# Bisyllabic Foot Stem in Japanese Adjective Truncation

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## 1 Introduction

Truncation is a very productive process in Japanese. It is observed in person's names (Mester, 1990), loanwords (Irwin, 2011), noun compounds (Hibiya, 1998), even verbs (Tsujimura and Davis, 2011), and adjectives (Daniel, 2018). This paper focuses on adjective truncation in the standard Japanese, the Tokyo dialect. The studies of noun and verb truncation indicate that bimoraic feet are the main criteria in Japanese truncation. Similarly, the truncated adjective stem is often truncated into bimoraic: *mu.zu.ka.shi-i* 'difficult' into *mu.zu-i* (-i is the adjective marker). Even so, there is an exception whose stem is trimoraic: *me.N.do.ku.sa-i* 'troublesome' into *me.N.do-i*. If these two types of adjectives are analyzed from the point of syllables, they have the same bisyllabic stem because a moraic nasal, *N* is placed in the coda of the first syllable (Kawahara, 2016). Hence, it is stipulated that Japanese native speakers prefer the adjective stem to be a bisyllabic foot, not a bimoraic foot. An experiment was conducted to find the evidence of this hypothesis. The results indicate that the native speakers judged the truncated adjectives with a bisyllabic foot stem as more acceptable than the ones with a bimoraic foot stem.

Based on the results of the experiment, adjective truncation is examined with the framework of Optimality Theory (OT). Truncation is observed as an output-output interaction according to Benua (1995). Her OT analysis on Japanese hypocoristic name truncation can be applied to Japanese adjective truncation. With OT analysis based on her study, there is no need to assume a specific mapping target template for adjective truncation.

The rest of this paper proceeds as follows. Section 2 reviews previous studies on noun truncation and verb truncation to show bimoraic feet play an important role in both cases. Then the problem in the previous study of adjective truncation is illustrated with an alternative hypothesis. Section 3 explains the experiment and the results. We discuss the results more deeply in Section 4.1. Section 4.2 is the discussion of the OT analysis based on the experimental results and Correspondence Theory (McCarthy and Prince, 2004, Benua, 1995).

## 2 Previous Studies on Truncation in Japanese

**2.1** *Truncation in Japanese Nouns* Poser (1990) states that the truncation of hypocoristic names occurs based on a bimoraic foot. In Japanese, the hypocoristic marker *-tyan* is used when hypocoristic names are produced as shown in (1). Periods represent mora boundaries.

(1) Hypocoristic name truncation

| | | | |
|---|---|---|---|
| a. | a.ki.ra | → a.ki-tyan | 'little Akira' |
| b. | ka.zu.ki | → ka.zu-tyan | 'little Kazuki' |
| c. | ma.sa.hi.ro | → ma.sa-tyan | 'little Masahiro' |
| d. | ju.N.ta.ro.u | → ju.N-tyan | 'little Juntarou' |

Names are truncated into bimoraic, and the hypocoristic marker follows them. As moras and light syllables coincide in Japanese, observing heavy syllables allows us whether moras or syllables play a role in the truncation of hypocoristic names. If truncated names are generated based on bisyllabic template, the truncated name of (1d) would be **ju.N.ta-tyan* because *N* is in the coda of the first syllable (Kawahara, 2016). Since this truncated name is not acceptable, the stem needs to be bimoraic in the truncation of hypocoristic names. In other words, names are truncated into one bimoraic foot because two moras usually consist of one foot in Japanese.

Bimoraic feet is used in loanword noun truncation as well. Ito (1990) shows that truncated loanword nouns are usually bimoraic or four moraic, i.e, one bimoraic foot or two bimoraic feet: see the truncated nouns below. Q and R stand for the first half of germinate and the second part of long vowel respectively.[1]

(2) a. Truncated loanword nouns with one foot

| | | |
|---|---|---|
| a.ma.chu.a | → a.ma | 'amateur' |

*I would like to thank Seunghun Lee for supporting this research. I also thank the participants at 5th Asian Junior Linguistics Conference for helpful comments. Thanks should also go to the participants of the experiment for this research.

[1] See Section 3.2 for more details.

| | | |
|---|---|---|
| pu.ro.fe.Q.sho.na.ru | → pu.ro | 'professional' |
| he.ri.ko.pu.ta.R | → he.ri | 'helicopter' |
| ru.po.ru.ta.R.ju | → ru.po | 'reportage' |

b. Truncated loanword nouns with two feet

| | | |
|---|---|---|
| ha.N.ka.chi.R.fu | → ha.N.ka.chi | handkerchief' |
| fu.ra.su.to.re.R.sho.N | → fu.ra.su.to | 'frustration' |
| i.ra.su.to.re.R.sho.N | → i.ra.su.to | 'illustration' |
| su.ka.to.ro.ji.R | → su.ka.to.ro | 'scatology' |

(Taken from Ito (1990) and revised)

Loanword nouns are truncated into bimoraic in (2a), and four moraic in (2b). Even though the number of moras is different, both truncated nouns are produced based on bimoraic feet.

Bimoraic feet are also found in loan compound word truncation. A compound word is made of two different words. When it is truncated, both words contribute a part to the surface form.

(3) Loan compound word truncation

| | | |
|---|---|---|
| wa.R.do pu.ro.se.Q.sa.R | → wa.R.pu.ro | 'word processor' |
| he.bi.R me.ta.ru | → he.bi.me.ta | 'heavy metal' |
| ra.ji.o ka.se.Q.to re.ko.R.da.R | → ra.ji.ka.se | 'radio casette recorder' |
| su.ke.R.to bo.R.do | → su.ke.bo.R | 'skateboard' |

(Taken from Ito (1990) and revised)

The truncated nouns in (3) have two bimoraic feet. Hence, this supports that bimoraic feet are the main criteria in loanword noun truncation.

The observations of truncated loanword nouns and loan compound word truncation indicate that bimoraic feet play a crucial role in noun truncation. From these observations, Ito (1990) proposes the minimal stem requirement.

(4) Minimal Stem Requirement: Min(STEM) = F = [μμ]

This requirement demands that the stem be minimally bimoraic, i.e., one bimoraic foot at a minimum. Therefore, monomoraic stem is not acceptable, such as **ju-tyan* in the truncation of hypocoristic names.

**2.2** *Truncation in Japanese Verbs* The minimal stem requirement in (4) is also applied to innovative verbs. Innovative verbs are the category of verbs made by truncating verbs or/and convert non-verbs into verbs by attaching the verb marker *-ru*. Truncation is not mandatory, but most innovative verbs are truncated. They are used in casual speech especially among young people. The innovative verb stem has to be a bimoraic foot at least excluding the verb marker. The N and V in the parentheses stand for the noun and verb respectively.

(5) Innovative verbs with bimoraic stem

| | | | |
|---|---|---|---|
| sha.shi.N me.R.ru (N) | 'photo mail' | → sha.me-ru | 'take a photo' |
| ga.chi.N.ko (N) | 'doing seriously' | → ga.chi-ru | 'do seriously' |
| ma.ku.do.na.ru.do (N) | 'MacDonald's' | → ma.ku-ru | 'go to MacDonald's' |
| gu.R.gu.ru (N) | 'Google' | → gu.gu-ru | 'Search on the Internet' |
| kya.pi.kya.pi-su.ru (V) | 'cavort | → kya.pi-ru | 'cavort' |

Tsujimura and Davis (2011) say that the length requirement of stems of innovative verbs is minimally bimoraic. In other words, the stem needs to be one bimoraic foot at a minimum. Hence, the minimal stem requirement is also applied to verb truncation.

**2.3** *Truncation in Japanese Adjectives* Adjective truncation is usually found in casual speech among young people. There are two types of adjectives in Japanese; na-adjectives and i-adjectives (Backhouse, 2004). Adjective truncation only occurs in i-adjectives. i-adjectives have the adjective maker *-i* at the end of words. According to Daniel (2018), the stem of adjective truncation is bimoraic as well.

(6) Daniel's clipping rule for adjectives

$[\mu_1\ \mu_2\ \mu_3 ... - \rightarrow \mu_1\mu_2 -]$ ← Form rule: source form clips to its first two morae

(7) u.za.t.ta-i 'annoying'

| u.za.t.ta- | → | u.za- | → | u.za- + -i | → | uza-i |
|---|---|---|---|---|---|---|
| Base | | Truncated Base | | Inflection | | Truncated Output |

(Taken from Daniel (2018))

Accoring to Daniel (2018), to generate truncated adjectives, the first two moras or one bimoraic foot in a base adjective are extracted, and the adjective marker is attached at the end. This meets the minimal stem requirement. However, the bimoraic foot template in this rule cannot actually explain all the existing truncated adjectives.

**2.4** *Statement of Problem and an Alternative Hypothesis* There are many truncated adjectives that have the same structure as *u.za-i* in (7).

(8) Existing truncated Adjectives

| Base adjective | Truncated adjective | Gross |
|---|---|---|
| a. mu.zu.ka.shi-i | → mu.zu-i | 'difficult' |
| b. ha.zu.ka.shi-i | → ha.zu-i | 'embarrassed' |
| c. na.tsu.ka.shi-i | → na.tsu-i | 'nostalgic' |
| d. ma.bu.shi-i | → ma.bu-i | 'dazzling' |
| e. ki.bi.shi-i | → ki.bi-i | 'hard to achieve' |
| f. ki.mo.chi.wa.ru-i | → ki.mo-i | 'gross' |
| g. ki.sho.ku.wa.ru-i | → ki.sho-i | 'creepy' |
| h. ke.ba.ke.ba.shi-i | → ke.ba-i | 'flashy' |
| i. mu.sa.ku.ru.shi-i | → mu.sa-i | 'squalid' |
| j. ke.mu.ta-i | → ke.mu-i | 'smokey' |

When these adjectives are truncated, one bimoraic foot is extracted and the adjective marker follows after the truncated adjective stem. These truncated adjectives obey the clipping rule for adjectives illustrated in (6). Hence, they also follow the minimal stem requirement illustrated in (4). However, there is an exception that cannot be explained by the clipping rule; see (9).

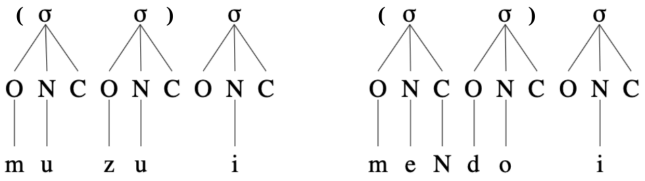
(9) Truncated adjective with trimoraic stem

| Base adjective | Truncated adjective | Gross |
|---|---|---|
| me.N.do.ku.sa-i | → me.N.do-i | 'troublesome' |

The truncated adjective of *me.N.do.ku.sa-i* has a trimoraic stem, not a bimoraic stem. Therefore, this truncated adjective cannot be generated by the clipping rule in (6). From this observation, it is stipulated that there may be another stem template in adjective truncation.

An alternative hypothesis is when adjectives are truncated, the truncated adjective stem has to be a bisyllabic foot. Compared to the truncated adjectives with the bimoraic stem in (8) to the truncated adjective with the trimoraic stem in (9), since *N* is placed in the coda of the first syllable, both of their stems are bisyllabic. If feet structure based on syllables exist in Japanese, the adjective truncation process is regarded as requiring a single bisyllabic foot; see (10).

(10) Internal structure of *mu.zu-i* 'difficult' and *me.N.do-i* 'troblesome' with a bisyllabic foot.




It is widely accepted that bimoraic feet are the main criteria in the standard Japanese. However, there is a study that the Kagoshima dialect has bisyllabic feet (Sato, 2010), so it is no wonder that the standard Japanese also has bisyllabic feet.

This bisyllabic foot stem does not contradict to the previous studies on noun and verb truncation in Section 2.1 and 2.2 because it does not mean that Japanese only has feet structure based on syllables. Rather, it says that adjective truncation use syllables as the main unit.

We call the type of truncated adjectives in (8) **light truncated adjectives** because the first syllable is CV, while the type of truncated adjectives in (9) is called **heavy truncated adjectives** due to the first syllable being CVC.

## 3 Experiment

An experiment was conducted to examine whether the Japanese native speakers prefer the truncated adjective stem to be a bisyllabic foot rather than to be a bimoraic foot. The experiment asked Japanese native speakers to choose truncated adjectives that likely exist from hypothetical truncated adjectives which were produced based on existing adjectives. The results indicate that the Japanese native speakers tend to choose the truncated adjectives with the bisyllabic stem as more acceptable.

**3.1** *Participants* Twenty-two Japanese native speakers who spoke the standard Japanese language participated in this experiment. They were between the age of 18 and 22. This age range was chosen because of the prevalent use of adjective truncation in this age group. The participants were recruited through the announcement in a language education class or by a direct message from the experimenter.

**3.2** *Materials and Methods* For the experiment, eight existing adjectives were selected. They had at least five moras, and three of them had N (a moraic nasal), Q (the first harf of geminate), or R (the second part of long vowel) in the second mora because they are placed in the coda of the first syllable and produce a heavy syllable (Kawahara, 2016).

Table 1: Light and heavy truncated adjectives listed by the number of moras

| The base adjective | i. two moras | ii. three moras | iii. four moras | iv. five moras |
|---|---|---|---|---|
| a. me.zu.ra.shi-i ‘rare’ | me-i (2) | me.zu-i (3) | me.zu.ra-i (4) | |
| b. mo.do.ka.shi-i ‘annoying’ | mo-i (2) | mo.do-i (3) | mo.do.ka-i (4) | |
| c. no.zo.ma.shi-i ‘hopeful’ | no-i (2) | no.zo-i (3) | no.zo.ma-i (4) | |
| d. ka.gu.wa.shi-i ‘fragrant’ | ka-i (2) | ka.gu-i (3) | ka.gu.wa-i (4) | |
| e. mu.tsu.ma.ji-i ‘friendly’ | mu-i (2) | mu.tsu-i (3) | mu.tsu.ma-i (4) | |
| f. ka.N.ba.shi-i ‘fragrant’ | ka-i (2) | ka.N-i (2) | ka.N.ba-i (3) | |
| g. mi.Q.to.mo.na-i ‘unsightly’ | mi-i (2) | mi.Q-i (2) | mi.Q.to-i (3) | mi.Q.to.mo-i (4) |
| h. ko.R.ba.shi-i ‘sweet’ | ko-i (2) | ko.R-i (2) | ko.R.ba-i (3) | |

Note: Vowel sequences [ai] and [oi] sometimes consist of a heavy syllable, or become a diphthong. However, according to Kubozono (2015), the vowels should be in the same morpheme to be a diphthong. Since the adjective marker is considered as an independent morpheme, this is not the case in Table 1.

The numbers in parentheses next to the truncated adjectives indicate the number of syllables. If the numbers in parentheses do not match the number of moras, it means that they are heavy truncated adjectives because N, Q, and R are counted as one mora, but they are located in the coda of the first syllable. (a) to (e) in Table 1 are light truncate adjectives whereas (f), (g), and (h) are heavy truncated adjectives.

The truncated adjectives were produced by selecting moras from base adjectives and adding the adjective marker *-i*. Suppose an adjective *1.2.3.4-i*. Its bimoraic truncated adjective would be *1-i*. If it is trimoraic, it would be *1.2-i*. The minimal number of moras in truncated adjectives is two in order to keep one mora from a base adjective and the adjective marker.

Based on the observation in (8), and (9) in Chapter 1, regardless of whether they are light truncated adjectives or heavy truncated adjectives, the truncated adjectives are trisyllabic; the bisyllabic foot stem and the adjective marker. Therefore, it is predicted that even in hypothetical truncated adjectives, trisyllabic truncated adjectives would receive higher acceptability. Since truncated adjectives in Table 1 are sorted by moras, light trisyllabic truncated adjectives are located in column (ii) while heavy trisyllabic truncated adjectives are located in column (iii). These trisyllabic truncated adjectives are shaded in grey.

In the experiment, a sentence was shown with each truncated adjective so that participants were able to imagine the situation where hypothetical truncated adjectives were used. Since truncated adjectives are usually used in casual communication, the sentences contained casual words. One of the questions of the experiment is shown below.

(11) Example of the questions of the experiment

a. Hypothetical truncated adjective

| | | |
|---|---|---|
| めずらしい | → | めい |
| me.zu.ra.shi-i | → | me-i |
| 'rare'(Base adjective) | | (Truncated adjective) |

b. Sentence

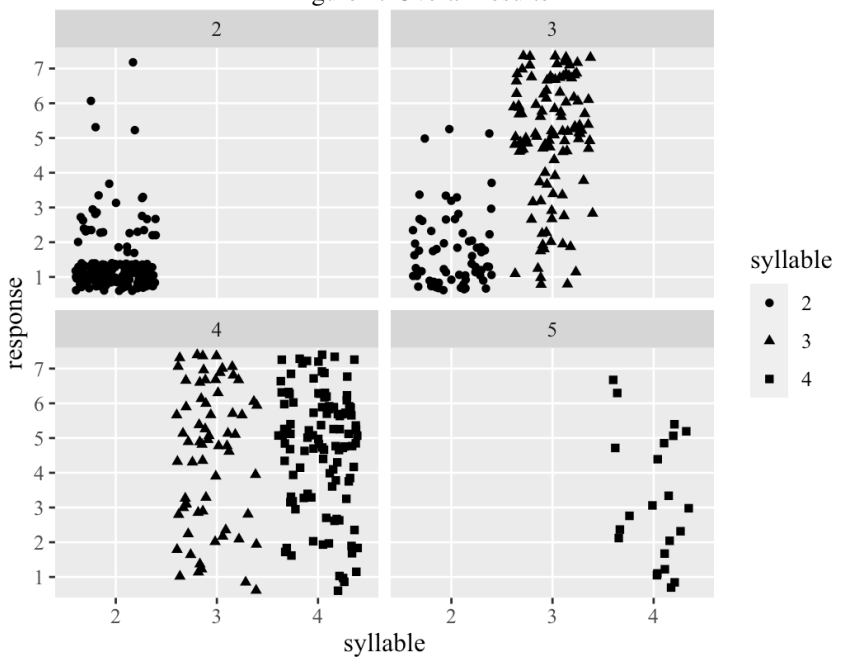
その虫はマジで ( ) よ。
sono mushi-wa majide ( ) yo
that bug-NOM super ( ) SFP (Sentence Final Particle)
'That bug is super ( ).'

Twenty-five truncated adjectives were shown randomly with their base adjective and a sentence. The same base adjective and the same sentence were presented if the base adjective was the same. In each truncated adjective, the scale ranging from 1 to 7 was provided, with 1 being "impossible to use", 2 and 3 being "difficult to use", 4 being "not sure", 5 and 6 being "able to use", and 7 being "possible to use". The participants were asked to select one of the scale for each truncated adjective.

The experiment was conducted on Google Forms. Before the questions, three example questions were shown for practice. All the explanations and questions were written in Japanese. The participants were asked to take the experiment in a quiet place. The data was collected between September 15th and October 19th, 2020.

**3.3** *Results* Since 22 participants were asked to mark one of the 1 to 7 numbers in 25 truncated adjectives, there were 550 responses in total. The responses are summarized in figure 1. The numbers located above in each panel indicate the number of moras while the numbers located below are the number of syllables. The vertical axis shows acceptability. If the dots are placed in the vertical line where the numbers located above and below the panel are the same, those dots represent the acceptability of light truncated adjectives. On the other hand, if the numbers do not correspond, they are the results of heavy truncated adjectives.

Figure 1: Overall results




Overall, the acceptability of light trisyllabic truncated adjectives (the stem is bimoraic and bisyllabic) in the upper right chart and heavy trisyllabic truncated adjectives (the stem is trimoraic and bisyllabic) on the lower left chart are high. Light four-syllabic truncated adjectives (the stem is trimoraic and trisyllabic, such as *me.zu.ra-i*) also show similar results. In contrast, in bisyllabic truncated adjectives, the acceptability is quite low regardless of their stems being monomoraic or bimoraic. The dots in the lower right chart is the acceptability of *mi.Q.to.mo-i* in Table 1. It received lower acceptability as well.

The detailed results in each adjective are illustrated in Table 2. The shaded truncated adjectives are trisyllabic which have the bisyllabic foot stem. They are the same as the shaded ones in Table 1.

Table 2: Detailed results

| Adjective | | Acceptability (%) | | | | | | |
|---|---|---|---|---|---|---|---|---|
| Base adjective | Truncated ajdective | 1 | 2 | 3 | 4 | 5 | 6 | 7 |
| a. me.zu.ra.shi-i 'rare' | i. me-i (2) | 86.4 | 4.5 | 9.1 | 0.0 | 0.0 | 0.0 | 0.0 |
| | ii. me.zu-i (3) | 4.5 | 4.5 | 9.1 | 9.1 | 22.7 | 27.3 | 22.7 |
| | iii. me.zu.ra-i (4) | 9.1 | 0.0 | 9.1 | 13.6 | 27.3 | 22.7 | 18.2 |
| b. mo.do.ka.shi-i 'annoying' | i. mo.i (2) | 72.7 | 9.1 | 4.5 | 0.0 | 9.1 | 4.5 | 0.0 |
| | ii. mo.do-i (3) | 4.5 | 0.0 | 4.5 | 9.1 | 22.7 | 40.9 | 18.2 |
| | iii. mo.do.ka-i (4) | 0.0 | 4.5 | 9.1 | 13.6 | 27.3 | 40.9 | 4.5 |
| c. no.zo.ma.shi-i 'hopeful' | i. no.i (2) | 77.3 | 18.2 | 4.5 | 0.0 | 0.0 | 0.0 | 0.0 |
| | ii. no.zo-i (3) | 18.2 | 9.1 | 13.6 | 0.0 | 36.4 | 13.6 | 9.1 |
| | iii. no.zo.ma-i (4) | 9.1 | 13.6 | 27.3 | 4.5 | 27.3 | 13.6 | 4.5 |
| d. ka.gu.wa.shi-i 'fragrant' | i. ka-i (2) | 86.4 | 4.5 | 9.1 | 0.0 | 0.0 | 0.0 | 0.0 |
| | ii. ka.gu-i (3) | 0.0 | 13.6 | 9.1 | 9.1 | 40.9 | 4.5 | 22.7 |
| | iii. ka.gu.wa-i (4) | 0.0 | 18.2 | 9.1 | 4.5 | 14.6 | 22.7 | 31.8 |
| e. mu.tsu.ma.ji-i 'friendly' | i. mu-i (2) | 81.8 | 9.1 | 9.1 | 0.0 | 0.0 | 0.0 | 0.0 |
| | ii. mu.tsu-i (3) | 0.0 | 9.1 | 4.5 | 0.0 | 31.8 | 9.1 | 45.5 |
| | iii. mu.tsu.ma-i (4) | 4.5 | 9.1 | 0.0 | 18.2 | 45.5 | 18.2 | 4.5 |
| f. ka.N.ba.shi-i 'fragrant' | i. ka-i (2) | 86.4 | 4.5 | 9.1 | 0.0 | 0.0 | 0.0 | 0.0 |
| | ii. ka.N-i (2) | 50.0 | 31.8 | 13.6 | 4.5 | 0.0 | 0.0 | 0.0 |
| | iii. ka.N.ba-i (3) | 9.1 | 13.6 | 4.5 | 14.6 | 13.6 | 18.2 | 27.3 |
| g. mi.Q.to.mo.na-i 'unsightly' | i. mi-i (2) | 81.8 | 13.6 | 0.0 | 0.0 | 0.0 | 0.0 | 4.5 |
| | ii. mi.Q-i (2) | 72.7 | 22.7 | 4.5 | 0.0 | 0.0 | 0.0 | 0.0 |
| | iii. mi.Q.to-i (3) | 9.1 | 22.7 | 13.6 | 4.5 | 22.7 | 18.2 | 9.1 |
| | iv. mi.Q.to.mo-i (4) | 33.7 | 22.7 | 18.2 | 4.5 | 33.7 | 4.5 | 4.5 |
| h. ko.R.ba.shi-i 'sweet' | i. ko-i (2) | 77.3 | 9.1 | 9.1 | 4.5 | 0.0 | 0.0 | 0.0 |
| | ii. ko.R-i (2) | 31.8 | 27.3 | 27.3 | 0.0 | 13.6 | 0.0 | 0.0 |
| | iii. ko.R.ba-i (3) | 9.1 | 0.0 | 22.7 | 4.5 | 22.7 | 9.1 | 31.8 |

Note: The numbers were rounded off to one decimal place.

The numbers in the Table 2 represent the percentages of participants who chose the numbers on the acceptability scale. It is obvious that the bisyllabic truncated adjectives were unacceptable. In almost all the cases, more than 90% of the subjects chose from 1(impossible to use) to 3 (difficult to use). On the other hand, in (a) to (e) in Table 2, acceptability of light trisyllabic truncated adjectives is higher. 72.7% of the subjects in (a, ii), 81.8% in (b, ii), 59.1% in (c, ii), 68.1% in (d, ii), and 86.4% in (e, ii) chose one of 5 (able to use) to 7 (possible).

Similar results were observed in heavy trisyllabic truncated adjectives. 59.1% of the subjects in (f, iii), 50% in (g, iii), and 63.6% in (h, iii) selected bwtween 5, 6, and 7. What is more, when comparing heavy bisyllabic truncated adjectives in (f, ii), (g, ii), and (h, ii) to heavy trisyllabic truncated adjectives in (f, iii), (g, iii), and (h, iii), heavy bisyllabic truncated adjectives received much lower acceptability even though their stems are bimoraic.

In heavy bisyllabic truncated adjectives, the subjects who chose between 1, 2, and 3 were 95.4% in (f, ii), 100% in (g, ii), and 86.4% in (h, ii), whereas in heavy trisyllabic truncated adjectives, the subjects of 27.2% in (f, iii), 45.4% in(g, iii), and 31.8% in (h, iii) did so.

In most cases, light four-syllabic truncated adjectives were also selected by most subjects; 68.3% in (a, iii) 72.7% in (b, iii), 45.4% in (c, iii), 69.1% in (d, iii).

## 4 Discussion

The experimental results indicate that the Japanese native speakers prefer truncated adjectives with a bisyllabic foot rather than a bimoraic foot. This section discusses this experimental results more deeply. Then, adjective truncation is examined with the OT framework. Adjective truncation is analyzed by applying Benua's study (1995) on Japanese hypocoristic name truncation with OT. Since the OT analysis of truncation is based on the research on reduplication (McCarthy and Prince, 2004), this study is briefly reviewed with examples of over-, and underapplication in Section 4.2.1. Then the discussion of Correspondence Theory is expanded to truncation. As reduplication, over- under-, and normal application occur due to the different ranking of BT-Identity (a set of faithful constraints between the base and the truncated form, which requires that the base and the truncated form be identical), and Phono-Constraint (a set of constraints affecting structural condition) between the base and the truncated form. Section 4.2.2 is a discussion about the OT analysis of Japanese hypocoristic name truncation. Benua(1995) proposes that the Japanese hypocoristic name truncation is an example of Emergent Unmarkedness (McCarthy and Prince, 1994). The truncation occurs due to the different ranking of BT-Identity and Phono-Constraint from over-, under, and normal application. In Section 4.2.3, adjective truncation is examined with OT. Without a specific mapping target template for adjective truncation, the optimal output with the bisyllabic foot stem is generated regardless of light or heavy truncated adjectives.

### 4.1 *Experimental Results Discussion*

**4.1.1** *Bisyllabic Truncated Adjectives* The experimental results show that bisyllabic truncated adjectives are strongly unacceptable. Interestingly, in (f, ii), (g, ii), and (h, ii) in Table 2, even though their truncated adjective stems are bimoraic, they received very low acceptability. It suggests that the truncated adjective stem needs to be a bisyllabic foot.

Another possibility that bisyllabic truncated adjectives are unacceptable is considered from the point of Message-Oriented Phonology (MOP: Hall et al., 2015). MOP says that messages which have high-predictability can be reduced while if they are not highly predictable, the speaker tends to produce more messages. It is assumed that the truncated adjectives with less than three syllables do not have enough messages to predict their meaning. Therefore, it needs to be trisyllabic at a minimum.

**4.1.2** *Trisyllabic Truncated Adjectives* Trisyllabic truncated adjectives are judged as the most acceptable regardless of light trisyllabic truncated adjectives or heavy trisyllabic truncated adjectives. This observation is another evidence that the truncated adjective stem needs to be bisyllabic in addition to the lower acceptability of monosyllabic (both monomoraic and bimoraic) truncated adjective stems discussed in Section 4.1.1.

From these results, it is assumed that the truncated adjective stem requires a single bisyllabic foot; see the truncated adjective stem requirement in (12).

(12) Truncated Adjective Stem Requirement: If a base adjective is $(\sigma_1\ \sigma_2)$...i
TRUNCATED ADJECTIVE STEM = $(\sigma_1\ \sigma_2)$

The subscript numbers in the truncated adjective stem stand for the first and second syllable of a base adjective. The first bisyllabic foot is extracted to generate the truncated adjective stem.

**4.1.3** *Four-moraic Truncated Adjectives* Four-moraic truncated adjectives received relatively higher acceptability (68.3% in (a, iii), 72.7% in (b, iii), 45.4% in (c, iii), 69.1% in (d, iii) in Table 2). One possible reason is considered with MOP. As shortly discussed in Section 4.1.1, according to MOP(Hall et al., 2015), if messages are highly predictable, they can be reduced, but if they are not, the speaker tends to produce longer messages. Since four moraic truncated adjectives are longer in hypothetical truncated adjectives and have more information, the participants might judged them as acceptable.

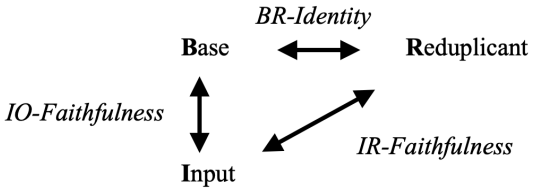
**4.1.4** *Brief Summary* The experimental results indicate that adjective truncation mainly use syllables as the main unit whereas the previous studies on noun and verb truncation suggest that moras are the main unit in hypocoristic name, noun and verb truncations. This supports that Japanese native speakers have access to not only moraic structure but also the syllable structure (cf. Kawahara, 2016). Furthermore, since different prosodic

units are used as the main units for truncation in different parts of speech, it is assumed that different parts of speech have different phonological systems even in the same language.

**4.2** *OT Analysis* This subsection analyzes adjective truncation with the framework of Optimality Theory (OT) based on the discussion of truncated adjectives in Section 4.1. Truncation is analyzed as an output-output interaction in the framework of OT (Benua 1995). This analysis was developed from the analysis of reduplication (McCarthy and Prince, 2004). The truncated form has an identical element to the base, but also lose some of it parts due to deletion. This alternation is caused by the interaction between BT-Identity, and Phono-Consraint. If BT-Identity is undominated, that is, stronger than Phono-Constraint, the identity between the base and the truncated form is maintained. This results in over- or underapplication of Phono-Constraint. The truncation of Japanese hypocoristic name, however, is caused by BT-Identity being dominated by Phono-Constraint (Benua, 1995). This analysis can be applied to adjective truncation with a little revision based on the experimental results.

**4.2.1** *Correspondence Theory for Truncation* McCarthy and Prince (2004) propose Correspondence Theory to explain over- and underapplication, and to form a model of constraints between the base and the reduplicant in reduplication. A correspondence is a relation between two structures. As there are three structures, the input, the base (output), and the redupicant in reduplication, there are three correspondence relations between them;

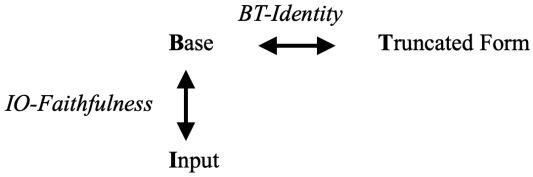
(13) Correspondence Theory for reduplication




IO-faithfulness and BR-Identity are cover terms which contain a set of faithfulness constraints MAX-IO, DEP-IO, IDENT-IO[F] etc., and MAX-BR, DEP-BR, IDENT-BR[F] etc. respectively. IR-Faithfulness is also needed because reduplicants are sometimes more identical to the input.

Benua (1995) applies Correspondence Theory illustrated in (13) to truncation. Correspondence Theory for truncation is similar to the one for reduplication, but there are only two correspondence relations;

(14) Correspondence Theory for truncation




Correspondences between the input and the base, and the base and the truncated form are called IO-Faithfulness, and BT-Identity respectively. There are mainly two differences between Correspondence Theory for reduplication and for truncation (Benua, 1995). One of them is the relation between the base and the truncated form. In reduplication, the base and the reduplicant are produced at the same time while the base and the truncated form are separated words in truncation. Therefore, the base word is generated first, and then the truncated form is produced when it is necessary. Another difference is that there is no correspondence relation between the truncated form and the input. This is because the truncated form is always less faithful to its input than to its base.

Over-, under-, and normal application are also observed in truncation as reduplication. When over- and underapplication are observed, BT-Identity is undominated by Phono-Constraint whereas it is dominated in normal application. Three examples are shown for each application. In Icelandic, vowels become long in stressed open syllables (Árnason, 1980), but this lengthening is observed in (15a) even though the truncated form is not an open syllable. Vowel lengthening is transcribed with the sequence of two vowels. (15b) comes from Yew York-Philadelphia English (Dunlap, 1990). The low front vowel [æ] is tensed in closed syllables in this dialect. This tensed allophone is transcribed [E]. Even though the truncated form [pæm] is a closed syllable, this vowel tensing is not observed. (15c) is an example of normal application. In Tiberian Hebrew, word-initial clusters are prohibited, and post-vocalic spirantization is observed (McCarthy, 1985). Underlines in (15c) stand for spirantization. Henceforth, periods represent **syllable boundaries**.

(15) Over-, under-, and normal application in truncation

a. Overapplication in Icelandic

| Base | Truncated form |
|---|---|
| [söö.tra] | → [söötr] |

b. Underapplication in New York-Philadelphia English

| Base | Truncated form |
|---|---|
| Janice [jæ.nɪs] | → Jan [jæn] |

c. Normal application in Tiberian Hebrew

| /Root/ | Imperfective (Base) | Imperative (Truncated form) |
|---|---|---|
| /ktb/ | yik̲tob̲ | kə̲tob̲ |

In (15a), although the truncated form is a closed syllable, vowel lengthening is 'observed'. That is, the lengthening constraint is overapplied. The low front vowel [æ] does not change in the truncated form in (15b) even though it is a closed syllable. Therefore, the phonological constraint that requires [æ] → [E] alternation is 'underapplied'. The truncated form in (15c) is well-behaved phonologically, so it is normal application.

These applications are explained by the ranking relation between BT-Identity, IO-faithfulness, and Phono-constraint. For over- and underapplication to happen, BT-Identity has to be undominated whereas this is not the case in normal application. The ranking schemata for the three applications are shown below (Benua, 1995).

(16) Ranking schemata

a. Overapplication
BT-Identity, Phono-Constraint » IO-Faithfulness

b. Underapplication
BT-Identity » Phono-Constraint » IO-Faithfulness

c. Normal application
Phono-Constraint » BT-Identity, IO-Faithfulness

Over- and underapplication are formally the same. BT-Identity is undominated in both cases. On the other hand, Phono-Constraint is outranked in the case of normal application. This makes the truncated form well-behaved phonologically.

**4.2.2** *OT Analysis of Japanese Hypocoristic Name Truncation* Benua (1995) discusses Japanese hypocoristic name truncation, which is in Section 2.1 in this paper, with the framework of OT. With OT, hypocoristic name truncation can be analyzed without a specific mapping target template, i.e., a single bimoraic foot for mapping. She concludes that hypocoristic name truncation in Japanese is caused by "Emergent unmarkedness"(McCarthy and Prince, 1994). To put it simply, the different ranking order of Phono-Constraint, IO-faithfulness, and BT-Identity as shown in (17).

(17) Emergent Unmarkedness
IO-Faithfulness » Phono-Constraint » BT-Identity

BT-identity is least ranked because hypocoristic name truncation undergoes shortening of the base, and the identity between the base and the truncated form is partially lost. In Emergent Unmarkedness, IO-faithfulness is outranked as Phono-Constraint is not always satisfied in Japanese. In monomoraic words such as *ki* 'tree', one of Phono-Constraint, FtBin is violated but it is the optimal candidate. This is because another candidate with a long vowel such as *kii* is eliminated by one of IO-Faithfulness, Ident-IO[v-length] (Benua, 1995). Therefore, IO-Faithfulness needs to be undominated. This analysis of hypocoristic name truncation can be applied to adjective truncation.

**4.2.3** *OT Analysis of Adjective Truncation* The adjective truncation is observed with OT based on Benua's study on hypocoristic name truncation with a little modification. The experimental results indicate that the truncated adjective stem needs to be a bisyllabic foot rather than a bimoraic foot. Five constraints are shown in this analysis to output the optimal candidate with the bisyllabic foot stem.

Let us quickly review the relation between base adjectives and truncated adjectives with a light truncated adjective, *mu.zu-i* in (8), and heavy truncated adjective, *me.N.do-i* in (9). Again, syllable boundaries are marked by periods.

(18) Base adjectives and truncated adjectives

| | Base adjective | Truncated adjective | Gross |
|---|---|---|---|
| a. | mu.zu.ka.shi-i | → mu.zu-i | 'difficult' |

b. meN.do.ku.sa-i → meN.do-i 'troublesome'

Both truncated adjectives have the bisyllabic foot stem as *N* is placed in the coda of the first syllable in (18b). Two constraints ensure that the truncated adjective stem have a bisyllabic foot:

(19) Constraints for ensuring that the truncated adjective stem have a bisyllabic foot
   a. ALIGN-FT-L: Feet must be aligned at the left edge.
   b. FIT-BIN: Feet must be binary under syllabic analysis.

ALIGN-FEET-L demands that feet be aligned at the left edge. Internal elements of feet must be bisyllabic by FIT-BIN.

These constraints are not enough to output the correct optimal candidate because internal elements can be anything which is bisyllabic. For instance, the optimal candidate of *mu.zu.ka.shi-i* 'difficult' could be *ra.shi-i* because *ra.shi* consists of one bisyllabic foot. Hence, two more constraints are needed which demand the internal elements of the bisyllabic foot stem be the same as the first two syllables of a base adjective:

(20) Constraints for ensuring that the truncated adjective stem have the first two syllables of a base adjective
   a. ANCHOR-L: The left edge of the base and the left edge of the truncated form are in correspondence.
   b. CONTIGUITY-STEM: The portion of the base stem standing in the truncated form is a contiguous string.

ANCHOR-L requires that the left edge of the base and the truncated form is the same (McCarthy and Prince, 2004). CONTIGUITY demands that the portion in the base which appears in the truncated form be not skipped (McCarthy and Prince, 2004). It is violated with the map abc → ac, but not with the map abc → ab. This constraint is not included in Benua (1995), but it is necessary to prevent an ungrammatical adjective stem which contains such as the first and the third syllable. CONTIGUITY-STEM is specific to the stem, and only violated when a contiguous string of the base stem is skipped in the truncated form because the adjective marker is required in the morphological domain. These two constraints rule out the candidates whose first two syllables do not correspond to the first two syllables of its base adjective.

In addition, MAX-BT is also included in this OT analysis because of the correspondence relation between the base and the truncated adjective:

(21) MAX-BT: Every segment of the base has a correspondent in the truncated form.

MAX-BT has to be least ranked because it can be violated by any truncated adjective. The ranking of other constraints can be any order. The ranking of the constraints is shown below.

(22) Ranking for adjective truncation
ALIGN-FT-L, FTBIN, ANCHOR-L, CONTIGUITY-STEM » MAX-BT

(22) follows the ranking schema for Emergent Unmarkedness illustrated in (17). Based on these constraints and the ranking, the tableau for *mu.zu-i* 'difficult' is illustrated. As mentioned, periods stand for syllable boundaries.

(23) Tableau for a light truncated adjective, *mu.zu-i*

| Base: (mɯ.dzɯ)(ka.ʃi)-i | ALIGN-FT-L | FTBIN | ANCHOR-L | CONTIGUITY-STEM | MAX-BT |
|---|---|---|---|---|---|
| a. (mɯ-i) | | | | | *****!* |
| b. mɯ.(dzɯ-i) | *! | | | | **** |
| c. ☞(mɯ.dzɯ)-i | | | | | **** |
| d. (mɯ.dzɯ-i) | | *! | | | **** |
| e. (mɯ.dzɯ)(ka-i) | *!* | | | | ** |
| f. (mɯ.dzɯ)(ka.ʃi)-i | *!* | | | | |
| g. (mɯ.ka)-i | | | | *!* | **** |
| h. (mɯ.ka)(ʃi-i) | *!* | | | ** | ** |
| i. (mɯ.ʃi)-i | | | | *!*** | **** |
| j. (dzɯ)-i | | *! | * | | ****** |
| k. (dzɯ.ka)-i | | | *! | | **** |
| l. (ka.ʃi)-i | | | *! | | **** |

Since the base is also the output as shown in (14), it already has feet.[2] We stipulate that the base also has syllabic feet structure here. ALIGN-FT-L is distant-sensitive, so the more feet aligned on the right, the more this constraint is violated. In Candidate (b), there is a syllable between the left edge and the foot, so one violation mark is provided. In contrast, even though all syllables are parsed into feet in Candidate (e), one of the feet is not at the left edge and two syllables are between them. Two violation marks appear in this case. Candidate (f), and (h) received two violation marks due to the same reasons. Candidate (d), and (j) are the violators of FTBIN because the feet are not bisyllabic. Since the first syllables in Candidate (j), (k), and (l) are not the correspondents to the one in the base, they violate ANCHOR-L. CONTIGUITY-STEM is violated by Candidate (g), (h), and (i). [dzɯ] in Candidate (g) and (h), and [dzɯ.ka] in Candidate (i) are skipped. MAX-BT is violated by almost all the candidates except (f). Although Candidate (a) and (c) also violate this constraint, since Candidate (c) causes less violation, Candidate (c), [(mɯ.dzɯ)-i] is the optimal candidate. As MAX-BT is violable, BT-Identity is not fully maintained and clipping the base is possible.

Heavy truncated adjectives are also explained with the same constraints and ranking.

(24) Tableau for a heavy truncated adjective, *meN.do-i*

| Base: (men.do)(kɯ.sa)-i | ALIGN-FT-L | FTBIN | ANCHOR-L | CONTIGUITY-STEM | MAX-BT |
|---|---|---|---|---|---|
| a. (me-i) | | | | | *****!** |
| b. (men)-i | | *! | | | ****** |
| c. (men-i) | | | | | *****!* |
| d. men(do-i) | *! | | | | **** |
| e. ☞(men.do)-i | | | | | **** |
| f. (men.do-i) | | *! | | | **** |
| g. (me.do)-i | | | | *! | ***** |
| h. (men.do)(kɯ-i) | *!* | | | | ** |
| i. (men.do)(kɯ.sa)-i | *!* | | | | |
| j. (men.kɯ)-i | | | | *!* | **** |
| k. (men.kɯ)(sa-i) | *!* | | | ** | ** |
| l. (men.sa)-i | | | | *!*** | **** |
| m. (do)-i | | *! | * | **** | ******* |
| n. (kɯ.sa)-i | | | *! | | ***** |

Light truncated adjectives and heavy truncated adjectives are not so different because regardless of the first syllable being light or heavy, a single bisyllabic foot is required as the truncated adjective stem. Candidate (d), (h), (i), and (k) are violators of ALIGN-FT-L. They have feet which are not aligned at the left edge. FTBIN is violated by Candidate (b), (f), and (m). Candidate (b) has two moras as its stem but since FTBIN in adjective truncation requires binarity of syllables, Candidate (b) violates this constraint. Candidate (m), and (n) incur the violation of ANCHOR-L. Candidate (g), (j), and (l) cause fatal violations at CONTIGUITY-STEM. Although Candidate (a), (c), and (e) violate MAX-BT, Candidate (e) received the least violation marks. Therefore, Candidate (e), [(men.do)-i] is the optimal candidate.

Adjective truncation which requires the stem be a single bisyllabic foot has been successfully explained with OT framework. Regardless of light or heavy truncated adjectives, truncation is caused by BT-Identity being dominated by Phono-Constraint. In addition to hypocoristic name truncation, adjective truncation is also an example of Emergent Unmarkedness.

## 5 Conclusion

In Section 1, we have reviewed previous studies on truncation and found that bimoraic feet play an important role in hypocoristic name, noun, and verb truncation in Japanese. However, this is not the case in adjective truncation because there is a truncated adjective, *meN.do-i* whose stem is trimoraic. This adjective stem is also bisyllabic because the second mora, *N* is placed in coda of the first syllable. Hence, we have stipulated that truncated adjective stem need to be a bisyllabic foot rather than a bimoraic foot. The experiment was conducted to examine whether the requirement that demands the truncated adjective stem be bisyllabic actually exist in the grammar of Japanese native speakers. The results show that Japanese native speakers prefer the bisyllabic foot stem to the bimoraic foot

[2]Even though the adjective marker *-i* is not included in feet, it is included in prosodic hierarchy by Weak Layering (Ito and Mester, 2003).

stem in adjective truncation. This finding supports that Japanese native speakers have access to syllable structure in addition to mora structure. Also, we have assumed that different phonological systems operate in different parts of speech even in the same language because hypocoristic name, noun, and verb truncation use moras as the main unit while the main unit is syllables in adjective truncation. In Section 4.2, truncated adjectives have been analyzed with the framework of OT based on the results of the experiment and previous studies on OT for reduplication and truncation. In previous studies, the optimal output is generated with the interaction of Phono-Constraint and BT-Identity without assuming a specific mapping target template for it. This analysis has been successfully applied to adjective truncation.

## References


Árnason, K. (1980). *Quantity in Historical Phonology: Icelandic and Related Cases*. Cambridge University Press.

Backhouse, A. E. (2004). Inflected and Uninflected Adjectives in Japanese. In R. M. W. Dixon & A. Y. Aikhenvald (Eds.), *Adjective Classes: A Cross-linguistic Typology* (pp. 266–290). Oxford University Press.

Benua, L. (1995). Identity Effect in Morphological Truncation. *University of Massachusetts Occasional Paper* (77–136). Graduate Linguistic Student Association.

Daniel, A. D. (2018). Grammaticality in Japanese clipping. *Calgary Working Paper in Linguistics*, *30*, 15–32. http://hdl.handle.net/1880/108951

Dunlap, E. (1990). æ Tensing in Lexical Phonology. *University of Massachusetts Occasional Papers in Linguistics*, *16*(14). https://scholarworks.umass.edu/umop/vol16/iss3/2

Hall, K. C., Hume, E., Jaeger, T. F., & Wedel, A. (2015). *The Message Shapes Phonology*. https://www.academia.edu/29087504/The_Message_Shapes_Phonology_updated_version_October_2016_

Hibiya, J. (1998). 複合後短縮 [compound truncation]. 世界の日本語教育 *[Japanese Language Education of the World]*, *8*, 47–65.

Irwin, M. (2011). Mora clipping of loanwords in Japanese. *Journal of Japanese Linguistics*, *27*, 71–81. https://doi.org/10.1515/jjl-2011-0105

Ito, J. (1990). Prosodic Minimality in Japanese. *CLS 26-II: Papers from the Parasession on the Syllable in Phonetics and Phonology*, 213–239.

Ito, J., & Mester, A. (2003). Weak Layering and Word Binarity. In T. Honma, M. Okazaki, T. Tabata, & S.-i. Tanaka (Eds.), *A New Century of Phonology and Phonological Theory: A Festschrift for Professor Shosuke Haraguchi on the Occasion of His Sixtieth Birthday* (pp. 26–65). Kaitakusha.

Kawahara, S. (2016). Japanese has syllables: a reply to Labrune. *Phonology*, *33*, 169–194. https://doi.org/10.1017/S0952675716000063

Kubozono, H. (2015). Diphthongs and vowel coalescence. In H. Kubozono (Ed.), *Handbook of Japanese Phonetics and Phonology* (pp. 215–249). De Gruyter Mouton.

McCarthy, J. J. (1985). *Formal Problems in Semitic Phonology and Morphology*. https://scholarworks.umass.edu/linguist_faculty_pubs/39

McCarthy, J. J., & Prince, A. (1994). The emergence of the unmarked: Optimality in prosodic morphology. *Proceedings of the North East Linguistics Society*, *24*(18). https://scholarworks.umass.edu/linguist_faculty_pubs/18

McCarthy, J. J., & Prince, A. (2004). Faithfulness and Identity in Prosodic Morphology. *Optimality Theory in Phonology* (77–98). John Wiley & Sons, Ltd. https://doi.org/https://doi.org/10.1002/9780470756171.ch3

Mester, R. A. (1990). Patterns of Truncation. *Linguistic Inquiry*, *21*(3), 478–485.

Poser, W. J. (1990). Evidence for Foot Structure in Japanese. *Language*, *66*(1), 78–105.

Sato, Y. (2010). Two Types of Tonal Feet in Japanese. *The MGU journal of liberal arts studies: Karuchuru*, *4*(1), 201–210.

Tsujimura, N., & Davis, S. (2011). A construction approach to innovative verbs in Japanese. *Cognitive Linguistics*, *22*(4), 799–825. https://doi.org/10.1515/COGL.2011.029