The Distribution of Dominant Accentual Patterns in Sino-Japanese Words: A Comparison with Loanwords*

Motong Li†

Osaka University

Abstract

Focusing on the distribution of accentual patterns in Sino-Japanese words, this paper mainly presents a standard Optimality-Theoretic analysis of the frequency asymmetry of Sino-Japanese words' accents, and compares it with loanwords' accentual patterns in Tokyo Japanese. Morphophonological constraints LexFt and MorFt separately utilized and quantity-sensitive constraint NonFin(**L**) newly introduced, this analysis proposes a constraint ranking that successfully generates dominant accentual patterns of both Sino-Japanese words and loanwords.

Keywords: accentual patterns, Sino-Japanese words, lexical category, frequency asymmetry, OT

1 Introduction

The contribution of segmental information to the classification of Japanese lexical strata has been widely studied (Ito & Mester, 1993, 1995; Nasu, 1999; Tateishi, 2002) under the framework of Optimality Theory (Prince & Smolensky, 1993(2004)). By contrast, few reports are available on inter-stratum comparisons based on suprasegmental information. In particular, from the perspective of accentual patterns, there are few OT-based studies on native or Sino-Japanese (hereafter SJ) stratum, compared with loanwords whose accentual patterns are relatively more predictable.

Taking loanwords into consideration for comparison, This paper mainly focuses on the distribution of dominant accentual patterns in SJ words. Section 2 makes a detailed observation on the frequency of accentual patterns of both SJ words and loanwords. Section 3 and 4 introduce previous work done by Ito & Mester (2016) on loanwords and Ogawa (2006) on SJ words respectively. Section 5 proposes a constraint ranking which makes use of some new constraints, and applies it to explaining the process of generation of dominant accentual patterns observed in the two lexical strata. Section 6 finally concludes and discusses the future work.

2 Frequency Asymmetry of Accentual Patterns

Magami et al. (1999) conducted a comprehensive investigation of Japanese accentual distribution classified by the number of moras and lexical strata, which used statistics of 67,779 nouns from *NHK Japanese Accent Pronunciation Dictionary, New Edition* (NHK Broadcasting Culture Research Institute, 1998). Figure 1[1] shows the relative frequencies of accentual patterns of SJ words (1μ – 6μ) and loanwords (2μ – 6μ).

With regard to 3μ SJ words, there is no noticeable frequency asymmetry between P0 and P1 (51% versus 44%) when the data is only classified by the number of moras. However, if we take the position of the morpheme boundary (represented by #) into consideration, we can find it clearly that μμ#μ has more P1 words while μ#μμ tends to be unaccented, which is also discussed in Ogawa (2008). This is shown in (1).

*This paper is an English translation of Li (2017). Some details are added and revised here based on the original Japanese version.

†ribokuto@gmail.com

[1]the number after the letter P (pattern) shows on which mora the accent falls. For instance, P1 means the accent is on the first mora. P0 stands for unaccentedness.

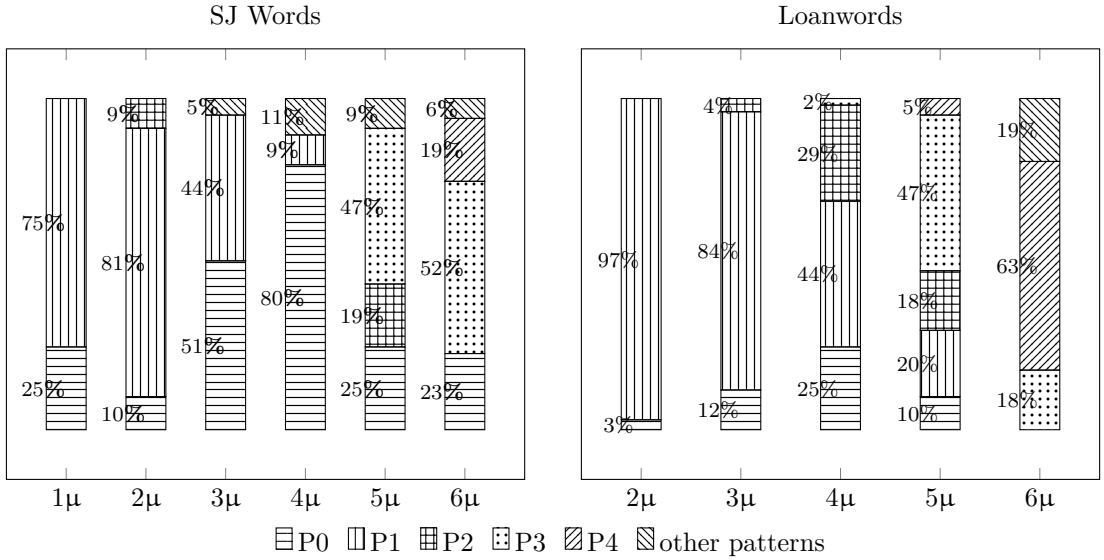


Figure 1: Relative Frequencies of Accentual Patterns of SJ words and Loanwords (Magami et al., 1999)

(1) *Accentual distribution in μμ#μ and μ#μμ*

Phonological Structure	Example	Total	P1	P0	P2	P3
μμ#μ	運河 (/ún#ga/ 'canal')	4,573 (100%)	3,050 (66.7%)	1,347 (29.5%)	98 (2.1%)	78 (1.7%)
μ#μμ	事情 (/ji#joː/ 'circumstances')	4,465 (100%)	986 (22.1%)	3,276 (73.4%)	196 (4.4%)	7 (0.2%)

As for loanwords, there is a widely-known rule claiming that accent falls on the syllable containing the antepenultimate mora, which attempts to explain the generalization of default accentual patterns. However, as mentioned in Kubozono (1996), 4μ loanwords that end with LL tend to be unaccented, making it clear that the antepenultimate-mora rule cannot be applied to phonological structures such as LLLL or HLL (L and H stand for the light and heavy syllable respectively).

3 Previous Study: Ito & Mester (2016)

In order to account for the priority of unaccentedness observed in specific loanword phonological structures, Ito & Mester (2016) proposed a new constraint ranking. Constraints used in Ito & Mester (2016) are shown in (2) (boldfaced **L** and **H** stand for the foothead).

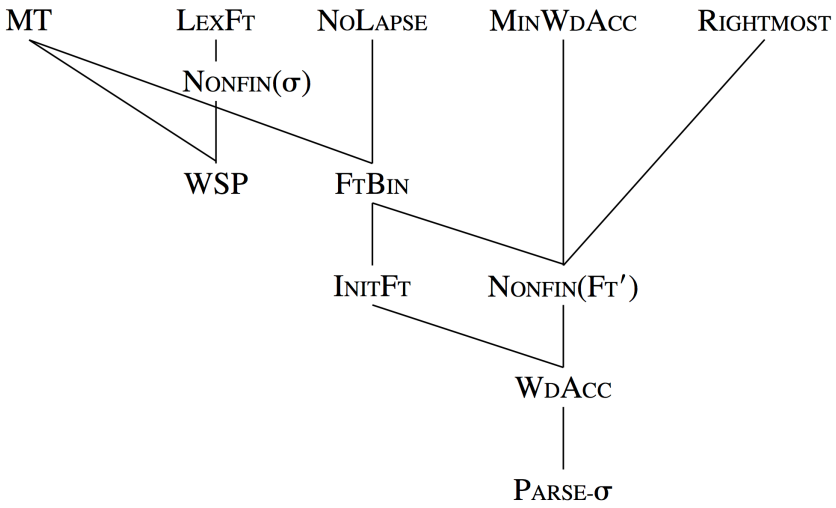
(2) *Definition of constraints used in Ito & Mester (2016)*

Constraint	Definition
LexFt	Every lexical morpheme (i.e., full content morpheme, not grammatical formative) minimally projects its own foot.
MT	Feet are (**H**), (**L**L), and (**L**).
NonFin(σ)	Word-final syllables are not footheads. Violated when a word-final syllable is a foothead: *(**H**)]$_{\text{PrWd}}$, *(**L**)]$_{\text{PrWd}}$, etc.
NoLapse	Syllables are maximally parsed into feet.
MinWdAcc	A minimal prosodic word contains a prominence peak. Violated when ω_{min} does not contain a prominence.

Constraint	Definition
RIGHTMOST	* Ft′...Ft...]$_\omega$ Violated by any foot following the head foot within the prosodic word.
WSP	Heavy syllables are footheads.
FTBIN	Feet are minimally binary at some level of analysis (mora, syllable).
INITFT	A prosodic word begins with a foot.
NONFIN(FT′)	* Ft′]$_\omega$ Violated by any head foot that is final in its PrWd.
WDACC	A prosodic word contains a prominence peak.
PARSE-σ	All syllables are parsed into feet.

The ranking consisting of above-mentioned constraints is shown in (3).

(3) *Constraint ranking proposed by Ito & Mester (2016)*



Here, we focus on the phonological structure LLLL, briefly presenting the analysis of how P0 is selected as the optimal in (4). Under this ranking, foot-formation constraints INITFT, FTBIN and NOLAPSE exclude (4c), (4d) and (4f) respectively. Though (4a), (4b) and (4e) are all maximally parsed into two feet, due to the fact that head foot constraints, RIGHTMOST and NONFIN(FT′), are ranked above WDACC, neither foot is able to be the head. As a result, (4a), which does not have a head foot, becomes the optimal output.

(4) *Unaccentedness configuration: LLLL (Ito & Mester, 2016)*

LLLL (イタリア /itaria/ 'Italy')	MT	NONFIN(σ)	NOLAPSE	MINWDACC	RIGHTMOST	WSP	FTBIN	INITFT	NONFIN(FT′)	WDACC	PARSE-σ
a. ☞ (**L**L)(**L**L)										*	
b. (**L**L)(**Ĺ**L)									*!		
c. L(**Ĺ**L)L								*!			**
d. (**L**)(**Ĺ**L)L							*!				*
e. (**Ĺ**L)(**L**L)					*!						
f. (**Ĺ**L)LL			*!								**

4 Previous Study: Ogawa (2006)

Compared to loanwords, the accentual distribution of SJ words is not sufficiently reported in the OT literature. Ogawa (2006) conducted a study on 3μ–4μ SJ words, analyzed the generation of dominant accentual patterns in OT, and compared it with the accentual distribution in loanwords. the constraint ranking proposed by Ogawa (2006) is presented in (5).

(5) *Constraint ranking proposed by Ogawa (2006)*

RightmostFoot′, NonFinality(Ft) ≫ Parse-σ, PrWd=GrWd, Ft-Bin(μ),Max(Acc) ≫ Dep(Acc) ≫ RhType=T, WSP ≫ Rightmost(σ)

What Ogawa (2006) did not mention, however, is the accentual distribution of 1μ–2μ SJ words, namely SJ words in the form of L, LL,H and L#L. Moreover, Ogawa (2006) used the constraint ranking (5) to analyze accentual distribution of both SJ words and loanwords simultaneously. He claimed that the difference of outputs between SJ words and loanwords was due to whether faithfulness constraints such as Max(Acc) and Dep(Acc) were activated or not, and the process of activation required reference to the accent feature in the input level. According to his analysis, accent features exist originally in the input of loanwords, but not in that of SJ words. Analyses of P1 of loanword LH and P0 of SJ word L#H conducted by Ogawa (2006) are presented in (6).

(6) *Analyses of LH and L#H (Ogawa, 2006)*

a. *LH (loanword, P1)*

LH [Acc] (フィジー /fíji:/ 'Fiji')		Parse-σ	PrWd=GrWd	Ft-Bin(μ)	Max(Acc)	Dep(Acc)	WSP
a.	☞ (Ĺ)H	*		*			
b.	(L)(H)		*	*	*!		
c.	L(H)	*	*		*!		

b. *L#H (SJ word, P0)*

L#H (違法 /i#ho:/ 'illegality')		Parse-σ	PrWd=GrWd	Ft-Bin(μ)	Max(Acc)	Dep(Acc)	WSP
a.	(Ĺ)#H	*		*		*!	
b.	☞ (L)#(H)		*	*			
c.	☞ L#(H)	*	*				

As a support for the existence of the accent feature in the input of loanwords, Ogawa (2006) stated that "Because original languages from which loanwords are borrowed have accents, it's no wonder that loanwords tend to be accented." However, Kitahara (1997) stated that "Phonology cannot refer to the actual phonetic form of original languages, but generates the output only from the underlying form," and "[T]he default accent of loanwords ... does not exist in the lexicon because it is widely distributed and predictable." In the analysis of Ito & Mester (2016), no accentual pre-specification is required in the input level of loanwords either. Therefore, more evidence need to be given in order to support Ogawa's analysis.

5 OT Analysis of both SJ Words and Loanwords

Though the main purpose of this paper is investigating the dominant accentual distribution of SJ words, taking into consideration that there cannot be more than one ranking in one phonological module in OT (McCarthy, 2008), I conduct an analysis accounting for both SJ words and loanwords simultaneously, based on results of Ito & Mester (2016). SJ words examined here are restricted to 1μ–4μ simple words.

5.1 New Constraints

If we use directly Ito & Mester's constraint ranking (3) to analyze phonological structures of SJ words, some of them will be incorrectly output as non-dominant accentual patterns. To begin with, consider the highest rank that LexFt obtains in (3). Due to its de facto inviolability, SJ words whose second morpheme is a light syllable (L#L, LL#L and H#L) are fully parsed into two feet ((**L**)#(**L**), (**L**L)#(**L**) and (**H**)#(**L**)), which wrongly leads to unaccented forms as illustrated in (4). For these structures to be generated properly as P1, they need to be handled without the second morpheme being parsed ((**Ĺ**)#L, (**Ĺ**L)#L and (**Ĥ**)#L).

In a somewhat contrary situation, Ito & Mester (2016) set NonFin(σ) highly to produce (**Ĺ**L)H, (**Ĥ**)H and L(**Ĥ**)L in loanwords, which handicaps the generation of L#H, LL#H and H#H in SJ words that need to be output as two-foot unaccented forms ((**L**)#(**H**), (**L**L)#(**H**) and (**H**)#(**H**)).

In order to explain the accentual distribution of truncated compounds in loanwords, LexFt was given the highest rank in Ito & Mester (2016). Unlike common loanwords (レシピ (/réshipi/ 'recipe') and ロンドン (/róndon/ 'London') for instance), truncated compounds are always unaccented, no matter what kind of phonological structure they have(コピペ (/kopi+pe/ 'copy and paste') and パソコン (/paso+kon/ 'personal computer') for instance. The symbol + stands for the lexeme boundary). To solve the paradox between P0 of truncated compounds in loanwords and P1 of SJ words whose second morpheme is a light syllable, notice the different levels of components in these two structures. In contrast to truncated compounds that consists of (truncated) lexemes (パソコン = パーソナル (/pá:sonaru/ 'personal') +コンピューター (/conpyú:ta:/ 'computer'), for instance), SJ words are generally constructed by bound morphemes. To preserve the effect of LexFt which ensures the P0 of truncated compounds in loanwords, while keeping it from intervening in SJ words, here the domain of LexFt is revised to lexemes, as shown in (7).

(7) *LexFt (domain revised)*

Every lexeme minimally projects its own foot.

Furthermore, to solve the problem of the P0 dominance in L#H, LL#H and H#H, notice that they all end in a heavy syllable. Here I propose two constraints, MorFt (8) that defined in the same way as LexFt proposed by Ito & Mester (2016), and NonFin(**L**) (9) that disfavors ...(**L**)] but permits ...(**H**)].

(8) *MorFt*

Every lexical morpheme minimally projects its own foot.

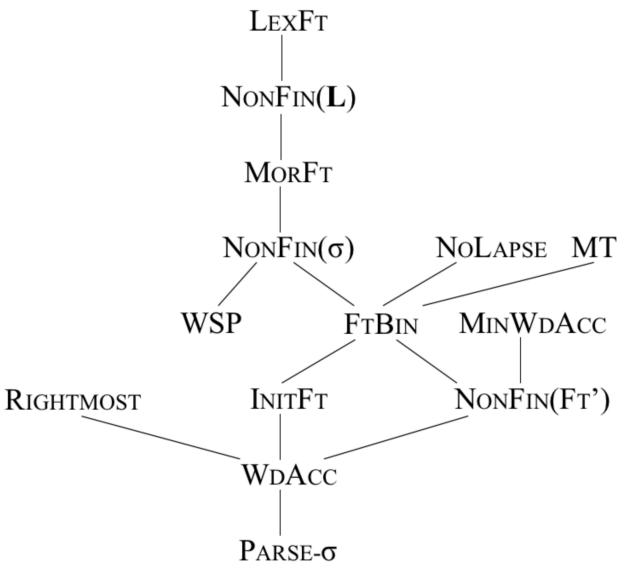
(9) *NonFin(**L**)*

Word-final light syllables are not footheads. Violated when a word-final light syllable is a foothead.

5.2 Results

With MorFt and NonFin(**L**) introduced above, and LexFt revised as in (7), an OT analysis has been carried out to account for the dominant accentual patterns in both SJ words and loanwords. the constraint ranking generated by OTSoft (Hayes et al., 1999-2016) is shown in (10). This section gives a detailed explanation about the generation of dominant accents in the two different lexical strata. Because of space limitations, tableaux are shown selectively below as examples. I also suppose that there is a high-ranking constraint that prohibits feet across the morpheme boundary (* (**L**#L)L for instance), so I will not present candidates that violate it.

(10) *Constraint ranking for SJ words and loanwords*



5.2.1 1μ–2μ Words

The word-initial accentuation in 1μ–2μ Words is ensured by the partial ranking MinWdAcc ≫ NonFin(Ft′). L and H are trivially accented on the first syllable. For LL (11), the iambic (11d) violates the high-ranking MT. Moreover, under the current constraint ranking, (11d) is harmonically bounded by the trochaic (11a), hence cannot be the optimal.

(11) *LL (SJ word and loanword, P1)*

LL (悪 /áku/ 'evil'; パリ /pári/ 'Paris')	LexFt	MT	NoLapse	MinWdAcc	Rightmost	NonFin(L)	MorFt	NonFin(σ)	WSP	FtBin	InitFt	NonFin(Ft′)	WdAcc	Parse-σ
a. ☞ (**Ĺ**L)											*			
b. (**Ĺ**)L									*!					*
c. (**L**L)				*!									*	
d. (L**Ĺ**)		*!				*		*			*			

For L#L (12), the second morpheme cannot be footed due to NonFin(**L**) ≫ MorFt, which only leaves the first morpheme to bear the accent.

(12) *L#L (SJ word, P1)*

L#L (所持 /shó#ji/ 'possessing')	LexFt	MT	NoLapse	MinWdAcc	Rightmost	NonFin(L)	MorFt	NonFin(σ)	WSP	FtBin	InitFt	NonFin(Ft′)	WdAcc	Parse-σ
a. ☞ (**Ĺ**)#L							*			*				*
b. (**L**)#(**L**)				*!		*		*		**			*	
c. (**L**)#(**Ĺ**)						*!		*		**		*		

5.2.2 3μ Words: without Heavy Syllables

For 3μ words that only consist of light syllables, the partial ranking LexFt ≫ NonFin(**L**) ≫ MorFt comes into force, showing the essential effect of morphophonological constraints. In regard to LL#L (13), the second morpheme is not parsed into a foot because of NonFin(**L**), and this leads to the result of P1 accentuation. On the other hand, L#LL (14) is maximally footed because

MorFt is ranked above FtBin, which generates the unaccented pattern. The foot structures of these two optimal outputs, (**Ĺ**L)#L versus (**L**)#(**L**L), show an incomplete mirror image relation.

(13) *LL#L (SJ word, P1)*

LL#L (確保 /káku#ho/ 'secure')	LexFt	MT	NoLapse	MinWdAcc	RightMost	NonFin(**L**)	MorFt	NonFin(σ)	WSP	FtBin	InitFt	NonFin(Ft′)	WdAcc	Parse-σ
a. ☞ (**Ĺ**L)#L							*							*
b. (**L**L)#(**L**)						*!		*		*			*	
c. (L**Ĺ**)#L		*!					*							*

(14) *L#LL (SJ word, P0)*

L#LL (可決 /ka#ketsu/ 'approval')	LexFt	MT	NoLapse	MinWdAcc	RightMost	NonFin(**L**)	MorFt	NonFin(σ)	WSP	FtBin	InitFt	NonFin(Ft′)	WdAcc	Parse-σ
a. ☞ (**L**)#(**L**L)										*			*	
b. (**L**)#(**Ĺ**L)										*		*!		
c. (**L**)#(**Ĺ**)L										**!				*
d. (**Ĺ**)#(**L**L)					*!					*				

Unlike SJ words, for the monomorphemic loanword LLL (15) that does not have a morpheme boundary in the input level, the word-final light syllable cannot be footed due to constraints such as InitFt and FtBin, which makes (15a) the winner. However, when it comes to the truncated compound (16), the two-foot structure is ensured by high-ranking LexFt, resulting in unaccentedness.

(15) *LLL (loanword, P1)*

LLL (バナナ /bánana/ 'banana')	LexFt	MT	NoLapse	MinWdAcc	RightMost	NonFin(**L**)	MorFt	NonFin(σ)	WSP	FtBin	InitFt	NonFin(Ft′)	WdAcc	Parse-σ
a. ☞ (**Ĺ**L)L														*
b. L(**Ĺ**L)											*!			*
c. (**L**)(**L**L)										*!			*	

(16) *LL+L (truncated compound, P0)*

LL+L (ファミマ /fami+ma/ 'FamilyMart Co., Ltd.')	LexFt	MT	NoLapse	MinWdAcc	RightMost	NonFin(**L**)	MorFt	NonFin(σ)	WSP	FtBin	InitFt	NonFin(Ft′)	WdAcc	Parse-σ
a. ☞ (**L**L)+(**L**)						*		*		*			*	
b. (**Ĺ**L)+L	*!						*							*

5.2.3 3μ Words: with Heavy Syllables

As stated in Section 5.1, the dominant accentual pattern of SJ words changes due to the word-final syllable weight. For 3μ Words with heavy syllables, the partial ranking NonFin(**L**) ≫ MorFt ≫ NonFin(σ) ≫ WSP plays a decisive role. If the word-final syllable is light (17), then it cannot be footed under the effect of NonFin(**L**), which leaves the P1 candidate to be selected as optimal. On the other hand, if the word-final syllable is heavy (18), then the input is parsed into two feet maximally forced by MorFt and output without an accent.

(17) *H#L (SJ word, P1)*

H#L (謳歌 /óː#ka/ 'praise')	LexFt	MT	NoLapse	MinWdAcc	RightMost	NonFin(**L**)	MorFt	NonFin(σ)	WSP	FtBin	InitFt	NonFin(Ft′)	WdAcc	Parse-σ
a. ☞ (**Ĥ**)#L							*							*
b. (**H**)#L							*						*!	*
c. (**H**)#(**L**)						*!		*		*			*	

(18) *L#H (SJ word, P0)*

L#H (火災 /ka#sai/ ‘fire’)	LexFt	MT	NoLapse	MinWdAcc	Rightmost	NonFin(**L**)	MorFt	NonFin(σ)	WSP	FtBin	InitFt	NonFin(Ft′)	WdAcc	Parse-σ
a. ☞ (**L**)#(**H**)								*		*			*	
b. (**L**)#(**Ĥ**)								*		*		*!		
c. (**L̂**)#H							*!		*	*				*
d. (**L̂**)#(**H**)					*!			*		*				

However, for loanword LH (19) which is monomorphemic, MorFt cannot trigger the foot formation maximally. Instead, NonFin(σ) prohibits the word-final syllable from being parsed, which selects the P1 candidate as optimal.

(19) *LH (loanword word, P1)*

LH (プリン /púrin/ ‘custard pudding’)	LexFt	MT	NoLapse	MinWdAcc	Rightmost	NonFin(**L**)	MorFt	NonFin(σ)	WSP	FtBin	InitFt	NonFin(Ft′)	WdAcc	Parse-σ
a. ☞ (**L̂**)H									*	*				*
b. L(**H**)							*!				*		*	*
c. (**L**)(**Ĥ**)							*!			*		*		
d. (**L**)(**H**)							*!			*			*	

5.2.4 4μ Words

In many cases (SJ words: LL#LL, H#LL, LL#H and H#H; Loanwords: LLLL, HLL and H+H), 4μ words are parsed into two feet and not accented. But for the simple loanword ending with a heavy syllable, the maximal foot formation is not ensured by MorFt or LexFt, and thus results in P1. Tableaux for LL#H and LLH are presented in (20) and (21) respectively for example.

(20) *LL#H (SJ word, P0)*

LL#H (確信 /kaku#shin/ ‘conviction’)	LexFt	MT	NoLapse	MinWdAcc	Rightmost	NonFin(**L**)	MorFt	NonFin(σ)	WSP	FtBin	InitFt	NonFin(Ft′)	WdAcc	Parse-σ
a. ☞ (**LL**)#(**H**)								*					*	
b. (**LL**)#(**Ĥ**)								*				*!		
c. (**L̂L**)#H							*!		*					*
d. (**L̂L**)#(**H**)					*!			*						

(21) *LLH (loanword word, P1)*

LLH (ドラゴン /dóragon/ ‘dragon’)	LexFt	MT	NoLapse	MinWdAcc	Rightmost	NonFin(**L**)	MorFt	NonFin(σ)	WSP	FtBin	InitFt	NonFin(Ft′)	WdAcc	Parse-σ
a. ☞ (**L̂L**)H									*					*
b. (**LL**)(**H**)								*!					*	
c. (**LL**)H									*				*!	*

6 Conclusions and Future Work

This paper have conducted an OT analysis of the distribution of dominant accentual patterns in both SJ words and loanwords simultaneously, which is based on the proposition of Ito & Mester (2016). Due to quantity-sensitive NonFin(**L**), The second morpheme of SJ words is unfooted when it is L, and footed when it is LL or H. As a result, P1 or P0 emerges as optimal respectively. Instead of pre-specifying accent features in the input level, morphophonological constraints LexFt and MorFt have been made use of, by which different dominant accentual patterns of the two lexical strata are successfully produced. (22) shows dominant accentual patterns of both SJ words and loanwords, with foot structures optimally specified.

(22) *Dominant accentual patterns of both SJ words and loanwords*

(**Ĺ**)	(**Ĺ**L)	(**Ĺ**)#L	(**Ĥ**)	(**L**)#(**L**L)	(**Ĺ**L)#L
(**Ĥ**)#L	(**L**)#(**H**)	(**L**L)#(**L**L)	(**H**)#(**L**L)	(**L**L)#(**H**)	(**H**)#(**H**)
(**Ĺ**L)L	(**Ĥ**)L	(**Ĺ**)H	(**L**L)(**L**L)	(**H**)(**L**L)	(**Ĺ**L)H
L(**Ĥ**)L	(**L**L)(**Ĺ**L)L	(**L**L)L(**Ĺ**L)LL	(**L**L)(**L**L)(**Ĺ**L)L	(**H**)L(**Ĺ**L)L	(**H**)(**Ĥ**)L
(**H**)(**Ĺ**)H	L(**Ĺ**L)H	L(**Ĥ**)H	L(**H**)(**L**L)	(**Ĥ**)H	(**L**L)+(**H**)
(**H**)+(**H**)	(**L**L)+(**L**)				

Although the analysis presented shows good agreement with the accentual distribution observed in SJ words and loanwords, it has significant limitations that require further work. NonFin(**L**), which is newly proposed to tackle the problem of P1 dominance in SJ words whose second morpheme is a light syllable, has a relatively narrow domain, and lacks evidence that proves it universal. Therefore, more phonological phenomena in Japanese and other languages need to be considered thoroughly in order to validate NonFin(**L**).

Focusing on dominant accentual patterns of SJ words and loanwords, this paper did not account for the non-dominant part (grammatical and lexical variations for instance), nor did it mention other lexical strata such as the native one. Moreover, how to account for the accentuation of compounds still remains unsolved. For example, truncated compounds in SJ words sometimes show a different accentual distribution compared to that of loanwords (国保[2] (/kóku+ho/ 'national health insurance', P1 SJ word) versus ファミマ (/fami+ma/ 'FamilyMart Co., Ltd.', P0 loanword), for instance). Future work pursuing these issues will enrich our understandings of the actual data distribution and the system of Japanese lexical strata.

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