in the immediate level above. It means that the node in the top level can only dominate the middle level which can only dominate the bottom level. However, the top level node cannot directly dominate the bottom level.

3. **Assumption 3** Parsing should be maximally binary, not to have more than two branches.

4. **Assumption 4** Parsing is also morphologically sensitive.

5. **Assumption 5** Minimality requirement in Japanese Itô (1990)
   a. Minimal Stem Requirement: Min (STEM) = F = [μμ]
   b. Minimal Word Requirement: Min (WORD) > σ

His analysis focused on the different inner structures in short and long compounds based on the above assumptions.
Early Studies on Word and Phrasal Compounding

Kubozono, Ito and Mester (1997) noticed five grammatical limitations on compounding. Two members in a compound may retain their own accents if they do not combine phonologically as a prosodic word, which is treated as compounding in the phrasal level by Ito and Mester (2007). Kubozono et al. gave five scenarios where semantic relations may cause two words not to combine as a word compound:

1. Certain prefixes such as ze’n “before” and bo’o “certain”\(^2\). However, if each member has no more than two morae, the compound will have one combined accent.

2. Two members are in an equal status. For example, ha’ku syu kassai “clapping hands and acclaiming” retain their own accents.

3. Two members have a subject-object relation. For example, ka’zi tetuda’i “helping of chores”

4. Names plus titles such as ku ri’n ton daito’oryoo “President Clinton”

5. Family names and first names such as yu’kawa hi’deki. However, if the internal structure of a name is not considered, the whole name can bear one accent.

If two parts of a compound refer to the same content such as N1: content N2: label, N1: last name N2: first name, N1: name N2: organization, or N1: title N2 name such as ka’wase ha’kase “Dr. Kawase”, they tend to be biphrasal compounds which retain their accents on both N1 and N2. The semantic information described here is also considered in my definition in Chapter 2.

Kubozono et al. also argued that Japanese has the tendency to block combining of the accents of two members in right branching compounds. They pointed out that N2 with more than 5 morae or three-morpheme Sino-Japanese words tend to keep their accent pattern, namely, to remain unaccented or to have the accent at the same position as the words in isolation.

\(^2\) All the long vowel “ou” in the Japanese data are represented as oo for consistency, even if the source used ou.
They believed that in a compound word, the accent of the two members are dependent, even if the two do not bear accents, and the whole compound will have at most one. By contrast, in a phrase, the accent of both members is independent and will not change. Some phrases may undergo the process of becoming a compound, for example, *eriza be su* “Elizabethan” + *zyoo’o* “queen” = *eriza besu zyoo’o* or *erizabe suzyoo’o* “Queen Elizabeth”. The affix connecting two members in a word may cause the accent on the first member to disappear, and this helps keep the accent of N2. This is similar to compounds in the de-accentuation pattern.

In order to account for the similarity between 5 morae and three-morpheme Sino-Japanese words, Kubozono introduces the standard of counting in feet. Two morae or a Sino-Japanese morpheme can constitute one foot. For words of five morae and three-morphemes, there are at least three feet.

When N2 is less than or equal to two feet, the whole compound is a word compound. For three-foot N2, accent pattern of N2 will be retained. For N2 with more than three feet, the accent of each of the two members will be retained (Kubozono et al. 1997). Oda (2006)’s analysis on short and long compounds correspond to the word compound level in Kubozono et al. (1997)’s research. Different length within word compounds may result in different accent locations.

**Deaccentuation**

Oda (2006) proposed three puzzles concerning deaccentuation phenomena in compounds:

First, finally accented N2 may cause the whole compound to be deaccented (McCawley 1968: 168).

Second, when the whole compound consists of four light syllables and N2 has two light syllables, the whole compound tends to be deaccented.

Third, if N2 is long, the whole compound will never be deaccented.
He labeled the second puzzle as the “2+2 deaccentuation”: with the same N2, a compound will have an accent in the antepenultimate position when its N1 is long, but it is realized with no accent when its N1 is bimoraic (with exceptions such as hi’me “princess”).

At the first glance, “2+2 deaccentuation” seems to be against the common assumption that N1 is invisible. Internal structure mapping may explain the invisibility of N1. Here is an example of garasu-dama “glass ball” given by Oda to illustrate that N1 is mapped as a whole with no concern about its internal structure (ψ means foot stem).

Oda proposed conditions on compounding that an accent must appear for compounds that have a culminating point (the point at the top node of the structure) of extended prosodic word and stated that the 2+2 phenomenon is not in contrast with the invisibility of N1 because the structure of N1 is visible but often ignored. The ‘2+2’ structure does not have a culminating point of an extended prosodic word as follows:
Figure 1-4. Oda’s analysis of the word “kuro neko”

It is different from a structure with a culminating point “ω+” of an extended Prwd such as the following structure:

Figure 1-5. Oda’s analysis of the word “hosi awabi”

Most of the research on compound accents above does not distinguish between word compounds and phrasal compounds. Almost everyone agrees that the assignment of accent relies on the length or the structure of N2. In the above overview of previous research, little attention has been given to the original accent on N2 and its role in determining the accent pattern. The generalization is missing that N2 with an original accent on the first mora will almost always retain it regardless of the length of N2. Even if a N2 is considered to be long or short, it may not behave as the rules predict because deeper structure is involved. Recent research, especially that in an OT approach, paid more attention to the comparison of the accent input and the output. In
later chapters, I develop a typology considering both the length, structure and the original accent of N2 as well as the structure of the whole compound.

**Analysis in an OT Approach**

Kubozono (1995) has done an OT analysis of Japanese compounds and has proposed five constraints:

1. **PARSE (accent):** N2 should retain its accent
2. **NON-FINALITY (μ’σ’):** Accents should not be assigned in the final mora or syllable in a prosodic word.
3. **Non-finality (F’):** No final accented foot in a prosodic word.
4. **ALIGN-CA:** The accent should be aligned either left or right to the N1-N2 boundary.
5. **Rightmostness:** The accent should be assigned to the right edge of a prosodic word.

He gave the ranking as “NON-FINALITY (μ’σ’) >> PARSE (accent) >> NON-FINALITY (F’), ALIGN-CA >> RIGHTMOSTNESS”.

Sino-Japanese morphemes are exceptions to compound rules such as in yo.ya.k<u> “reserved” + se’k<i> “seats” = yo.ya.k<u>’. se.k<i> “reservation”. Kubozono explained that SJ words behave as if they are monosyllabic, and if the final “i” in seki is invisible to the above rule, then SJ words will not be an exception. Kubozono hence proposed a constraint NON-FINALITY (μ’σ’) to solve this problem. This prohibits a final accent in the final foot so that the problem of SJ exceptions can be explained.

After the first analysis in the OT approach by Kubozono, Tanaka (2001) has concluded, based on previous research, that there are three primary characteristics of Japanese compounds. First, the accent on N2 is usually retained or a new accent will occur on the first mora of N2. Second, accent on the final syllable or mora is avoided. Finally, for short N2, namely one or two morae, an accent will occur just before the N1-N2 boundary, otherwise it will occur immediately.
after it. These three properties may be in conflict when accent needs to appear before the boundary and N2 needs to retain its accent.

Tanaka revised Kubozono’s generalization and pointed out that compound accent is usually assigned to the penultimate foot unless preservation is needed in foreign, archaic native and Sino-Japanese heads. Accordingly, Tanaka based his constraints on Kubozono’s MAX (accent), which requires the accent of the head root to be retained; ALIGN-L (σ’,root), which requires the accented syllable to align to the left edge of a head root; and ALIGN-R (PrWd, σ’), which requires the alignment between the right edge of a prosodic word and that of the accented syllable.

Tanaka explained that MAX (accent) accounts for unaccented words better than PARSE (accent) in the case of unaccented N2. ALIGN-L (σ’,root) emphasizes the head which can be N1 in mimetic words. ALIGN-R (PrWd, σ’) is better because of its gradient property, and it can be applied among many languages.

For native words such as ningyo ’hime “doll princess”, the accent cannot occur on the first mora of “hi’me” because it violates NON-FINALITY (μ’σ’F’), which ranks higher than MAX (accent) according to Tanaka.

For Sino-Japanese words, some final accented words are still parsed but there are also unparsed variations such as niho ’n “Japan” +zi’n “person” = nihonzi’n or niho ’nzin “Japanese people” Tanaka argued that NON-FINALITY (μ’σ’F’) and MAX (accent) are re-rankable. For foreign compounds, the ranking is almost always MAX (accent) >> NON-FINALITY (μ’σ’F’) with some exceptions of nativized loanwords such as su’upaa “super” +ma’n “man” = suupa’aman “superman”.

25
Tanaka explained all the data using the constraints mentioned above. For foreign (parsed), MAX (accent) ranks higher than NON-FINALITY ($\mu'\sigma'F'$) so that N2 can retain its accent. For some variations in archaic native and Sino-Japanese words, MAX (accent) and NON-FINALITY ($\mu'\sigma'F'$) are rerankable. For general and nativized foreign words MAX (accent) ranks higher than NON-FINALITY ($\mu'\sigma'F'$). For quadrimoraic heads, MAX (accent) and ALIGN-L ($\sigma'$, root), which requires the left edge of an accented syllable to align to the root, ensure that the winner will have its accent on the left edge of N2 mora.

Tanaka gave three cases where the de-accentuation phenomenon occurs: final-accented N2, quadrimoraic words and words with both conditions met.

For this phenomenon, Tanaka proposed a new constraint called NON-FINALITY (PrWd$'$) which forbids the accent to occur on the final prosodic word. So the constraint ranking is revised as below (the dotted lines are an indication of rerankable constraints):

![Constraint Ranking](image)

**Figure 1-6. Constraint ranking by Tanaka (2001)**

In this ranking, there are three pairs that can be re-ranked because Tanaka’s analysis does not distinguish different compound structures. It can be improved by using different constraints to analyze different structures, namely, the basic nine types presented in Chapter 2. In my analysis in Chapter 3, I split the constraint “MAX (accent)” into different levels to deal with both
word and phrasal compounds separately. Tanaka proposes the constraint “NON-FINALITY (PrWd’)” in order to account for the deaccentuation phenomenon. However, this constraint is violated by almost every candidate and thus is not so convincing. My OT analysis approaches this problem by using the constraint IDENT O-Iω (accent) which requires the accent to stay in N2.

Except for compounds undergoing deaccentuation, there is no constraint in this ranking to reflect the fact that most compounds need at least one accent regardless of their structure. The data show that a constraint is needed to account for this generalization, and Chapter 3 provides a more specific explanation.

The above sections provide an overview of Japanese accents on single words and compounds and the OT analyses proposed to date. Except for the level of word and phrasal compounds mentioned in Kubozono et al. (1997), most previous research has focused more on word level. In the following discussion, I introduce recent research on dividing the compounds into three levels by Ito and Mester (2007). Following that, I redefine the three levels and provide a new typology for further analysis on complex structures in Japanese compounding.
CHAPTER 2
NEW TYPOLOGY AND COMPLEX STRUCTURES

Current Typology

Ito and Mester (2007) proposed three basic categories for Japanese: intonation group (ι), phrase (Φ) and word (ω). The internal structure of compounds may cause different accent patterns. Apart from these three categories, relational projections are defined: “maximal (Φ/ω)/minimal (Φ/ω) projection is the highest/lowest element in a projection.” It is argued that Japanese can have only one accent in each phrase (Φ) because the phrase has only one head for pitch accent (Ito and Mester 2007).

Ito and Mester classified compounds into word compounds and phrasal compounds. Only in a word compound can a junctural accent occur. The standard for distinguishing a word compound from a phrasal compound lies in the length of the second member. If the second member contains more than four morae, then the whole compound has to be parsed as a phrasal compound (Ito and Mester 1997).

Monophrasal and biphrasal compounds do not allow any junctural accent to happen according to Kubozono (1988). In a word compound, a junctural accent is placed in Figure 2-1.

![Junctural accent diagram]

Figure 2-1. Junctural accent

However, the position of the junctural accent may coincide with the original N2 accent. For example, in the biphrasal compound *yu’kawa hi’deki* “Yukawa Hideki (name),” the original
accent of N2 is on the junctural position. So on the surface, finding an accent in the junctural position may not be a perfect standard to determine whether a compound is a word or a phrasal compound. Although Ito et al. (2007) argued that N2 under four mora should form a word compound, the compound *a'ka* “red” + *ke* “hair” = *akage* “red hair”, does not have a junctural accent and should be an exception. The “2+2” structures also contain a N2 that is less than four mora such as *tabi* “travel” + *hito* “person” = *tabibito* “traveler”, without any junctural accent.

Moreover, since N2 with more than 5 morae should form a phrasal compound, no junctural accent should occur, as is given in Ito and Mester (2007). However, in the word *hoogen*a'kusento* “dialect and accents”, there is an accent in the juncture position which coincides with the original accent on *a'kusento* “accent”. Another exception to this analysis is the word *tenka ta'imingu* “the timing of the sparks”. The N2 of this compound has five morae, which should stay unaccented according to Ito and Mester’s analysis, however, the junctural accent occurs since *taimigu* is originally unaccented.

The following table shows the typology Ito and Mester proposed. In this table, the square ■ represents the minimal projection, and the round shape ○ represents the maximal projection. The symbol “r” represents the phenomenon of Rendaku. Rendaku is a phenomenon that happens in compounding where the first consonant, if it is an obstruent, of the second word becomes voiced after being combined into a compound. For example, *iro* “color” and *kami* “paper” combines to form *irogami* “colored paper” where the consonant “k” becomes the voiced “g” (Tsujimura 2007). Rendaku can only occur at the place of a “+r” but not “-r”. The word on the right branching usually has the “+r”.

![Table](image-url)
Table 2-1. The typology of compounds by Ito and Mester (2007)

<table>
<thead>
<tr>
<th>Word Compounds</th>
<th>Phrasal Compounds</th>
</tr>
</thead>
<tbody>
<tr>
<td><img src="image" alt="Word Compound Diagram" /></td>
<td><img src="image" alt="Phrasal Compound Diagram" /></td>
</tr>
</tbody>
</table>

According to Kubozono, Ito and Mester (1997), the crucial factor that determines whether a compound is a word compound or phrasal compound is the length of N2. However, it is apparently not true for biphrasal compounds since even if N2 contains fewer than 4 morae, there is no junctural accent. For *minami amerika asupara’gasu* “South American asparagus”, the derivation steps are:

<table>
<thead>
<tr>
<th>Input</th>
<th>Output</th>
<th>Rules</th>
</tr>
</thead>
<tbody>
<tr>
<td>Step 1 minami +amerika</td>
<td>minami a’merika</td>
<td>junctural accent</td>
</tr>
<tr>
<td>Step 2 minami a’merika+asupara’gasu</td>
<td>minami amerika asupara’gasu</td>
<td>deaccentuate N1</td>
</tr>
</tbody>
</table>

It is clear that N1 *minami amerika* “South America” is deaccented because it is originally *minamia’merika* “South America”. When attached to a 5 morae word *asupagashu*, N1 undergoes deaccentuation, and the whole compound is thus a monophrase. For words with fewer
than 5 morae, such as *bi’iru “beer”, they usually have an original accent on the first mora. So in a left branching compound minami amerika bi’iru “South America beer”, one cannot be certain if it is a word compound with a new junctural accent on N2 or if it is a monophrasal compound which retains its original accent. I will treat it as a monophrasal compound in the OT approach section, to make it parallel with the “South American asparagus” case, which must be a monophone.

Words exceeding 4 morae can be more easily identified as monophones because they can have an original accent on a position other than the first mora. Thus when N1 is added, although N1 is deaccented, the compound accent will not occur in the default position as the new accent for a compound word, while N2 retains its own accent as seen in asupara’gasu “asparagus” and minami amerika asupara’gasu “South American asparagus”.

Words of fewer than four morae can also have an accent on a position other than the first mora. In compounding, those words will also retain their accents, such as kuda’mono “fruits” and ore’nzi “orange” where no junctural accent will appear.

(1) mu’ “without” + nooyaku “pesticides” + kuda’mono “fruits” = muno’oyaku + kuda’mono = munooyakukuda’mono “organic fruits”

(2) amerika + sa’n + ore’nzi = amerikasan+ ore’nzi = amerikasan ore’nzi “American oranges”

Since the junctural accent does not occur as in *munooyaku ku’damono “organic fruits”, it is a phrase and not a word compound. The derivation steps are as follows:

<table>
<thead>
<tr>
<th>Input</th>
<th>Output</th>
<th>Rules</th>
</tr>
</thead>
<tbody>
<tr>
<td>Step 1 mu + nooyaku</td>
<td>muno’oyaku</td>
<td>junctural accent</td>
</tr>
<tr>
<td>Step 2 muno’oyaku + kuda’mono</td>
<td>munooyakukuda’mono</td>
<td>deaccentuation of N1</td>
</tr>
</tbody>
</table>
If it were a biphrasal compound, then it should be * muno’oyaku kuda’mono “organic fruits”. This is because the two lexical items in the input of step 2 should have retained their accents. So we can say that it is a monophrase with an N2 of only four morae.

The phenomenon of Rendaku (sequential voicing) has something to do with compound structure as shown in the typology table above. Rendaku usually happens in word compounds. However, the occurrence of Rendaku cannot guarantee the identity of a word compound. There are variations to word compounds and monophrasal compounds (Kubozono 1995, 1997). Monophrasal compounds can also have Rendaku.

Rendaku does not happen in a predicate-argument relation such as sakana turi “fishing”. Biphrasal compounds usually happen in words having a predicate-argument relation as in ka’zi “chores”+tetu’dai “helping”= ka’zitetu’dai “helping with chores”. Rendaku usually occurs in N2 of word compounds, but not always. For example, the compound sakana “fish”+turi “catch” =sakana’turi “fishing”, (data from Sugioka (1986)) has the characteristics of a word compound because the accent falls on the last mora of N1 which is a “junctural accent”. However, if it is a word compound, then Rendaku should appear according to the prediction of Ito & Mester (2007). On the contrary, if a compound shows the characteristics of a biphrasal compound, Rendaku will not occur between two phrases.

Tanaka points out that the version of the accent on N2 being retained in compounds is archaic, which means that the second type in the output such as densyo ba’to and koomori ga’sa is archaic as follows (Tanaka 2001):

(3) densyo “transferring messages”+hato “pigeon”= densyo’bato/densyo ba’to “homing pigeon”
(4) ko’omori “bat”+ka’sa “umbrella”= koomori’gasa/koomori ga’sa “black umbrella”
(5) hidari “left”+uti’wa “Japanese fan”= hidariu’tiwa /hidari uti’wa “comfortable life”
He did not treat these variations with different compound structures. But they can actually be analyzed as having different compound structures: word compounds or monophrasal compounds, so there is a trend for these words to change from a monophrasal compound to a word compound. In English, a similar phenomenon called lexicalization can occur, where a phrase may lose its internal phonological structure. For example, the phrase ice ’cream may lose its stress on the word “cream” and the stress is assigned on “ice” because the whole phrase enters into the lexicon and becomes “’ice cream”. In Old English, lexicalization may happen so that the whole compound may be fused into a word such as “earwig< OE ear’+wicga ‘one that moves’ ” Brinton (2005). In French, syntactic phrases can be lexicalized with a pattern of “A+N” and “N+A”, such as saint-bernard “St Bernard Dog” and table ronde “round table meeting” (Mathieu-Colas 1996). In Dutch, phrases become compounds frequently as well, such as sneltrein “fast train” (Schlucker 2008).

In Japanese, there can be variations as in mono “things”+hosi’ “drying” =monoho’si/ monohosi’ “frame for drying clothes”. The compound mono hosi’ is a biphrasal compound which retains its accent pattern on N1 and N2. If it is a word compound, N2 final accent should cause the whole compound to be deaccented. Thus, the fact that the accent occurs on monoho’si is still unexplained.

No Rendaku happens in the monohosi “dried clothes” because of the predicate-argument relation, while we do see Rendaku happen in kagebosi “dry in the shadow”. The accent is ka’ge “shadow”+hosi’ “drying”=kagebosi'/ kagebosi “dry in the shadow”. The forms kage’bosi and kagebosi reflect a word compound structure while kagebosi’ is a monophrase.

Kubozono mentioned the variation: so’n “Son (last name)”+goku’wu “gokuwu (first name)” =so’n goku’wu/ son go’kuwu “Son Gokuwu (name)” which reflects the variation of a
biphrasal and word compound. Usually, for biphrasal compounds, Rendaku does not happen, as for example between the first and last family name.

**The New Typology and the Application of Compound Accent Rules**

**Reanalysis of the Data**

It has been mentioned in Chapter 1 that there are exceptions to the standard of the length of N2. In Ito & Mester (2007)’s data *dai+sakusika* “great lyric-person” is unaccented even though *sakusika* has only four morae. They explain that the structure is *(saku)(si)+(ka)* instead of binary *(saku)(si+ka)*, so the word violates MAXBIN because of the superbinary second member. Thus, the whole compound should be a monophrasal one. However, the four-mora word *danraku* “paragraph” remains unaccented in the compound *huku*su’u “plural”*+danraku* “paragraph” = *huku*suudanraku “more than one paragraph”, although this word *danraku* observes MAXBIN (two bimoraic feet). Moreover, the binary word *hanayome* has two morphemes *hana* “flower” and *yome* “bride”, which is binary, but the whole compound retains its accent in *nihonzin hana’yome* “Japanese bride”. Using the current data, I explore the accent pattern according to the length of N2 as follows (Please refer to Appendix B for more data):

It is interesting to note that if the length of N2 is greater than five morae, then final accented examples are hard to find. The accent on N2 of more than five morae is the most stable because the whole compound can keep its accent or remain unaccented if N2 is originally so. It is relatively hard to remain unaccented if N2 contains fewer than 5 morae and does not have an accent originally. On the contrary, the whole compound tends to keep the accent on the first syllable if N2 has an original accent there, but N2 with 2 morae or fewer can be so active that even the accent on the first syllable can shift. Moreover, finally accented N2 usually triggers deaccentuation of the whole compound, but finally accented N2 with fewer than 5 morae may still have a junctural accent when forming a compound.
Table 2-2. Possible accent patterns for N2 fewer than or equal to two morae

<table>
<thead>
<tr>
<th>Short N2 Length&lt;=2 morae</th>
<th>N2 Accented on the first syllable</th>
<th>Retain the original accent of N2 on first syllable or shift to the final syllable of N1 (junctural accent)</th>
<th>densyo “carrier”+ha’to “pigeon”= densyoba’to or desyo’bato “carrier pigeon” From Tanaka (2001)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Only shift the original accent of N2 to the final syllable of N1</td>
<td>ni’ngyo “mermaid”+hi’me “princess”=nigyo’hime “mermaid princess” From Tanaka (2001)</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Only retain the original accent of N2</td>
<td>ka’fe “café”+ ba’a “bar”=kafeba’a “café bar” From Tanaka (2001)</td>
<td></td>
</tr>
<tr>
<td>N2 Unaccented</td>
<td>A new junctural accent may appear</td>
<td>sasa “bamboo leaf”+ame“candy”=sasa’ame “candy wrapped in bamboo leaves”</td>
<td></td>
</tr>
<tr>
<td></td>
<td>The lack of accent may remain</td>
<td>eda “branch”+ke “hair”=edage “split hair”</td>
<td></td>
</tr>
<tr>
<td>N2 Final accented</td>
<td>The accent may shift to the final syllable of N1.</td>
<td>suido “waterworks”+hasi’ “bridge”=suido ‘basi “Suido Bridge (place name)”</td>
<td></td>
</tr>
<tr>
<td></td>
<td>The whole compound may be deaccented</td>
<td>akane “madder”+iro’ “color”=akaneiro “madder red”</td>
<td></td>
</tr>
</tbody>
</table>

Table 2-3. Possible accent patterns for N2 of three or four morae long

<table>
<thead>
<tr>
<th>Short N2 Length=3 or 4 morae</th>
<th>N2 Accented on the first syllable</th>
<th>Retain accent on the first syllable: coincides with the junctural accent</th>
<th>so’osa “investigation”+ka’igi “conference”=soosaka’igi “investigation meetings”</th>
</tr>
</thead>
<tbody>
<tr>
<td>N2 Unaccented</td>
<td>New junctural accent may appear</td>
<td>si’n “New”+yokohama “Yokohama (place name)”= Sinyo’kohama “New Yokohama” From Tanaka (2001)</td>
<td></td>
</tr>
<tr>
<td></td>
<td>The whole compound may remain unaccented</td>
<td>hukusu’u “plural”+danraku “paragraph”=hukusuu danraku “more than one paragraph”</td>
<td></td>
</tr>
<tr>
<td>N2 Final accented</td>
<td>Accent may shift to junctural position</td>
<td>deza’ato “dessert”+azuki’ “red azuki bean”=dezaato’a’zuki “dessert made of red azuki bean”</td>
<td></td>
</tr>
<tr>
<td></td>
<td>The whole compound may be deaccented</td>
<td>hasan “bankruptcy” +tuutisyo’ “notification”= hasan tuutisyo “the notification of bankruptcy”</td>
<td></td>
</tr>
<tr>
<td>N2 Accented in the middle</td>
<td>The accent may be retained</td>
<td>sa’ga “saga (name)”+teno’o “emperor”=sagatenno’u “Emperor Saga”</td>
<td></td>
</tr>
<tr>
<td></td>
<td>The accent may be shifted to the first mora of N2</td>
<td>genkin “cash”+huriko’mi “deposit”=genkin hu’rikomi “cash deposit” From Tanaka (2001)</td>
<td></td>
</tr>
</tbody>
</table>
Table 2-4. Possible accent patterns for N2 with more than five morae

<table>
<thead>
<tr>
<th>Long N2 Length&gt;=5 morae</th>
<th>N2 Accented on the first syllable</th>
<th>Retain accent on the first syllable: coincides with the junctural accent</th>
<th>sokuseki “on the spot” +da’ietto “diet”= sokuseki da’ietto “diet that can be effective immediately”</th>
</tr>
</thead>
<tbody>
<tr>
<td>N2 Unaccented</td>
<td>New junctural accent may appear</td>
<td>kyo’oka “strengthen”+taimingu “timing”=kyooka ta’imingu “fine tune timing”</td>
<td></td>
</tr>
<tr>
<td></td>
<td>The lack of an accent may remain</td>
<td>koon “high temperature”+taikyuusei “durability”= koon taikyuusei “durability of high temperature”</td>
<td></td>
</tr>
<tr>
<td>N2 Accented in the middle</td>
<td>The accent may be retained</td>
<td>sya’nai “in a company”+danketu’ryoku “power of unity”= syanai danketu’ryoku “the power of unity in a company”</td>
<td></td>
</tr>
</tbody>
</table>

Looking through all of the tables, the length of N2 is related to the accent pattern of the whole compound, but it is not decisive. The inner structure of the compounds concerning its semantics and other factors might have led to the accent pattern. There are some common characteristics in the accent patterns across the tables such as the junctural accent and the retention of the accent. Based on those characteristics, I offered new definitions of word, monophrasal and biphrasal compound in the next section.

**Definitions and Structures**

A word compound has a junctural accent either on the first syllable of N2 or the last syllable of N1 except for deaccentuation, which happens in the “2+2 phenomenon” and word compounds with final accented N2. A monophrasal compound retains the accent on N2, and N1 will be deaccented if it has an accent. No junctural accent will occur even if neither N1 or N2 has an accent. A biphrasal compound retains both N1’s accent and N2’s accent, and no junctural accent will occur, even if neither N1 or N2 has an accent. By “retain”, I mean to retain its accent...
position on N2 or keep unaccented if N2 is originally so. Rendaku can only happen in word and monophrasal compounds, but some word compounds may not have Rendaku. So if there is a case in which N1 (unaccented)+N2 (unaccented)=Compound (unaccented), then this compound can either be a monophrasal or biphrasal compound. However, if Rendaku occurs, it is definitely not a biphrasal compound.

Table 2-5. The new typology for compounds

<table>
<thead>
<tr>
<th>Word Compounds</th>
<th>Mono-Phrasal Compounds</th>
<th>Biphasral Compounds</th>
</tr>
</thead>
<tbody>
<tr>
<td><img src="image1" alt="Diagram 1" /></td>
<td><img src="image2" alt="Diagram 2" /></td>
<td><img src="image3" alt="Diagram 3" /></td>
</tr>
<tr>
<td>sunabokori ta’isaku “dust treatment”</td>
<td>denkika’misori “electric shaver”</td>
<td>minami a’merika “south America”</td>
</tr>
<tr>
<td><img src="image4" alt="Diagram 4" /></td>
<td><img src="image5" alt="Diagram 5" /></td>
<td><img src="image6" alt="Diagram 6" /></td>
</tr>
<tr>
<td>amerikasan ore’ nzi “American oranges”</td>
<td>kaigai ryugakuse’ido “(oversea) study abroad system”</td>
<td>Siro asupara’gasu “White asparagus”</td>
</tr>
<tr>
<td><img src="image7" alt="Diagram 7" /></td>
<td><img src="image8" alt="Diagram 8" /></td>
<td><img src="image9" alt="Diagram 9" /></td>
</tr>
<tr>
<td>sunabo’kori boosi “dust treatment”</td>
<td>infule’na ka kudai “the spreading of influenza”</td>
<td>tyu’ugoku hoomon “Visits to China”</td>
</tr>
</tbody>
</table>
I believe that there should be no potential Rendaku position occurring in the right branching under a phrase containing two phrases as in

![Figure 2-2. Biphrasal structure and Rendaku distribution](attachment:image.png)

It can happen in the branching under $\omega$ dominated by $\Phi$ as in

![Figure 2-3. The structure of a word compound dominated by a phrasal node](attachment:image.png)

So within a Japanese name such as *yamaguti sakura*, Rendaku can happen in *guti* but not *sakura*.

The insertion rule of [+voice] does not happen between two phrases.

Ito and Mester (2003, 71-99) divide the accentuation patterns of reduplicated words into two kinds. Intensive/pluralizing reduplication may have junctural accents. Mimetic reduplication has its accent on the first syllable of the mimetic while dvanda compounds (compounds with two co-ordinated lexical items) retain the accent on N1 (Shibatani 2003).

They propose an analysis of Rendaku by treating it as a morpheme “R” with a feature [+voice]. Coordinating compounds and object-verb compounds (OV compounds) with a predicate-argument relation will not have Rendaku. Unger (1975) proposes a hypothesis that the origin of Rendaku is a nasal sound. Rendaku requires N2 to be able to add the suffix *no* or *ni*. OV compounds cannot meet this requirement because the suffix *no* and *ni* cannot be added to N2.
Thus, Rendaku does not happen accordingly. The following section includes data for nine basic types; more data can be found in Appendix A.

A Review of the Nine Basic Types

Type 1

The junctural accent rule happens at the last mora of N1 if N2 has one or two morae. However, when the original accent on N2 is on the first syllable, two powers are competing with each other: either to retain the accent or to move it to the junctural location. If N2 has three morae or more, then the junctural accent will appear on the first mora of N2. Unlike in the case when N2 has only one or two morae, there will be no conflicting power to shift the accent to word boundary because the default junctural position coincides with the first mora of N2.

The compound rule first applies to $\omega_1+\omega_2$, then $\omega_1'$ will then combine with $\omega_3$ where the compound rule applies again. Rendaku may happen in $\omega_2$ and $\omega_3$ as in Ito and Mester (2007). For example, the word *suna* “sand” and *hokori* “dust” form a compound $\omega_1'sunabo'kori$ “sand and dust”. When the third word *taisaku* “treatment” is added, the whole compound *sunabokori ta'isaku* “dust treatment” has an accent on the junctural place, namely on the first mora of $\omega_3$.

Problems are that some examples can be categorized either as a compound or a monophrase such as *kikoo* “climate”+$hendoo$ “change”+$sa'mitto$ “summit”=$kikoohe'ndoo$
+sa’mitto= kikoohendoo sa’mitto “climate change summit”. This is because the original accent of sa’mitto is on its first mora, which coincides with the junctural position.

It is clear that if ω3 has an accent shift, then there is no ambiguity of categorization such as iti’ “one”+ zi “time”+harai “payment”=iti’zi+harai=itiiziba’rai “one-time payment”. It is not the case that every ω3 will shift its accent in this type such as kudamonok “fruit” and orenzi “orange”, which is considered to be another type of compound. However, for words more than three morae that already have an original accent on their first mora, they cannot “shift” to form the junctural accent since the original accent coincides with the junctural position.

Data of this type are as follows:

(6) tabi’ “travel”+hito “person”+ne’tto “net”=tabibito+ne’tto = tabibitone’tto

“traveler’s net”

(7) suna “sand”+hokori “dust”+taisaku “treatment”=sunabokori+taisaku

(unaccented)=sunabokori ta’isaku

“dust treatment”

The following can be categorized into type 1 or 4 since N2 in the compound has its accent on the first mora and the compound accent still shows on the first mora of N2, so it is hard to tell if the accent on N2 is retained or a new junctural accent has occurred.

(8) yo’ “night”+sakura “cherry blossoms”+gi’n zi “ginzi (name)”= yoza’kura+gin’zi=yozakura gi’n zi “Yozakura Ginzi (name)”

(9) maki’zusi “hand-rolled sushi”+wa’arudo “world”= makizusi wa’arudo “hand-rolled sushi world”

(10)nyu’u “new”+sa’maa “summer”+ore’nzi ”orange”= nyuusa’maa+ore’nzi=nyuusamaa o’renzi “new summer orange”
Type 2

Figure 2-5. Type 2 Right-branching word compounds

The compound rule first applies to $\omega_2+\omega_3$, then $\omega_1'$ will combine with $\omega_1$ where the compound rule applies again. Rendaku may occur only in $\omega_3$ as in Ito and Mester (2007). This type has been explored extensively in Ito and Mester (2007). Examples given by them are:

- *ta’ nuki tani no’bori* “valley climbing by badgers”, *genkin fu’ rikomi* “cash deposit”, *aka* *ta’manegi* “red (round)-onion”, *nooto pa’ sokon* “notebook PC”. I have found a word that used to be in another type, then changes its accent to be categorized as type 2: *muhuu* “without wind” + *ti’* “earth” + *ta’i* “zone” = *muhuuti’tai* (it used to be *muhutita’i*). “the region of calms”

Data of this type are as follows:

(11) *ka’igai* “oversea” + *ryuugaku* “study abroad” + *se’ido* “system” = *ka’igai+ryuugakuse’ido* = *kaigai ryuugakuse’ido* “(oversea) study abroad system”

(12) *niho’n* “Japan” + *si’* “history” + *gaku* “subject” = *niho’n+si’gaku=nihon si’gaku* “Japanese History Studies”

Some data from Tanaka (2001) fall into this type

(13) *de’ nki* “electric” + *kami’* “hair” + *so’ri* “shave” = *de’nki+kamiso’ri=denkika’ misori* “electric shaver”
Figure 2-6. Type 3 word compounds

This type basically has two possible accentuations: one is to have a junctural accent, the other is to be unaccented. The compound rule of junctural accent applies here too. Unaccented types must contain a word that loses its original accent. If the words are originally unaccented, they are considered to have retained their accent patterns. Unaccented pattern usually happens on “2+2” and for final-accented ω2, but there are exceptions as follows:

(15) ma’kura “pillow” +ki’ “wood” = makura’gi “crossties”
(16) iro “color” +kami’ “paper” = iro’gami “colored paper”
(17) a’sa “morning” +kiri “mist” = asa’giri “morning mist”
(18) hosı “star” +so’ra “sky” = hosızo’ra “starry sky”

One problem is that since 4 morae N2 can also have a junctural accent, the mora length does not determine which compound can have junctural accents. If the boundary of word length is abandoned, and instead used to categorize monophrasal and word compounds according to their characteristics, some of the words may fall into two categories. Consider the example so’osa “investigation” + ka’igi “meeting” = soosaka’igi “the meeting of investigation”; it has a
junctural accent which is a characteristic of a word compound. However, the position of the
junctural accent coincides with the original accent on N2 so that the same compound can be
understood as to retain N2 and deaccent N1, which is a typical characteristic of the monophrasal
compounds. It can be predicted that Rendaku can happen on N2 if it is a monophrasal or a word
compound. In later types, it can be seen that Rendaku will not happen on N2 in biphrasal
compounds. N2 here refers to the item directly dominated by the top node.

There are some similar difficulties for distinguishing word, monophrasal and biphrasal
compounds. If N1 is originally unaccented and N2 has an original accent on the first mora such
as hosí “star”+so′ra “sky”=hosizo′ra “starry sky”, this will make the combination look like a
biphrasal compound where two accents of N1 and N2 are retained. However, Rendaku occurs in
this case, which suggests that it should be a word or a monophrasal compound.

Word compound data are as follows:

The juncture type:

(19) a′sa “morning”+kiri “mist”=asa′giri “morning mist”
(20) hana′ “flower”+kotoba′ “languages” =hanako′toba “the language of flowers”
(21) a′ka “red”+tonbo “dragonfly”= aka to’nbo “red dragonfly”

The following show a junctural accent, but usually compounds with a final-accented N2 will be
deaccented:

(22) suido “suido (name)”+hasi “bridge”=suidoo ‘basi “Suido Bridge (place name)”
(23) to’kati “tokati (place name)”+hasi “bridge”= tokati’basi “Tokati Bridge (place name)”

The unaccented type:

(24) ma’e “before”+asi “leg”=maeasi “fore-leg”
(25) ma’e “before”+kami “hair”=maegami “forelock”
Type 4

Figure 2-7. Type 4 left-branching monophrasal compounds

The compound rule applies to ω1 and ω2 first. A junctural accent may appear in ω1’ or it may remain unaccented. When combined with ω3, the accent on ω3 will be retained and ω1’ will be deaccented. If there is no accent on ω1’ or ω3, they will still remain unaccented. Problems as illustrated in type 1, are that when ω3 has an accent on its first mora, it is hard to tell whether it is a word compound or a monophrasal compound. For the case of the unaccented ω1’ and ω3, it may look like biphrasal compounds which retain their accent patterns, but biphrasal compounds do not have Rendaku while monophrasal compounds can.

Data are as follows:

(26) amerika “America”+sa’n “product”+ore’nzi “orange”=amerikasan+ore’nzi=amerikasan ore’nzi
  “American oranges”

(27) minami “south”+amerika “America”+asupara’gasu “asparagus”
    =minmia’merika+asupara’gasu= minmiamerika asupara’gasu “South American asparagus”
Figure 2-8. Type 5 right-branching monophasal compounds

The compound rule applies in the combination of ω2 and ω3. Alternatively, ω1’ can remain unaccented if ω2+ω3 are unaccented. Rendaku can happen on ω3. The problems are similar to previous types that when the accent of ω1’ falls on the first mora, and ω1 is deaccented, the whole can be treated both as a word compound or a monophasal right-branching compound such as niho’n “Japan”+si’ “history”+gaku “study” =niho’n+si’gaku=nihon si’gaku “Japanese history study”. Ito & Mester (2007) have data which fall into this type: genzi monoga’tari “Genzi story-telling”, sinkokuritu ge’kizoo “new national theater”, daisakusika “great lyric person”. I have also found a word:

(28)ka’igai “abroad”+ryuugaku “study”+se’ido “system”=ka’igai+ryuugakuse’ido= kaigai ryuugakuse’ido “(oversea) study abroad system” and muhuu (unaccented)+(ti’+ta’i)=muhuuta’i “region of calms”

Type 6

In this type, ω2 retains its accent pattern: either to be unaccented or to be accented in the original position while ω1 should be deaccented. However, if ω1 does not have an accent originally, it may look like a biphasal compound in which both accent patterns are retained. Rendaku can indicate how to categorize the data. Consider the two words monohosi’ “dried
things” and kagebosi’ “drying in the shade”; the accent pattern looks alike, but Rendaku occurs only in the second one, which does not have a predicate-argument as the first one. The accent in kagebosi’ can be explained as to retain the accent on hosi’ “dry” and deaccent ka’ge “shadow” while the accent in monohosi’ can be said to have retained both accent types of ω1 and ω2. Thus, kagebosi’ belongs to type 6 while monohosi’ belongs to type 9 (biphrasal compound).

Another problem has been accounted for type 3 when ω2 has an accent on the first mora:

(29) so’osa “investigation”+ka’igi “conference”=soosaka’igi “investigation meetings”
(30) ryuugaku (unaccented)+se’ido=ryuugakuse’ido “study abroad system”
(31) a’ka “red”+ke “hair”=akage “red hair”
(32) kanzi’kaki “writing characters”+zyun “order”=kanzi kaki zyun “the stroke order of characters”

However, since ω2 with one or two morae should have the accent on the final mora of ω1, or be deaccented in “2+2”, so the word hosı’ “star”+so’ra “sky”=hosizo’ra “starry sky” is a monophrasal compound.

**Type 7**

In this type, compound rules first apply to ω1 and ω2 to form a prosodic ω1’ which is dominated by Φ1. Then Φ2 dominating ω3 will combine with Φ1. Both Φ1 and Φ2 tend to preserve their own accents. No accent is shifted and no new accent emerges if they are originally
Figure 2-10. Type 7 left-branching biphrasal compounds unaccented. Rendaku can happen in the level of prosodic words but not between phrases. Names are good examples of phrasal compounds. Some family names are made of two morphemes that may stand alone and conform to compound formation rules such as yama’ “mountain”+kuti “mouth”+sa’kura “cherry blossom”= yama’guti+sa’kura “Sakura Yamaguti (name)”.

Kubozono (1994) has mentioned one type of biphrasal compounds “organization name+position”. It allows the internal structure such as ziti’kai kaityo- “the president of the self-governed region” in which ziti’kai “self-governed regions” is a word compound which is further combined with kaityo- “president”, the name of the position.

Data of this type are as follows:

(33)zi’mu “clerical work”+’kyoku “department”+syoku’in “staff”=zimu’kyoku+syoku’in=zimu’kyokusyoku’in “staff in Secretariat”

(34)kezai “Economics”+’kyoku “department”+syoku’in “staff”=kezai’kyoku+syoku’in=kezai’kyokusyoku’in

‘staff in Economic Bureau’

(35)a’ka “red”+matu “pine” + ma’sato “masato (name)” =aka’matu +ma’sato=aka’matu ma’sato “Masato Akamatu (name)”
This word *ko’o uirusu ma’suku* “anti-virus mask” can be treated as a monophrasal compound referring to a special mask as a whole. It can be also treated as a biphrasal left-branching compounds where the accents on *ko’o* “anti” and *ma’suku* “mask” are retained but *uirusu* “virus” is deaccented. However, the combination of *koou’irusu* has a junctural accent and when the third word is attached to it, the accent on *koo* appears again. Similarly, one speaker treated *yozakura ginzi zi’ken* “The event of Yozakura Ginzi (name)” as a biphrasal compound with the accent *yoza’kura ginzi zi’ken*, though she deaccented *yoza’kura* in the combination of *yozakura gi’nzi*. However, the accent on *yoza’kura* reappears after combining with *zi’ken* while *gi’nzi* is instead deaccented.

Similar examples are as follows:

(36) *ko’o* “anti”+*uirusu* “virus”+*tiryoo* “treatment”=*koouirusu*tiryoo (unaccented)=*k’ouirusu* 
*ti’ryoo* “anti-virus treatment”
(37) *ko’o* “anti”+*uirusu* “virus”+*ya’ku* “medicine”=*koo uirusu*+*ya’ku*=*k’ouirusuya’ku* 
“anti-virus medicine”
(38) *ko’o* “anti”+*uirusu* “virus”+*zai* “dose”=*koouirusu*+*zai*=*k’o uirusu zai* “anti-virus dose”

**Type 8**

![Diagram of Type 8 right-branching biphrasal compounds]

Figure 2-11. Type 8 right-branching biphrasal compounds

In this type, *ω2* and *ω3* combine as a word compound where compound rules apply. The accent *ω2’* will be retained as a phrasal accent and so *Φ1* retains its accent.
Although the “name+title” is considered to be a biphrasal compound, if the title has an internal structure, the accent will be retained on a higher level such as *ka’wase meiyo* kyo’ozyu “Honored Professor Kawase”. If there is no *meiyo* “honored”, the accent will be *ka’wase kyoozyu* “Professor Kawase”, in which *kyoozyu* remains unaccented. However, *meiyokyo’o zyu* “honored professor” is combined as a compound word at the prosodic level before being further combined as a phrasal compound. Another possibility is to treat it as a tri-phrasal compound *ka’wase meiyo kyoozyu*.

Data from this type are as follows:

(39) yo’ru “night”+yo’ “night”+na’ka “middle”=yo’ru+yonaka’=yo’ru yonaka “midnight”

(40) infurue’nza “influenze”+kansen “spreading”+kakudai “spreading”=infurue’nza+kansenka’kudai= infurue’nza kansen ka’kudai “the spreading of influenza”

(41) nyuugaku “admission”+si’kan “application”+hyoo “forms”= nyuugaku+sikanhyoo= nyuugaku sikanhyoo “application forms for universities”

**Figure 2-12. Type 9 biphrasal compounds**

In this type, the accent patterns on Φ1 and Φ2 will be retained. If there is no accent on Φ1 and Φ2, no new accent should appear and there should be no accent shifts from any position. The problem is that some words may have the same accent pattern as the monophrasal compounds since “unaccented+unaccented=unaccented” can be explained as to retain the accent of the last
word and deaccent the first word or combined word, such as the pair *monohosi* and *kagebosi* explained in type 6.

As Kubozono (1994) mentioned, compounds with a predicate-argument relation are usually biphrasal compounds.

(42) tyu’ugoku “China” + hoomon “visit” = tyu’ugoku hoomon “visits to China”

(43) ka’ngoku “Korea” + hoomon “visits” = ka’ngoku hoomon “visits to Korea”

(44) kita “North” + tyoose’n “challenge” + hoomon “visits” = kitatyoose’n +

hoomon=kitatyoose’n hoomon “visits to Northern Korea”

However, with the same structure and the same verbal noun *hoomon* “visits”, the compound *katei ho’omon* “home visits” is treated as a word compound referring to home visits as a fixed expression. (*katei “home” + hoomon “visits” = katei ho’umon “home visits”*)

Although names usually fall into the biphrasal compound types, some names show the accent pattern of a word compound consistently such as “X-taroo”.

**X-taroo compounds:**

There are three kinds of accents in X-taroo compounds Kubozono (2001):

1. **Word compounds.**

When N1 has only one syllable, the whole compound will be unaccented.

2. **Word compounds.**

When N1 has two syllables and two morae, the compound will be assigned an accent to the final syllable of N1.

3. **Monophrasal compounds.**

When N1 has three moras or more, N2 will retain the accent.

Data of the biphrasal compounds (type 9) are as follows:

(45) ka’wase “kawase (name)” + senpai “senior colleague” = ka’wase senpai “Senior Colleague
Kawase"

(46) yo’ru “night” + hiru “day” = yo’ru hiru “night and day”

(47) ma’e “before” + usiro “after” = ma’eusiro “before and behind”

Some data from Kubozono (1994) also fall into this type:

(48) i’ppu “one husband” + tasai “many wives” = i’ppu tasai “polygyny”

(49) ha’kusyu “clapping” + kassai “cheering” = ha’kusyukassai “clapping and cheering”

(50) kaisya “company” + syatyou “president” = kaisyasyatyou “president of the company”

(51) niho’n “Japan” + ze’ngoku “the whole nation” = niho’nze’ngoku “the whole nation of Japan”

(52) syoosoku “correspondence” + humei “lost” = syoosokuhumei “lost in contact”

(53) i’siki “conscious” + humei “lost” = i’sikihumei “losing one’s consciousness”

Complex Structures

Some compounds have complex structures based on the nine basic structures analyzed above.

Triphrasal Structure:

Right-branching compounds:

(54) doosoo “members of the alumni” + ka’i “organization” + ko’ozin “private” + zyooohoo

“information” + ho’go “protection” + hoosin “policy” = dooso’ukai +
kozinzyo’uhoo + hogo’hosin = dooso’okai + kozinzyo’ohoohogo’osin =
dooso’okaikoizinzyo’ohoohogo’osin

“protection policy of private information in the alumni”

Figure 2-13. The complex structure for “dooso’ukaikoizinzyo’ohoohogo ho’osin”
(55) minami “south”+oosawa “oosawa (name)”+kyanpasu “campus”=minamiosawa+kyanpasu=minamiosawa kyanpasu “South ōsawa Campus”

(56) sa’ngaku “industry and education”+kooryuu “communication”+’kai “organization”= sa’ngaku+kooryuu’kai= sangaku kooryuu’ukai “Industry and education forum of South ōsawa campus”

Figure 2-14. The complex structure for the word “sangaku kooryuu’ukai”

**Left branching compounds:**

(57) hookei “law and economics”+gakubu “department”+ke’izai “economics”+gakka “subject”+so’tu “graduation”=hookeiga’kubu+keizaigak’ka+so’tu=

hookeiga’kubukeizaigak’ka+so’tu=hookeiga’kubukeizaigak’kasotu “economics major from the department of law and economics”

Figure 2-15. The complex structure for the word “hookeiga’kubukeizaigak’kasotu”

(58) syuto “capital”+daigaku “university”+tookyoo “Tokyo”+soogoo “comprehensive”+kyo’ogi “sports”+taikai “meeting”=

syuto+da’igaku+tookyoo+soogookyo’ogi+taikai=
syutoda’igakutookyoo+soogookyoogita’ikai= syutoda’igakutookyoo soogookyoogita’ikai
“sports meeting in Tokyo Metropolitan University”

Figure 2-16. The complex structure for “syutoda’igakutookyoo soogookyoogi ta’ikai”

(59) tyo’o “super”+kantan “simple”+setuyaku “saving”+re’sipi “recipe”=tyo’o kantan+setuyakure’sipi= tyo’o kantansetuyakure’sipi “very simple time-saving recipe”

Figure 2-17. The complex structure for the word “tyo’o kantansetuyakure’sipi”

(60) kita “North”+kariforunia “California”+asuparagasu “asparagus”=kitakariforunia + asupara’gasu= kitakariforunia asupara’gasu “North California asparagus”

(61) kita “North”+kariforunia “California”+ore’nzi “orange”=kitakariforunia + ore’nzi= kitakariforunia ore’nzi “North California orange”

Figure 2-18. The complex structure for “kitakariforunia asupara’gasu/ore’nzi”
Biphrasal Structure

(62) keizai “economics”+kikaku “plan”+tyo’o “agency”+nyutyoo
    “joining”=keizaikikaku+tyo’o+nyuutyoo (unaccented)= keizaikikaku’tyoo+nyuutyoo=
    keizaikikaku’tyoo nyuutyoo “joining the planning agency”

Figure 2-19. The complex structure for the word “keizaikikaku’tyoo nyuutyoo”

(63) kaisya “company”+setumei “explanation”+’kai “meeting”+ setuei=kaisya setumei’kai
    setuei
    “setting up the venue for company presentations”

Figure 2-20. The complex structure for the word “kaisya setumei’kai setuei”

(64) oosaka “oosaka (name)”+ ba’nkoku “world”+hakuran “exposition”+’kai
    “meeting”=oosaka+ ba’nkoku +kakura’nkai=oosaka+bankoku hakura’nkai=
    oosakabankoku hakura’nkai
    “ōsaka World Exposition”
Figure 2-21. The complex structure for the word “oosakabankoku hakura’nkai”

(65) nihō’n “Japan”+se’ihu “government”+daihyoo “representitives”+’bu “department”=nihon se’ihu daihyo’obu “Delegation of Japanese government”

Figure 2-22. The complex structure for the word “nihon sei’hu daihyoo’bu”

(66) oosaka “oosaka (name)”+ ba’nkoku “world”+hakuran “exposition”+’kai “meeting”=oosaka+ ba’nkoku +hakura’nkai=oosaka+ba’nkoku hakura’nkai=
oosakaba’nkoku hakura’nkai

“ōsaka World Exposition” (This one has a different structure from the same word in the Figure 2-21)

Figure 2-23. The complex structure for the word “oosakaba’nkoku hakura’nkai”
(67) minami “south”+ oosawa “oosawa (name)”+ haku’butu “natural history”+’kan
“building”=minamioo’sawa+ hakubutu’kan= minamioo’sawa hakubutu’kan
“South Ōsawa museum”

Figure 2-24. The complex structure for the word “minamioo’sawa hakubutu’kan”

(68) syuusyoku “employment”+zi “time”+mensetu “interview”+sidoo “instruction”=
syuusyoku’zimensetusi’doo= syuusyoku’zi mensetusi’doo
“the instruction of employment interviews”

Figure 2-25. The complex structure for the word “syuusyoku’zi mensetusi’doo”

(69) nihon’ “Japan”+ si’gaku “history studies”+kooza “lectures”=nihon si’gaku+ ko’oza= nihon
si’gaku ko’oza “lectures of Japanese history studies”
Figure 2-26. The complex structure for the word “nihon si’gaku ko’oza”

(70) minami “south”+oosawa “oosawa (name)”+kya’npasu “campus”+ sa’ngaku “industry and education”+kooryu “communication”+’kai “meeting” =minamio’osawa+kya’npasu+ sa’ngaku+kooryuu’kai =minamioosawa kya’npasu sangaku kooryu’ukai

“Industry and education forum of South Ōsawa campus”

Figure 2-27. The complex structure for “minamioosawa kya’npasusangakukooryu’u kai”

Complex Word (Monophrasal) Compound

(71) yo’ “night”+sakura “cherry blossoms”+gin’zi “ginzi (name)”+zi’ken “event”= yoza’kura+ gin’zi+ zi’ken =yo zakura gin’zi+ zi’ken = yo zakura ginzi zi’ken

“Yozakura Ginzi (name) event”

The word “yozakura ginzi” has a word structure but it is a name
Figure 2-28. The complex structure for the word “yo zakura ginzi zi’ken”

(72) doku’ “poison”+iri “added”+ore’nzi “orange”+zi’ken “incident” =

dokuiri+ore’nzi+zi’ken=dokuiriorenzizi’ken “poisonous orange incident”

Figure 2-29. The complex structure of the word “dokuiriorenzizi’ken”

(73) niho’n “Japan”+si’ “history”+gaku “subject”+kooza “lectures” = nihonsi+gaku+kooza =

nihonsi’gaku+kooza= nihon sigaku ko’oza

“lectures of Japanese history studies”

Figure 2-30. The complex structure of the word “nihon sigaku ko’oza”

This chapter introduced a new typology and further analyzes the nine basic structures. The internal structure of more complex compounds may also be constructed based on those basic
structures predicting the location of accent in the complex structures based on the generalization found in the nine basic types. In the following chapter, I analyze the data using the OT approach and propose constraints for compounds of word and phrasal levels. In the last part of the next chapter, I also explore the internal structures of prefixes.
CHAPTER 3
ANALYSIS IN AN OT APPROACH

An OT Approach in Analyzing the Nine Types

Chapter 3 analyzes all the data collected under the optimality theory framework. Constraints proposed can account for the internal structures of compounds in two levels and for the deaccentuation phenomenon. At the end of this chapter, prefixes are also analyzed in those two levels. In this analysis, I will use constraints proposed by Kubozono (1995) and Tanaka (2001): NON-FINALITY $(\mu',\sigma')$, NON-FINALITY $(F')$, MAX (accent), ALIGN-L$(\sigma',\text{root})$ and ALIGN-R $(\text{PrWd},\sigma')$. The constraint NON-FINALITY $(\mu',\sigma')$ and NON-FINALITY $(F')$ tend to avoid final accents on N2. The constraint MAX (accent) requires the accent on the head of a compound to be retained. The alignment constraint ALIGN-L $(\sigma', \text{root})$ requires that the accented syllable align with the root to the left while ALIGN-R $(\text{PrWd},\sigma')$ requires the accented syllable to align with the prosodic word to the right.

I have restricted the constraints of NON-FINALITY $(\mu',\sigma')$, NON-FINALITY $(F')$, MAX (accent) only to word compounds and rewrote them as NON-FINALITY $\omega$ $(\mu',\sigma')$, NON-FINALITY $\omega$ $(F')$ and MAXIO $\omega$ (accent).

The definitions for some new constraints used are as follows:

1. MAXIO $\omega$ (accent) requires an accent corresponding to the head in a prosodic word
2. MAXIO $\Phi$ (accent) requires an accent corresponding to the head in a phrasal compound
3. and forbid more than one accent
4. ACCENT $\omega$ requires at least one accent in the highest level of a prosodic compound
5. ACCENT $\Phi$ requires at least one accent on the head in a phrasal compound
6. IDENT O-Io $\omega$ (accent) requires the accent to stay in N2 (The second prosodic word of the first branch) without movement.
This IDENT constraint above is devoted only to the retention of the accent position. If an accent is deleted, then it violates MAXIO\(\omega\) (accent) but not IDENT O-I\(\omega\) (accent).

In type 1 compounds, since the second candidate in Table 3-1 “\{sunabokori\} \omega\{(tai’)(saku)\} \omega\” should lose to the winner, ALIGN-L (\(\sigma’\),root) must rank higher than ALIGN-R (PrWd,\(\sigma’\)). Similarly, since the fourth candidate “\{sunabokori\} \omega\{(tai)(saku)\} \omega\” loses, ACCENT \(\omega\) has to rank higher than ALIGN-R (PrWd,\(\sigma’\)). The third candidate “\{sunabokori\} \omega\{(tai)(sa’ku)\} \omega\” has the accent on the final syllable, so it violates the constraints NON-FINALITY\(\omega\) (\(\mu’,\sigma’\)) and NON-FINALITY (F’).

### Table 3-1. Type 1 the constraint ranking for the word “sunabokori ta’isaku”

<table>
<thead>
<tr>
<th>(/{{suna}\omega+{hokori}\omega} \omega+{taisaku}\omega) \omega/</th>
<th>NON-FINALITY(\omega) ((\mu’,\sigma’))</th>
<th>NON-FINALITY(\omega) (F’)</th>
<th>ACCENT (\omega)</th>
<th>MAXIO(\omega) (accent)</th>
<th>ALIGN-L ((\sigma’),root)</th>
<th>ALIGN-R (PrWd,(\sigma’))</th>
</tr>
</thead>
<tbody>
<tr>
<td>{sunabokori} \omega{(tai’)(saku)} \omega\</td>
<td>*!</td>
<td>*</td>
<td>*</td>
<td>*</td>
<td>***</td>
<td></td>
</tr>
<tr>
<td>{sunabokori} \omega{(tai’)(saku)} \omega\</td>
<td>*</td>
<td>*</td>
<td>*</td>
<td>*</td>
<td>**</td>
<td></td>
</tr>
<tr>
<td>{sunabokori} \omega{(tai)(sa’ku)} \omega\</td>
<td>*</td>
<td>*!</td>
<td>*</td>
<td>*</td>
<td></td>
<td></td>
</tr>
<tr>
<td>{sunabokori} \omega{(tai)(saku)} \omega\</td>
<td>*!</td>
<td>*</td>
<td>*</td>
<td>*</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

In Table 3-1, since the constraint ALIGN-L(\(\sigma’\), root) requires aligning the prosodic word with the accented syllable, all candidates except for the winner violate this constraint. The last candidate does not have an accent which violates ACCENT\(\omega\). The winner violates ALIGN-R(PrWd,\(\sigma’\)) which is a gradient constraint requiring the accented syllable to align with the prosodic word from the right. So violations are counted from the right in the unit of a syllable.
In the Table 3-2, since the second candidate “\{nihonsi\}ω{(ga’ku)}ω\}ω” loses to the winner, NON-FINALITYω(μ’,σ’) and NON-FINALITYω(F’) should rank higher than ALIGN-L(σ’,root). So it can be concluded that NON-FINALITYω(μ’,σ’), NON-FINALITYω(F’)>> ALIGN-L(σ’,root), ACCENTω>> ALIGN-R(PrWd,σ’).

Table 3-2. Type 1 the constraint ranking for the word “nihonsi’gaku”

<table>
<thead>
<tr>
<th>Constraint</th>
<th>1</th>
<th>2</th>
<th>3</th>
<th>4</th>
<th>5</th>
</tr>
</thead>
<tbody>
<tr>
<td>/{niho’n}ω+{si’}ω+{gaku}ω/</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>NON-FINALITYω(μ’,σ’)</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>1</td>
</tr>
<tr>
<td>NON-FINALITYω(F’)</td>
<td>2</td>
<td>2</td>
<td>2</td>
<td>2</td>
<td>2</td>
</tr>
<tr>
<td>ACCENTω</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>2</td>
</tr>
<tr>
<td>MAXω(accent)</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>3</td>
</tr>
<tr>
<td>ALIGN-L(σ’,root)</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>4</td>
</tr>
<tr>
<td>ALIGN-R(PrWd,σ’)</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>5</td>
</tr>
</tbody>
</table>

In Table 3-3, NON-FINALITYω(μ’,σ’) and NON-FINALITYω(F’) should rank higher than MAXIOω(accent) to ensure that the second candidate “\{soosu\}ω{(yaki)(so’ba)}ω\}ω” loses.

A compound such as hosı (unaccented)+so’ra=hosızo’ra may look similar to a word compound but can only be a monophrase because if it is a prosodic word, NON-FINALITYω(μ’,σ’) will move the accent on so’ra. Moreover, the occurrence of Rendaku precludes the structure from being biphasal. In Table 3-4, the constraint ALIGN-L(σ’,root) rules out the third and last candidates.
Table 3-3. Type 2 the constraint ranking for the word “soosuya’kisoba”

<table>
<thead>
<tr>
<th>Constraint Ranking</th>
<th>NON-FINALITY_ω(μ, σ')</th>
<th>NON-FINALITY_ω(F')</th>
<th>ACCENT_ω</th>
<th>MAXIO_ω(accent)</th>
<th>ALIGN-L_ω(σ', root)</th>
<th>ALIGN-R_ω(PrWd, σ')</th>
</tr>
</thead>
<tbody>
<tr>
<td>/ { {so’osu}ω+ {yaki}ω+ {so’ba}ω }_ω/</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>{soosu}ω {ya’ki}ω</td>
<td>*</td>
<td></td>
<td></td>
<td>*</td>
<td></td>
<td>***</td>
</tr>
<tr>
<td>(soba) }_ω }_ω</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>{soosu}ω {yaki}{so’ba}ω</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>}_ω</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>{soosu}ω {(yaki)(so’ba)}ω</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>}_ω</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>{soosu}ω {(yaki’)(so ba)}ω</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>}_ω</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>{so’osu}ω {(ya’ki)(soba)}ω</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>}_ω</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Table 3-4. Type 3 the constraint ranking for the word “kaigai ryu’ugaku”

<table>
<thead>
<tr>
<th>Constraint Ranking</th>
<th>NON-FINALITY_ω(μ, σ')</th>
<th>NON-FINALITY_ω(F')</th>
<th>ACCENT_ω</th>
<th>MAXIO_ω(accent)</th>
<th>ALIGN-L_ω(σ’, root)</th>
<th>ALIGN-R_ω(PrWd, σ’)</th>
</tr>
</thead>
<tbody>
<tr>
<td>/ / {ka’igai}ω+ {ryuugaku}ω }_ω/</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>{kaigai(ryuu)(gaku)}ω</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>**</td>
</tr>
<tr>
<td>}_ω</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
| {kaigai(ryuu)(ga’ku)}ω | | | | | | *
| }_ω | | | | | | |
| {kaigai’(ryuu)(gaku)}ω | | | | | | *** |
| }_ω | | | | | | |
| {kaigai(ryuu)(gaku)}ω | | | | | | **** |
| }_ω | | | | | | |
In Table 3-5, the last constraint does not have an accent and violates ACCENT $\omega$.

### Table 3-5. Type 3 the constraint ranking for the word “inaka’ma”

<table>
<thead>
<tr>
<th>Constraint</th>
<th>NON-FINALITY $\omega$ $(\mu', \sigma')$</th>
<th>NON-FINALITY $\omega$ $(F')$</th>
<th>ACCENT $\omega$</th>
<th>MAXIO$\omega$ (accent)</th>
<th>ALIGN-L $(\sigma', \text{root})$</th>
<th>ALIGN-R $(\text{PrWd}, \sigma')$</th>
</tr>
</thead>
<tbody>
<tr>
<td>{inaka’ma} $\omega$</td>
<td><em>!</em></td>
<td>*</td>
<td>*</td>
<td>*</td>
<td>*</td>
<td>*</td>
</tr>
<tr>
<td>{ina’kama} $\omega$</td>
<td><em>!</em></td>
<td>*</td>
<td>*</td>
<td>*</td>
<td>*</td>
<td>*</td>
</tr>
<tr>
<td>{inakama’} $\omega$</td>
<td><em>!</em></td>
<td>*</td>
<td>*</td>
<td>*</td>
<td>*</td>
<td>*</td>
</tr>
<tr>
<td>{inaka ma} $\omega$</td>
<td><em>!</em></td>
<td>*</td>
<td>*</td>
<td>*</td>
<td>*</td>
<td>*</td>
</tr>
</tbody>
</table>

In Table 3-6, the constraint ACCENT $\omega$ rules out candidate without an accent. The constraints NON-FINALITY $\omega(\mu', \sigma')$ and NON-FINALITY $\omega(F')$ rule out candidates with a final accent.

### Table 3-6. Type 3 the constraint ranking for the word “asa’giri”

<table>
<thead>
<tr>
<th>Constraint</th>
<th>NON-FINALITY $\omega$ $(\mu', \sigma')$</th>
<th>NON-FINALITY $\omega$ $(F')$</th>
<th>ACCENT $\omega$</th>
<th>MAXIO$\omega$ (accent)</th>
<th>ALIGN-L $(\sigma', \text{root})$</th>
<th>ALIGN-R $(\text{PrWd}, \sigma')$</th>
</tr>
</thead>
<tbody>
<tr>
<td>{asa’giri} $\omega$</td>
<td><em>!</em></td>
<td>*</td>
<td>*</td>
<td>*</td>
<td>*</td>
<td>*</td>
</tr>
<tr>
<td>{asa(giri)} $\omega$</td>
<td><em>!</em></td>
<td>*</td>
<td>*</td>
<td>*</td>
<td>*</td>
<td>*</td>
</tr>
<tr>
<td>{asa(gi’ri)} $\omega$</td>
<td><em>!</em></td>
<td>*</td>
<td>*</td>
<td>*</td>
<td>*</td>
<td>*</td>
</tr>
<tr>
<td>{asa(giri’)} $\omega$</td>
<td><em>!</em></td>
<td>*</td>
<td>*</td>
<td>*</td>
<td>*</td>
<td>*</td>
</tr>
</tbody>
</table>

Even for N2 with final accent, the whole compound will be deaccented only when N2 contains fewer than 2 morae. For N2 with three morae or more, a junctural accent will appear. In Table 3-7, a new constraint IDENT O-I$\omega$ (accent) is used which won’t affect other tableaus because candidates in other tableaus do not violate this constraint. To ensure the second candidate “{kinu’(ito)} $\omega$” loses, IDENT O-I$\omega$ (accent) should rank higher than ACCENT $\omega$ and
MAXIOω (accent). So the ranking turns to NON-FINALITYω (μ’,σ’), NON-FINALITYω (F’)>> IDENT O-Iω (accent)>> MAXIOω (accent), ALIGN-L (σ’,root), ACCENT ω>> ALIGN-R (PrWd,σ’). The second candidate {kinu’(ito)}ω in Table 3-7 violates IDENT O-Iω (accent) because the accent of N2 moves out to the N1-N2 boundary.

Table 3-7. Type 3 the constraint ranking for the word “kinuito”

<table>
<thead>
<tr>
<th></th>
<th>NON-FINALITYω (μ’,σ’)</th>
<th>NON-FINALITYω (F’)</th>
<th>IDENT O-Iω (accent)</th>
<th>ACCENT ω</th>
<th>MAXIOω (accent)</th>
<th>ALIGN-L (σ’,root)</th>
<th>ALIGN-R (PrWd,σ’)</th>
</tr>
</thead>
<tbody>
<tr>
<td>{ { ki’n}u{ı+{ı’to} }ω</td>
<td>{ { kinu(ito)}ω</td>
<td>*</td>
<td>*</td>
<td>****</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>{ { ki’n}u{ı’to} }ω</td>
<td>*!</td>
<td>*</td>
<td>*</td>
<td>**</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>{ { ki’n}u{ı’to} }ω</td>
<td>*!</td>
<td>*</td>
<td>*</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Table 3-8. Type 3 the constraint ranking for the word “garasudama”

<table>
<thead>
<tr>
<th></th>
<th>NON-FINALITYω (μ’,σ’)</th>
<th>NON-FINALITYω (F’)</th>
<th>IDENT O-Iω (accent)</th>
<th>ACCENT ω</th>
<th>MAXIOω (accent)</th>
<th>ALIGN-L (σ’,root)</th>
<th>ALIGN-R (PrWd,σ’)</th>
</tr>
</thead>
<tbody>
<tr>
<td>{ { garasu}ω+{tama’} }ω</td>
<td>{ { garasu(dama) }ω</td>
<td>*</td>
<td>*</td>
<td>*****</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>{ { garasu’(dama) }ω</td>
<td>*!</td>
<td>*</td>
<td>*</td>
<td>**</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>{ { garasu(da’ma) }ω</td>
<td>*!</td>
<td>*</td>
<td>*</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>{ { garasu(dama’) }ω</td>
<td>*!</td>
<td>*</td>
<td>*</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>{ { garasu(dama’) }ω</td>
<td>*!</td>
<td>*</td>
<td>*</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
Table 3-9. Type 3 the constraint ranking for the word “settyuuta’ue”

<table>
<thead>
<tr>
<th>Constraints</th>
<th>NON-FINALITY_ω (μ',σ')</th>
<th>NON-FINALITY_ω (F)</th>
<th>IDENTOTO_ω(accnt)</th>
<th>ACCENT_ω</th>
<th>MAXIOω(accnt)</th>
<th>ALIGN-L_σ(‘root)</th>
<th>ALIGN-R_σ(‘root)</th>
</tr>
</thead>
<tbody>
<tr>
<td>/{(settuu+u’+u) }ω/</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>{settyuu(τa’)(ue)} }ω</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>{settyuu(τ)(ue) }ω</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>{settyuu’(τ)(ue) }ω</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>{settyuu(τ)(u’e) }ω</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Table 3-10. Type 4 the constraint ranking for the word “amerikasan ore’nzi”

<table>
<thead>
<tr>
<th>Constraints</th>
<th>MAXIO_Φ(accnt)</th>
<th>NON-FINALITY_ω (μ',σ')</th>
<th>NON-FINALITY_ω (F)</th>
<th>ACCENT_Φ</th>
<th>ACCENT_ω</th>
<th>MAXIOω(accnt)</th>
<th>ALIGN-L_σ(‘root)</th>
<th>ALIGN-R_σ(‘root)</th>
</tr>
</thead>
<tbody>
<tr>
<td>/{(amerika{+sa’n}{ω}{+ore’nzi} }ω}</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>{amerikasan}ω{(ore’n)(zi)} }ω</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>{amerikasan}ω{(o’re n)(zi)} }ω</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>{amerikasan’n}ω{(oren n)(zi)} }ω</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>{amerikasan}ω{(oren ) (zi)} }ω</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

In the tableaus for type 4, 5, 6, 7, 8 and 9, two constraints MAXIO_Φ (accent) and ACCENT_Φ are used, which will not affect previous tableaus because candidates in previous tableaus do not violate this constraint. MAXIO_Φ (accent) has to rank higher than NON-
FINALITYω (μ',σ') because the second, third and fourth candidate have to lose to the winner. The candidate \{\{amerikasa’n\}ω\{(oren)(zi)\} ω\} Φ in Table 3-10 does not have an accent on the head N2 and violates ACCENT Φ. The candidate in Table 3-10 \{\{amerikasan\}ω\{(o’ren)(zi)\} ω\} Φ violates MAXIOΦ (accent) because the original accent on the head of the monophrase is changed. Examples of N2 with other accent patterns and different internal structures are given from Table 3-11 to Table 3-16.

In Table 3-11, the second candidate loses because it has a final accented syllable. The third candidate does not have a corresponding accent on the head of the phrasal compound and violates ACCENT Φ. The forth candidate has two accents in one phrasal compound and should not win.

Table 3-11. Type 5 the constraint ranking for the word “genzi monoga’tari”

<table>
<thead>
<tr>
<th>Constraint</th>
<th>MAXIOΦ (accent)</th>
<th>NON-FINALITY_ω (μ',σ')</th>
<th>NON-FINALITY_ω (F')</th>
<th>ACCENT Φ</th>
<th>MAXIO_ω (accent)</th>
<th>ALIGN-L (σ',root)</th>
<th>ALIGN-R (PrWd_σ)</th>
</tr>
</thead>
<tbody>
<tr>
<td>{genzi}ω{mono}ω+{ga’tari}ω} Φ /</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>{genzi}ω{mono}ω{ga’(tari)}ω} Φ</td>
<td></td>
<td>*!</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>**</td>
</tr>
<tr>
<td>{genzi}ω{mo’no}ω{ga’(tari)}ω} Φ</td>
<td></td>
<td></td>
<td>*!</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>{ge’nzi}ω{mono}ω{ga’(tari)}ω} Φ</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td><strong>,</strong>*</td>
<td></td>
</tr>
</tbody>
</table>

67
Table 3-12. Type 6 the constraint ranking for the word “kita kariforunia”

<table>
<thead>
<tr>
<th></th>
<th>MAXIO</th>
<th>NON-FINALITY</th>
<th>NON-FINALITY</th>
<th>IDENT O-Io(accents)</th>
<th>ACCENT</th>
<th>MAXIO_0(accents)</th>
<th>ALIGN-L</th>
<th>ALIGN-R</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Φ</td>
<td>(accent)</td>
<td>(ω, σ')</td>
<td>(ω, σ')</td>
<td>(accent)</td>
<td>(σ', root)</td>
<td>(PrWd, σ')</td>
<td></td>
</tr>
<tr>
<td>{kita}+{kariforunia}</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>****</td>
</tr>
<tr>
<td></td>
<td>Φ</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>{kita}(kari)(foru)(ni a)</td>
<td>**</td>
<td></td>
<td></td>
<td></td>
<td>*</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>{kita}(ka’ri)(foru)(nia)</td>
<td>*</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>**</td>
</tr>
<tr>
<td>{kita}(kari)(foru)(ni’a)</td>
<td>*</td>
<td></td>
<td></td>
<td></td>
<td>*</td>
<td></td>
<td></td>
<td>**</td>
</tr>
<tr>
<td>{kita’}(kari)(foru)(nia)</td>
<td>*</td>
<td></td>
<td></td>
<td></td>
<td>*</td>
<td></td>
<td></td>
<td>****</td>
</tr>
</tbody>
</table>

Table 3-13. Type 6 the constraint ranking for the word “singata infurue’nza”

<table>
<thead>
<tr>
<th></th>
<th>MAXIO</th>
<th>NON-FINALITY</th>
<th>NON-FINALITY</th>
<th>IDENT O-Io(accents)</th>
<th>ACCENT</th>
<th>MAXIO_0(accents)</th>
<th>ALIGN-L</th>
<th>ALIGN-R</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Φ</td>
<td>(accent)</td>
<td>(ω, σ')</td>
<td>(ω, σ')</td>
<td>(accent)</td>
<td>(σ', root)</td>
<td>(PrWd, σ')</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>{singata}+{infurue’nza}</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>****</td>
</tr>
<tr>
<td>{singata}+{infurue’nza}</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>{singata}(in)(furu)(e’nza)</td>
<td>*</td>
<td></td>
<td></td>
<td></td>
<td>*</td>
<td></td>
<td></td>
<td>****</td>
</tr>
<tr>
<td>{singata}+{infurue’nza}</td>
<td>*</td>
<td></td>
<td></td>
<td></td>
<td>*</td>
<td></td>
<td></td>
<td>****</td>
</tr>
<tr>
<td>{singata}(i’n)(furu)(enza)</td>
<td>*</td>
<td></td>
<td></td>
<td></td>
<td>*</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>{singata}+{infurue’nza}</td>
<td>*</td>
<td></td>
<td></td>
<td></td>
<td>*</td>
<td></td>
<td></td>
<td>****</td>
</tr>
<tr>
<td>{singata}(in)(furu)(enza)</td>
<td>*</td>
<td></td>
<td></td>
<td></td>
<td>*</td>
<td></td>
<td></td>
<td>****</td>
</tr>
</tbody>
</table>

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In Tables 3-12 and 3-13, other candidates all violate MAXIOφ (accent) and therefore lose.

In Table 3-14, the second and fourth candidates do not have a corresponding accent to the original accent on the head of either the first or second phrase. The third candidate has a final accented syllable and should lose to the winner.
Table 3-15. Type 8 the constraint ranking for the word “infurue’nza kansenka’ku”

|  /
| {infu're'nza}  
| ω}Φ  
| {kansen 
| }ω  
| {kakudai}  
| ω}ω}Φ  
| | MAXIOΦ(accent) | NON-FINALITY o(μ',σ') | NON-FINALITY o(F') | IDENT O-1o(accent) | ACCENT Φ | ACCENT ω | MAXIOω(accent) | ALIGN-L (σ',root) | ALIGN-R (PrWd,σ') |
|________|________|________|________|________|________|________|________|________|________|
| /
| {infu'renza}  
| ω}Φ  
| {kansen 
| (ka'ku)(dai) }ω}Φ  
| | *! | | | * | * | *** |
| /
| {infu'renza}  
| ω}Φ  
| {kansen 
| (ka'ku)(dai) }ω}Φ  
| | *! | * | | * | * | * |
| /
| {infu'renza}  
| ω}Φ  
| {kansen 
| (ka'ku)(da'i) }ω}Φ  
| | *! | | | * | * | *,*** |
| /
| {infu'renza}  
| ω}Φ  
| {kansen' 
| (ka'ku)(dai) }ω}Φ  
| | *! | | | * | * | **** |
| /
| {infu'renza}  
| ω}Φ  
| {kansen 
| (ka'ku)(dai) }ω}Φ  
| | *! | | | * | * | **** |

In Table 3-15, the fourth candidate does not have an accent on kansenkakudai and violates ACCENT ω. The last candidate does not retain its accent on the head and violates ACCENT Φ. The other candidates violate the constraint MAXIO Φ(accent) and cannot win.
Table 3-16. Type 9 the constraint ranking for the word “ka’ngoku hoomon”

<table>
<thead>
<tr>
<th>{}{ka’ngoku}{ω}Φ + {}{(hoo)(mon)}{ω}Φ</th>
<th>MAXIO (accent)</th>
<th>NON-FINALITY (ω(F’))</th>
<th>NON-FINALITY (ω(μ’,σ’))</th>
<th>ACCENT (ω)</th>
<th>MAXIO(ω)(accent)</th>
<th>ALIGN-L (σ’,root)</th>
<th>ALIGN-R (PrWd,σ’)</th>
</tr>
</thead>
<tbody>
<tr>
<td>{{ka’ngoku}{ω}Φ</td>
<td>*</td>
<td>*</td>
<td>*</td>
<td>**</td>
<td>**</td>
<td>**</td>
<td>**</td>
</tr>
<tr>
<td>+{{(hoo)(mon)}{ω}Φ</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>{{ka’ngoku}{ω}Φ</td>
<td>*</td>
<td>*</td>
<td>*</td>
<td>**</td>
<td>**</td>
<td>**</td>
<td>**</td>
</tr>
<tr>
<td>+{{(ho’u)(mon)}{ω}Φ</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>{{kangoku}{ω}Φ</td>
<td>*</td>
<td>*</td>
<td>*</td>
<td>***</td>
<td>**</td>
<td>**</td>
<td>**</td>
</tr>
<tr>
<td>+{{(hoo)(mon)}{ω}Φ</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

In the OT section above, I proposed five new constraints to deal with the internal structures of compounds. Those constraints are also divided into the word and phrasal level which correspond to the levels of compounds. MAXIO Φ (accent) and ACCENT Φ can deal with the retention of accent in phrasal compounds. ACCENT ω and MAXIOω (accent) operate at the word level. IDENT O-Iω (accent) accounts for the deaccentuation phenomenon. This analysis needs no rerankable constraints as in Tanaka (2001)

Prefixes

For prefixes, if they are in a biphrasal construction, they will retain their accent. If they appear in a word structure, it means that the phrasal structure of the prefix is somewhat restricted from being active in a whole word compound, indicated by ‘(Φ)’. I explore the following examples with the prefix “koo” meaning high:
(74) 高分子 koo bu’nsi “high polymer”

(75) 高エネルギー kooener’gi “high energy”

(76) 高病原性 ko’o byoogensei “highly pathogenic”

(77) 高耐久性 ko’o taikyuusei “high perduable”

Each represents the word, monophrasal or biphrasal compound.

Figure 3-1. The structure of the word “koo bunsi”

Figure 3-2. The structure of the word “koo enerugi”

Figure 3-3. The structure of the word “ko’o byoogen sei”

Other prefixes such as tyo’o and hi’ can show either word or biphrasal compound structure.

Left branching tri-phrasal compounding is also possible such as:
It is interesting that some combinations of a prefix and a root can restrict the biphrasal structure of the prefix in a word compound such as koou’irusu. When this word compound is put under a phrasal compound ko’ouirusu ya’ku, the restricted biphrasal structure of the prefix gains its biphrasal status again.

If in a phrasal compound, N1 has a phrasal structure while N2 only has a word structure, then we expect that N2 will be deaccented because of Max Φ (accent) which requires only the phrasal head to retain its accent in a phrasal compound.

So the word compound koou’irusu has the structure:
Figure 3-4. The structure of the word “koo u’irusu”

When this word compound needs to be combined with another phrasal structure, a ‘Φ’ which dominates this current structure and the ko’o retains its original accent and u’irusu is deaccented:

Figure 3-5. The structure of the word “ko’o uirusu ya’ku”

Other structures such as the following are not possible:

Figure 3-6. The wrong structure of the word “kou u’irusu ya’ku”
The accent will be retained on “u’irusu” for the two structures in Figure 3-6 and 3-7. As described above, prefixes can also have different internal structures at different levels. Constraints from word and phrasal levels are more suitable for analyzing internal structures of different levels. In the following chapter, two constraints are proposed to deal with the deaccentuation phenomenon and two constraints are to account for the difference between left-branching and right-branching compounds. The advantages and problems of my analysis are summarized as well.
In this chapter, the advantages of the new typology and that of the new tableaux are discussed. The chapter also explores an OT analysis for the “2+2” phenomenon and explains the difference between left-branching and right-branching compounds using an OT approach. Finally, I explain the limitations of my analysis and make suggestions on further research.

The Advantages of the New Analysis

The new typology is based on the redefinition of word, monophrasal and biphrasal compounds. This new definition helps to categorize different levels of compounds by comparing the input and the output of N2 rather than only focusing on the occurrence of the junctural accent. The new definition helps compare and contrast the characteristics of word, monophrasal and biphrasal compounds. Since junctural accent cannot be used to define biphrasal compounds, the new definition is especially helpful in including biphrasal compounds in the new typology. This way of categorization distinguishes each level well by considering the characteristics of the input and output. Each level of compounds may have the internal structure of left-branching, right branching or flat structure (N1+N2). The phenomenon of Rendaku can be also predicted in correspondence to different structures. Based on the nine basic structures, more complex structures can be analyzed successfully. The prefix, which has not been well analyzed in previous research, can be analyzed using the new typology as well. Since compounds can be divided into different levels, constraints of the corresponding levels are needed as well such as MAXIOω (accent), MAXIOΦ (accent), ACCENTω and ACCENT Φ.

The “2+2” Phenomenon in an OT Approach

As for the deaccentuation problem, IDENT O-Iω (accent) can explain why N2 with a final accent tends to be deaccented. Another phenomenon related to the deaccentuation is the “2+2”
phenomenon, mentioned in Chapter 1; however, not all “2+2” structure will be deaccented, only balanced structures can be deaccented. The following data are from Tanaka (2001):

(85) ma’n “full” + ge’tu “moon” = ma’ngetu “full moon”

(86) tyo’o “punishment” + ba’tu “infliction” = tyo’obatu “punishment infliction”

These structures are weaker than the “2+2” structure, because the nasal and one part of a long vowel cannot bear an accent. So the structure can be demonstrated as μ(μ)μμ which is different from the structure of unaccented kuro neko which has no nasals or long vowels with a structure of μμμμ. Other “2+2” data are as follows Tanaka (2001):

(87) on “sound” + in “rhythm” = onin “phonology”

(88) usu “light” + azi “taste” = usuazi “light taste”

(89) ro’o “labor” + do’o “work” = roodoo “manual labor”

(90) ka’n “see” + ko’o “light” = kankoo “sightseeing”

For the data above, onin “phonology”, roodoo “manual labor” and kankoo “sightseeing” all have the structure μ(μ)μ(μ) while usuazi “light taste” has the structure of μμμμ. For “2+2” data, balanced “2+2” structures do not need an accent such as

```
\[ \sigma \sigma \sigma \sigma \]
\[ \mu \mu \mu \mu \]
\[ \mu (\mu) \mu (\mu) \]
```

Figure 4-1. The balanced structures

In the cases where N2 does not have a final accent, if two morphemes in a compound word (<=4 morae) have a balanced structure “[μ μ] [μ μ]” or [μ (μ)] [μ (μ)], no accent should appear (Constraint A). On the contrary, if two morphemes fail to have the same structure, then an accent has to occur (Constraint B). These are descriptive constraints whose motivation I leave for further research.
Left-branching and Right-branching Differences in an OT Approach

In the following section, I examine the reason that left-branching compounds tend to be a
whole word compound. Truckenbrodt (1999) has investigated the relation between phonological
phrases and syntactic XP. He proposes the constraint WRAP-XP which requires that every XP
has to be contained in a phonological phrase. Selkirk (1995) modified the ALIGN constraint
proposed by McCarthy and Prince (1993) and created the constraint ALIGN-XP,R which was
declared as “For each XP there is a P such that the left edge of XP coincides with the left edge of
P.”

In the case of Japanese, the constraint for biphrasal compounds requires that the left edge
of every accented prosodic word be aligned with an XP. The constraint ALIGN-NP,L can be used
to analyze Japanese compounds.
Left-branching:

\[(N1+N2)NP2+N3]NP1

\( (\quad)p \)

Right-branching

\[N1+(N2+N3)NP2]NP1

\( (\quad)p(\quad)P \)

In left-branching compounds, there is no conflict between ALIGN-NP,L and WRAP-NP.
In right-branching compounds, the left edge is required by ALIGN-NP, L which is in conflict
with WRAP-NP since the whole NP1 is not included in a prosodic word. So left-branching
compounds have the tendency to be treated as a whole prosodic word—word compound.

For Right-branching compounds, if WRAP-NP>>ALIGN-NP,L, then the compound is
treated as a whole prosodic word—word compound. If ALIGN-NP,L, >>WRAP-NP, then it is
treated as a phrasal compound. This analysis in the OT approach can provide an explanation for the difference of left-branching and right-branching compounds.

**Conclusions, Problems and Further Research**

My analysis of the new typology has some limitations which remain to be solved in the future. According to the definition, it is difficult to distinguish a word compound from a monophrasal one when a long N2 has its accent on the first mora, which coincides with the default junctural accent position. The previous research by Ito and Mester (2007) relies only on the junctural accent to determine if it is a word or monophrasal compound and by my definition, all “monophrasal compounds” which have an original accent on the first syllable of N2 will be word compounds in Ito and Mester’s standard. There is also one exception that Rendaku does not show up in the predicted structure, which is the word *sakanaturi* “fishing” mentioned in chapter two. This cannot be explained either by my analysis or previous analyses. In some compounds, a word level can dominate the monophrasal level such as in:

(91) eda ”branch”+ke ”hair”+taisaku “treatment” = edage+taisaku = edageta’isaku

“split hair treatment”

(92) ondan ”warming”+ka “change”+boosi “prevention” = ondanka+boosi = ondankabo’osi

“(global) warming prevention”

They have the following structure:

![Figure 4-2. The structure of the word “ondankabo’osi”](image-url)
So a monophrasal compound is made first and then combined with another prosodic word to form a word compound which dominates the monophrasal compound. It may be argued that the word and phrasal level should have some order since the phrasal level dominates the word level in most cases.

In the OT approach section, the input is already labeled with phrasal or word structures. The constraints that determine the input’s compound structure need to be found, which exist not only in the phonological level but also in the semantic and pragmatic levels as mentioned by Ito & Mester (2007). The constraint IDENT O-Iω (accent) explains the deaccentuation phenomenon, but according to the data in Appendix B, final accented N2 may not always trigger deaccentuation. IDENT O-Iω (accent) alone cannot explain this. Moreover, the constraint A and constraint B mentioned in this chapter need further investigations in order to reflect deeper reasons for the requirement of balanced structures. The competition of the power between syllables and feet may be one of the reasons.

This thesis has succeeded in accounting for a variety of compounds using a new typology and a set of OT constraints. It also provides further data for research to resolve the remaining questions about the location of accents in compound structures.
APPENDIX A
DATA OF NINE BASIC TYPES

Type 1

(93) hosī “star” + so’ra “sky” + nyuumon “introduction” = hosizo’ra + nyuumon = hosizora nyu’umon

“Introduction to Astro observation”

(94) niho’n “Japan” + si’ “history” + gaku “subject” = nihonsi + gaku = nihonsi’gaku

“The subject of Japanese history”

(95) sin gata “new-type” + infurue’nza “influenza” + zyoohoo “information” = sin gata infurue’nza + zyoohoo = sin gata infuruenzayo’uhoo

“New-type influenza information”

The following can be categorized into type 1 or 4:

(96) si’ro “white” + asupara’gasu “asparagus” + ryo’uri “cooking” = siroasupara’gasu + ryo’uri

“white asparagus dish”

(97) minami “south” + oosawa “oosawa (place name)” + kya’npasu “campus” = minamio’osawa + kya’npasu = minamioosawa kya’npasu “South Oosawa (place name) campus”

(98) minami “south” + oosawa “oosawa (place name)” + me’ibutu “special local product” = minamiosawa’wa + me’ibutu = minamiosawa me’ibutu

“South Oosawa (place name) special local product”

(99) minami “south” + amerika “America” + bi’iru “beer” = minmia’merika + bi’iru = minamimerika bi’iru “South American beer”

(100) nyuusen “breast” + ga’n “cancer” + se’nta “center” = nyuuse’ngan + se’nta = nyuusengan se’nta

“breast cancer center”

(101) hoppoo “northern” + kankei “relationship” + si’ryoo “resources” = hoppoo kankei si’ryoo

“northern studies collections”
Type 3

The junctural accent type

(102) inaka “country” +ma “space”=inaka’ma “tatami size (176cm*88cm) or a unit of measure, 1.8m”

(103) a’ka “red”+sato’o “sugar”=akaza’too “brown sugar”

(104) a’o “green”+kaeru “frog”=aoga’eru “green frog”

(105) ha’nabi “fireworks”+taikai “festival”=hanabita’ikai “fireworks festival”

(106) ha’nabi “fireworks”+kansyo “appreciation” =hanabika’nsyo “fireworks appreciation”

(107) ha’nabi “firework”+tokusyu “specials”=hanabi to’kusyu “firework specials”

(108) a’o “blue”+tatami “tatami mat”=aoda’tami “new tatami mat”

(109) hude “pen”+tukai “usage” =hudedu’kai “brush work”

(110) kuti “mouth”+kuruma “car” =kutigu’ruma “cajolery”

(111) minami “south”+amerika “America”=minamia’merika ‘South America’

(112) kikoo “climate”+hendoo “change”= kikoohe’ndoo “climate change”

(113) ti’ “earth”+ta’i “zone”=ti’tai “area”

(114) kansen “inflection”+kakudai “spread”= kansen ka’kudai “spread of infection”

(115) ka’igai “overseas”+ryuugaku “study abroad”=kaigai ryu’ugaku “study abroad”

(116) nyuusen “breast”+ga’n “cancer”=nyuuse’ngan “breast cancer”

(117) suna “sand”+hokori “dust”=sunabo’kori “dust”

(118) hoppoo “northern”+kankei “relation”=hoppoo ka’nkei “northern relation”

(119) mu’ “without”+nooyaku “pesticides”=muno’uyaku “no pesticides”

(120) hosii “star”+so’ra “sky”=hosizo’ra “starry sky”
so’osa “investigation”+ka’igi “conference”=soosaka’igi “investigation meetings”

ryuugaku “studying abroad”+se’ido “system”=ryuugakuse’ido

“the system of studying abroad”

The unaccented pattern

tabi’ “travel”+hito “person”=tabibito “traveler”
niho’n “Japan”+hasi’ “bridge”= nihon basi’ “Bridge of Japan (place name)”
musi “worm”+ha’ “tooth”=musiba “decayed teeth”
a’ka “red”+me’ “eye”=akame “red eye”
kuti “mouth”+kuse’ “habit”=kutiguse “pet phrase”
hosi “star”+so’ra “sky”=hosizora “starry sky”
niho’n “Japan”+si’ “history”=nihon si “Japanese history”

Type 4

minami “South”+amerika “America”+ore’nzi “orange” =minmia’merika+ ore’nzi =
minmiamerika ore’nzi “South American orange”

minami “South”+oosutora’ria “Australia”+kanga’ruu “kangaroo”=
minamio’osutoraria+kanga’ruu =minami oosutoraria kanga’ruu

“South Australia Kangaroo”

hoppoo “north”+kankei “relationship”+si’ryoo “resources”= hoppoo ka’nkei +si’ryoo
=hoppoo kankei si’ryoo “Northern studies collection”

mu “without”+nooyaku “pesticide”+kuda’mono “fruit”=
muno’uyaku+kuda’mono=munooyaku kuda’mono “organic fruit”

Type 6

eda “branch”+ke “hair”=edage “split hair”
(135) a’ka “red”+mi “meat”=akami unaccented “lean meat”
(136) kita “North”+kariforunia “California”=kitakariforunia “North California”
(137) sin gata “new type”+infurue’nza “influenza”= sin gata infurue’nza “New type influenza”
(138) ti’ “earth”+ta’i “zone”=tita’i “area”
(139) sa’ga “saga (name)”+tenno’o “emperor”= sagatenno’o “Emperor Saga”
(140) dokuiri “poisonous”+ore’nzi “orange”=dokuiriore’nzi “poisonous oranges”
Type 7
(141) suna “sand”+hokori “dust”+boosi “prevention”=sunabo’kori+boosi (unaccented)=
sunabo’kori boosi “prevention of dust”
(142) yama’ “mountain”+kuti “mouth”+senpai “senior colleague”= yama’guti+senpai
“senior colleague Yamaguti (name)”
(143) syu’to “capital”+daigaku “university”+tookyoo “Tokyo”=syutoda’igaku tookyoo
“Tokyo Metropolitan University”
Type 9
(144) bo’n “bon festival”+mukae “welcome”+’bi “fire”=bo’n+mukae’bi=bo’n mukae’bi
“fireworks for Bon festival”
(145) ka’wase “kawase (name)”+sa’kura “cherry blossoms (name)”=ka’wase sa’kura
“Sakura Kawase (name)”
(146) a’ka “red”+tonbo “dragonfly”=a’katonbo (now: aka to’nbo) “red dragonfly”
(147) sa’ga “saga (name)”+tenno’o “emperor”=it was “sa’gatennoo” now sagatenno’o
“Emperor Saga”
## APPENDIX B
### THE TABLE FOR ALL ACCENT PATTERNS

Possible accent patterns for N2 less than or equal to two morae

<table>
<thead>
<tr>
<th>N2</th>
<th>Short N2 Length&lt;=2 morae</th>
</tr>
</thead>
<tbody>
<tr>
<td>Accented on the first syllable</td>
<td>Retain the original accent of N2 on first syllable or shift to the final syllable of N1 (junctural accent)</td>
</tr>
</tbody>
</table>
| densyo “carrier”+ha’to “pigeon”= densyoba’to or desyo’bato “carrier pigeon”  
ko’omori “Western”+ka’sa “umbrella”= koomori’gasa “Western umbrella” From Tanaka (2001)  
Only shift the original accent of N2 to the final syllable of N1  
i’ngyo “mermaid”+hi’mekko “princess”=ni’ngyo’hime “mermaid princess”  
kansou “dry”+ha’dakko “skin”=kanso’uhada “dry skin”  
kansoo “dry”+ne’gi “leek”= kanso’onegi “dry leek” From Tanaka (2001)  
Only retain the original accent of N2  
ka’fe “cafe”+ ba’a “bar”=kafeba’a “cafe bar”  
eiga “movie”+fa’n “fan”=eigafan “movie fan”  
br’e’tu’u “best”+te’n “ten”=besutote’n “best ten” From Tanaka (2001) |
| Unaccented | A new junctural accent may appear  
Sasa “bamboo leaf”+ame“candy”=sasa’ame “candy wrapped in bamboo leaves”  
a’sa “morning”+kiri “mist”=asa’giri “morning mist”  
inaka “country”+ma “space”=inaka’ma “tatami size(176cm*88cm) or a unit of measure, 1.8m”  
The lack of accent may remain  
edu “branch”+ke “hair”=edage “split hair”  
a’ka “red”+mi “meat”=akami unaccented “lean meat”  
kanzi’kaki+zyun (unaccented)=kanzi kaki zyun |
| Final accented | The accent may shift to the final syllable of N1.  
Suido “waterworks”+hasi’ “bridge”=suido ‘basi “Suido Bridge (place name)”  
to’kati “tokati (place name)”+hasi’ “bridge”= tokati’basi “Tokati Bridge (place name)”  
abura “oil”+kami “paper”= abura’gami “oil-absorbent paper”  
The whole compound may be deaccented  
akane “madder”+iro’ “color”=akaneiro “madder red” |
Possible accent patterns for N2 equal to three or four morae

<table>
<thead>
<tr>
<th>N2 Accented on the first syllable</th>
<th>Retain accent on the first syllable coincides with the junctural accent</th>
<th>so’osa “investigation”+ka’igi “conference”=soosaka’igi “investigation meetings” yama “mountain”+kuti “mouth”+sa’kura “cherry blossom”= yama’guti+sa’kura ‘Sakura Yamaguti (name)’ minami “south”+oosawa “oosawa (place name)”+kya’npasu “campus”=minamio’osawa +kya’npasu=minamiosawa kya’npasu “South Ōsawa (place name) campus”</th>
</tr>
</thead>
<tbody>
<tr>
<td>N2 Unaccented</td>
<td>New junctural accent may appear</td>
<td>si’n “New”+yokohama “Yokohama (place name)”= Sinyo’kohama “New Yokohama” kuti “mouth”+yakusoku “promise”=kutiya’kusoku “verbal promise” From Tanaka (2001) a’ka “red”+tonbo “dragonfly”= a’katonbo(before) =aka to’nbo (now) “red dragonfly” a’o “green”+kaeru “frog”=aoga’eru “green frog” ha’nabi “fireworks”+taikai“festival”= hanabita’ikai “fireworks festival” ha’nabi “fireworks”+kansyo “appreciation” =hanabika’nsyo “fireworks appreciation” ha’nabi “firework”+tokusyu “specials”= hanabi to’kusyu “firework specials”</td>
</tr>
<tr>
<td>The whole compound may remain unaccented</td>
<td></td>
<td>hukusu’u “plural”+danraku “paragraph”=hukusuu danraku “more than one paragraph” ori’zinaru “original”+tezome “hand dyeing”=orizinarutezome “original hand dyeing” kookyuu “luxurious”+tyanomi “tea-drinking”= kookyuu tyanomi “luxurious tea-drinking”</td>
</tr>
<tr>
<td>N2 Final accented</td>
<td>Accent may shift to junctural position</td>
<td>deza’ato “dessert”+azuki “red azuki bean”=dezaatoa’zuki “dessert made of red azuki bean” syuumatu “weekend”+danziki “fast”=syuumatu da’n ziki “fast in weekends” hana “flower”+tubomi’ “bud”=hanatu’bomi “the bud of flowers” hue’ru “expand”+wakame’ “seaweed”= hueruwa’kame “seaweed that can expand”</td>
</tr>
<tr>
<td>The whole compound may be deaccented</td>
<td></td>
<td>hasan “bankruptcy”+tuutisyo “notification”= hasan tuutisyo “the notification of bankruptcy” nai tei “unofficial decision”+tuutisyo “notification”= nai tei tuutisyo “the notification of an unofficial decision”</td>
</tr>
<tr>
<td>N2 Accented in the middle</td>
<td>The accent may be retained</td>
<td>mura’ saki “purple” sa’ga “saga (name)”+tenno’o “emperor”=sagatenno’u “Emperor Saga”</td>
</tr>
</tbody>
</table>
mu “without”+nooyaku “pesticide”+kuda’mono “fruit”=muno’uyaku+kuda’mono=munooyaku kuda’mono “organic fruit”

The accent may be shifted to the first mora of N2
genkin “cash”+huriko’mi “deposit”=genkin hu’rikomi “cash deposit”
onna’ “woman”+kokoro “heart”=onnago’koro “woman’s heart”
yude’ “boiled”+tama’go “egg”=yudeta’mago “boiled egg”
kami’ “paper”+omu’tu “diaper”=kamio’mutu “paper diaper”
From Tanaka (2001)

<table>
<thead>
<tr>
<th>Possible accent patterns for N2 more than five morae</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Long N2 Length&gt;=5 morae</strong></td>
</tr>
<tr>
<td><strong>N2</strong></td>
</tr>
<tr>
<td><strong>N2 Unaccented</strong></td>
</tr>
<tr>
<td><strong>The lack of an accent may remain</strong></td>
</tr>
<tr>
<td><strong>N2</strong></td>
</tr>
</tbody>
</table>

From Tanaka (2001)
REFERENCES


BIOGRAPHICAL SKETCH

Si Chen was born in 1986 in Nanjing, China. She is the only child in her family. Since her father and mother are musicians, Chen has received musical training from an early age and gained the high proficiency certificate of piano skills in China. Her interests in languages were developed since middle school. After graduation from Jinling High School in Nanjing, she chose English linguistics and literature as her major and received her bachelor’s degree from Beijing International Studies University. Upon graduation, she pursued her master’s degree in linguistics in University of Florida and began to focus her research on phonology and phonetics in Chinese and Japanese.