Sound-symbolic effects of voiced obstruents and mora counts on monster names in *Digital Monster* and *Monster Hunter* and on the spell names in *Final Fantasy*

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Summary

The current paper shows three case studies of sound symbolism in fictional names featured in popular Japanese computer games: *Digital Monster*, *Monster Hunter*, and *Final Fantasy*. First, we show positive correlations between evolutionary stages and the number of voiced obstruents and the number of morae in *Digital Monster*. This replicates the results of the sound-symbolic analysis of *Pokémon* names conducted by Kawahara et al. (2018a). Second, we show that only the effect of the morae is positively associated with the size (height) of the monsters in *Monster Hunter*. Third, we reveal a positive correlation between the spell levels in *Final Fantasy* and the number of voiced obstruents, but not between the spell levels and the number of morae.

Keywords

sound symbolism, voiced obstruents, mora counts, evolution, size, strength

1. Introduction

Sound symbolism is a phenomenon in which linguistic sounds evoke particular meanings and images (e.g., Hinton et al. 1994/2006). Recently, there have been a large body of research on sound symbolism in the fields of linguistics, psychology, and cognitive sciences (for recent overviews, see Akita 2015, Dingamense et al. 2015, Hinton et al. 1994/2006, Kawahara 2017a, Lookwood & Dingamense 2015, Sidhu & Pexman 2018), and a prospective view has been proposed that sound symbolism can be useful in teaching linguistics, including phonetics (Kawahara 2017a, b, 2019, Kawahara & Monou 2017, MacKenzie 2018).

Scholars studying sound symbolism take it for granted that names are not always determined arbitrarily or randomly. For example, cross-linguistically, words for "nose" and "lips" are more likely to contain nasal and labial stops, respectively (Urban 2011) (e.g., English = ***n**ose*, *li**p**s*;

Japanese = *ha**n**a*, *kuti**b**iru*; Spanish = ***n**ariz*, *la**b**ios*). Those for "breast" are also likely to contain labials (Wichmann et al. 2010) (e.g., English = ***b**reast*; Japanese = ***m**une*; Spanish = ***m**ucho*). For another example beyond such basic vocabulary, it has been shown that male names, both in English and Japanese, are more likely to contain obstruents while female names are more likely to contain sonorants (e.g., Kawahara 2017a, Kawahara et al. 2015, Shinohara & Kawahara 2013, Slater & Feinman 1985, Wright et al. 2005). The sound-symbolic effects of names also appear in fictional characters in computer games, as creators who speak the games' primary language give them congruent names (Sidhu & Pexman 2019).

In recent years, a number of case studies have provided a sound-symbolic analysis of fictional (character) names that appear in popular Japanese computer games. Kawahara et al. (2018a) analysed the Japanese names of more than 700 *Pokémon* characters (*Pokémon* is a series of computer games that have been released since 1996 by Nintendo). Some *Pokémon* characters evolve to become bigger, heavier, and stronger. Kawahara et al. found that as *Pokémon* characters evolve, their names are more likely to contain voiced obstruents and more morae (e.g., ***g**o-o-su* (three morae) → ***g**o-o-su-to* (four morae) → ***g**e-n-**g**a-a* (four morae)). In addition, they found that the number of voiced obstruents and morae is positively correlated with the weight, height, and strength of *Pokémon* characters. The association of voiced obstruents with these images can be explained by the frequency code hypothesis (Hinton et al. 1994, Ohala 1984, 1994), and the effect of mora counts may be attributed to iconicity of quantity (Haiman 1980) (for more details, see Kawahara et al. 2018a, Kawahara & Kumagai 2019a, Kumagai & Kawahara 2019).

In a related study, Kawahara (2017b) offers a sound-symbolic analysis of the spell names used in *Dragon Quest*, a series of computer games first released in Japan in 1986, in which spells are classified by strength into several levels. He found positive correlations between the level of a spell and the number of voiced obstruents in its name, as well as between the spell levels and the number of morae in the name (e.g., *me-ra* (two morae) → *me-ra-mi* (three) → *me-ra-**z**o-o-ma* (five) → *me-ra-**g**a-i-ya-a* (six)). In addition to these studies, others have looked at the names of the monsters in the *Ultraman* series (Kawahara & Monou 2017) as well as villain names featured in Disney animations and the specific attributes of *Pokémon* characters (Hosokawa et al. 2018; Uno et al. to appear).

However, issues remain in sound-symbolic studies on fictional names in Japanese computer games. One is that only a few studies since Kawahara (2017b) and Kawahara et al. (2018a) have examined the effects of voiced obstruents and morae. To address this issue, the current paper presents three case studies. First, we examine whether the same sound-symbolic trend found in *Pokémon* names is also observed in 574 monster names featured in the Japanese computer game named *Digital Monster* (also known as *Digimon*) in which each monster transforms via evolution. When the monsters undergo evolution, do their names become longer and gain more voiced obstruents? Second, we analyse the monster names in another computer game, *Monster Hunter* (also known as *Monhan*), in which each monster has a different size (height). We examine whether the voiced obstruents and the mora counts are related to the height of the monsters. Finally, following Kawahara (2017b), we examine whether the same effects of voiced obstruents and mora counts are found in the spell names of *Final Fantasy* (also known as FF), a series of role-playing games in which, like *Dragon Quest*, spells are gradually categorised into levels based on spell strength.

2. An analysis of the monsters' names in *Digital Monster*

2.1 Background

Digimon is a computer game released in 1997 by Bandai. Players raise and battle monsters that have artificial intelligence in a computer network called the Digital World. The monsters evolve to be stronger. There are six basic levels of evolution: Baby I (*Younenki*-I) (e.g., *Botamon*, *Punimon*); Baby II (*Younenki*-II) (e.g., *Koromon*, *Tsunomon*); Child (*Seichouki*) (e.g., *Agumon*, *Gabumon*); Adult (*Seijukuki*) (e.g., *Gureimon*, *Garurumon*); Perfect (*Kanzentai*) (e.g., *Metarugureimon*, *Waagarurumon*); and Ultimate (*Kyūkyokutai*) (e.g., *Woogureimon*, *Metarugarurumon*). In addition to these, there are several additional levels of evolution: Armor (*Āamātai*), Hybrid (*Haiburiddotai*), and Xros Wars (*Kurosuuōzu*). Since these three levels are exceptional, our analysis targets the six basic levels.

2.2 Analysis

The current analysis extracted 806 monster names from the official *Digimon* website[1] and excluded 99 monsters that belonged to the exceptional evolutionary levels. In the study on *Pokémon* names, Kawahara et al. (2018a) excluded monster names with prefixes such as *mega-* "mega" or with suffixes such as *-osu* "male" and *-mesu* "female". Along this analytical method, we also excluded monster names that contained prefixes (*arutimetto-* "ultimate"; *bancho-* "a leader of a group of juvenile delinquents"; *burakku-* "black"; *enshento-* "ancient"; *giga-* "giga"; *inperiaru-* 'imperial'; *kingu-* "king"; *metaru-* "metal"; *puratina-* "platinum"; *waru-* "evil") and suffixes, including figures

(*-hakase* “Dr.”; *-moodo* “mode”; *-puromooto* “promote”; *7D6 in Igudorashiru 7D6*) and names that were sisters (e.g., *Sisutamon sieru*, *Sisutamon nowaaru*). When monster names had bracketed subnames (e.g., *Beufemon (X-kootai)* “X-antibody”), we analysed only the main name (i.e., *Berufemon*). When a monster’s name was identical with/without its subnames (e.g., *Agumon*, *Agumon (X-kootai)* “X-antibody”; *Koadoramon (midori)* (“green”), *Koadoramon (ao)* (“blue”)), we counted those as one monster, without analysing the subname (i.e. *midori*; *ao*). The final target of our analysis was 574 monsters.

For the analysis, each of the six basic evolutionary levels was encoded numerically: Baby I (*Younenki* -I) → 1; Baby II (*Younenki* -II) → 2; Child (*Seichouki*) → 3; Adult (*Seijukuki*) → 4; Perfect (*Kanzentai*) → 5; and Ultimate (*Kyūkyokutai*) → 6. The current study applied multiple regression analysis: the dependent variables being evolutionary levels and the independent variables being the numbers of voiced obstruents and morae. In the analysis of *Pokémon* names, Kawahara et al. (2018a) confirmed each independent effect of mora counts and the number of voiced obstruents, but not the interaction effect between them. Examining whether such an interaction effect is observed or not is important because it may be possible that the longer the name is, the more likely the number of voiced obstruents will increase. Following this analytical procedure, we first conducted the multiple regression analysis to confirm whether the interaction effects at issue were present in the names of *Digimon*. If the interaction effect was not found, then we would conclude that each effect worked independently on the monster names of *Digimon*. However, the interaction effect was detected, and thus each effect was not independent of each other. We then conducted simple slope analyses (Cohen & Cohen 1983) which used one standard deviation above and below the mean of mora counts and one standard deviation above and below the mean of voiced obstruents.

2.3 Results

Table 1 indicates the average number of morae and voiced obstruents contained in the monsters’ names at each evolutionary level. As Figures 1 and 2 show, the higher the evolutionary level, the more likely the name is to have more morae and voiced obstruents. The Spearman’s correlation analysis showed that the correlation between evolution and morae was significant (ρ = .495, p < .001) and between evolution and voiced obstruents (ρ = .242, p < .001). However, as shown in Table 2, the multiple regression analysis revealed not only the effects of mora counts (β = 0.598, SE = 0.054, t = 11.174, p < .001) and voiced obstruents (β = 1.231, SE = 0.246, t = 5.003, p < .001), but also the interaction effect between morae and voiced obstruents (β = −0.177, SE = 0.034, t = −4.546, $p < .001$). This means that the effects of morae and voiced obstruents were not independent of each other.

Table 1 Average numbers of morae and voiced obstruents at each evolutionary level

Evolution	N	Mora	Voiced obstruents
1	34	4.21	0.26
2	36	4.33	0.31
3	83	4.93	0.60
4	143	5.61	0.82
5	131	6.11	0.75
6	147	6.52	1.01
ALL	574	—	—

Table 2 The results of multiple regression analyses (n = 574)

Predictor	Estimate	Standard error	t-value	p-value
Intercept	0.79868	0.29660	2.693	0.00729
Voiced obstruents	1.23123	0.24612	5.003	7.54e−07
Morae	0.59784	0.05350	11.174	< 2e−16
Interaction = voiced obstruents and morae	−0.17648	0.03857	−4.576	5.83e−06

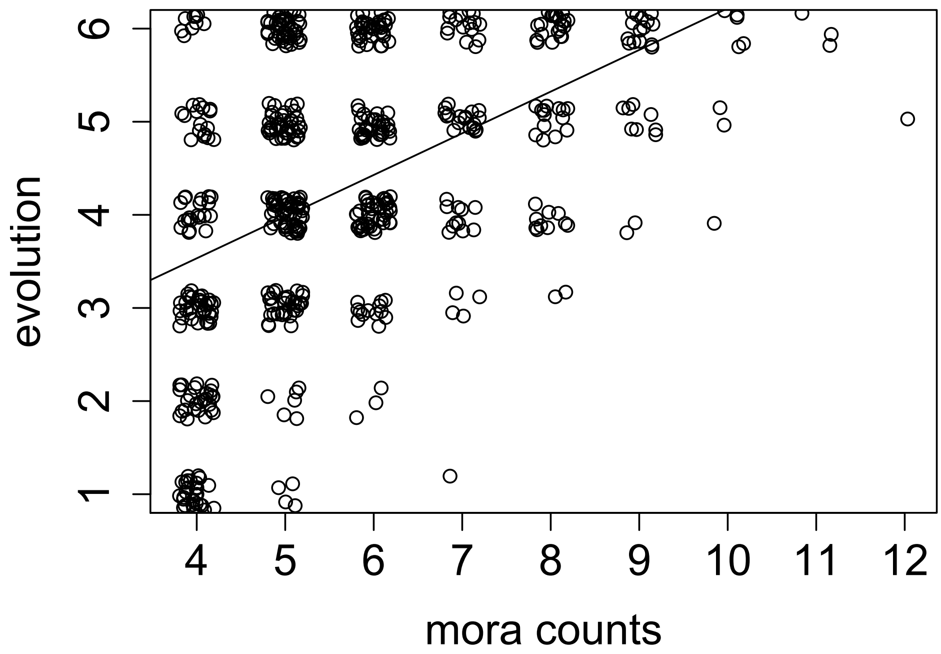

Figure 1 Correlation between evolution and mora counts

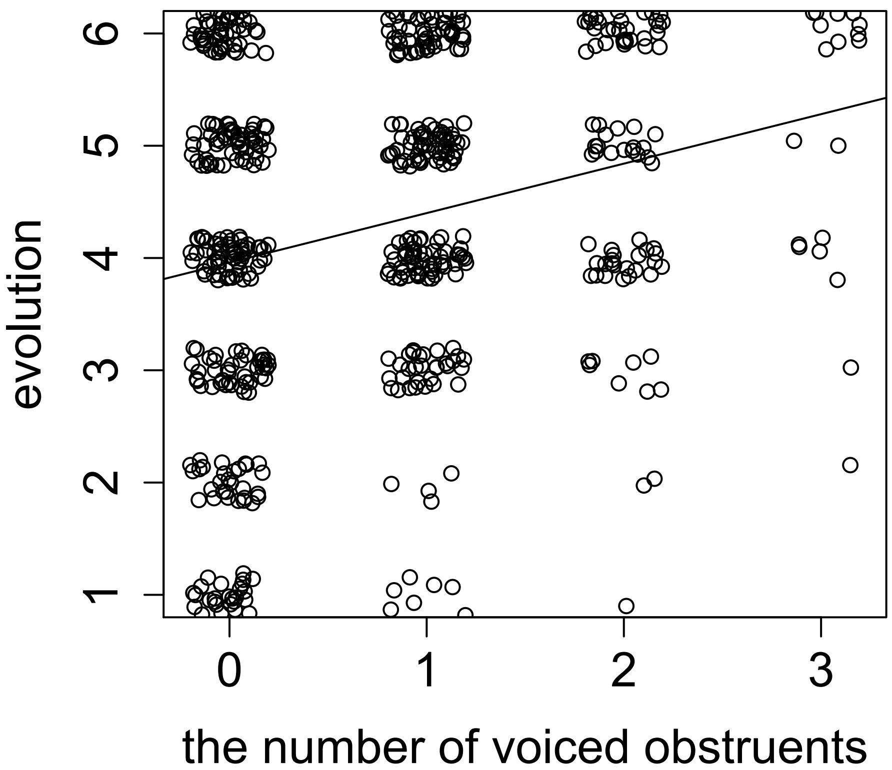

Figure 2 Correlation between evolution and voiced obstruents

We then conducted simple slope analyses (Cohen & Cohen 1983). The results (Table 3) show that there were significant effects of mora counts both at the high values of voiced obstruents (β = 0.32, SE = 0.042, t = 7.563, p < .001) and at the low values of voiced obstruents (β = 0.61, SE = 0.055, t = 11.006, p < .001). On the other hand, there was a significant effect of voiced obstruents at the low values of morae (β = 0.498, SE = 0.102, t = 4.865, p < .001), but not at the high values (β = −0.05, SE = 0.081, t = −0.579, *n.s*). To summarise, the effect of mora counts appeared regardless of the number of voiced obstruents, while the effect of voiced obstruents manifested itself when the mora counts were low.

Table 3 The results of simple slope analyses (n = 574)

Predictor	Estimate	Standard error	t-value	p-value
Intercept	2.73996	0.28500	9.614	< 2e−16
Morae	0.31958	0.04226	7.563	1.59e−13
Voiced obstruents (high)	1.23123	0.24612	5.003	7.54e−07
Interaction = morae and voiced obstruents (high)	−0.17648	0.03857	−4.576	5.83e−06

Predictor	Estimate	Standard error	t-value	p-value
Intercept	0.71925	0.30767	2.338	0.0197
Morae	0.60923	0.05535	11.006	< 2e−16
Voiced obstruents (low)	1.23123	0.24612	5.003	7.54e−07
Interaction = morae and voiced obstruents (low)	−0.17648	0.03857	−4.576	5.83e−06

Predictor	Estimate	Standard error	t-value	p-value
Intercept	5.12800	0.12271	41.789	< 2e−16
Voiced obstruents	−0.04678	0.08075	-0.579	0.563
Morae (high)	0.59784	0.05350	11.174	< 2e−16
Interaction = voiced obstruents and morae (high)	−0.17648	0.03857	−4.576	5.83e−06

Predictor	Estimate	Standard error	t-value	p-value
Intercept	3.28101	0.09719	33.757	< 2e−16
Voiced obstruents	0.49845	0.10246	4.865	1.49e−06
Morae (low)	0.59784	0.05350	11.174	< 2e−16
Interaction = voiced obstruents and morae (low)	−0.17648	0.03857	−4.576	5.83e−06

3. An analysis of the monsters' names in *Monster Hunter*

3.1 Background

Monhan is a series of computer games that was first released in 2004 by Capcom. Players slay and trap monsters that inhabit different places. Each monster has a different size, although there seems to be individual size difference for each monster. Note that not all of the monsters' sizes are publicly released. The current analysis focuses only on the monsters whose size is available on the Internet.

3.2 Analysis

The current study extracted 155 monster names from the website[2], but excluded 65 of these from analysis because the monsters' sizes had not been publicly released. Like the analysis of *Digimon*, we also excluded the monster names with affixes; for example, since we had the monster names *Tyatyabuu* and *Kingutyatyabuu* (*kingu*- "king"), and *Gianosu* and *Dosugianosu*, we excluded the names with such prefixes (i.e. *Kingutyatyabuu*; *Dosugianosu*). Note that we did not exclude the monster name *Dosufango*, as there did not exist a monster named *Fango* itself in the data. The final targeted names were 82 in total.

Since some monsters are less than one metre in size, while others exceed 400 metres (e.g., *Meraruu* = 0.39m; *Dara amadyura* = 440.397m), their real size (m) was log-transformed (base = e) in our analysis. We performed multiple regression analyses with the log-transformed sizes as dependent variables and the numbers of voiced obstruents and morae as independent variables.

3.3 Results

Tables 4 and 5 indicate the average log-transformed size by morae and number of voiced obstruents, respectively. Figure 3 shows the relationship between size (log m) and morae, and Figure 4 shows the relationship between size (log m) and number of voiced obstruents. The Spearman's analysis showed that size was correlated with the number of morae (ρ = .672, p < .001) and the number of voiced obstruents (ρ = .29, p < .01). However, as in Table 6, the multiple regression analysis showed a significantly positive correlation between size and the number of morae (β = 0.221, SE = 0.058, t = 3.8, p < .001), while the effect of the number of voiced obstruents on size was not significant (β = −0.029, SE = 0.236, t = −0.122, *n.s*).

Table 4 Average log-transformed size by mora

Mora	*N*	LogSize
2	2	2.44
3	6	2.53
4	16	2.58
5	29	3.11
6	20	3.38
7	7	3.47
8	1	4.41
9	1	2.84
ALL	82	—

Table 5 Average log-transformed size by voiced obstruents

Voiced obstruents	N	LogSize
0	25	2.82
1	32	3.12
2	20	3.17
3	2	3.73
4	3	3.14
ALL	82	—

Table 6 The results of multiple regression analyses (n = 82)

Predictor	Estimate	Standard error	t-value	p-value
Intercept	1.84812	0.29852	6.191	2.6e−08
Voiced obstruents	−0.02874	0.23613	−0.122	0.903452
Morae	0.22088	0.05812	3.800	0.000285
Interaction = voiced obstruents and morae	−0.01981	0.04275	0.463	0.644299

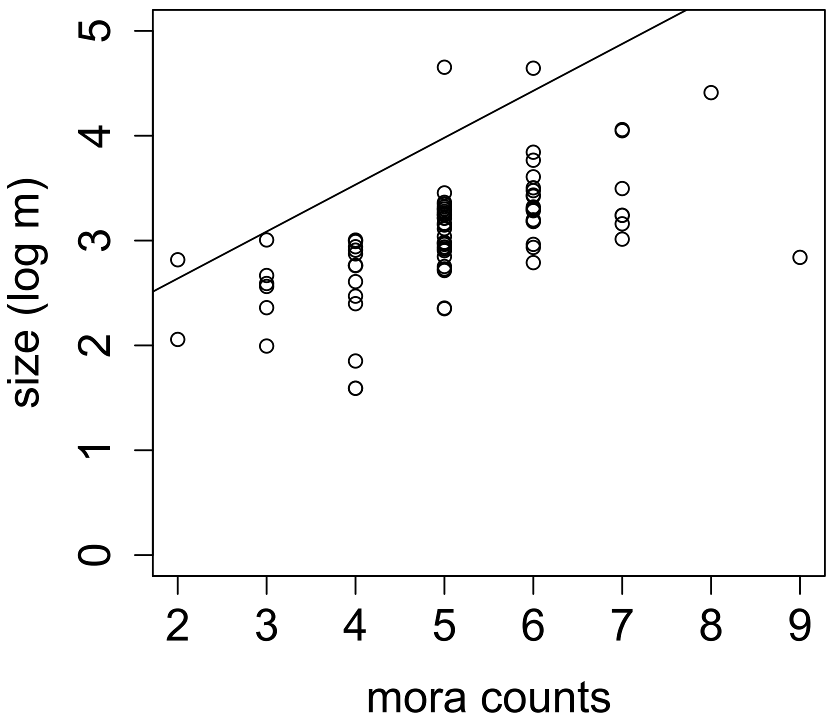

Figure 3 Correlation between size and mora counts

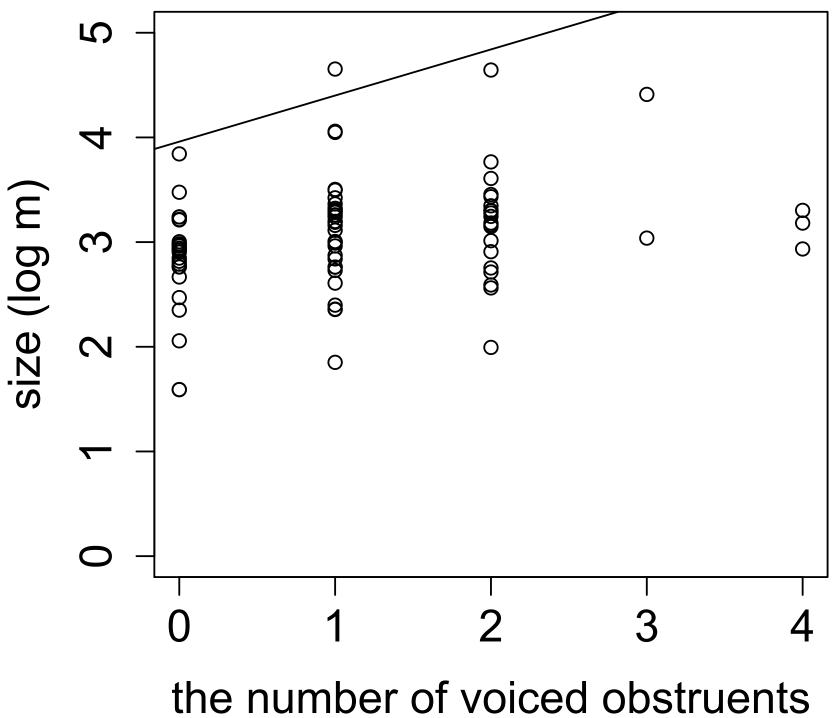

Figure 4 Correlation between size and voiced obstruents

4. An analysis of the spell names in *Final Fantasy*

4.1 Background

FF is a series of Japanese role-playing games released by Square Enix. Since 1987, it has released 15 instalments. Players battle monsters using items and spells called *mahoo* in Japanese (cf. spells are called *jyumon* in *Dragon Quest*). In FF, there are a variety of spell types, such as “Restore” and “Attack.” A spell has a maximum of five stronger variants. For example, *kearu* (English: “Cure”) is a recurring spell that restores a small amount of hit points (HP). Its stronger variants include, in order of strength, *kearua, kearura, kearuda, kearuga*, and *furukea*.

4.2 Analysis

The current analysis focused on the spell names that appear in the first to fourteenth instalments (i.e., FF1 to FF14) and excluded spell names that appear in the sequels of those, such as FF10-2 and FF13-2. We analysed 258 spell names from their website[3].

The six levels of spells were coded by level numbers (e.g., *kearu* → 1; *kearua* → 2; *kearura* → 3; *kearuda* → 4; *kearuga* → 5; *furukea* → 6). In order to examine the effects of voiced obstruents and mora counts on the spell levels, we conducted multiple regression analyses in which the spell levels were dependent variables and the numbers of voiced obstruents and morae were independent variables.

4.3 Results

Table 7 shows the average number of morae and voiced obstruents at each spell level. Figures 5 and 6 illustrate the effects of morae and voiced obstruents on spell levels, respectively. The Spearman’s analysis showed that the number of voiced obstruents was correlated with spell levels (ρ = .21, p < .001) but that the number of morae was not (ρ = .032, *n.s*). The results of the multiple regression analysis (Table 8) showed that there was a significant correlation between the spell levels and the number of voiced obstruents (β = 0.775, SE = 0.351, t = 2.209, p < .05), but not between the spell levels and the number of morae (β = 0.031, SE = 0.099, t = 0.312, *n.s.*).

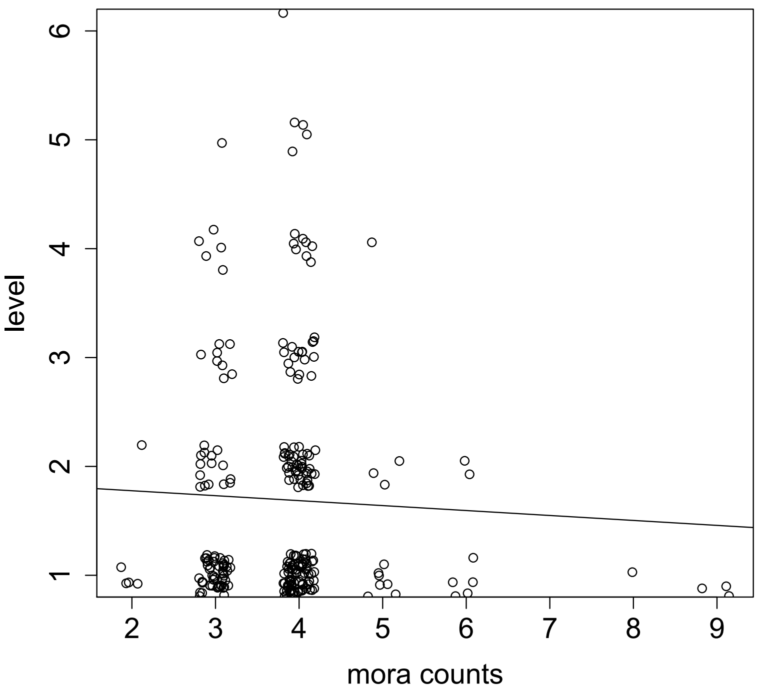

Figure 5 Correlation between spell levels and mora counts

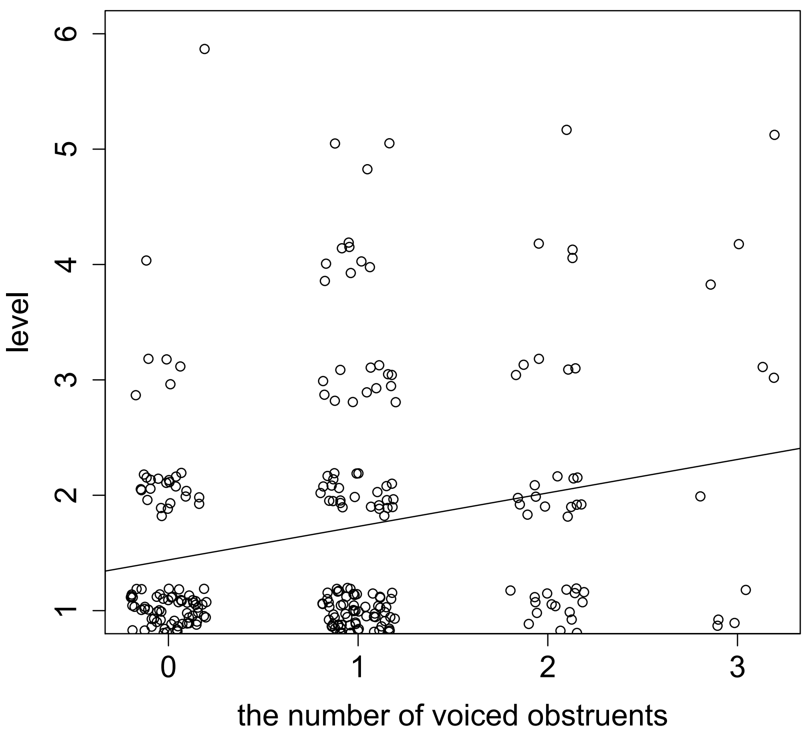

Figure 6 Correlation between spell levels and voiced obstruents

Table 7 Average numbers of morae and voiced obstruents at each spell level

Spell Levels	*N*	Mora	Voiced obstruents
1	151	3.85	0.75
2	62	3.84	0.89
3	25	3.68	1.16
4	14	3.71	1.43
5	5	3.8	1.6
6	1	4	0
ALL	258	—	—

Table 8 The results of multiple regression analyses (n = 258)

Predictor	Estimate	Standard error	t-value	p-value
Intercept	1.30737	0.38801	3.369	0.00087
Voiced obstruents	0.77479	0.35073	2.209	0.02806
Morae	0.03081	0.09873	0.312	0.75526
Interaction = voiced obstruents and morae	−0.11993	0.08604	−1.394	0.16458

5. Discussion and concluding remarks

The current paper shows three case studies of sound symbolism in fictional names featured in popular Japanese computer games. First, we presented a sound-symbolic analysis of 574 monster names in *Digital Monster*. The results show positive correlations between evolutionary stages and the number of voiced obstruents and the number of morae. This study replicates the results of *Pokémon* names reported by Kawahara et al. (2018a).

Second, we examined the effects of voiced obstruents and morae counts on the monster names in *Monster Hunter*. The results show that only the number of morae is positively associated with the size (height) of monsters. Third, we looked at whether those effects relate to the strength of the spell names in *Final Fantasy*. The results show a positive correlation between spell levels and the number of voiced obstruents, but not between spell levels and the number of morae. In other words, either effect of voiced obstruents or morae counts, both of which are found in *Pokémon* names and the spell names in *Dragon Quest*, is observed in both the monster names in *Monhan* and the spell names in *Final Fantasy*.

The research on *Pokémon* names has continued to develop in subsequent experiments, using imaginary *Pokémon* characters to demonstrate the productivity of the sound-symbolic associations (Kawahara & Kumagai 2019a, b; Kumagai & Kawahara 2019; Kawahara et al. 2018b). Experimental studies on imaginary monster or spell names in the three games featured in the current paper are left for future research.

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Notes

1. [Digimon] https://www.b-boys.jp/series/digimon/
2. [Monhan] https://matome.naver.jp/odai/2141802741963299701
3. [FF] https://dic.nicovideo.jp/t/a/ファイナルファンタジーの魔法一覧#cure

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