

A sound-symbolic alternation to express cuteness and the orthographic Lyman's Law in Japanese

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The current study deals with two topics. One is the new nicknaming trend in Japanese whereby [h] alternates with [p]. In Experiment I, I established the hypothesis that the process is driven to express cuteness, and experimentally demonstrated that singleton [p] is more likely to be associated with cuteness than other consonants in Japanese. The other topic discussed in the current paper is the orthographic Lyman's Law, or OCP(diacritic) (Kawahara 2018). In Experiment II, I tested whether OCP(diacritic) is psychologically real in the minds of Japanese speakers, using nicknames with [h]→[p] alternation already applied. The results showed that the naturalness of nicknames is reduced when they contain singleton [p] and voiced obstruents, both of which need a diacritical mark in hiragana and katakana. This suggests that OCP(diacritic) is active in nicknaming processes beyond rendaku and devoicing of voiced geminates. Experiment II also showed that the naturalness of nicknames is affected by other OCP effects such as OCP(C), OCP(CV), and OCP(labial). This result suggests that such OCP effects impinge on the patterns resulting from nicknaming formation.

Keywords: sound symbolism, Lyman's Law, experimental phonology, Japanese

1 Introduction

1.1 A sound-symbolic [h]→[p] alternation

There are morphophonological processes in languages that add meaning to the entire word. For example, in English, smallness can be expressed by adding diminutive suffixes such as *-ie* and *-y* as in *doggie* and *piggy*. Similarly, in Japanese, smallness/childishness can be conveyed by replacing coronal fricatives and [ts] with [tʃ, dʒ] even before non-front vowels (e.g., *onaka suite* → *onaka [tʃ]uita* '(Are you) hungry?'; *tumetai* → *[tʃ]umetai* '(Is it) cold?'; *tiizu wa oisii* → *tii[dʒ]u wa oi[tʃ]ii* 'The cheese is yummy') (Alderete and Kochetov 2017; Kochetov and Alderete 2011; see also Chew 1969; Mester and Ito 1989).¹ The Japanese process, which is called iconic/expressive palatalization (Kochetov and Alderete 2011), is neither assimilatory nor phonologically conditioned, and is thus distinguished from the assimilatory palatalization triggered by /i/ (e.g., /t/ → [tʃ]/ ___ i; /s/ → [ʃ]/ ___ i).²

The current paper discusses a new process in Japanese that involves a semantically driven process just like the expressive palatalization. There is a restriction on the occurrence of singleton [p] in Japanese: it is disallowed to occur in word-initial position in native words (e.g., Ito and Mester 1995, Ito and Mester 1999; Nasu 2015), and if it occurs, it results from the [h]→[p] alternation in word-medial position in native

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¹ With respect to the pragmatic aspects of expressive palatalization, Sawada (2013) argues that it has modes in which the speaker treats the addressee as a baby or the speaker himself/herself behaves as a baby.

² For palatalization in Japanese mimetics, see Alderete and Kochetov (2009), Hamano (1986, 2014), and Mester and Ito (1989).

and Sino-Japanese words (e.g., *su-* ‘bare’ + *hadaka* ‘naked’ → *sup-padaka*³ ‘naked’; *kin* + *hatu* → *kin-patu* ‘blond (golden) hair’: Labrune 2012). However, as will be seen in detail in Section 2.1, the [h]→[p] alternation has recently been observed even in word-initial position in nicknaming (e.g., *haruka* ‘Haruka’ → *paru-ru*; *hikaru* ‘Hikaru’ + *-ko* ‘child’ → *pika-ko*). As it is mainly applied to female names, it is speculated that [h] alternates with [p] to express cuteness, which is a key component of femininity in Japanese culture. As far as I know, there is no study that explores the expressive [h]→[p] alternation from a linguistic perspective, apart from the semantic argument of Hamano (1986, 2014) that [p] in Japanese mimetic vocabulary denotes the “explosion of a tensely stretched surface” or smallness/lightness (see Section 2.5 for discussion). Thus, the current paper hypothesizes that the [h]→[p] alternation in nicknaming is not driven by a particular morphophonological condition, but is instead a semantically driven process involving a sound-symbolic phenomenon, in which a particular sound conveys particular images or meanings (see, e.g., Blasi et al. 2016; Dingemanse et al. 2015; Hinton et al. 2006; Kawahara 2017; Lockwood and Dingemanse 2015; Sidhu and Pexman 2017 for recent surveys on sound symbolism), and I accordingly experimentally examine whether singleton [p] is more likely to evoke cuteness than other consonants that can be used in Japanese.

1.2 The orthographic version of Lyman’s Law

The current study additionally explores a well-known constraint that is active in Japanese phonology and morphophonology, Lyman’s Law (henceforth, LL) or OCP(−son,+voice), which disallows two or more voiced obstruents to occur in a single morpheme or in the second member of compounds (e.g., Ito and Mester 1986, Ito and Mester 1995, Ito and Mester 2003; Kawahara 2006; Kawahara 2012; Kawahara and Sano 2014, Kawahara and Sano 2016a; McCawley 1968; Nishimura 2006, Nishimura 2013; Vance 1979, Vance 1980, Vance 1987, Vance 2015, Vance 2016; a.o.). LL allows us to account for the fact that there are few monomorphemic words in Japanese that contain two voiced obstruents: we have *huta* [ɸuta] ‘lid’, *huda* [ɸuda] ‘tag’, and *buta* [buta] ‘pig’, but not *buda* [buda] (Ito and Mester 1995), the last of which contains two voiced obstruents [b, d]. It is also known that LL plays a role in blocking or inducing rule application. The former is illustrated by *rendaku*, a morphophonological phenomenon in which a voiceless obstruent /t, k, s, h/ in the second member of compounds becomes its voiced counterpart [d, g, z, b], respectively (see Vance 1987, Vance 2015, Vance 2016; Vance and Irwin 2016; a.o.), as in (1a). The *rendaku* rule does not apply when the second member of compounds already contains a voiced obstruent, as exemplified in (1b). For example, while the native word *kaki* ‘persimmon’ undergoes *rendaku*, then resulting in *gaki* (e.g., *sibu* ‘sour’ + *kaki* ‘persimmon’ → *sibu-gaki* ‘sour persimmon’), the native word *kagi* ‘key’ does not (e.g., *ie* ‘house’ + *kagi* ‘key’ → *ie-kagi* ‘house key’/**ie-gagi*).

(1) (a) Rendaku application and (b) rendaku blocking by Lyman’s Law

a.	oo	‘big’	+	tako	‘octopus’	→	oo- d ako	‘big octopus’
	sibu	‘sour’	+	kaki	‘persimmon’	→	sibu- g aki	‘sour persimmon’
	oo	‘big’	+	sake	‘alcohol’	→	oo- z ake	‘heavy drinking’
	hude	‘pencil’	+	hako	‘box’	→	hude- b ako	‘pencil case’
b.	hitori	‘alone’	+	tabi	‘travel’	→	hitori- t abi/	*hitori- d abi ‘travelling alone’
	ie	‘house’	+	kagi	‘key’	→	ie- k agi/	*ie- g agi ‘house key’
	kuro	‘black’	+	sabi	‘rust’	→	kuro- s abi/	*kuro- z abi ‘black rust’

³ The first half of the geminated [pp] is assumed to be a consonant that is inserted to create emphatic forms, as the prefix /su-/ does not always trigger consonant gemination (cf. *su* ‘bare’ + *te* ‘hand’ → [su^hde] ‘bare hand’/*[su^htte]).

tori 'bird' + hada 'skin' → tori-hada/ *tori-bada 'gooseflesh'

On the other hand, LL induces the devoicing of voiced geminates. It has long been known that in Japanese, voiced geminates are tolerated in loanwords (e.g., *doggu* 'dog'; *baggu* 'bag') while they are not in native words (Ito and Mester 1995, Ito and Mester 1999), but they are devoiced when the word contains a voiced obstruent elsewhere (e.g., *doggu* 'dog' → [doggu] ~ [dokku]; *baggu* 'bag' → [baggu] ~ [bakku]) (Kawahara 2006; Nishimura 2006; see Kawahara 2015a for an overview of geminate devoicing in Japanese). More interestingly, the devoicing of the voiced geminates does not occur when the word contains a voiceless consonant (e.g., *heddo* 'head' → [heddo] ~ ?*[hetto]) or a sonorant elsewhere (e.g., *reddo* 'red' → [reddo] ~ ?*[retto]). The studies mentioned above suggest that LL plays a vital role in Japanese native and loan phonologies.

Evidently, LL is a phonological constraint that is active in Japanese phonology and morphophonology. On the other hand, there is also a view that LL can be captured in terms of orthography (Kawahara 2018). In Japanese orthography, voiced obstruents need a diacritical mark called a *dakuten* (゛). Since rendaku requires a voiceless obstruent /t, k, s, h/ to become a voiced [d, g, z, b], the rendaku rule can be also defined as a process that adds the *dakuten*, as shown in (2) (Vance 2007, Vance 2015, Vance 2016). Also, LL can also be redefined as a constraint that prohibits two diacritics from occurring in a single morpheme or in the second member of compounds, which is the orthographic version of LL (i.e., OCP(diacritic)) (Kawahara 2018).

(2) Rendaku as a process of adding a diacritical mark

oo	'big'	+	tako	'octopus'	→	oo- d ako	'big octopus'
			ta = “た”			da = “だ”	
hi	'sun'	+	kasa	'umbrella'	→	hi- g asa	'parasol'
			ka = “か”			ga = “が”	
oo	'big'	+	sake	'alcohol'	→	oo- z ake	'heavy drinking'
			sa = “さ”			za = “ざ”	
hude	'pencil'	+	hako	'box'	→	hude- b ako	'pencil case'
			ha = “は”			ba = “ば”	

An advantage of adopting OCP(diacritic) instead of OCP(-son,+voice) is that we can account for the devoicing of voiced geminates in a word containing singleton [p] (Kawahara 2018). Recent studies have shown that the devoicing of voiced geminates also occurs in words containing singleton [p], as exemplified in (3) (Fukazawa et al. 2015), and that geminate devoicing can be induced by singleton [p] as well as a voiced obstruent (Kawahara and Sano 2016b).

(3) /p/-driven devoicing of voiced geminates (Letters with diacritics are underlined.)

ai-poddo	'i-Pod'	→	ai-poddo	[ai-poddo]	~	ai- p otto	[ai-potto]
アイポ <u>ッ</u> ド			アイポ <u>ッ</u> ド			アイポ <u>ッ</u> ト	
piramid <u>ド</u>	'pyramid'	→	piramid <u>ド</u>	[piramid <u>ド</u>]	~	piram <u>い</u> tt <u>ト</u>	[piramitto]
ピラミ <u>ッ</u> ド			ピラミ <u>ッ</u> ド			ピラミ <u>ッ</u> ト	
kyuupid <u>ド</u>	'cupid'	→	kyuupid <u>ド</u>	[k ^h u:pid <u>ド</u>]	~	kyuup <u>い</u> tt <u>ト</u>	[k ^h u:pitto]
キューピ <u>ッ</u> ド			キューピ <u>ッ</u> ド			キューピ <u>ッ</u> ト	

In Japanese orthography, singleton [p] requires a diacritical mark called a *han-dakuten* (°) (e.g., *pa*; *pi*; *pu*; *pe*; *po* “ぱ, ぴ, ぷ, ぺ, ぽ” in *hiragana* or “パ, ピ, プ, ペ, ポ” in *katakana*⁴). If OCP(diacritic) applies, then we can understand the devoicing of voiced geminates in loanwords as in (3) as a process that eliminates one of the two diacritics. In this regard, the orthographic version of LL, or OCP(diacritic), has more explanatory power than the traditional LL (see Kawahara 2018 for further argumentation).

In addition to an experiment on the sound-symbolic effect of singleton [p], the current paper conducted an experiment to examine whether OCP(diacritic) plays a role in Japanese (morpho)phonology beyond *rendaku* and the devoicing of consonant geminates. Generally, OCP constraints prevent identical features from occurring in a certain domain, irrespective of ordering of the features (for OCP effects, see, e.g., Alderete and Frisch 2007; Bye 2011; Goldsmith 1978; Leben 1973; McCarthy 1986; Odden 1986, Odden 1988; Rose 2001; Suzuki 1998; Yip 1988). Accordingly, OCP(diacritic) tested here should also be defined as a constraint that prevents singleton [p] from occurring with a voiced obstruent (D), in any environment where one either precedes or follows the other (e.g., *[p...D]; *[D...p]). However, as singleton [p] rarely occurs in Japanese native words (e.g., Ito and Mester 1995, Ito and Mester 1999; Nasu 2015), it is difficult to find words in which a voiced obstruent precedes [p]. Thus, the current study focuses on testing the constraint prohibiting singleton [p] from preceding a voiced obstruent (i.e. the *[p...D] constraint) by employing the new nicknaming process with the [h]→[p] alternation mentioned above. Specifically, by using for the stimuli a process that clips the two moras from each member of full names (e.g., *Kimura* + *Takuya* → *Kimu-taku*) (see, e.g., Ito 1990; Kubozono 2015; Labrune 2006; Moon in press for compound truncation in Japanese), I examine whether the second member of the nickname in which the [h]→[p] alternation already applied is less likely to be judged as natural when it already contains a voiced obstruent (D) than when it does not; for example, I examine whether *Kasi-pada* (← *Kasino* + *Hadami*) is less acceptable than *Kasi-pane* (← *Kasino* + *Hanemi*). The current experiment also examines whether the second member of the nickname is less likely to be tolerated when it incurs violation of other OCP constraints, such as OCP(C), OCP(CV), and OCP(labial), as already demonstrated by a number of experimental studies (e.g., Kawahara and Sano 2014, Kawahara and Sano 2016a; Kumagai 2017; Kumagai and Kawahara 2018); for example, I examine whether *Kasi-pabi* (← *Kasino* + *Habiyo*) (violation of OCP(labial) constraint) is less acceptable than *Kasi-pane* (← *Kasino* + *Hanemi*).

The organization of the current paper is as follows. From the perspective of sound symbolism, Section 2 (Experiment I) examines whether singleton [p] observed in nicknames is more likely to express cuteness than other consonants, and the results show that it is the most likely to be associated with cuteness in Japanese. Section 3 (Experiment II) tests whether the *[p...D] constraint is psychologically real and also whether OCP constraints demonstrated in past experimental studies (OCP(C), OCP(CV), and OCP(labial)) are active in nicknaming processes as well. The results show that nicknames in which the [h]→[p] alternation has already applied are less likely to be judged natural when the second member of the nickname already contains a voiced obstruent, and that the effect of the OCP constraints tested here shows up in the nicknaming process. Section 4 presents a general discussion; Section 4.1 discusses whether the sound-image association between singleton [p] and cuteness is possessed by general speakers of Japanese; Section 4.2 addresses the question of whether or not loanwords that contain two diacritics are induced by OCP(diacritic) to undergo devoicing of voiced obstruents and voiced geminates; and Section 4.3 further discusses the psychological status of OCP(diacritic). Section 5 gives a brief conclusion.

2 Experiment I

2.1 A sound-symbolic [h]→[p] alternation in nicknames

⁴ In general, *hiragana* is used for native words, and *katakana* for loanwords.

Section 2 begins with a brief explanation of the Japanese voiceless glottal fricative /h/ and its alternations with other consonants. Japanese /h/ has several allophones: It is realized as a voiceless bilabial fricative [ɸ] before /u/, a voiceless palatal fricative [ç] before /i/, and [h] before /a, e, o/ (e.g., Labrune 2012; Tsujimura 2014)⁵. Also, it shows two patterns of alternation, as described below. First, as shown in (4), [h] becomes [b] in *rendaku* (see Vance and Irwin 2016 for a collection of recent studies on *rendaku*) and in post-nasal voicing (e.g., Ito et al. 1995, Ito et al. 2001; Ito and Mester 1999; Rice 1997, Rice 2005). Second, word-medial /h/ alternates with [p] in native or Sino-Japanese words (Labrune 2012). In (5a), [h] is geminated to create emphatic forms, with the surface realization of [pp], as the occurrence of /hh/ is limited to loans (e.g., *Mach* → [mahha]; *Gogh* → [gohho]) and a number of Sino-Japanese words and compounds (e.g., *juu* ‘ten’ + *hari* ‘stitch’ → [dʒuuhhari] ‘ten stitches’; *zet(u)* + *huchoo* ‘in a slump’ → [zeɸɸuɸo:] ‘bad condition’) (Labrune 2012). In Sino-Japanese words, as seen in (5b), [h] becomes [p] when attached to a stem that ends with a nasal, and in (5c) [h] is realized as [p] following a preceding consonant [t, k], which in turn is then realized as [p].⁶

(4) [h]→[b] alternation in (a) *rendaku* and (b) post-nasal voicing

- | | | | | | | | | |
|----|-------------|--------------|---|-------------|-----------|---|-------------------|---------------|
| a. | <i>hako</i> | ‘box’ | + | <i>hune</i> | ‘ship’ | → | <i>hako-bune</i> | ‘ark’ |
| | <i>hude</i> | ‘pencil’ | + | <i>hako</i> | ‘box’ | → | <i>hude-bako</i> | ‘pencil case’ |
| b. | <i>hun</i> | ‘to step on’ | + | <i>haru</i> | ‘stretch’ | → | <i>hu[m]-baru</i> | ‘stand firm’ |

(5) [h]→[(p)p] in (a) native words and in (b, c) Sino-Japanese words

- | | | | | | | | | |
|----|---------------|-----------------|---|---------------|------------|---|-------------------|--------------------------|
| a. | <i>suki</i> | ‘empty’ | + | <i>hara</i> | ‘stomach’ | → | <i>sukippara</i> | ‘empty stomach’ |
| | <i>su-</i> | ‘bare’ (prefix) | + | <i>hadaka</i> | ‘naked’ | → | <i>suppadaka</i> | ‘naked’ |
| b. | <i>sen</i> | 先 | + | <i>hai</i> | 輩 | → | <i>se[m]-pai</i> | ‘boss’ |
| | <i>en</i> | 鉛 | + | <i>hitu</i> | 筆 | → | <i>e[m]-pitsu</i> | ‘pencil’ |
| | <i>san</i> | 三 ‘three’ | + | <i>hun</i> | 分 ‘minute’ | → | <i>sa[m]-pun</i> | ‘three minutes’ |
| | <i>san</i> | 三 ‘three’ | + | <i>hen</i> | 編 ‘volume’ | → | <i>sa[m]-pen</i> | ‘three volumes’ |
| | <i>san</i> | 散 | + | <i>ho</i> | 步 | → | <i>sa[m]-po</i> | ‘walking’ |
| c. | <i>sit(u)</i> | 失 | + | <i>hai</i> | 敗 | → | <i>sip-pai</i> | ‘failure’ |
| | <i>zet(u)</i> | 絶 | + | <i>hin</i> | 品 | → | <i>zep-pin</i> | ‘a superb piece of work’ |
| | <i>rok(u)</i> | 六 ‘six’ | + | <i>hun</i> | 分 ‘minute’ | → | <i>rop-pun</i> | ‘six minutes’ |
| | <i>it(i)</i> | 一 ‘one’ | + | <i>hen</i> | 片 | → | <i>ip-pen</i> | ‘a piece’ |
| | <i>it(i)</i> | 一 ‘one’ | + | <i>hon</i> | 本 | → | <i>ip-pon</i> | ‘a ...; one ...’ |

As seen in (5), the [h]→[p] alternation occurs in word-medial position in native or Sino-Japanese words. However, it has recently been observed that it applies productively to nicknaming processes, as exemplified in (6).

⁵ There is a view positing *h* as /p/ in underlying forms (see, e.g., Ito and Mester 1999; McCawley 1968; Nasu 2015); the singleton /p/ is debuccalized to [h] in word-initial position (e.g., **pune* ‘ship’ → *hune*). In the current paper, the *h* is assumed to be /h/ underlyingly.

⁶ The [h]→[p] alternation is blocked in complex compounds (e.g., [*mannen*]_{compound} ‘ten thousands years’ + *hitu* ‘pen’ → [*mannen*]-*hitu*/ **mannen-pitu*; *sin* ‘new’ + [*hatumei*]_{compound} ‘invention’ → *sin*-[*hatumei*]_{compound} ‘new invention’/ **sin-patumei*) (see, e.g., Ito and Mester 1996; Labrune 2012; McCawley 1968 for details).

- (6) [h]→[p] alternation in Japanese nicknaming⁷
- a. haruka ‘Haruka’ + (RED) → paru-ru
- b. hikaru ‘Hikaru’ + -ko ‘child’ → pika-ko
- c. kirari ‘Kirari’ + hikaru ‘Hikaru’ → kira-pika
- d. Ayu ‘Ayu’ + hime ‘princess’ → ayu-pime ‘Princess Ayu’

In (6a), the [h]→[p] alternation occurs in (*Shimazaki*) Haruka, an ex-member of AKB48 (a Japanese group that consists of young women who dance and sing); *Haruka* becomes *Paru-ru*, with the second mora, *ru*, reduplicated and with the third mora, *ka*, deleted. Similarly, a make-up artist named hikaru in (6b) is called *pika-ko* with the suffix *-ko* ‘child’ added. These two examples show that the [h]→[p] alternation occurs even in word-initial position, unlike the [h]→[p] alternation in native and Sino-Japanese words. In (6c), hikaru changes to *pika* under application of [h]→[p]; *kira-pika* is a duo of singers in the Japanese anime “Kirarin-reboryuusion” that consists of two members, (*Tsukishima*) Kirari and (*Mizuki*) Hikaru. In (6d), I find *hime* ‘princess’ becomes *pime* when a girl’s name like *Aya* is attached. This is an interesting example in that while the word *hime* does not undergo reduplication because of the OCP-labial effect (i.e., *[b...m]) (*mai* ‘dancing’ + *hime* ‘princess’ → *mai-hime*/**mai-bime*) (Kawahara et al. 2006; Kumagai 2017), it does undergo [h]→[p] alternation, producing a sequence of labials (i.e., [p...m]) (this example will also be discussed in Section 3.5). As this new nicknaming trend is often seen in female names, the unconditional [h]→[p] alternation may express cuteness. In the remainder of this section, I experimentally test the hypothesis that Japanese [p] is more likely to be associated with cuteness than other consonants.

2.2 Stimuli

As stimuli, I prepared 39 pairs of nonce words in which /p/ minimally contrasts with other Japanese phonemes /t, k, s, h, m, n, r, w, j/ in word-initial position, as shown in Table 1.⁸

Insert Table 1 about here.

Table 1
Set of stimuli

contrasts	/p/ group	vs.	non-/p/ group
/p/ vs. /t/	paonun	vs.	taonun
	pironen	vs.	tironen
	puhikee	vs.	tuhikee
	pemomon	vs.	temomon
	pokatun	vs.	tokatun
/p/ vs. /k/	pakutun	vs.	kakutun
	piisun	vs.	kiisun
	pukekee	vs.	kukekee

⁷ Truncating names to two-mora forms is a commonplace process observed in Japanese hypocoristics (see, e.g., Ito 1990; Ito and Mester 2015b; Mester 1990; Poser 1984a, Poser 1984b, Poser 1990).

⁸ The current experiment used word-initial minimal pairs because recent studies of the sound symbolic effect (Kawahara et al. 2008; Kawahara and Kumagai in press) have shown that the contrasts in the initial position are more likely to give rise to clear results (a positional effect).

	pehohen	vs.	kehohen
	pokutun	vs.	kokutun
/p/ vs. /s/	payokin	vs.	sayokin
	pitakon	vs.	sitakon
	pukikon	vs.	sukikon
	pesatee	vs.	sesatee
	pomitin	vs.	somitin
/p/ vs. /h/	pahenun	vs.	hahenun
	pieyoo	vs.	hieyoo
	purisun	vs.	hurisun
	petayan	vs.	hetayan
	potosen	vs.	hotosen
/p/ vs. /m/	patoreenu	vs.	matoreenu
	pisimaanu	vs.	misimaanu
	punanuunu	vs.	munanuunu
	pehaiinu	vs.	mehaiinu
	pokikaanu	vs.	mokikaanu
/p/ vs. /n/	paesun	vs.	naesun
	pisamuu	vs.	nisamuu
	punitun	vs.	nunitun
	pesiman	vs.	nesiman
	potenun	vs.	notenun
/p/ vs. /r/	pawanan	vs.	rawanan
	piyamon	vs.	riyamon
	pukikon	vs.	rukikon
	pekehin	vs.	rekehin
	potinii	vs.	rotinii
/p/ vs. /w/	patinaa	vs.	watinaa
/p/ vs. /j/	pamuen	vs.	yamuen
	purunee	vs.	yurunee
	posison	vs.	yosison

Voiced obstruents /b, d, g, z/ were excluded from the set of stimuli because they have been shown to evoke heaviness and largeness in Japanese (e.g., Hamano 1986, Hamano 2014; Kawahara 2017; Kawahara et al. 2018; Kawahara and Kumagai in press; Kawahara and Shinohara 2016; Kumagai and Kawahara to appear), which is not compatible with cuteness, and also because they are more likely to appear in Japanese male names than in female names (Kawahara 2015b). For the first seven consonants /t, k, s, h, m, n, r/, I created five pairs for each consonant in such a way that every vowel /i, e, a, o, u/ followed each consonant (7*5=35 pairs). For the last two consonants /w, j/, I created one nonce word that begins with [wa] and three that begins with [ja, jo, ju] (1+3 = 4 pairs), since /w/ and /j/ are phonotactically allowed to occur only before /a/ and /a, o, u/ in native words, respectively. To avoid the experimenter's bias when creating nonce words, the current experiment employed a random generator of Japanese nonce words that is available at <http://bit.ly/2iGaKko>. Since the nonce words the website generated seemed not to sound natural as names, I added some extensions such as /n/, a long vowel /R/, or the combination of a long vowel and *nu* /Rnu/ to the end of the words it generated.

2.3 Participants and procedure

The experiment was conducted using SurveyMonkey, which recruited 35 female native speakers of Japanese at a Japanese university in Tokyo. Their ages as of October 2017, when the experiment was run, ranged from 18 to 19. They were presented 39 pairs of stimuli written in *katakana*, and then were asked which name is cuter (*kawaii* in Japanese) than the other (e.g., *paonun* vs. *taonun*). The questions were presented in random order to each participant.

2.4 Results

The rates of response to words containing /p/ (the left column in Table 1 in Section 2.2) are shown in all of the figures presented in this section, in which error bars represent 95% confidence intervals. The overall results are shown in Figure 1. Each response proportion is as follows: /p/ vs. /t/ = 0.79; /p/ vs. /k/ = 0.87; /p/ vs. /s/ = 0.83; /p/ vs. /h/ = 0.9; /p/ vs. /m/ = 0.59; /p/ vs. /n/ = 0.86; /p/ vs. /r/ = 0.79; /p/ vs. /w/ = 0.69; /p/ vs. /y/ = 0.83. All of these responses are greater than 0.5, the level expected for chance, although the results for the /p/ vs. /m/ pairs seem to be less clear, as we will see shortly. Since the current experiment used a forced-choice task, a generalized mixed-effects logistic regression was implemented, using the *glmer()* function of the *language R* and *lme4* packages (Baayen 2008) of R (R Development Core Team 2016), with subjects and items coded as random effects. The results showed that the /p/ groups were judged as cute names significantly more often than the non-/p/ groups ($z = 17.52, p < .001$).

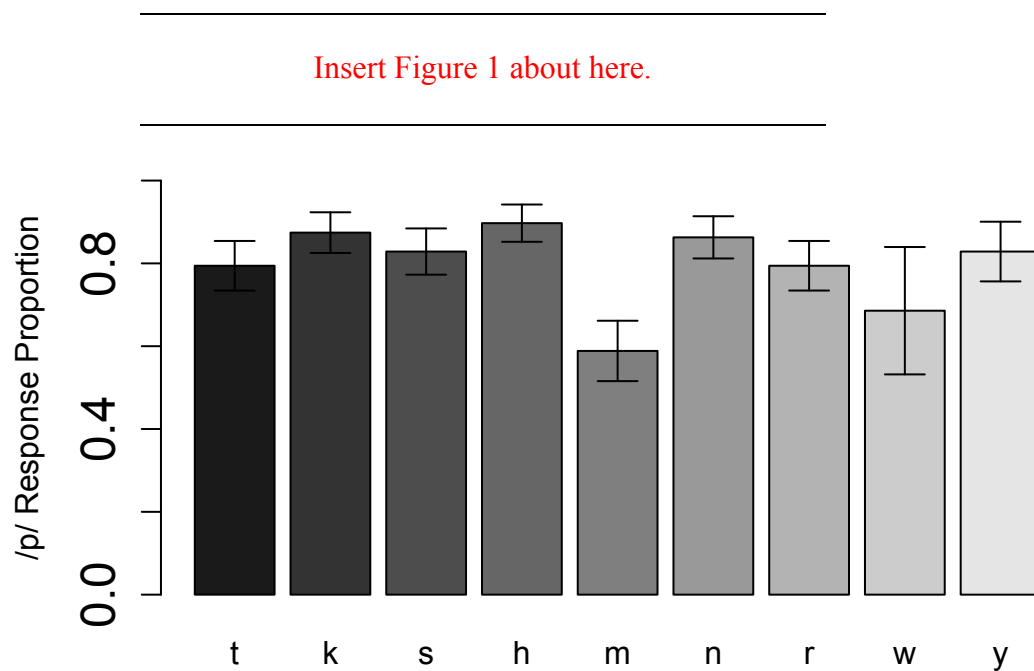


Figure 1. /p/ response proportion

Figure 1 shows that the response rate in /p/ vs. /h/ pairs was the highest and that in /p/ vs. /m/ pairs was the lowest. We now take a closer look at each pair in turn. The results for the /p/ vs. /h/ pairs by following vowel are presented in Figure 2. The rate for each vowel is as follows: /pi/ vs. /hi/ = 0.91; /pe/ vs. /he/ = 0.91; /pa/ vs. /ha/ = 0.94; /po/ vs. /ho/ = 0.91; /pu/ vs. /hu/ = 0.8. Statistically, the rate of response to the /p/ groups was significant ($z = 12.31, p < .001$), which clearly indicates that singleton /p/ is much more

likely to evoke cuteness than singleton /h/, no matter which vowel follows the first consonant. This suggests that alternations of [h] with [p] can express cuteness in Japanese.

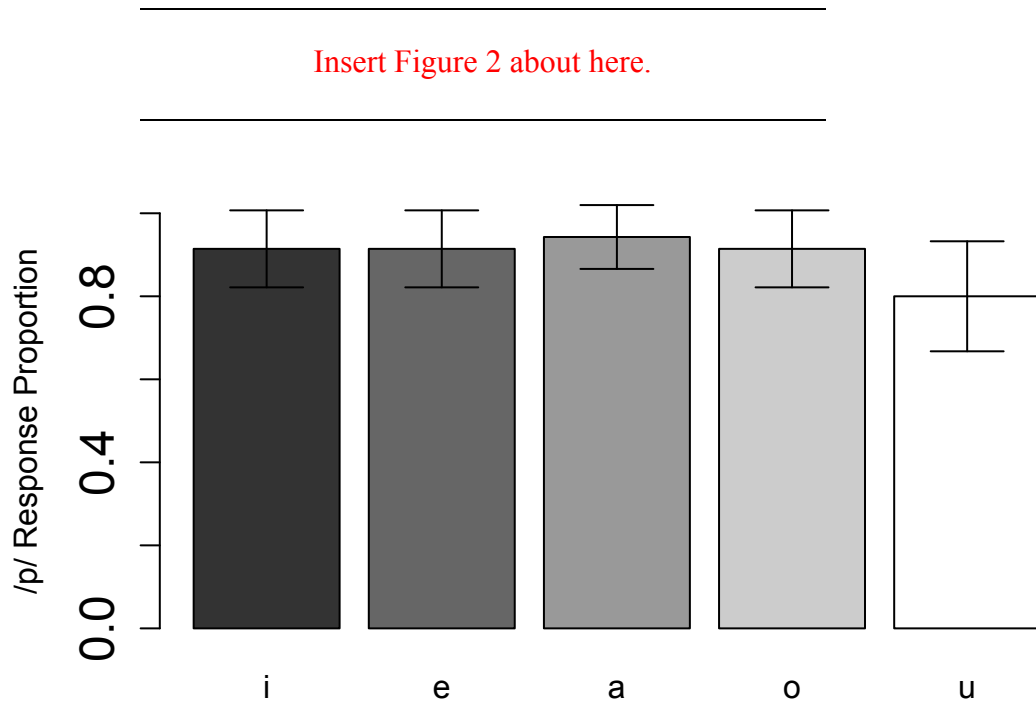


Figure 2. /p/ response proportion (/p/ vs. /h/)

We next look at the detailed results for the /p/ vs. /m/ pairs presented in Figure 3. The rate for each vowel is as follows: /pi/ vs. /mi/ = 0.54; /pe/ vs. /me/ = 0.49; /pa/ vs. /ma/ = 0.49; /po/ vs. /mo/ = 0.66; /pu/ vs. /mu/ = 0.77. While the response rates for the last two pairs are well above 0.5, chance level, those for the first three pairs are near chance level. Statistically, however, the rate of response to the /p/ groups was significant ($z = 2.474, p < .05$).

Insert Figure 3 about here.

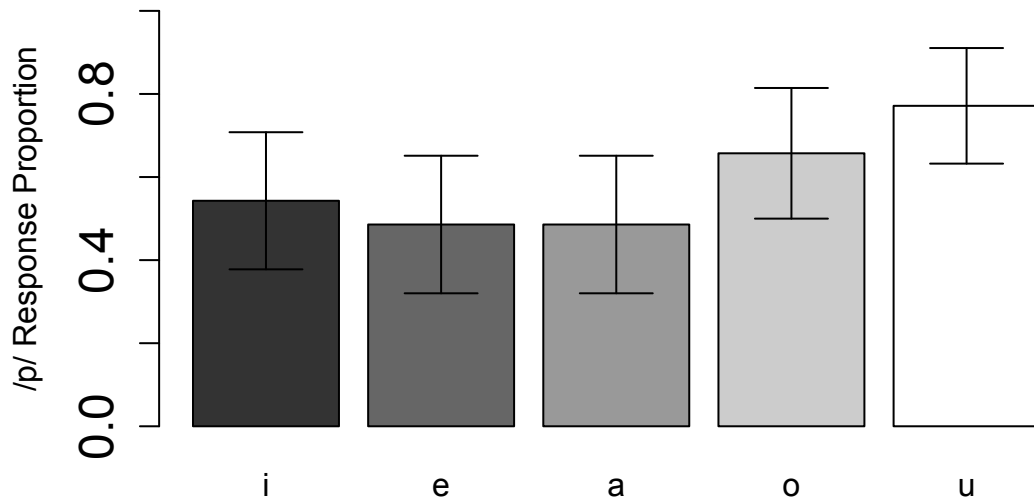


Figure 3. /p/ response proportion (/p/ vs. /m/)

2.5 Discussion

The results of Experiment I indicate that singleton [p] is more likely to be associated with cuteness than are the other consonants, although the results for the /p/ vs. /m/ pairs are less clear. There are two questions that need further discussion. First, if [p] is the consonant most likely to be used to express cuteness (with [m] the second), then how is this learned by Japanese speakers? There are two possibilities, although they are not mutually exclusive. One is that it arises from a sound-image association between labials and babies; Kumagai and Kawahara (2017) have reported that the labials [p, m] are contained in the names of well-known Japanese diaper brands, which they argue may bear on the fact that labial stops are acquired by babies earlier than other consonants (Jakobson 1941/1968; see Ota 2015 for an overview of phonological development in Japanese). If Japanese speakers have a sound-symbolic association between labials and babies, then it is unsurprising that they also have the sound-symbolic association between labials and cuteness. The second possibility is that it arises from a sound-symbolic effect whereby, as Hamano (1986, 2014) argues, voiceless consonants including [p] convey smallness/lightness in mimetic vocabulary.⁹

Second, if not only [p] but also [m] is associated with cuteness, then is there a possibility that [h] alternates with [m] as well in Japanese nicknaming? Probably not. While, as already seen in (5), [p] is derived from underlying [h], there is no alternation between [h] and [m]. Thus, even if [m] is a consonant that conveys cuteness, it is predicted that /h/ will not alternate with [m] in Japanese. Whether [m] itself is in fact another consonant expressive of cuteness is another interesting topic, but one that will be left for future research as it is beyond the scope of the current paper.

To conclude, Experiment I examined whether singleton [p] conveys cuteness to Japanese speakers. The results showed that names that contain [p] were more likely to be judged as cute names than those that do not, which thus leads to the conclusion that the new trend of nicknaming utilizes the [h]→[p] alternation to express cuteness. By employing the sound-symbolic [h]→[p] alternation, the next section

⁹ A criticism that can be raised against these possibilities is that it is unlikely that the sound-symbolic effect observed in mimetic vocabulary holds in non-mimetic vocabulary as well, since non-mimetic words do not always have sound-symbolic associations in meaning. Whether sound-symbolic effects of mimetic vocabulary apply to non-mimetic vocabulary needs further research.

will examine whether the *[p...D] constraint, part of OCP(diacritic), is psychologically real and also examine whether other OCP constraints are at work in nicknaming processes.

3 Experiment II

3.1 OCP effects in Japanese

In this section, I use the nicknaming process with [h]→[p] alternation to experimentally examine whether the *[p...D] constraint that is part of OCP(diacritic) (Kawahara 2018) is psychologically real in the minds of Japanese speakers. I also test whether OCP constraints, such as OCP(C) and OCP(CV) (i.e., Identity Avoidance) (Kawahara and Sano 2014, Kawahara and Sano 2016a; Kumagai and Kawahara 2018; Moon 2016) and OCP(labial) constraint (Kumagai 2017; Moon in press), are at play in the nicknaming process.

OCP is the phenomenon in which a sequence of identical consonants or moras or a sequence of consonants/tones that share identical features are disfavored (see, e.g., Bye 2011; Goldsmith 1978; Leben 1973; McCarthy 1986; Odden 1986, Odden 1988; Rose 2001; Suzuki 1998; Yip 1988 for OCP effects). In Japanese, a dictionary-based survey (Kawahara et al. 2006) indicated that homorganic consonants are less likely to co-occur in native words, and, as already explained in Section 1.2, sequences of two or more voiced obstruents are severely restricted by LL (aka OCP(−son,+voice)). In experimental settings, OCP has also been observed across morpheme boundaries (Kawahara and Sano 2016a; Kumagai and Kawahara 2018; Moon 2016, Moon in press) and within the second member of compounds (Kawahara and Sano 2014; Kumagai 2017). Kawahara and Sano (2016a) have demonstrated that the rendaku rule is more likely to be blocked when the resulting form would produce identical consonants or moras than when it would not; for example, when *iga* ‘burr’ is attached to *kaniro* (nonce word), the rendaku rule is less likely to apply because the resulting form would be *iga-ganiro*, in which there are identical moras, *ga-ga*, across the morpheme boundary. Kumagai and Kawahara (2018) have shown that identical nasals or moras are more likely to be eschewed in the word ordering of group names; for example, given *hana* (a girl’s name) and *nami* (a girl’s name), *nami-hana* is more likely to be favored than *hana-nami*, which has identical moras, *na-na*, across the morpheme boundary. Moon (in press) reports that identical place features of consonants can affect patterns of compound truncation with loanwords; she focuses on the fact that *paasonaru-konpyuutaa* ‘personal computer’ is abbreviated as *paso-kon*, but *shaapu-pensiru* ‘mechanical pencil’ is shortened to *shaa-pen* rather than **shapu-pen*, in which there is a sequence of the singleton [p] across the morpheme boundary of the truncated compounds (see Moon 2016 for other examples). The experiment that she conducted with nonce words shows that, for example, when *riipino* (nonce word) is combined with *panfuretto* ‘pamphlet,’ *rii-pan* is more likely to be chosen as an acceptable form than the form with double [p], *ripi-pan*. In line with these studies, Experiment II examines whether the naturalness of nicknames showing the [h]→[p] alternation is reduced by consonantal and CV-moraic Identity Avoidance effects across the morpheme boundary.

The current experiment also examines the OCP-labial effect that has been observed in rendaku (Kumagai 2017). In rendaku, there are a number of blocking constraints in addition to LL. For example, /h/ does not undergo rendaku if followed by labial [m], as exemplified in (7) (Kawahara et al. 2006; Kawahara 2015c). Presumably, if [h] is realized as [b], the resultant form would contain a sequence of homorganic consonants [b...m], which would violate a putative OCP-labial constraint, as observed in other languages (Alderete and Frisch 2007; Bye 2011; Odden 1994; Selkirk 1993; Zuraw and Lu 2009).

- (7) Rendaku blocking ([b...m])
- | | | | | | | | |
|------|-----------|---|------|------------|---|--------------|------------|
| suna | ‘sand’ | + | hama | ‘beach’ | → | suna-hama/ | *suna-bama |
| | | | | | | ‘sand beach’ | |
| mai | ‘dancing’ | + | hime | ‘princess’ | → | mai-hime/ | *mai-bime |

	kutu	‘shoe’	+	himo	‘lace’	→	kutu-himo/ *kutu- bimo ‘shoe lace’
cf.	hako	‘box’	+	hune	‘ship’	→	hako- bune ‘ark’
	hude	‘pencil’	+	hako	‘box’	→	hude- bako ‘pencil case’

Kumagai (2017) reported an experiment that examined whether rendaku is blocked in nonce words that contain labial consonants. The results showed that the OCP-labial effect manifests itself when the initial consonant [b] is followed by another labial consonant [b, m, ɸ] in the second member of compounds (e.g., *nise-bamara*), and that the more similar the following consonant in the second member of compounds, the more unlikely the rendaku rule is to apply. The latter finding reflects the quasi-universal tendency that the more similar two consonants are, the more strongly a sequence of them is disfavored (e.g., Berent and Shimron 2003; Berent et al. 2004; Buckley 1997; Frisch et al. 2004; Greenberg 1950; Pierrehumbert 1993). In Experiment II, I will test whether the OCP-labial effect is active in nicknaming processes as well as rendaku. Specifically, I examine whether a nickname with the [h]→[p] alternation already applied is less likely to be judged natural when it contains another labial consonant; if the OCP-labial effect works more widely than just to rendaku, then the nickname will be less acceptable when its second member contains a labial consonant (e.g., [p...b]) than when it contains a non-labial consonant (e.g., [p...n] or [p...d]).

To sum up, Experiment II examines whether the *[p...D] constraint, part of OCP(diacritic), is active in nickname processes as well as in rendaku and the devoicing of geminates, and also examines whether OCP(C) and OCP(CV) effects (across morpheme boundaries) and the OCP-labial effect (within the second member of nicknames) are at play.

3.2 Stimuli

As stimuli, the current experiment used compound forms in which the two moras from each member of the full name are clipped (e.g., *Ki₁mu₂ra* (family name) + *Ta₁ku₂ya* (given name) → *Ki₁mu₂-ta₁ku₂*). Tables 2-1 through 2-4 show all tested items. To examine the effects of *[p...D] and OCP(labial) constraints, I created three groups of given names: [p...n], [p...d], and [p...b]. Each included three trimoraic girls’ names whose first vowel (V₁) was any of the vowels /a, i, u/. The names in each group begin with /h...n/ (e.g., *hanemi*), /h...d/ (e.g., *hadami*), and /h...b/ (e.g., *habiyo*), respectively. When these names undergo truncation and [h]→[p] alternation applies, they will be [p...n], [p...d], or [p...b], respectively (e.g., *ha₁ne₂mi* → *pa₁ne₂*; *ha₁da₂mi* → *pa₁da₂*; *ha₁bi₂yo* → *pa₁bi₂*). The last two violate the *[p...D] constraint, and the [p...b] pair violates the OCP(labial) as well as *[p...D] constraints.¹⁰

I set up four family name conditions. The CV condition (CV#) (the control group) consists of names with three light (CV-moraic) syllables (e.g., *kasino*). The first two moras of the original family names are left after truncation (e.g., *ka₁si₂no* + *ha₁na₂mi* → *ka₁si₂-pa₁na₂*). I also prepared a coda-nasal (m#)

¹⁰ Words with [p...z] and [p...g] were excluded from the set of stimuli because we cannot directly compare them with a control group [p...n]: there is a difference in continuancy between [n] and [z] (i.e., [n] = [−continuant]; [z] = [+continuant]) and a difference in place of articulation between /n/ and /g/. Thus, even if the sequence [p...z] or [p...g] is less acceptable than [p...n], we cannot deny the possibility that this could be due either to the *[p...D] constraint or to the difference in continuancy or place of articulation, or both. For Japanese /g/, it is known that word-medial /g/ is realized as [ŋ] (see Ito and Mester 1997; Vance 1987 for details), but at present this nasalization is dying out in Tokyo, although there are individual or regional differences (Zendo Uwano, p.c. on February 27, 2018).

condition that consists of trimoraic names whose second mora is a coda-nasal (e.g., *kanno*),¹¹ because we predicted the coda-nasal condition to be more likely to tolerate [h]→[p] alternation than the CV condition since, as shown in Section 1.2, [h] alternates with [p] when preceded by a nasal in Sino-Japanese (e.g., *kin* + *hatu* → *kin-patu* ‘blond (golden) hair’) (Labrune 2012). Like the CV condition, the first two moras of original family names survive in the coda-nasal condition (e.g., *ka₁n₂no* + *ha₁na₂mi* → *ka₁n₂-pa₁na₂*) (note that the coda-nasal *n* is pronounced as [m] because it is followed by labial [p] (i.e., *ka₁n₂-pa₁na₂* = [kampana]). To examine consonantal or moraic Identity Avoidance effects, I prepared OCP(C) and OCP(CV) conditions in which the first and third moras of the original family names are preserved in nicknames. In the OCP(C) (pV#p) condition, the two consonants across the morpheme boundary are identical (e.g., *ke₁m₂pe₃* + *ha₁ne₂mi* → *ke₁pe₃-pa₁ne₂*), and in the OCP(CV) (pV#pV) condition, the consecutive moras across the morpheme boundary are identical (e.g., *ta₁m₂pa₃* + *ha₁ne₂mi* → *ta₁pa₃-pa₁ne₂*).¹²

Insert Table 2 about here.

Table 2-1

Test items (CV condition)

	family names		given names		nicknames		*[p...D]	OCP(lab)
a.	<i>kasino</i>	+	<i>hanemi</i>	→	<i>kasi-pane</i>	[p...n]	<i>not violated</i>	<i>not violated</i>
b.	<i>kosino</i>	+	<i>hinako</i>	→	<i>kosi-pina</i>	[p...n]	<i>not violated</i>	<i>not violated</i>
c.	<i>hosino</i>	+	<i>huneko</i>	→	<i>hosi-pune</i>	[p...n]	<i>not violated</i>	<i>not violated</i>
a.	<i>kasino</i>	+	<i>hadami</i>	→	<i>kasi-pada</i>	[p...d]	<i>violated</i>	<i>not violated</i>
b.	<i>kosino</i>	+	<i>hidemi</i>	→	<i>kosi-pide</i>	[p...d]	<i>violated</i>	<i>not violated</i>
c.	<i>hosino</i>	+	<i>hudeko</i>	→	<i>hosi-pude</i>	[p...d]	<i>violated</i>	<i>not violated</i>
a.	<i>kasino</i>	+	<i>habiyo</i>	→	<i>kasi-pabi</i>	[p...b]	<i>violated</i>	<i>violated</i>
b.	<i>kosino</i>	+	<i>hibari</i>	→	<i>kosi-piba</i>	[p...b]	<i>violated</i>	<i>violated</i>
c.	<i>hosino</i>	+	<i>hubeko</i>	→	<i>hosi-pube</i>	[p...b]	<i>violated</i>	<i>violated</i>

Table 2-2

Test items (Coda-nasal condition)

	family names		given names		nicknames		*[p...D]	OCP(lab)
a.	<i>kanno</i>	+	<i>hanemi</i>	→	<i>kan-pane</i>	[p...n]	<i>not violated</i>	<i>not violated</i>
b.	<i>konno</i>	+	<i>hinako</i>	→	<i>kon-pina</i>	[p...n]	<i>not violated</i>	<i>not violated</i>
c.	<i>honda</i>	+	<i>huneko</i>	→	<i>hon-pune</i>	[p...n]	<i>not violated</i>	<i>not violated</i>
a.	<i>kanno</i>	+	<i>hadami</i>	→	<i>kan-pada</i>	[p...d]	<i>violated</i>	<i>not violated</i>
b.	<i>konno</i>	+	<i>hidemi</i>	→	<i>kon-pide</i>	[p...d]	<i>violated</i>	<i>not violated</i>
c.	<i>honda</i>	+	<i>hudeko</i>	→	<i>hon-pude</i>	[p...d]	<i>violated</i>	<i>not violated</i>
a.	<i>kanno</i>	+	<i>habiyo</i>	→	<i>kan-pabi</i>	[p...b]	<i>violated</i>	<i>violated</i>
b.	<i>konno</i>	+	<i>hibari</i>	→	<i>kon-piba</i>	[p...b]	<i>violated</i>	<i>violated</i>
c.	<i>honda</i>	+	<i>hubeko</i>	→	<i>hon-pube</i>	[p...b]	<i>violated</i>	<i>violated</i>

¹¹ The coda nasal is counted as one mora in Japanese (e.g., Kubozono 2015; Labrune 2012; Tsujimura 2014).

¹² I used family names that contain singleton [p] in the third mora rather than the second, as there are few Japanese family names that contain singleton [p] in the second-initial mora.

Table 2-3

Test items (OCP(C) condition)

	family names		given names		nicknames		*[p...D]	OCP(lab)
a.	<i>kempe</i>	+	<i>hanemi</i>	→	<i>kepe-pane</i>	[p...n]	<i>not violated</i>	<i>not violated</i>
b.	<i>kampa</i>	+	<i>hinako</i>	→	<i>kapa-pina</i>	[p...n]	<i>not violated</i>	<i>not violated</i>
c.	<i>simpo</i>	+	<i>huneko</i>	→	<i>sipo-pune</i>	[p...n]	<i>not violated</i>	<i>not violated</i>
a.	<i>kempe</i>	+	<i>hadami</i>	→	<i>kepe-pada</i>	[p...d]	<i>violated</i>	<i>not violated</i>
b.	<i>kampa</i>	+	<i>hidemi</i>	→	<i>kapa-pide</i>	[p...d]	<i>violated</i>	<i>not violated</i>
c.	<i>simpo</i>	+	<i>hudeko</i>	→	<i>sipo-pude</i>	[p...d]	<i>violated</i>	<i>not violated</i>
a.	<i>kempe</i>	+	<i>habiyo</i>	→	<i>kepe-pabi</i>	[p...b]	<i>violated</i>	<i>violated</i>
b.	<i>kampa</i>	+	<i>hibari</i>	→	<i>kapa-piba</i>	[p...b]	<i>violated</i>	<i>violated</i>
c.	<i>simpo</i>	+	<i>hubeko</i>	→	<i>sipo-pube</i>	[p...b]	<i>violated</i>	<i>violated</i>

Table 2-4

Test items (OCP(CV) condition)

	family names		given names		nicknames		*[p...D]	OCP(lab)
a.	<i>tampa</i>	+	<i>hanemi</i>	→	<i>tapa-pane</i>	[p...n]	<i>not violated</i>	<i>not violated</i>
b.	<i>sappinai</i>	+	<i>hinako</i>	→	<i>sapi-pina</i>	[p...n]	<i>not violated</i>	<i>not violated</i>
c.	<i>tampu</i>	+	<i>huneko</i>	→	<i>tapu-pune</i>	[p...n]	<i>not violated</i>	<i>not violated</i>
a.	<i>tampa</i>	+	<i>hadami</i>	→	<i>tapa-pada</i>	[p...d]	<i>violated</i>	<i>not violated</i>
b.	<i>sappinai</i>	+	<i>hidemi</i>	→	<i>sapi-pide</i>	[p...d]	<i>violated</i>	<i>not violated</i>
c.	<i>tampu</i>	+	<i>hudeko</i>	→	<i>tapu-pude</i>	[p...d]	<i>violated</i>	<i>not violated</i>
a.	<i>tampa</i>	+	<i>habiyo</i>	→	<i>tapa-pabi</i>	[p...b]	<i>violated</i>	<i>violated</i>
b.	<i>sappinai</i>	+	<i>hibari</i>	→	<i>sapi-piba</i>	[p...b]	<i>violated</i>	<i>violated</i>
c.	<i>tampu</i>	+	<i>hubeko</i>	→	<i>tapu-pube</i>	[p...b]	<i>violated</i>	<i>violated</i>

3.3 Participants and procedure

The experiment was run online using SurveyMonkey. Participants in Experiment II were 69 native speakers of Japanese from various Japanese universities in Tokyo who did not participate in Experiment I. Their age range is 18 to 19 as of June 2017, when the experiment was conducted. The instructions and questions were provided in Japanese. In the instruction session, they were asked to judge the naturalness of nicknames with the [h]→[p] alternation already applied, using a 6-point Likert scale (1: very unnatural to 6: very natural), and were then provided with a few actual examples of nicknames and asked to evaluate them for practice before the test session. All test items were written in *hiragana*. The order of questions was randomized and different for each participant.

3.4 Results

In the remainder of the current paper, for the sake of convenience, the CV (CV#) and coda-nasal (m#) conditions in Tables 2-1 and 2-2 are referred to as non-identity-avoidance (non-IA) conditions, and the OCP(C) (pV#p) and OCP(CV) (pV#pV) conditions in Tables 2-3 and 2-4 as identity-avoidance (IA) conditions. Before presenting a detailed analysis, we first look at the results for the non-IA conditions and IA conditions. The results for average naturalness under each condition are presented in Table 3, indicating that the average naturalness seems to be lower under the IA conditions than the non-IA conditions. The results of a linear mixed model showed that there were significant differences between the CV condition and the IA conditions (/CV#p-n/ vs. /pV#p-n/: $t = -6.764, p < .001$; /CV#p-d/ vs. /pV#p-d/: $t = -6.114, p < .001$; /CV#p-b/ vs. /pV#p-b/: $t = -5.212, p < .001$; /CV#p-n/ vs. /pV#pV-n/: $t = -5.624, p < .001$; /CV#p-d/ vs. /pV#pV-d/: $t = -4.957, p < .001$; /CV#p-b/ vs. /pV#pV-b/: $t = -3.144, p < .01$), and that there were also significant differences between the coda-nasal condition and the IA conditions (/m#p-n/ vs.

/p#p-n/: $t = -6.756, p < .001$; /m#p-d/ vs. /p#p-d/: $t = -4.978, p < .001$; /m#p-b/ vs. /p#p-b/: $t = -4.527, p < .001$; /m#p-n/ vs. /pV#pV-n/: $t = -5.495, p < .001$; /m#p-d/ vs. /pV#pV-d/: $t = -3.895, p < .001$; /m#p-b/ vs. /pV#pV-b/: $t = -2.404, p < .05$). These results suggest that the IA conditions are more likely to reduce the naturalness of nicknames with the [h]→[p] alternation applied than the non-IA conditions.

Insert Table 3 about here.

Table 3
Average naturalness in each condition

		Conditions	CV (non-IA)	Coda-nasal (non-IA)	OCP(C) (IA)	OCP(CV) (IA)
		OCP(C)	<i>not violated</i>	<i>not violated</i>	<i>violated</i>	<i>violated</i>
		OCP(CV)	<i>not violated</i>	<i>not violated</i>	<i>not violated</i>	<i>violated</i>
	*[p...D]	OCP(lab)				
p-n	<i>not violated</i>	<i>not violated</i>	3.28	3.31	2.39	2.54
p-d	<i>violated</i>	<i>not violated</i>	2.77	2.68	2.06	2.19
p-b	<i>violated</i>	<i>violated</i>	2.49	2.43	1.91	2.14

We next look at the results for each condition in detail. Figure 4 shows the average naturalness in the non-IA conditions (i.e., CV and coda-nasal conditions in Tables 2-1 and 2-2). As already explained in Section 3.2, the [p-d] pairs violate the *[p...D] constraint, and the [p-b] pairs violate the *[p...D] and OCP(labial) constraints. The results presented in Figure 4 indicate that, the more constraints the nicknames violate, the more likely the average naturalness is to decrease within each condition. For the CV condition, there were significant differences between /CV#p-n/ and /CV#p-d/ ($t = 3.429, p < .001$) and between /CV#p-n/ and /CV#p-b/ ($t = 5.542, p < .001$). For the coda-nasal condition, there were also significant differences between /m#p-n/ and /m#p-d/ ($t = 4.384, p < .001$) and between /m#p-n/ and /m#p-b/ ($t = 6.355, p < .001$). These results suggest that the *[p...D] constraint is clearly active in the nicknaming process. With respect to the OCP-labial effect, there was a significant difference between /CV#p-d/ and /CV#p-b/ ($t = 1.984, p < .05$), but not between /m#p-d/ and /m#p-b/ ($t = 1.841, n.s, p = .062$), which suggests that the OCP (labial) effect seems to be at work, although its effect was less likely to appear than the effect of the *[p...D] constraint.

Insert Figure 4 about here.

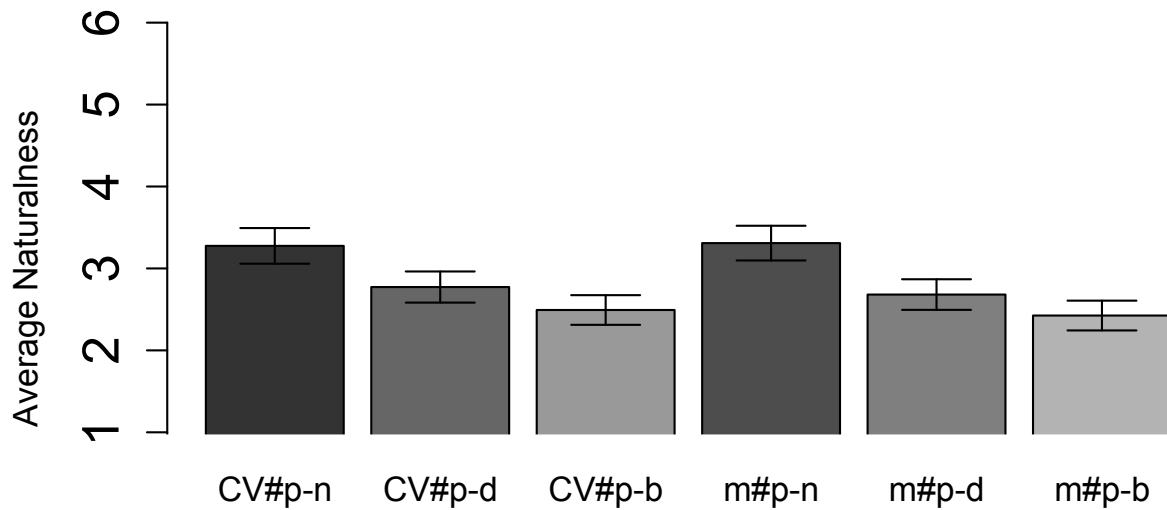


Figure 4. Average naturalness in non-identity-avoidance conditions (i.e., CV (CV#) and coda-nasal (m#) conditions)

I predicted that the coda-nasal condition would be more likely to improve naturalness for nicknames to which the [h]→[p] alternation already applied than the CV condition, but the results showed that there was no significant difference in average naturalness between those conditions (/CV#p-n/ vs. /m#p-n/: $t = 0.22$, *n.s.*; /CV#p-d/ vs. /m#p-d/: $t = -0.679$, *n.s.*; /CV#p-b/ vs. /m#p-b/: $t = -0.52$, *n.s.*). This means that a nasal before the morpheme boundary never induces the [h]→[p] alternation in the nicknaming process (see Section 3.5 for discussion). This result might lead one to think that conditions before the morpheme boundary do not affect the naturalness judgments of the resulting forms of novel nicknames, but, as we will see in Figure 5, the average naturalness is reduced under IA conditions.

Figure 5 shows the average naturalness under the IA conditions (OCP(C) and OCP(CV) conditions). As under the non-IA conditions (Figure 4), it appears that the more constraints the nicknames violate, the lower their average naturalness is. For the OCP(C) condition, there were significant differences between /pV#p-n/ and /pV#p-d/ ($t = 2.797$, $p < .01$) and between /pV#p-n/ and /pV#p-b/ ($t = 4.326$, $p < .001$). For the OCP(CV) condition, there were significant differences between /pV#pV-n/ and /pV#pV-d/ ($t = 2.805$, $p < .01$) and between /pV#pV-n/ and /pV#pV-b/ ($t = 3.388$, $p < .001$). These results suggest that the *[p...D] constraint is active under the IA conditions as well as the non-IA conditions. However, with respect to the OCP-labial effect, there were no significant differences between /pV#p-d/ and /pV#p-b/ ($t = 1.355$, *n.s.*) or between /pV#pV-d/ and /pV#pV-b/ ($t = 0.454$, *n.s.*), which may be because the overall naturalness under the OCP(C) and OCP(CV) conditions was too low to yield a significant difference between the [p-d] and [p-b] pairs.

Insert Figure 5 about here.

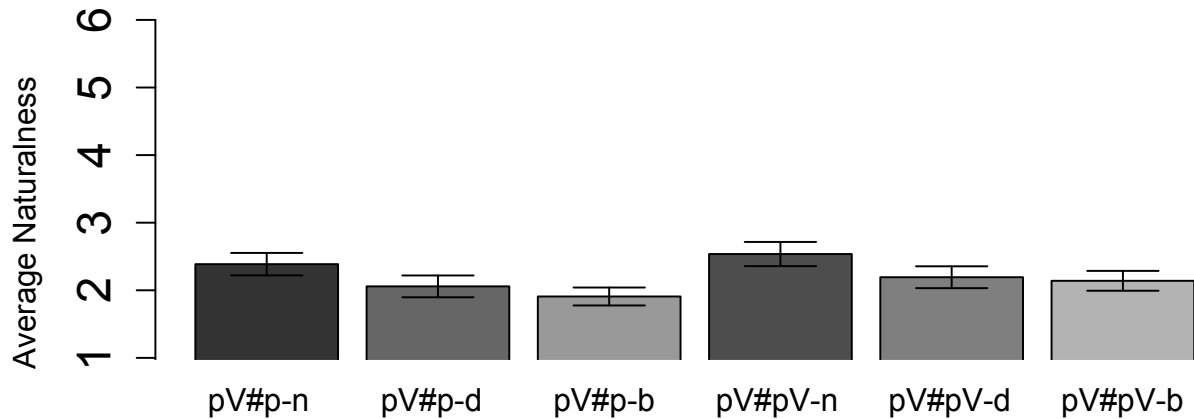


Figure 5. Average naturalness in identity avoidance conditions (i.e., OCP(C) (pV#p) and OCP(CV) (pV#pV) conditions)

Comparing the two conditions in Figure 5, the average naturalness is higher under the OCP(CV) condition (/pV#pV-n/ = 2.54; /pV#pV-d/ = 2.19; /pV#pV-b/ = 2.14) than under the OCP(C) condition (/pV#p-n/ = 2.39; /pV#p-d/ = 2.06; /pV#p-b/ = 1.91), although there may be little or no significant differences between the two conditions (/pV#p-n/ vs. /pV#pV-n/: $t = 1.209$, *n.s.*; /pV#p-d/ vs. /pV#pV-d/: $t = 1.168$, *n.s.*; /pV#p-b/ vs. /pV#pV-b/: $t = 2.309$, $p < .05$). This result was unexpected because previous experiments that examined OCP(C) and OCP(CV) effects (Kawahara and Sano 2016a; Kumagai and Kawahara 2018) showed that identical moras are disfavored more strongly than identical consonants. A possible reason for this result is that Japanese speakers may favor a sequence of identical moras across the morpheme boundary over one of identical consonants. This will be discussed in detail in Section 3.5.

To recapitulate, Experiment II has revealed the five points in (8):

- (8) Summary of results of Experiment II
- a. The *[p...D] constraint, part of OCP(diacritic), is active in the nicknaming process.
 - b. The OCP-labial effect seems to apply in all cases under non-IA conditions, although its effect is less likely to appear than the effect of the *[p...D] constraint.
 - c. There was no difference in the average naturalness between the CV and coda-nasal conditions.
 - d. The average naturalness is reduced under IA conditions (i.e., OCP(C) and OCP(CV) conditions).
 - e. There was no difference in the average naturalness between the OCP(C) and OCP(CV) conditions.

3.5 Discussion

This section discusses the results presented in (8c, 8d, 8e, 8b) in turn. First, I address the question of why the coda-nasal (m#) condition did not improve the average naturalness for nicknames showing the [h]→[p] alternation. Since [h] becomes [p] when it follows a nasal in Sino-Japanese (Labrune 2012), I predicted that the coda-nasal condition was more likely to tolerate the [h]→[p] alternation in the nicknaming process than the CV condition, but the results showed that there was no significant difference between these conditions. This supports the view that the [h]→[p] alternation in the nicknaming process is not phonologically conditioned, but is rather an alternation to express cuteness, as demonstrated by Experiment I.

I now discuss the result that the average naturalness of nicknames was lower under IA conditions than non-IA conditions. The nicknames in the non-IA conditions violate the *[p...D] and/or OCP(labial) constraints (e.g., *kasi-pada*; *kasi-pabi*; *kan-pada*; *kam-pabi*), but those in the IA conditions violate not only these but also the OCP(C) and/or OCP(CV) constraints (e.g., *kepe-pada*; *kepe-pabi*; *tapa-pada*; *tapa-pabi*), although the current results suggested that the effect of the OCP(CV) constraint was suspect. In other words, more markedness constraints are violated under the IA conditions than the non-IA conditions, thus rendering the nicknames under the IA conditions less acceptable than those under the non-IA conditions.

An anonymous reviewer points out that the nicknames under the IA conditions (e.g., *kepe-pada*; *tapa-pada*) were likely unacceptable not because of violations of the OCP(C) and OCP(CV) constraints but rather the intervocalic /p/ of the first member of the nickname (i.e. *kepe-pada*; *tapa-pada*). If nickname formations must obey the grammar of a language, the intervocalic /p/ could have made the nicknames more unacceptable since singleton [p] is disallowed to occur in Japanese native words. However, I argue that nickname formation does not always obey the grammar of languages; in other words, when lexical words are used in nicknames, they can show phonological behaviors that they would not otherwise. For example, as presented in (6d) (Section 2.1), despite the fact that the native word *hime* ‘princess’ does not undergo rendaku due to OCP-labial effects (e.g., *mai* ‘dancing’ + *hime* ‘princess’ → *mai-hime* ‘dancing girl’/ **mai-bime*) (Kawahara et al. 2006; Kumagai 2017), it undergoes the [h]→[p] alternation in nicknaming, thereby incurring violation of the OCP(labial) constraint (e.g., *ayu* ‘Ayu’ + *hime* ‘princess’ → *ayu-pime* ‘Princess Ayu’). This is not an exception showing that the word *hime* ‘princess’ can violate the OCP(labial) constraint, but rather that it is exempt from the phonological restrictions that it would be subject to otherwise since it is being used in a nickname. Thus, I do not agree that the nicknames with intervocalic [p] in IA conditions were unacceptable simply because singleton [p] is disallowed in native words. Arguably, the low naturalness of the nicknames in IA conditions results from cumulative violations of OCP(C) and/or OCP(CV) constraints, as already observed in past experimental studies (e.g., Kawahara and Sano 2016a; Kumagai and Kawahara 2018).

I now discuss the result that there was little or no significant difference in average naturalness between the OCP(C) and OCP(CV) conditions. In principle, when a form violates the OCP(CV) constraint it always violates the OCP(C) constraint as well, and thus the OCP(CV) condition should render the naturalness of nicknames lower than the OCP(C) condition. There are two possibilities for this result. The first possibility is that the OCP(CV) constraint does not apply in any case in the nicknaming process. If the OCP(CV) constraint does not exist at all, we can expect there to be no difference in average naturalness between the OCP(C) and OCP(CV) conditions. However, previous experiments on the OCP(C) and OCP(CV) constraints have demonstrated that the OCP(CV) constraint has a strong effect on Japanese compounding processes, such as rendaku formation (Kawahara and Sano 2016a), group naming formation (Kumagai and Kawahara 2018), and compound truncation (Moon 2016), and moreover that the weight for the OCP(CV) constraint is higher than that for the OCP(C) constraint in the analysis of group naming and rendaku in the framework of Maximum Entropy Grammar (Kumagai and Kawahara 2018; see, e.g., Hayes 2017; Zuraw and Hayes 2017 for the MaxEnt). Therefore, the first possibility may not be a valid one.

The second possibility for why there was no difference in average naturalness between the OCP(C) and OCP(CV) conditions is that identical moras are *avored* over identical consonants in Japanese nicknaming processes. Looking back at the example presented in (6a), *Haruka* yielded *Paru-ru*, in which the second mora, *ru*, is reduplicated. This reduplication is pervasive in Japanese nicknaming (e.g., *Aya* → *Ayaya*; *Riho* → *Ripopo*; *Yuna* → *Yunana*: see Hashimoto 2016 for other examples), which is why the Japanese speakers who participated in the current experiment may have opted more positively for forms with repeated identical moras (e.g., *tapa-pane*; *sapi-pina*; *tapu-pune*) than for forms with repeated

identical consonants (e.g., *kepe-pane*; *kapa-pina*; *sipo-pune*). However, it is still uncertain whether or not identical moras are favored only in nicknaming processes, which will be left for future research.

Finally, I would add that there is an issue about the OCP-labial effect that should be resolved in further research. In testing the OCP-labial effect on rendaku, Kumagai (2017) argues that rendaku involves both OCP(labial) and OCP(labial,–continuant) constraints to account for a sequence of [b...m] to be less likely to be preferred to a sequence of [b...ϕ]. Experiment II in the current paper revealed, strictly speaking, the effect of the OCP (labial, –continuant) constraint, rather than the effect of the OCP(labial) constraint, since it only examined the condition where [p] is followed by [b]. Thus, it is necessary to examine whether the OCP-labial effect shows up as well when the nickname contains other labial consonants.

4 General Discussion

The current experiments have revealed that there is a sound-symbolic association between the singleton [p] and cuteness (Experiment I) and that the psychological status of the *[p...D] constraint is real in the minds of Japanese speakers (Experiment II). The current section discusses these results further. Section 4.1 discusses generality of the sound-image association in terms of generational differences. Section 4.2 addresses the question of whether or not loanwords that contain double diacritics are induced by OCP(diacritic) to undergo devoicing, a process that reduces the number of diacritics. Section 4.3 discusses the psychological status of OCP(diacritic) in greater depth.

4.1 Generality of the sound-symbolic association

It is often the case that language use within a single language is not uniform between generations. In Tokyo Japanese, for example, different accent patterns in loanwords are favored between generations (Kubozono 2008). If sound-symbolic associations are part of the grammar of a language, then a generational difference in the effects of sound-symbolic associations would not be strange. Do the sound-symbolic associations between singleton [p] and cuteness hold then for all generations of Japanese? In the current experiments, participants were asked to report how old they were, although they were not always asked to report their gender or birthplace. As described in Sections 2.3. and 3.3, all of the participants in the current experiments were 18 to 19 years old (presumably born in 1998 or 1999). Given these data, it is suggested that at least the younger Japanese generations have the sound-symbolic association between singleton [p] and cuteness, but it is unclear whether it is possessed by the older generations as well. This issue needs to be explored in future research. If it derives from the sound-symbolic association between labials and babies (Kumagai and Kawahara 2017) or from smallness/lightness in mimetic vocabulary (Hamano 1986, Hamano 2014), then we would expect to observe the effect of the sound-symbolic association between singleton [p] and cuteness in older generations as well.

4.2 OCP(diacritic) in the grammar of Japanese

In this section, I tackle the question of whether OCP(diacritic) induces the devoicing of voiced obstruents and their geminates. As already seen in Section 1.2, in Japanese orthography the voiced obstruents and [p] require diacritics, *dakuten* (゜) and *han-dakuten* (゜), respectively ([da] = ダ; [ga] = ガ; [za] = ザ; [ba] = バ; [pa] = パ, in *katakana*), while voiceless obstruents except for [p] do not ([ta] = タ; [ka] = カ; [sa] = サ; [ha] = ハ, in *katakana*). If OCP(diacritic) is psychologically real, loanwords that contain double diacritics should undergo a process that reduces the number of diacritics. For example, in the case of *doggu* ‘dog’ (ドッヅ) and *poddo* ‘pod’ (ポッヅ), the diacritic in word-initial position can be removed by devoicing the word-initial voiced obstruent or by turning [p] into [h], but in fact such devoicing never occurs (e.g., *doggu* ‘dog’ (ドッヅ) → **toggu* (トッヅ); *poddo* ‘pod’ (ポッヅ) → **hoddo* (ホッヅ)). Why does this never occur

if OCP(diacritic) really exists? This question will be addressed below by building upon a proposal by Kawahara (2006).

As we have already seen in Section 1.1, while the devoicing of the voiced geminates does not occur when the word also contains a voiceless consonant or a sonorant elsewhere (e.g., *heddo* ‘head’ → [heddo] ~ ?*[hetto]; *reddo* ‘red’ → [reddo] ~ ?*[retto]), voiced geminates do undergo devoicing when there is another voiced obstruent elsewhere in the word (e.g., *doggu* ‘dog’ → [doggu] ~ [dokku]; *baggu* ‘bag’ → [baggu] ~ [bakku]) (e.g., Nishimura 2006; Kawahara 2006). More importantly, a voiced obstruent does not exhibit devoicing even if the word contains another voiced obstruent (e.g., *bagu* ‘bug’ → [bagu] ~ ?*[baku]; *gibu* ‘give’ → [gibu] ~ ?*[gipu]). In short, a single voiced obstruent is less likely to devoice than is a voiced geminate. Within the framework of Optimality Theory (OT: Prince & Smolensky 1993/2004), Kawahara (2006) proposes that IDENT(voice)_{singleton} be ranked higher than IDENT(voice)_{geminates}, with OCP(-son,+voice) (i.e., Lyman’s Law) ranked between them. Building on this proposal, we assume that IDENT(diacritic)_{singleton} is ranked higher than IDENT(diacritic)_{geminates}, with OCP(diacritic) ranked between them. IDENT(diacritic)_{singleton} and IDENT(diacritic)_{geminates} are defined as constraints that ban the addition or removal of diacritics from singleton and geminates, respectively. In what follows, I will show that the constraint ranking (i.e. IDENT(diacritic)_{singleton} >> OCP(diacritic) >> IDENT(diacritic)_{geminates}) can account for why a possible process to eliminate double diacritics never occurs.

I first discuss two types of examples in (9): (9a) contains a voiced obstruent and voiced geminates; and (9b) contains two singleton voiced obstruents. As mentioned above, loanwords as in (9a) show devoicing of voiced geminates (e.g., *doggu* ‘dog’ → [doggu] ~ [dokku]; *baggu* ‘bag’ → [baggu] ~ [bakku]), but devoicing of the singleton voiced obstruent never occurs. Similarly, none of the singleton voiced obstruents as in (9b) shows devoicing. Why does devoicing that would serve to eliminate double diacritics never occur?

(9) Devoicing of a voiced obstruent? (Letters with diacritics are underlined.)

a.	<i>doggu</i>	[doggu]	‘dog’	<u>ド</u> ッ <u>グ</u>	→	* <i>toggu</i>	[toggu]	トッ <u>グ</u>
	<i>baggu</i>	[baggu]	‘bag’	<u>バ</u> ッ <u>グ</u>	→	* <i>haggu</i>	[haggu]	ハッ <u>グ</u>
b.	<i>bagu</i>	[bagu]	‘bug’	<u>バ</u> <u>グ</u>	→	* <i>baku</i>	[baku]	<u>バ</u> <u>ク</u>
	<i>gibu</i>	[gibu]	‘give’	<u>ギ</u> <u>ブ</u>	→	* <i>kibu</i>	[kibu]	<u>キ</u> <u>ブ</u>

Tableau (10) concerns *doggu* (ドッグ) in (9a). To eliminate one or both of the double diacritics, we have three alternative candidates: in (10b), the diacritic of the third letter (グ) is removed by devoicing the voiced geminate; in (10c), the diacritic of the first letter (ド) is removed by devoicing the voiced obstruent; in (10d), both of the diacritics are eliminated. However, the candidates (c, d) in which the voiced obstruent devoices are likely unacceptable due to a violation of highly ranked IDENT(diacritic)_{singleton}. Consequently, candidate (b) *dokku* is chosen as an optimal form, which is consistent with the analysis by Nishimura (2006) and Kawahara (2006).

(10) Tableau (doggu ‘dog’ in (9a) → *toggu)

	/doggu/	<u>ド</u> ッ <u>グ</u>	IDENT (diacritic) singleton	OCP (diacritic)	IDENT (diacritic) geminate
a.	doggu	<u>ド</u> ッ <u>グ</u>		*!	
b.	→ dokku	<u>ド</u> ッ <u>ク</u>			*
c.	toggu	トッ <u>グ</u>	*!		
d.	tokku	トッ <u>ク</u>	*!		*

Tableau (11) concerns *bagu* (バ グ) in (9b). The only way to eliminate the double diacritics is to devoice one of the two voiced obstruents, as in candidate (11b). However, candidate (b) is ruled out because IDENT(diacritic)_{singleton} ranks higher than OCP(diacritic).

(11) Tableau (*bagu* ‘bug’ in (9b) → *baku)

	/bagu/	<u>バ</u> <u>グ</u>	IDENT (diacritic) singleton	OCP (diacritic)	IDENT (diacritic) geminate
a.	→ bagu	<u>バ</u> <u>グ</u>		*	
b.	baku	<u>バ</u> <u>ク</u>	*!		

Let us now discuss the examples presented in (12) that contain two diacritics: (12a) contains singleton [p] and voiced geminates; (12b) contains a voiced obstruent and geminate [pp]; and (12c) contains singleton [p] and geminate [pp]. It will be shown below that the proposed constraint ranking can predict that the voiced obstruent in (12b) does not devoice and that singleton [p] in (12a, 12c) does not become [h].

(12) Devoicing of a voiced obstruent? (Letters with diacritics are underlined.)

- a. poddo [poddo] ‘pod’ ポッド → *hoddo [hoddo] ホッド
- b. zippu [zippu] ‘zip’ ジップ → *sippu [ʃippu] シップ
- gyappu [g^lappu] ‘gap’ ギャップ → *kyappu [k^lappu] キャップ
- Deppu [deppu] ‘Depp’ デップ → *teppu [teppu] テップ
- c. poppo [poppo] ‘Poppo’ ポッポ → *hoppo [hoppo] ホッポ

Tableau (13) concerns *poddo* ‘pod’ in (12a). As already seen in (3), it has been reported to exhibit devoicing of the voiced geminates (i.e. *poddo* ‘pod’ → *potto* in (13d)) because of the singleton [p] (Fukazawa et al. 2015; Kawahara and Sano 2016a). This devoicing is correctly predicted by the constraint ranking proposed above. It may be possible to eliminate the first diacritic by turning [p] into [h] (i.e. *poddo*: ポッド → *hoddo*: ホッド), as in the last two candidates (13e, 13f), but that possibility can be ruled out since IDENT(diacritic)_{singleton} is ranked high.

(13) Tableau (poddo ‘pod’ in (12a) → *hoddo)

	/poddo/	ポッド	IDENT (diacritic) singleton	OCP (diacritic)	IDENT (diacritic) geminate
a.	boddo	ポッド	*!	*	
b.	botto	ボット	*!		*
c.	poddo	ポッド		*!	
d. →	potto	ポット			*
e.	hoddo	ホッド	*!		
f.	hotto	ホット	*!		*

Tableaux (14) and (15) concern *zippu* ‘zip’ in (12b) and *poppo* ‘Poppo’¹³ in (12c), respectively. To the best of my knowledge, these words are never pronounced as another form like **sippu* (シップ) or **hoppo* (ホッポ); that is, candidates (14b) and (15e) are chosen as an optimal forms, respectively. For these examples, there are two ways to eliminate one of the double diacritics. One is that the word-initial diacritic is removed by turning [z] into [s] or [p] into [h], as in candidates (14d) and (15h) (*zippu* ‘zip’ (ジップ) → *sippu* (シップ); *poppo* ‘Poppo’ (ポッポ) → *hoppo* (ホッポ)). The other changes /pp/ into [hh] to eliminate the word-final diacritic (*zippu* ‘zip’ (ジップ) → *zihhu* (ジッフ); *poppo* ‘Poppo’ (ポッポ) → *pohho* (ポッホ)), as in the candidates (14e) and (15f). However, neither happens to these examples: candidates (14d) and (15h) are not chosen because of IDENT(diacritic)_{singleton}; candidates (14e) and (15f) are almost inconceivable because geminate [hh] is more marked than geminate [pp] in Japanese, in that geminate [hh] rarely occurs in Japanese (Labrune 2012) while geminate [pp] is allowed to occur word-medially (e.g., *happa* ‘leaf’; *kappa* ‘water imp’).

¹³ *Poppo* is a character name in Pokémon, a game series current in Japan since 1995.

(14) Tableau (zippu 'zip' in (12b) → *sippu)

	/zippu/	ジッヅ	*[hh]	IDENT (diacritic) singleton	OCP (diacritic)	IDENT (diacritic) geminate
a.	zibbu	ジッヅ			*	*!
b.	→ zippu	ジッヅ			*	
c.	sibbu	シッヅ		*!		*
d.	sippu	シッヅ		*!		
e.	zihhu	ジッフ	*!			*
f.	sihhu	シッフ	*!			*

(15) Tableau (poppo 'Poppo' in (12c) → *hoppo)

	/poppo/	ポッポ	*[hh]	IDENT (diacritic) singleton	OCP (diacritic)	IDENT (diacritic) geminate
a.	bobbo	ボッポ		*!	*	*
b.	boppo	ボッポ		*!	*	
c.	bohho	ボッホ	*!	*		*
d.	pobbo	ポッポ			*	*!
e.	→ poppo	ポッポ			*	
f.	pohho	ポッホ	*!			*
g.	hobbo	ホッポ		*!		*
h.	hoppo	ホッポ		*!		
i.	hohho	ホッホ	*!	*		*

To summarize, this section addressed the question of whether OCP(diacritic) induces loanwords that contain double diacritics to undergo a process that reduces the number of diacritics (i.e., devoicing). Though voiced obstruents and singleton [p] require a diacritical mark in orthography, it rarely or never happens that a single voiced obstruent devoices or that singleton [p] turns into [h]. This can be accounted for by assuming that IDENT(diacritic)_{singleton} is ranked higher than OCP(diacritic) in the grammar of Japanese; in brief, removing the diacritic in the singleton consonant is strictly disallowed.

4.3 Does OCP(diacritic) really exist?

In Section 1.1, OCP(diacritic) was defined as a constraint which prohibits two diacritics from occurring in a single morpheme or in the second member of compounds. Since this constraint is based on the Japanese orthographic convention that voiced obstruents and [p] require a diacritical mark in Japanese *hiragana* and *katakana* and would thus be learned at a relatively late age, it is unlikely to be an innate constraint. Probably OCP(diacritic) would not be acquired until *hiragana* or *katakana* are learned. Though this hypothesis should be tested in future research, if it is correct, then it follows that preliterate children do not have OCP(diacritic) in their grammar. What then does this predict about preliterate children's phonology? A prediction is that since there is no constraint that bans a sequence of [p...D], nicknames with [p...D] (e.g., *kasi-pada*; *kasi-pabi*) are likely to sound as natural to preliterate children as those with [p...n] (e.g., *kasi-pane*). Testing this prediction will provide us with a clue to resolving the issue of whether OCP(diacritic) can be learned.

Experiment II tested the psychological status of OCP(diacritic) in adult grammar. Participants were asked to judge the naturalness of stimuli written in *hiragana*. One might suspect that this method is insufficient to demonstrate that OCP(diacritic) is psychologically real, because the respondents might have made a phonological judgment based on visual stimuli. This issue could be resolved by a follow-up experiment with audible stimuli. However, even if participants were provided only with audible stimuli, the possibility could not be ruled out that they make judgments based on the orthography recalled by the audible stimuli. In short, it seems to be methodologically impossible to tease apart the orthography from the phonology unless we target children who have not yet learned the orthography (see Kawahara 2018 for a similar discussion). Though the methodological problem remains to be solved, I argue that OCP(diacritic) is at play in the nickname judgment presented in Experiment II, because there is no more valid account of the result that nicknames with [p...D] were less natural than those with [p...n].

There is another possible definition for OCP(diacritic): It is not unlikely that OCP(diacritic) is also defined in such a way that it prevents [p, b, d, g, z] from co-occurring in a single morpheme or in the second member of compounds, because *rendaku* application or blocking does occur in the orthography that does not use diacritical marks (e.g., *kanji* (Chinese-characters) orthography) (e.g., 家 [ie] 'house' + 鍵 [kagi] 'key' → 家鍵 [ie-kagi] 'house key'/*[ie-gagi]). This possibility should be pursued in future research. In sum, a more detailed examination is necessary to demonstrate the psychological status of OCP(diacritic).

5. Conclusions

The current study dealt with two topics. One is the new nicknaming trend in Japanese whereby [h] alternates with [p]. In Experiment I, I established the hypothesis that the process is driven to express cuteness, and experimentally demonstrated that singleton [p] is more likely to be associated with cuteness than other consonants in Japanese. Thus, it is suggested that the [h]→[p] alternation observed in Japanese nicknaming is a semantically driven process. The other topic discussed in the current paper is the orthographic Lyman's Law, or OCP(diacritic) (Kawahara 2018). In Experiment II, I tested whether OCP(diacritic) is psychologically real in the minds of Japanese speakers, using nicknames with [h]→[p] alternation already applied. The results showed that the naturalness of nicknames is reduced when they contain singleton [p] and voiced obstruents, both of which need a diacritical mark in *hiragana* and *katakana*. This suggests that OCP(diacritic) is active in nicknaming processes beyond *rendaku* and devoicing of voiced geminates. Experiment II also showed that the naturalness of nicknames is affected by other OCP effects such as OCP(C), OCP(CV), and OCP(labial). This result suggests that such OCP effects impinge on the patterns resulting from nicknaming formation.

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