

# The phonetic realization of Japanese compounds with non-fusion accent: The difference between “family name + first name” and “family name + job title”

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## ABSTRACT

The accent pattern of Japanese compounds is commonly classified into two types. In compounds with a modifier-head structure, the accent is fused into a single prosodic unit (fusion accent). In contrast, in other compounds, such as human names or dvandva compounds, the accents are not fused; instead, the lexical accents of each component are retained (non-fusion accent). However, it remains unclear whether the phonetic realization of non-fusion accent is uniform across different semantic structures. This study investigates pitch movements in two types of Japanese compounds: (1) “family name + first name” and (2) “family name + job title,” both of which are generally regarded as exhibiting non-fusion accents. Acoustic analysis reveals that the pitch accent of the second element is more notably weakened in (2) than in (1). These findings indicate that non-fusion accent in Japanese compounds does not have a single, invariant phonetic realization.

**Keywords:** Japanese, compound words, non-fusion accent, phonetic realization, pitch movement

## 1. Introduction

### 1.1 Accent system in Japanese

Standard Japanese, based on the Tokyo dialect and mainly spoken in the Tokyo area (henceforth referred to simply as Japanese), employs a pitch accent system. In many words, accent is realized as an abrupt pitch fall between two morae (HL tone), referred to as the accent nucleus. The accent nucleus can occur on any mora within a word, a property known as free accent. There are also words with no accent nucleus, known as flat-type. In addition, unless the accent nucleus occurs on the first mora, all words begin with a pitch rise (LH tone) across the first two morae. This phenomenon is known as initial lowering<sup>(1)</sup>.

As a result, Japanese accent patterns can be represented as in (1). The pitch fall and initial lowering are indicated by ' and ʔ, respectively.

- (1) a. i'notei=ga (HLL=L) “life=NOM”  
 b. taʔma'go=ga (LHL=L) “egg=NOM”  
 c. oʔtoko'=ga (LHH=L) “man=NOM”  
 d. saʔkana=ga (LHH=H) “fish=NOM”

### 1.2 Accent system in Japanese compounds

In Japanese compounds, accent patterns are broadly classified into fusion and non-fusion types. In compounds with a modifier–head structure, in which the first element semantically restricts the second, the accents of the two elements are fused into a single periodic unit. This pattern is referred to as fusion accent, as illustrated in (2a). In contrast, in certain other compounds, such as human names or dvandva compounds, the accents are not fused; instead, the accents of each component word are retained. This pattern is referred to as non-fusion accent, as shown in (2b).

- (2) a. tee'ko (HL) + miʔjage (LHH) → tee'komi'jage (LHHLL)  
 “Czech”            “souvenir”            “souvenir from Czech”

- b. tɛ'ko (HL) + suʔrobakia (LHHHH) → tɛ'kosuʔrobakia (HLLHHHH)  
 “Czech”            “Slovakia”                    “Czechoslovakia”

Several previous studies have investigated which types of compounds exhibit a non-fusion accent. Kubozono (1995) identified the following patterns and examples of compounds with non-fusion accent (henceforth referred to as non-fusion compounds):

- (3) a. dvandva compound:  
 ip'puʔ taʔsai “polygamy” (lit. one husband + many wives)
- b. organization + job title:  
 se'eɸuʔ joʔoɰziŋ “government dignitary”
- c. family name + first name:  
 mi'ki ta'keci “MIKI Takeshi”
- d. team name:  
 ga'mba oʔosaka “Gamba Osaka” (a professional soccer team)
- e. name + job title:  
 juu'kawa ha'kase “Dr. Yukawa” (lit. Yukawa + doctor)
- f. area + its modifier:  
 do'itsu ho'kuubu “Northern Germany” (lit. Germany + northern part)
- g. case relation:  
 se'neʔu se'neʔse “player oath” (lit. player [NOM] + swearing)

Kori (2016) summarizes that a compound exhibits a non-fusion accent if (i) the second element does not denote a concrete entity or a non-active or non-state concept, or (ii) the first element does not semantically restrict the content of the second element.

Although non-fusion compounds generally retain the lexical accents of both the first and second elements, the realization of these accents differs from their realization in isolation. Kori (2012; 2016) notes that the accent of the second element is typically weakened in non-fusion compounds and that its pitch movements are suppressed. More specifically, the pitch peak is relatively lowered, and the initial lowering is less salient in the second element.

Nevertheless, it remains unclear whether the phonetic realization of non-fusion accent is completely uniform across different semantic structures. As shown in (3), non-fusion compounds encompass several types with substantially different semantic properties. It is therefore plausible that the phonetic realization of accent varies according to the semantic structure of the compound.

## 2. Survey

### 2.1 Target words

The present study examines the pitch movements of non-fusion compounds, focusing on two types: “family name + first name” (henceforth human name) and “family name + job title” (henceforth job title). Both types are regarded as exhibiting non-fusion accents, as illustrated in (3).

Table 1. Target words

	(a) human name	(b) job title
(I) μ'μμ + μ'μμ	mo'rita ha'ruka mo'rita mi'dori mo'rita ta'roo	mo'rita ha'kase mo'rita ko'mon
(II) μ'μμ + μ'μμ	ka'too ma'koto ka'too ma'moruu ka'too ta'keruu	ka'too ea'teoo ka'too buu'teoo ka'too ka'teoo
(III) μ'μμ + μ'μμ	ja'mada ma'koto ja'mada ma'moruu ja'mada ta'keruu	ja'mada ea'teoo ja'mada buu'teoo ja'mada ka'teoo

The target words consist of the compounds listed in Table 1. All elements composing the compounds are three-mora words. Some have an accent nucleus after the first mora (μ'μμ [HLL]), while others lack an accent nucleus (μ'μμ [LHH]). The first elements for both human names and job titles are *mo'rita*, *ka'roo*, and *ja'mada*, all of which are common Japanese family names. The second elements for human names include *ha'ruka*, *mi'dori*, *ta'roo*, *ma'koto*, *ma'moruu*, and *ta'keruu*, which are common given names. The second elements for job titles include *ha'kase* “doctor,” *ko'mon*

“adviser,” *εaʎteoo* “president,” *buʎteoo* “department manager,” and *kaʎteoo* “section chief.”

The accent pattern combinations are (I)  $\mu'\mu\mu + \mu'\mu\mu$ , (II)  $\mu'\mu\mu + \mu\lambda\mu\mu$ , and (III)  $\mu\lambda\mu\mu + \mu\lambda\mu\mu$ . The remaining pattern,  $\mu\lambda\mu\mu + \mu'\mu\mu$ , is excluded because it is identical to a fusion accent pattern, making accent weakening unobservable. Using these target words, the phonetic realization of accents is compared between (Ia–IIIa) and (Ib–IIIb).

## 2.2 Experiment

A production experiment was conducted using the target words in Table 1. Six native speakers of Japanese participated in the experiment. All participants were born and raised in the Tokyo area and were between 20 and 31 years of age.

Participants were instructed to read the target words within the career sentence shown in (4).

- (4) ..... ga teema desu “..... is the theme.”  
NOM theme COP (PRES)

Each sentence was read six times by each participant, resulting in a total of 36 tokens per compound<sup>(2), (3)</sup>. All materials were recorded using a linear PCM recorder and a condenser microphone.

## 2.3 Analysis

Recorded materials were analyzed using Praat (Boersma and Weenink 2020). For all materials, fundamental frequency (fo) (in semitone re 50 Hz) was measured at three points: (i) the peak in the first element (= P1), (ii) the peak in the mora where a high (H) pitch is expected to occur for the first time in the second element (= P2), namely  $\mu'\mu\mu + \mu'\mu\mu$  [HLLHLL],  $\mu'\mu\mu + \mu\lambda\mu\mu$  [HLLLHH], or  $\mu\lambda\mu\mu + \mu\lambda\mu\mu$  [LHHLHH], and (iii) the lowest point, or valley, in the mora preceding (ii) (= V), that is,  $\mu'\mu\mu + \mu'\mu\mu$  [HLLHLL],  $\mu'\mu\mu + \mu\lambda\mu\mu$  [HLLLHH], or  $\mu\lambda\mu\mu + \mu\lambda\mu\mu$  [LHHLLHH]. We can observe the amount of the pitch falling and rising by calculating P1–V and P2–V, respectively. The examples of the pitch curves and the points at which fo was measured are shown

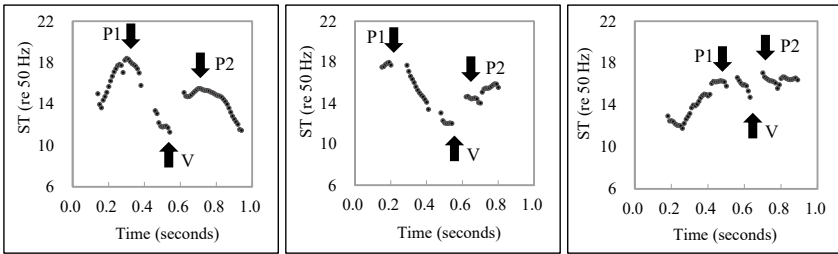


Figure 1. Pitch curves of *mo'rita ta'roo* (left), *ka'oo ta'keru* (center), and *ja'mada ta'keru* (right)

in Figure 1.

### 3. Results

#### 3.1 Mean fo values

The mean fo values of P1, V, and P2 for (I)  $\mu^1\mu\mu + \mu^1\mu\mu$ , (II)  $\mu^1\mu\mu + \mu^7\mu\mu$ , and (III)  $\mu^7\mu\mu + \mu^7\mu\mu$  are shown in Figure 2.

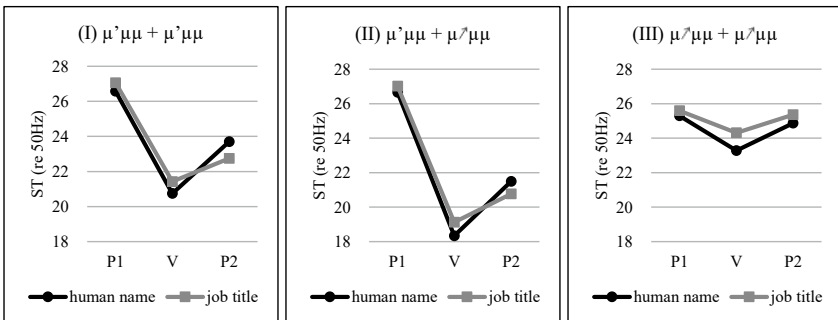


Figure 2. Mean fo values of P1, V, and P2 for (I)  $\mu^1\mu\mu + \mu^1\mu\mu$  (left), (II)  $\mu^1\mu\mu + \mu^7\mu\mu$  (center), and (III)  $\mu^7\mu\mu + \mu^7\mu\mu$  (right)

Figure 2 shows that the amounts of pitch rising from V to P2 are larger for human names than for job titles in conditions (I) and (II), and that the pitch valley is deeper for human names than for job titles in condition (III). These findings suggest that the phonetic realization of non-fusion accents is not completely uniform across different

semantic structures of non-fusion compounds. More specifically, pitch movement tends to be more suppressed in job titles than in human names.

### 3.2 Amount of falling and rising

In this section, the amount of pitch falling and rising is examined by calculating P1–V and P2–V values, which are then subjected to statistical analyses.

First, we focus on the pitch rising. Figure 3 shows the mean values of P2–V. HN and JT represent human name and job title, respectively, and the error bars indicate the standard errors.

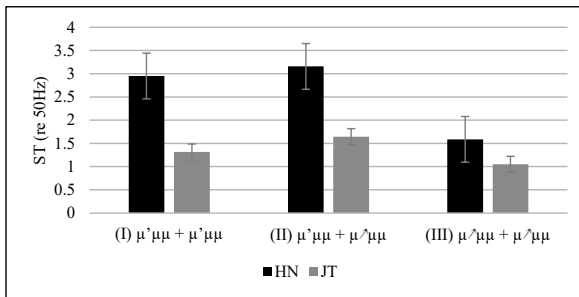


Figure 3. Mean values of P2–V

Figure 3 shows that P2–V values, that is, the amount of the pitch rising, are larger for human names than for job titles in conditions (I), (II), and (III). These differences are statistically significant (Mann–Whitney U test) in (I) ( $U = 2070.0, p < .01$ ) and (II) ( $U = 3026.5, p < .01$ ), but not in (III) ( $U = 3430.0, p = .08$ ). These results can be interpreted as evidence of accent weakening in job titles, in the sense that the pitch movement in the second element is suppressed compared with that in human names, regardless of whether the second element has an accent nucleus or is a flat-type word.

Next, we consider the values of P1–V. Figure 4 shows the mean P1–V values.

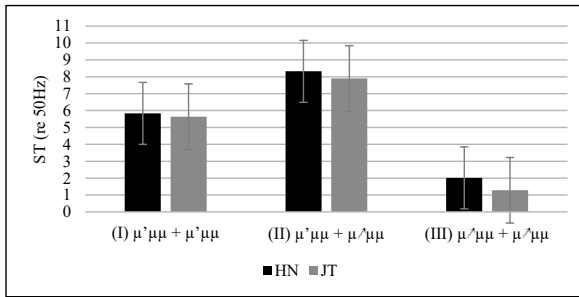


Figure 4. Mean values of P1-V

Figure 4 indicates that P1-V values, that is, the amount of pitch falling, are larger for human names than for job titles in condition (III). Although this difference appears small, it is statistically significant (Mann-Whitney U test:  $U = 2771.5$ ,  $p < .01$ ). This result indicates that the pitch at the beginning of the second element is less lowered in job titles than in human names. This pattern can again be interpreted as accent weakening in job titles, in the sense that pitch movement is less dynamic than in human names.

#### 4. Conclusion

This study examined pitch movements in Japanese non-fusion compounds, focusing on human names and job titles. The acoustic analysis showed that the amount of pitch rising is larger for human names than for job titles when the first element contains an accent nucleus, and that the amount of pitch falling is larger for human names than for job titles when the first element is a flat-type word. Overall, the accent of the second element is weakened more, and pitch movement is correspondingly suppressed, in job titles compared with human names, even though both are categorized as having non-fusion accents. These findings indicate that the so-called non-fusion accent in Japanese compounds does not have a single phonetic realization but instead exhibits several variations depending on the semantic structures of the compounds.

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### Notes

- (1) Initial lowering is generally regarded not as a characteristic of pitch accent but as an intonational feature signaling the beginning of a phrase. However, Kori (2004) argued that initial lowering is a suprasegmental feature that every word either has or does not have and should therefore be regarded as a property of word accents. Following Kori (2004), the present study treats initial lowering as part of word accents.
- (2) One participant read the target words in condition (IIIb), namely ja<sup>7</sup>mada ea<sup>7</sup>teoo, ja<sup>7</sup>mada buu<sup>7</sup>teoo, and ja<sup>7</sup>mada ka<sup>7</sup>teoo with fusion accents, producing forms such as ja<sup>7</sup>mada ea<sup>7</sup>teoo, ja<sup>7</sup>mada buu<sup>7</sup>teoo, and ja<sup>7</sup>mada ka<sup>7</sup>teoo. These tokens, as well as their counterparts ja<sup>7</sup>mada ma<sup>7</sup>koto, ja<sup>7</sup>mada ma<sup>7</sup>moruu, and ja<sup>7</sup>mada ta<sup>7</sup>keruu (IIIa), were excluded from the analysis.
- (3) One compound was read five times rather than six times by a participant; therefore, the number of tokens for this compound was 35.

### Abbreviations

COP: copula, NOM: nominative, PRES: present

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