Title

Perceptual Strength Norms for 510 Japanese Words, Including Ideophones: A Comparative Study with English

Permalink

https://escholarship.org/uc/item/1cg0835m

Journal

Proceedings of the Annual Meeting of the Cognitive Science Society, 45(45)

Authors

Iida, Hinano
Akita, Kimi

Publication Date

2023

Peer reviewed

Perceptual Strength Norms for 510 Japanese Words, Including Ideophones: A Comparative Study with English

Hinano Iida (iida.hinano.i1@s.mail.nagoya-u.ac.jp)
Department of English Linguistics, Nagoya University, Furo-cho, Chikusa-ku, Nagoya
Aichi 464-8601 Japan

Kimi Akita (akita.kimi.s4@f.mail.nagoya-u.ac.jp)
Department of English Linguistics, Nagoya University, Furo-cho, Chikusa-ku, Nagoya
Aichi 464-8601 Japan

Abstract

Words express various sensory information to various degrees. Norming studies have collected native speakers' subjective perceptual strength ratings for numerous words in several languages. This paper presents perceptual strength norms for 510 Japanese words, including iconic lexemes called ideophones. The newly collected norms replicated some previous findings, such as visual dominance, olfactory inferiority, and the correlation between overall perceptual strength and iconicity. A systematic comparison between the Japanese and English perceptual strength norms further revealed that Japanese onomatopoeic ideophones tend to be more multisensory than their English equivalents and that Japanese words in general tend to encode more interoceptive information than English words. These findings suggest the usefulness of norming data in typological discussions on lexical semantics.

Keywords: perceptual strength; iconicity; multisensoriality; interoception; ideophones; linguistic typology; Japanese; English

Introduction

"[L]anguage is deeply infused with sensory information" and "provides a window into the senses" (Winter, 2019, p. 246). Humans express their sensory experience by language, and words encode various sensory information to various degrees. Norming studies have collected subjective ratings for words' sensory information from native speakers of several languages, such as English (Lynott & Connell, 2009, 2013; Lynott, Connell, Brysbaert, Brand, & Carney, 2019), Dutch (Speed & Majid, 2017), French (Miceli, Wauthia, Lefebvre, Ris, & Loureiro, 2021), Italian (Repetto, Rodella, Conca, Santi, & Catricalà, 2022), Spanish (Díez-Álamo, Díez, Alonso, Vargas, & Fernandez, 2018), Russian (Miklashevsky, 2018), Serbian (Filipović Đurđević, Popović Stijačić, & Karapandžić, 2016), and Mandarin (Chen, Zhao, Long, Lu, & Huang, 2019). Among these, the Lancaster Sensorimotor Norms (Lynott et al., 2019) quantify the strength of association between 39,707 English words and six perceptual modalities: touch, hearing, smell, taste, vision, and interoception (i.e., senses inside the body). These norms have been applied in various ways and revealed that the sensory information of words can predict their other properties, such as iconicity (Winter, Perlman, Perry, & Lupyan, 2017; Perlman, Little, Thompson, & Thompson, 2018), frequency, semantic complexity, emotionality, and patterns of crossmodal expressions (Winter, 2019).

The purpose of this paper is to provide perceptual strength norms for 510 Japanese words, compare them with the Lancaster Sensorimotor Norms for English words, and discuss some language-general and language-specific characteristics of sensory semantics. [1] Specifically, after replicating the previous reports on dominance relations between the senses and the correlation between perceptual strength norms and iconicity, we make two typologically informed observations: the multisensoriality of Japanese ideophones and the interoceptivity of the entire Japanese lexicon.

Method

Participants

A total of 179 participants were recruited via CrowdWorks. They had Japanese as their first language. They were remunerated 330 yen for their completion of the survey.

Stimuli

The stimulus set used in this study was a total of 510 Japanese words (123 adjectives, 112 ideophones, 106 nouns, 131 verbs, and 38 function words). 453 of these words were taken from Thompson, Akita, and Do's (2020) iconicity norms for frequent words in the Balanced Corpus of Contemporary Written Japanese (BCCWJ). We excluded 69 words, including obsolete or uncommon words (e.g., *kano* 'that', *nari* 'to be') and homonyms (e.g., *toku* 'to undo' or 'benefit', *washi* 'me' or 'eagle'), from Thompson et al.'s original word list and added 57 most frequent ideophones to roughly balance the number of words across lexical categories. We divided the total stimulus set into 17 lists of 30 test items plus a constant set of five calibrators that appeared in all lists. Thus, each list rated by participants consisted of 35 words.

---

[1] Suzuki, Gyoba, Kawabata, Yamaguchi, and Komatsu (2006) present what they call "modality-differential" profiles for 75 antonymic pairs of Japanese adjectives, rather than for individual adjectives separately. Yaguchi (2011) collected perceptual strength norms for 47 ideophones in Japanese but did not include interception.

Five calibrator words were presented at the beginning of each list, in the same order, to introduce participants to unambiguous examples. We used the Japanese translations of five calibrator words used in Lynott et al. (2019), as no perceptual strength norms have been collected for non-ideophonic words in Japanese (see fn. 1). We used *kooza* '(bank) account' as a word with low strength across all modalities, *iki* 'breath' as a word with medium strength across multiple modalities, *hankyoo-on* 'echo' as a word with high strength in a single modality (i.e., audition), *kuufuku-na* 'be hungry' as a word with uneven strength across modalities (i.e., interoception > haptics), and *ekitai* 'liquid' as a word with high strength across multiple modalities (i.e., vision, haptics, gustation).

Following and extending Thompson et al. (2020), we coded the Japanese words for lexical category (adjective, ideophone, noun, verb, or function word), frequency in BCCWJ (National Institute for Japanese Language and Linguistics & Lago Institute of Language, 2012), iconicity ratings, and etymological ideophonicity (i.e., whether the word has putative imitative or echoic origin or not according to *Nihon Kokugo Daijiten*, 2000-2002).[2] We also identified onomatopoeic (i.e., sound-mimicking) ideophones by consulting Kakehi, Tamori, and Schourup (1996). We did the same coding for Lynott et al.'s (2019) English norms using the *Oxford English Dictionary* for etymological ideophonicity and onomatopoeicity. Frequency and iconicity ratings were taken from Winter, Lupyan, Perry, Dingemanse, & Perlman (2023).[3, 4]

Procedure

We created Google Forms questionnaires that took the original perceptual strength norms of Lynott et al. (2019) as a model. The participants read the instructions that they would be asked to rate how much they experience everyday concepts using the six perceptual modalities, there were no right or wrong answers, and they should use their own intuition. The rating scales ran from 0 (not experienced at all with that sensory modality) to 5 (experienced greatly with that sensory modality). The words were displayed on separate pages, and the six sensory modalities (touch, hearing, smell, taste, vision, and senses inside the body) were displayed in a random order below the words. The participants completed one of the 34 word lists (2 versions × 17 lists, for counterbalancing). Each word was rated by at least 10 participants ($M = 11.93$). The collected data were thoroughly reviewed, looking for repeated rating responses to ensure a high data quality. No participant's responses were excluded by this procedure.

Ethics approval for the project was granted by the Graduate School of Humanities' Ethics Committee at Nagoya University (NUHM-22-007). All participants gave informed consent to take part in the study.

All statistical analyses reported in this paper were conducted with R version 4.2.3 (R Core Team, 2023). Plots were generated with ggplot2 package version 3.4.2 (Wickham, 2016).

Result 1: Replication of Previous Findings

The obtained Japanese norms replicated some of the previous findings in other languages.[5] Here, we focus on dominance relations between the six sensory modalities and their relation to iconicity.

Dominance Relations

Sensory information is not encoded equally across modalities in lexicons. It has been shown that language tends to describe sight (visual dominance) and not to describe smell (olfactory inferiority). Using Lynott and Connell's (2009) perceptual strength norms, Winter (2019) shows that English adjectives are particularly high in visual ratings, followed by haptic and then auditory, gustatory, and olfactory ratings. He also demonstrates that nearly half of the English adjectives primarily encode visual information, whereas only 6% of the adjectives are classified as smell words, and the other modalities are located in between. Furthermore, English speakers were shown to verbalize visual information more frequently than other sensory information.

Our Japanese norms replicated visual dominance and olfactory inferiority in all three respects. First, vision received the highest mean strength ($M = 3.26$, $SD = 0.93$), followed by interoception ($M = 2.63$, $SD = 0.88$), audition ($M = 2.08$, $SD = 0.94$), haptics ($M = 1.99$, $SD = 1.22$), olfaction ($M = 1.00$, $SD = 0.96$), and gustation ($M = 0.95$, $SD = 0.96$). Second, 278 words (54.51%) were classified as dominantly visual (e.g., *shiroi* 'be white', *sora* 'sky'), 124 (24.31%) as dominantly interoceptive (e.g., *nemui* 'be sleepy'), 36 (7.06%) as dominantly haptic (e.g., *tsumetai* 'be cold'), 35 (6.86%) as dominantly auditory (e.g., *yobu* 'to call'), 13 (2.55%) as dominantly gustatory (e.g., *nigai* 'be bitter'), and 2 (0.39%) as dominantly olfactory (e.g., *kusai* 'be bad-smelling'). 22 words (4.31%) received the same maximum perceptual strength ratings in more than one sensory modality. Third, as shown in Figure 1, dominantly visual words are more frequent than other words in BCCWJ.

---

[2] The words were also coded for lexical stratum (native non-ideophonic, native ideophonic, Sino-Japanese, or loaned), a factor that is not considered in this paper.

[3] Although we used a corpus of written Japanese for word frequency, the English data are based on a spoken corpus. This difference might have some influence on the results since Japanese ideophones more frequently appear in informal conversation than in formal writing (Schourup, 1993). However, we assume the

influence to be limited, as ideophones are generally infrequent compared to other word classes in both registers (Akita, 2012).

[4] While in Winter et al. (2023) participants rated the iconicity of words on a positive scale from 1 to 7, Thompson et al.'s (2020) Japanese norms used a scale of from −5 to +5, with the result that the average iconicity ratings of Japanese words are generally lower than those of English words (see also fn. 6).

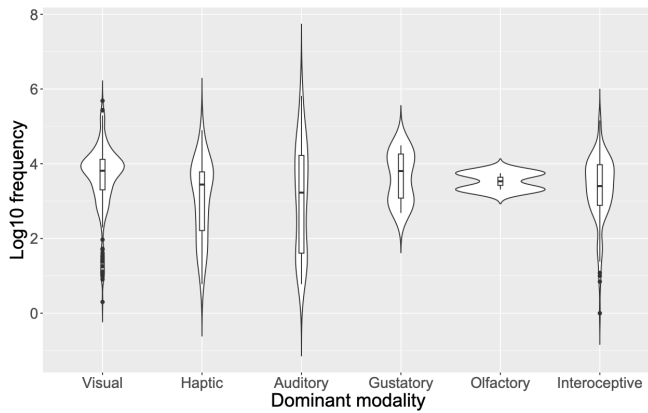[5] The norms and all R scripts are available at: https://osf.io/s63qb/.

Figure 1: Log10 frequency by dominant modality

Iconicity

Perceptual strength is also known to correlate with some linguistic properties of words. It has been shown in English and Spanish that words that are more strongly related to sensory information tend to be more iconic (Winter, Perlman, Perry, & Lupyan, 2017; Hinojosa, Haro, Magallares, Duñabeitia, & Ferré, 2021).

To test this correlation in Japanese, following Winter et al. (2017), we used the maximum perceptual strength rating for each word (e.g., the gustatory rating ($M = 4.90$) for the word *oishii* 'be tasty'). As shown in Figure 2, a linear model predicting rated iconicity from maximum perceptual strength revealed a reliable positive association between the two ($b = 0.30$, $SE = 0.05$, $t = 5.68$, $p < .001$, $R^2 = .06$).
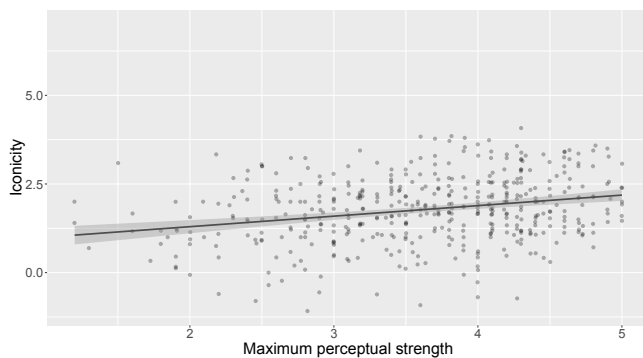

Figure 2: Maximum perceptual strength and iconicity

Winter et at. (2017) further show that different sensory modalities show different degrees of iconicity: the auditory and haptic modalities are associated with higher iconicity ratings than the olfactory, gustatory, and visual modalities.[6]

As shown in Figure 3, our Japanese dataset shows somewhat different results: the haptic modality has the highest iconicity ratings ($M = 2.73$, $SD = 0.97$), followed by the auditory ($M = 2.11$, $SD = 0.99$), olfactory ($M = 2.04$, SD

$= 0.06$), gustatory ($M = 1.78$, $SD = 0.70$), and visual modalities ($M = 1.73$, $SD = 0.92$). Dominantly interoceptive words have the lowest iconicity ratings ($M = 1.41$, $SD = 0.93$), indicating that words expressing abstract concepts (e.g., *jiko* 'self', *kimochi* 'feelings', *kako* 'past'), which are grounded to the inner senses, tend to be less iconic than concrete, sensory words (Connell, Lynott, & Banks, 2018; Lupyan & Winter, 2018; Winter et al., 2017).
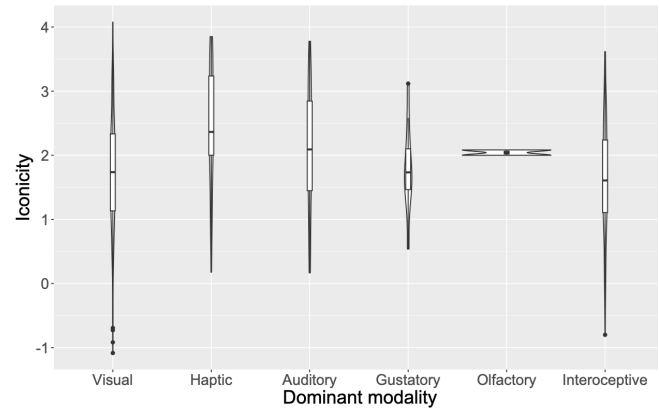

Figure 3: Iconicity by dominant modality

Figure 4 more directly shows the relationship between perceptual strength and iconicity ratings in the six modalities. A linear model that predicts iconicity from perceptual strength, sensory modality, and their interaction, with audition as a baseline, revealed a reliable positive association between iconicity and haptics ($b = 0.12$, $SE = 0.06$, $t = 2.04$, $p < .05$, $R^2 = .01$) and a nearly reliable negative association between iconicity and olfaction ($b = –0.13$, $SE = 0.07$, $t = –1.90$, $p = .06$).
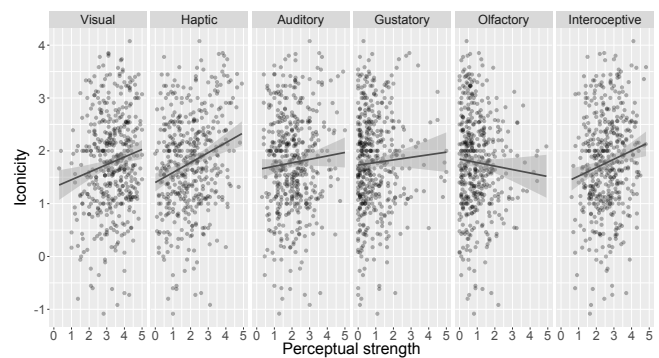

Figure 4: Perceptual strength and iconicity across sensory modalities

---

[6] The results look very different when we use Winter et al.'s (2023) enhanced dataset: haptic ($M = 4.47$, $SD = 0.97$) > olfactory ($M = 3.96$, $SD = 1.00$) > visual ($M = 3.76$, $SD = 1.00$) > auditory (M = 3.72, $SD = 1.04$) > interoceptive ($M = 3.70$, $SD = 0.84$) > gustatory ($M = 3.56$, $SD = 0.90$).

Result 2: Multisensoriality of Ideophones

The current dataset allows us to go beyond a mere replication of previous findings, giving us a glimpse into the language-specificity of sensory semantics. This section focuses on ideophones, which are "member[s] of an open lexical class of marked words that depict sensory imagery" (Dingemanse, 2019, p. 16) and abound in numerous languages of the world, including Japanese. Recent studies suggest that ideophones in ideophone-rich languages, such as Japanese (Akita, 2013) and Pastaza Quichua (Nuckolls, 2019), evoke multisensory imagery. For example, the Japanese ideophone *karikari* simultaneously evokes auditory (a repeated crunching sound) and visual/tactile sensations (a relatively thin, hard surface). Here, we examine this qualitative proposal by comparing the Japanese and English norms.

We adopted Lynott and Connell's (2009) "modality exclusivity" as an inverse measure of multisensoriality. It is defined as the range of perceptual strength ratings divided by the sum and then multiplied by 100 so that exclusivities can be expressed as percentages. For example, *nagameru* 'to look at' and *burogu* 'blog' have the highest modality exclusivity score (66.7%), which means that these words are least multisensory and tied to a single sensory modality (vision).

As shown in Figure 5, it was found that Japanese words generally tend to be more multisensory than English words. A linear model that predicts modality exclusivity from language, lexical category, and their interaction, with Japanese adjectives as a baseline, revealed that the multisensoriality of Japanese as compared with English is particularly pronounced in ideophones ($b = -9.52$, $SE = 2.68$, $t = -3.56$, $p < .001$, $R^2 = .07$). The same crosslinguistic difference was obtained when we limited ourselves to onomatopoeic words: Japanese onomatopoeia are more likely than English onomatopoeia to evoke both auditory and non-auditory imagery ($b = -18.05$, $SE = 2.50$, $t = -7.23$, $p < .001$, $R^2 = .37$).[7] These results are the first quantitative evidence for the multisensory semantics of Japanese ideophones.
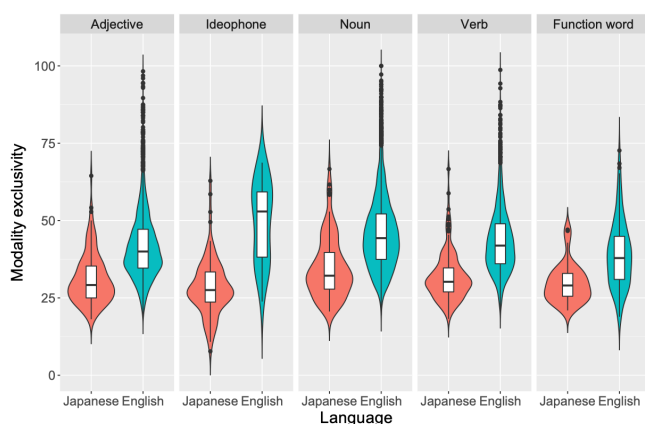
Result 3: Interoceptivity of Japanese

Another language-specific aspect of sensory semantics concerns the sixth sensory modality: interoception. Researchers have recognized the high interoceptivity and emotionality of Japanese ideophones, which made Childs (2001, p. 70) ask "Why are Japanese ideophones psychological in their orientation and African ideophones so perceptual or sensual?" In fact, Japanese has a sizable subset of ideophones for inner feelings called "psychomimes" (Martin, 1975), such as *dokkiri* 'startled', *iraira* 'irritated', and *zokuzoku* 'feeling a chill, thrilled'. However, it has not been clarified whether this interoceptive/psychological orientation is unique to ideophones or common across the whole Japanese lexicon. In fact, Makino (2007) notes that psychological and evaluative adjectives in Japanese contain the special submorphemic marker -*shi(-i)*, as in *kanashii* 'be sad', *natsukashii* 'be nostalgic', *ureshii* 'be happy', and *utsukushii* 'be beautiful', suggesting that interoception is also an important semantic feature in the non-ideophonic, prosaic part of the lexicon.

To avoid the possibility that the Japanese norms contained more words specialized in inner feelings (e.g., psych-verbs) than the English norms, we focused on 465 pairs of Japanese and English words.[8] We searched the English norms for a translation equivalent to each Japanese word (e.g., *splash* for *bachabacha* 'splashing', *stupid* for *baka-na* 'be stupid', *place* for *basho* 'place') and compared the perceptual strength profiles of the word pairs. We could not find English equivalents for 45 Japanese words (e.g., *burogu* 'blog', *karui* 'be light').

As shown in Figure 6, Japanese tends to receive higher perceptual strength ratings than English across the board. A linear model that predicts perceptual strength from language, sensory modality, and their interaction, with Japanese visual strength as a baseline, revealed that perceptual strength in Japanese is particularly strong in the interoceptive modality as compared with English ($b = 0.73$, $SE = 0.09$, $t = 8.48$, $p < .001$, $R^2 = .47$).

Figure 5: Modality exclusivity across lexical categories
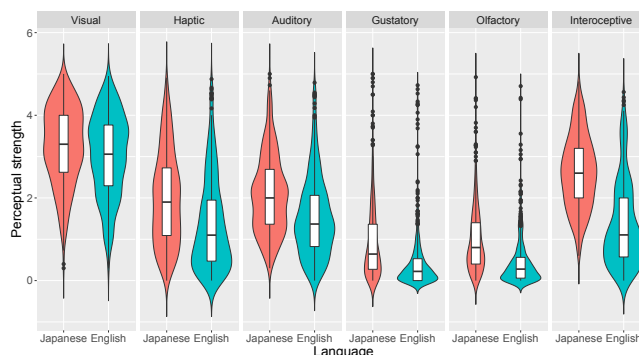
Figure 6: Perceptual strength in Japanese and English

---

[7] We did not consider English equivalents of non-onomatopoeic ideophones, as there is no consensus on how to identify them.

[8] Similar results were obtained when we examined the whole datasets.

Crucially, interoceptive strength in Japanese did not differ reliably between ideophones and prosaic words with ideophonic origin ($b = -0.005$, $SE = 0.17$, $t = -0.03$, $p = .98$, $R^2 = .005$) or between ideophones and prosaic words without ideophonic origin ($b = -0.18$, $SE = 0.09$, $t = -1.91$, $p = .06$). Thus, we can conclude that Japanese words, both ideophonic and prosaic, tend to involve more interoceptive information than English words.

General Discussion

The current study has presented the first large set of perceptual strength norms in Japanese, which revealed both crosslinguistically shared and language-particular tendencies in sensory semantics. In Result 1, Japanese perceptual strength replicated the previously reported visual dominance, olfactory inferiority, and correlation between overall perceptual strength and iconicity. The obtained crosslinguistic difference in the correlations between sensory modalities and iconicity (Japanese: haptic > auditory > olfactory > gustatory > visual vs. English: auditory > haptic > gustatory > olfactory > visual) might be ascribed to Japanese ideophones' broad semantic coverage that goes far beyond the auditory domain.[9]

In Result 2, we demonstrated that Japanese words, especially ideophones, tend to be more multisensory than English words. Although this observation supports the previously proposed multisensoriality of Japanese ideophones, it remains to be investigated why this semantic characteristic is shared with the rest of the lexicon to some extent.

This question might be partly related to Result 3: Japanese words generally tend to involve interoceptive information, often in addition to the other types of sensory information.[10] The obtained high interoceptivity of the Japanese lexicon is consistent with East Asians' previously reported great somatic awareness in everyday life (Ma-Kellams, 2014; see also Doi, 1962; Nittono, 2016; Wierzbicka, 1991). The current results also remind us of Slobin's (2000) "thinking for speaking" hypothesis. In his investigation of motion event descriptions, he observes that while speakers of satellite-framed languages, such as English, tend to attend to motion itself, speakers of verb-framed languages, such as Japanese, tend to pay relatively more attention to scene settings and movers' inner state. The latter tendency might be a usage-level manifestation of interoceptive Japanese. Moreover, some linguists argue that, in describing events, Japanese tends to take a subjective perspective, whereas English tends to take an objective perspective (Ikegami, 1991; see also Langacker, 1985). It might be that the self-centeredness of the Japanese language has incorporated subjective, interoceptive information into its lexicon.

Subjective norms have illuminated how language is grounded in human perception and cognition (Winter, 2019). However, the three sets of results reported in this paper indicate that they can also help us to address core linguistic issues, including typological ones. Future research needs to extend the current study by increasing data in Japanese and other languages. Also, it will be worth investigating how our perceptual strength norms are related to other properties of words, such as valence, arousal, concreteness, imageability, familiarity, and age of acquisition (Amano & Kondo, 1999, etc.). Furthermore, a closer look at the multisensoriality of ideophones might shed new light on the longstanding discussions as to whether onomatopoeia in "ideophone-poor" languages, such as English, should be considered ideophones and if they should, how we can deal with the crosslinguistic diversity in ideophone semantics (Dingemanse, 2012). Last but not least, our focus on the language-specific aspects of perceptual strength and iconicity may help us to refine our discussion on the role of iconicity in language evolution (Perlman, Dale, & Lupyan, 2015), which tends to pay more attention to the universal aspects of human communication.

Acknowledgments

References

Akita, K. (2012). Toward a frame-semantic definition of sound-symbolic words: A collocational analysis of Japanese mimetics. *Cognitive Linguistics*, *23*, 67-90.

Akita, K. (2013). Constraints on the semantic extension of onomatopoeia. *Public Journal of Semiotics*, *5*, 21-37.

Amano, S., & Kondo, T. (1999). *Nihongo no goi tokusei, dai-1-ki* [Lexical properties of Japanese, 1st period]. Tokyo: Sanseido.

Chen, I-H., Zhao, Q., Long, Y., Lu, Q., & Huang, C.-R. (2019). Mandarin Chinese modality exclusivity norms. *PLoS ONE*, *14*, e0211336.

Childs, G. T. (2001). Research on ideophones, whither hence?: The need for a social theory of ideophones. In F. K. E. Voeltz & C. Kilian-Hatz (Eds.), *Ideophones*. Amsterdam & Philadelphia: John Benjamins.

Connell, L. M., Lynott, D. J., & Banks, B. (2018). Interoception: The forgotten modality in perceptual grounding of abstract and concrete concepts. *Philosophical Transactions of the Royal Society B*, *373*, 20170143.

Díez-Álamo, A. M., Díez, E., Alonso, M. Á., Vargas, C. A., & Fernandez, A. (2018). Normative ratings for perceptual

---

[9] Winter (2019, p. 193) shows that, in English adjectives, high iconicity is localized in the auditory domain (e.g., *meowing*, *murmuring*, *rustling*).

[10] However, modality exclusivity as calculated without interoceptive ratings still shows the greater multisensoriality of Japanese than English ($b = 14.90$, $SE = 0.62$, $t = 24.04$, $p < .001$, $R^2 = .04$).

and motor attributes of 750 object concepts in Spanish. *Behavior Research Methods*, *50*, 1632-1644.

Dingemanse, M. (2012). Advances in the cross-linguistic study of ideophones. *Language and Linguistics Compass*, *6*, 654-672.

Dingemanse, M. (2019). "Ideophone" as a comparative concept. In K. Akita & P. Pardeshi (Eds.), *Ideophones, mimetics and expressives*. Amsterdam & Philadelphia: John Benjamins.

Doi, L. T. (1962). *Amae*: A key concept for understanding Japanese personality structure. *Psychologia*, *5*, 1-7.

Filipović Đurđević, D., Popović Stijačić, M., & Karapandžić, J. (2016). A quest for sources of perceptual richness: Several candidates. In S. Halupka-Rešetar & S. Martínez-Ferreiro (Eds.), *Studies in language and mind*. Novi Sad, Serbia: Filozofski fakultet u Novom Sadu.

Hinojosa, J. A., Haro, J., Magallares, S., Duñabeitia, J. A., & Ferré, P. (2021). Iconicity ratings for 10,995 Spanish words and their relationship with psycholinguistic variables. *Behavior Research Methods*, *53*, 1262-1275.

Ikegami, Y. (1991). 'DO-language' and 'BECOME-language': Two contrasting types of linguistic representation. In Y. Ikegami (Ed.), *The empire of signs: Semiotic essays on Japanese culture*. Amsterdam: John Benjamins.

Kakehi, H., Tamori, I., & Schourup, L. (1996). *Dictionary of iconic expressions in Japanese*. Berlin & New York: Mouton de Gruyter.

Langacker, R. W. (1985). Observations and speculations on subjectivity. In J. Haiman (Ed.), *Iconicity in syntax: Proceedings of a symposium on iconicity in syntax, Stanford, June 24-26, 1983*. Amsterdam: John Benjamins.

Lupyan, G., & Winter, B. (2018). Language is more abstract than you think, or, why aren't languages more iconic? *Philosophical Transactions of the Royal Society B*, *373*, 20170137.

Lynott, D., & Connell, L. (2009). Modality exclusivity norms for 423 object properties. *Behavior Research Methods*, *41*, 558-564.

Lynott, D., & Connell, L. (2013). Modality exclusivity norms for 400 nouns: The relationship between perceptual experience and surface word form. *Behavior Research Methods*, *45*, 516-526.

Lynott, D., Connell, L., Brysbaert, M., Brand, J., & Carney, J. (2019). The Lancaster Sensorimotor Norms: Multidimensional measures of perceptual and action strength for 40,000 English words. *Behavior Research Methods*, *52*, 1271-1291.

Ma-Kellams, C. (2014). Cross-cultural differences in somatic awareness and interoceptive accuracy: A review of the literature and directions for future research. *Frontiers in Psychology*, *5*, 1379.

Makino, S. (2007). An argument for non-arbitrary relationship between sound and meaning in Japanese grammar. In Y. Ikegami, V. Eschbach-Szabo, & A. Wlodarczyk (Eds.), *Japanese linguistics: European chapter*. Tokyo: Kurosio.

Martin, S. E. (1975). *A reference grammar of Japanese*. New Haven & London: Yale University Press.

Miceli, A., Wauthia, E., Lefebvre, L., Ris, L., & Simoes Loureiro, I. (2021). Perceptual and interoceptive strength norms for 270 French words. *Frontiers in Psychology*, *12*, 667271.

Miklashevsky, A. (2018). Perceptual experience norms for 506 Russian nouns: Modality rating, spatial localization, manipulability, imageability and other variables. *Journal of Psycholinguistic Research*, *47*, 641-661.

National Institute for Japanese Language and Linguistics & Lago Institute of Language. (2012). NINJAL-LWP for BCCWJ. https://nlb.ninjal.ac.jp/

Nihon kokugo daijiten [Great dictionary of the Japanese language]. 2000-2002. 2nd edn. Tokyo: Shogakukan.

Nittono, H. (2016). The two-layer model of 'kawaii': A behavioural science framework for understanding kawaii and cuteness. *East Asian Journal of Popular Culture*, *2*, 79-95.

Nuckolls, J. B. (2019). The sensori-semantic clustering of ideophonic meaning in Pastaza Quichua. In K. Akita & P. Pardeshi (Eds.), *Ideophones, mimetics and expressives*. Amsterdam & Philadelphia: John Benjamins.

Oxford English dictionary online. (2022). Oxford: Oxford University Press.

Perlman, M., Dale, R., & Lupyan, G. (2015). Iconicity can ground the creation of vocal symbols. *Royal Society Open Science*, *2*, 150152.

Perlman, M., Little, H., Thompson, B., & Thompson, R. L. (2018). Iconicity in signed and spoken vocabulary: A comparison between American Sign Language, British Sign Language, English, and Spanish. *Frontiers in Psychology*, *9*, 1433.

R Core Team. (2023). R: A language and environment for statistical computing. Vienna: R Foundation for Statistical Computing.

Repetto, C., Rodella, C., Conca, F., Santi, G. C., & Catricalà, E. (2022). The Italian Sensorimotor Norms: Perception and action strength measures for 959 words. *Behavior Research Methods*.

Schourup, L. (1993). Nihongo no kaki kotoba/hanashi kotoba ni okeru onomatope no bunpu ni tsuite [On the distribution of ideophones in written and spoken Japanese]. In H. Kakehi & I. Tamori (Eds.), *Onomatopia: Gion-/gitaigo no rakuen* [Onomatopia: A utopia of mimetics]. Tokyo: Keiso Shobo.

Slobin, D. I. (2000). Verbalized events: A dynamic approach to linguistic relativity and determinism. In S. Niemeier & R. Dirven (Eds.), *Evidence for linguistic relativity*. Amsterdam & Philadelphia: John Benjamins.

Speed, L. J., & Majid, A. (2017). Dutch modality exclusivity norms: Simulating perceptual modality in space. *Behavior Research Methods*, *49*, 1-15.

Suzuki, M., Gyoba, J., Kawabata, H., Yamaguchi, H., & Komatsu, H. (2006). Modariti difarensharu hō ni yoru keiyōshi no kankaku kanrensei no bunseki [Analyses of the sensory-relevance of adjective pairs by the modality

differential method]. *The Japanese Journal of Psychology*, *77*, 464-470.

Thompson, A. L., Akita, K., & Do, Y. (2020). Iconicity ratings across the Japanese lexicon: A comparative study with English. *Linguistics Vanguard*, *6*, 20190088.

Wickham, H. (2016). ggplot2: Elegant graphics for data analysis. New York: Springer-Verlag.

Wierzbicka, A. (1991). Japanese key words and core cultural values. *Language in Society*, *20*, 333-385.

Winter, B. (2019). *Sensory linguistics: Language, perception and metaphor*. Amsterdam & Philadelphia: John Benjamins.

Winter, B., Lupyan, G., Perry, L. K., Dingemanse, M. & Perlman, M. (2023). Iconicity ratings for 14,000+ English words. *Behavior Research Methods*.

Winter, B., Perlman, M., Perry, L. K., & Lupyan, G. (2017). Which words are most iconic?: Iconicity in English sensory words. *Interaction Studies*, *18*, 433-454.

Yaguchi, Y. (2011). Onomatope o mochiita kyōkankakuteki hiyu no imi rikai kōzō [The comprehension of synesthetic expressions with onomatopoeic words]. *The Japanese Journal of Cognitive Psychology*, *8*, 119-129.