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Rendering the Notion of Luminosity in the English Language: The Effectiveness of Studying Iconicity of English Words by Means of an Experimental Data

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Abstract

This paper examines the iconicity of the semantic group of English words that indicate brightness. The study's word corpus was derived from Roget's Thesaurus and reduced to 77 lexemes through additional in-depth etymological analysis. The analysis's conclusions indicated that phonemes like /b/, /l/, and /g/ contribute to the way the English language expresses luminosity. Subsequent investigation showed that the initial phonaesthemes bl-, fl-, and gl- and the concept of luminosity were correlated exactly. Additionally, the study demonstrated the value of using an experimental data statistical method to obtain trustworthy estimates of the distribution of a discrete random variable in order to study the iconicity of English words.

Keywords: English Text; English Language; Luminosity.

1. Introduction

There is no denying that research on inconisity, particularly sound-symbolism, has been gaining traction in disciplines like linguistics, psycholinguistics, and cognitive sciences. This has sparked productive interdisciplinary research and created new avenues for theoretical and empirical advancements. The idea that sound-symbolism should be viewed as an opponent of arbitrariness rather than just the opposition of arbitrariness appears to be rather ineffective given the abundance of examples of peaceful coexistence between the two systems in language, and the growing acceptance of the iconic links between sound and meaning as a general feature of language. This is one of the most obvious signs of progress in this field. According to Perniss (2010) and research, non-arbitrary form-to-meaning relationships help with learning because they allow similar words to be grouped into categories and are based on established perceptual and cognitive systems. Many successful experimental investigations of sound-shape correlations have been conducted; these investigations are all variants of the well-known and traditional "light-headedness" experiment by Kohler (1929).

It should come as no surprise that English has been the language of study for the majority of linguistic phenomena. Further examination of other languages reveals that, despite being represented in various ways, sound symbolism is a constant and common trait in all language families and cannot be written off as incidental. Psychological tests demonstrating how speakers of different languages typically perceive sound symbolism lend credence to the idea that sound symbolism is a universal phenomenon across languages. It was long overdue to reject the Saussurian postulate of linguistic sign arbitrariness. However, comprehensive comparative studies of various language groups remain to be conducted. With a vocabulary of several thousand "sound-imitation" and "manner-symbolic" words, Korean and Japanese, for instance, have one of the largest systems of ideophones or mimetics, according to some researchers, while English does not exhibit a systematic pattern of sound symbolism. Apart from these classifications, Korean also contains "psycho-mimes," or terms that depict mental states. In addition, mimetic vocabulary is an essential component of grammar since variations in vowels and consonants are consistently linked to variations in meaning. More amazing is the fact that sound-symbolic words—like "dark" and "pitch dark"—are frequently repeated, signifying a change in consonant as well as an increase in intensity or force (Cho 2006).

Remarkably, reduplicated ideophones in Hindi are described as standing out from other words and representing sensory images, such as visual and auditory ones, in an empirical study on the impact of iconicity flash blindness. Therefore, the concept of phonemes and phonaesthemes having multiple meanings offers an intriguing angle for examining their multivalence and flexibility. The English language's luminosity-expressing phonaesthemes appear to be the most fascinating sound symbolic phonaesthemes. It has been demonstrated that English contains a number of sounds that represent different luminosity patterns: fl- "moving light" (flash, flare, flame, flicker, flimmer); gl- "unmoving light" (glow, glare, gloat, gloom); "big light or noise" (blare, flare, glare, stare) (Parault 2002). Another study claims that there are 47 distinct gl-words in Modern English. These words have the following meanings: 15 mean "light, brightness," 4 mean "dark light," 8 more mean "looking, seeing," which is logically related to light, and 7 mean "light movement" (Sadowski 2001). Out of 47 words, 35 (72%) are gl-words that accurately convey luminosity and the related light and fluid movement. In Lockwood and Dingemanse's experimental study, which combined evidence from natural languages with insights from psychology and neuroscience to investigate the role of sound-symbolism in language learning, language processing, and communication, voiced consonants and low back vowels were consistently linked to roundness, darkness in color, darkness in light intensity, and slowness, while voiceless consonants and high front vowels were consistently linked to spikiness, brightness in color, and brightness in light intensity (Lockwood & Dingemanse 2015; Besedina and Noland, 2014). Using psycholinguistic experiments and statistics, this paper investigates the relationship between sound meaning and the semantic group of English words that indicate luminosity (Maklakova, 2019).

2. Literature Review

In this context, it can be challenging to define association; in general, it refers to the sense in which the phonemes in question appear connected to, or to naturally coincide with, stimuli that have the associated elements or features. Reported behavior indicates the emergence of sound symbolic associations, wherein nonwords with specific phonemes are particularly useful for labeling specific targets. Congruent phoneme-stimulus pairings may elicit a different response than incongruent pairings on implicit tasks, where they may also surface (Westbury, 2005). These associations between sounds and symbols have significant ramifications for how we interpret language. Although language's arbitrariness has long been seen as one of its distinguishing characteristics (Hockett, 1963), sound symbolism offers one way in which nonarbitrariness can be relevant. It accomplishes this by finding congruencies between the meaning and phoneme-sound symbolic associations of a word. This can occur, for instance, when a word meaning "small" has phonemes that are acoustically linked to the concept of smallness. Language processing and learning may be impacted by these congruencies (Imai & Kita, 2014). Furthermore, it has been demonstrated that sound symbolic associations have broader effects on cognition, affecting memory, action, and categorization (see Lockwood & Dingemanse, 2015 for a recent review of sound symbolism effects).

There is a growing interest in sound symbolism in psychology. Of the 28 articles on sound symbolism and/or the closely related subject of iconicity published in 2001, Ramachandran and Hubbard's work reignited interest in the phenomenon3. In contrast, 193 articles on iconicity and/or sound symbolism were published in total in 2016 (see Fig. 1). The mechanism underlying these associations, however, has largely gone unnoticed despite the phenomenon's growing interest. That is, explanations for how specific phonemes end up linked to specific semantic and/or perceptual characteristics. Despite the abundance of proposals, there is a dearth of experimental work devoted to deciding which one to choose. One possible explanation for this could be that, as the current article aims to do, the mechanisms have not yet been comprehensively described and assessed in a single work (Shinohara & Kawahara, 2010). To set the stage, we start by discussing two well-known examples of sound symbolism. The significance of this topic is then demonstrated by reviewing the function of sound symbolism in language. Subsequently, we examine the characteristics of phonemes that could be implicated in associations and subsequently investigate the suggested processes through which these characteristics become linked to specific categories of stimuli. Lastly, we list the unresolved problems on this subject that still need to be worked on and offer some possible directions for future research in the area.

3. Methodology

The experimental material was taken from Roget's Thesaurus and further verified in detail using etymological dictionaries and English synonym dictionaries. The corpus was then reduced to 77 English lexemes, all of which had a root that indicated luminosity in the reconstructed Proto-Indo-European (PIE) language. Using a Random Number Generator, the comparative random sample that represents the English language in general was produced. It should be

mentioned that every important speech component is present in this sample. Since it is known that the function of a random variable is also a random variable, the corpus of words obtained in this manner was also random. The final sample size was relatively large (n ≥ 30) and the obtained corpus was processed using an experimental data statistical method by Hudson (1970) that allows obtaining reliable estimates of distribution of a discrete random variable. These crucial variables included: x̄, which stands for the sample mean and variance; ***S***x, the sample standard deviation; ***S***x/√***n***, the Root Mean Square Error; and CV, which stands for the standard deviation to mean ratio.

The method used to carry out the study significantly differs from the analysis technique used in the previous studies of words denoting light and brightness. This method of analysis proved to be rather effective in similar studies of sound symbolism of such lexical groups as, for example, the designation of "roundness"; of "smoothness, lubricity and slipperiness"; of "chumping and munching" and of "noisy and greedy devourment of food." An associative psycholinguistic experiment, commonly used in iconicity studies, was conducted as part of the complementary experiment (Mubarakshina and Abdrakhmanova, 2019).

4. Result

The studied group exhibits the occurrences of phonemes such as /g/, /b/, /l/, and /f/ that exceed their mathematical expectations in the English language by 6. 0; 4. 5; 3. 4; 1. 2 times accordingly, according to the structural phonetic analysis of the studied corpus and the random sample of English words created by using a Random Number Generator and intended to represent the English language as a whole (see Table 1). This is revealed with a 95% confidence interval. Due to length restrictions, it appears reasonable to only provide a subset of the collected data, as shown in Table 1 below. This subset consists of statistical data on phonemes that showed occurrences in the studied luminosity words that were more frequent than coincidental.

Table 1. *The Results of Statistical Data Processing of Phonemes in the English Words Denoting Luminosity*

No	phoneme	*r*	$\bar{x}$	$S_x/\sqrt{n}$	μ	*CV* (%)	r_{cs}	$\bar{x}_{cs}$	$S_x/\sqrt{n_{cs}}$	μ_{cs}	CV_{cs} (%)	μ/μ_{cs}
1	b	35	0.104	0.017	0.104±0.033	16.3	106	0.023	0.002	0.023±0.004	3.0	2.63<4.52<7.21
2	f	8.0	0.024	0.008	0.024 ± 0.016	33.3	91	0.020	0.002	0.020 ± 0.004	10.3	0.33<1.20<2.50
3	l	68	0.202	0.022	0.202 ± 0.044	10.9	276	0.059	0.003	0.059 ± 0.006	5.7	2.40<3.42<4.71
4	g	26	0.078	0.015	0.078±0.030	19.2	60	0.013	0.002	0.013±0.004	12.5	3.00<6.00<10.80
5	m	13	0.039	0.011	0.039±0.022	28.2	154	0.033	0.003	0.033±0.006	8.0	0.45<1.18<2.18

n = 336 n = 465

The analysis revealed that phoneathemes, or specific sound complexes, rather than individual phonemes, are far more crucial in how the English language expresses the concept of luminosity. The words beginning with the same phonaesthemes that were found in the random sample of words representing the English language were compared with the luminosity words in order to demonstrate the unique role that some initial phonaesthemes play in these words. Table 2 displays the obtained results.

Table 2. *The Results of the Statistical Data Processing of the Studied English Words Denoting Luminosity with Initial Phonaesthemes bl-, fl-, and gl-*

No	Phonesthemes	*r*	$\bar{x}$	$S_x/\sqrt{n}$	μ	*CV* (%)	r_{cs}	$\bar{x}_{cs}$	$S_x/\sqrt{n_{cs}}$	μ_{cs}	CV_{cs}	μ/μ_{cs}
1	**bl**	29	0.377	0.055	0.377 ± 0.110	14.9	11	0.016	0.005	0.016 ± 0,010,0	31.3	10.00<**23.13**<80
2	**fl**	7	0.091	0.033	0.091 ± 0.065	36.3	6	0.009	0.004	0.009 ± 0,008	44.4	1.53<**10.11**<156

3	**gl**	25	0.325	0.053	0.325 ± 0.104	16.3	4	0.006	0.003	0.006 ± 0,006	50.0	18.42<**54.17**< ∞
	n = 77						n = 700					

Therefore, a sample of English luminosemisms was compared with words initiated with these three phonaesthemes that were obtained by continuous sampling from the Oxford English Dictionary Online (OED), all of which were non-derivative words from the perspective of modern English, in order to more clearly identify the special role of the aforementioned phonaesthemes in rendering the notion of luminosity. Table 3 presents the findings.

Table 3. *The Results of the Statistical Data Processing of the Studied English Words Denoting Luminosity with the Initial Phonaesthemes bl-, fl-, and gl- in Comparison with Similar Words Taken from OED*

No	Phones themes	*r*	$\bar{x}$	$S_x/\sqrt{n}$	μ	CV (%)	r_{cs}	$\bar{x}_{cs}$	$S_x/\sqrt{n_{cs}}$	μ_{cs}	CV_{cs} (%)	μ/μ_{cs}
1	**bl**	29	0.371.	0,055	0.371 ± 0.110	14.9	84	0.00014	0.00002	0.00014±0.00004	14.3	1490<2690<4849
2	**fl**	7	0091	0,033	0.091 ± 0.065	3.3	92	0.00015	0.00002	0.00015±0.00004	13.3	140<606<1410
3	**gl**	25	0.325	0,053	0.325 ± 0.104	16.3	70	0.00012	0.00001	0.00012±0.00002	8.3	1571<2705<4293
	n = 77						n = 600 000					

The English luminosity corpus is represented in Fig. 1, where 79% of the words begin with one of three phonaesthemes (bl-, gl-, or fl-). It appears to be highly significant because, rather than choosing our research materials based on phonemic composition, we chose them based on the semantics of the words. Finding the proportion of words in the OED's total word count that have the initial phonaesthemes bl-, fl-, or gl- was also quite fascinating. The findings are displayed in Figure 2, and the percentage of words initialized with one of these phonaesthemes in relation to all words having this specific phonaestheme in the initial position in OED is displayed in Figures 3, 4, and 5. Additionally, for each luminosemism in the corpus under study, the proportion of English luminosity designations with the initial phonaesthemes bl-, fl-, and gl- was computed. The outcome is displayed in Fig. 6.

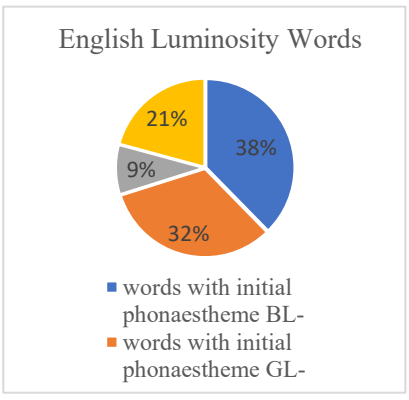

Fig. 1

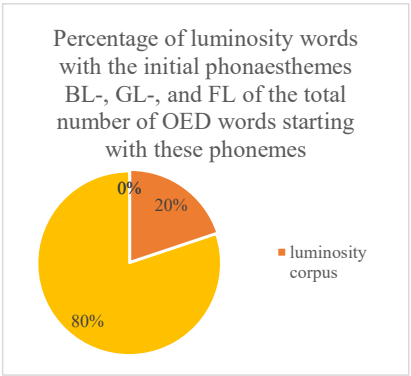

Fig.2

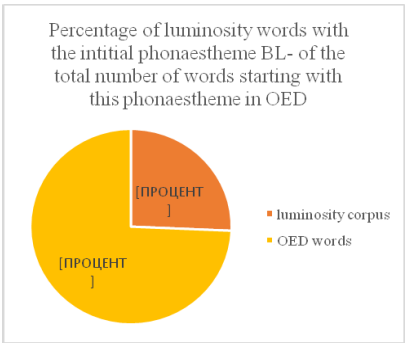

Fig.3

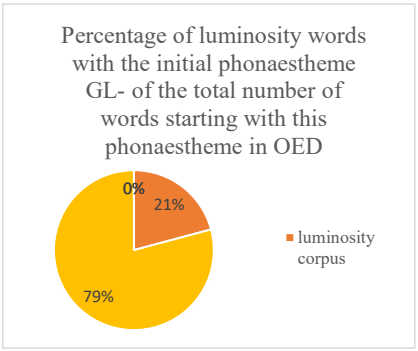

Fig.4

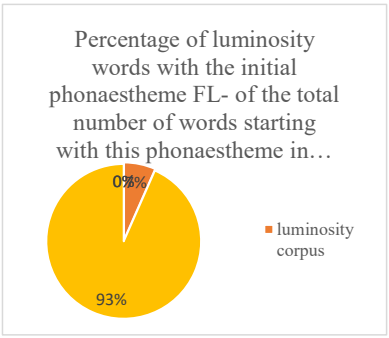

Fig.5

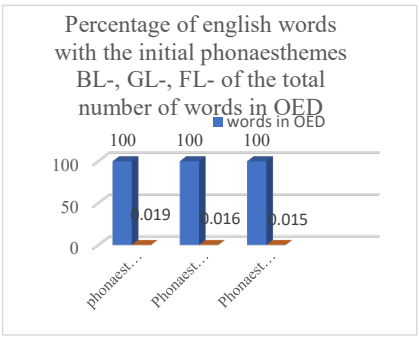

Fig.6

The data in Table 4 shows that, compared to the other English words included in the random sampling, the phonemes found in the English corpus of luminosity words show an improved than chance occurrence in the nonce words that the respondents "invented." However, it should be noted that due to the wide range of values, the results obtained can be taken as 100% reliable. As a result, more research involving a larger sample size should be done. When compared to similar words taken from the comparative sample from the complete dictionary of the English language (Kuznetsov 1998), which consisted of 700 English words, Table 5's statistical data processing results for the studied non-words denoting luminosity with the initial phonaesthemes bl- (5 words), fl- (5 words), and gl- (5 words) created by the English respondents showed that each of these three phonaestemes exceeds its mathematical expectation in the English language (presented by the sample) by an average of 50 times. Again, even though the figure appears to be highly convincing and agrees well with the data obtained for English luminosity words, the high ratios of the standard deviation to the mean and the small number of respondents raise some doubts about the accuracy of the data obtained.

5. Discussion

As a result, the following can be used to summarize the study's findings: The initial phonaesthemes of bl-, fl-, and gl- represent 38%, 9%, and 32% of English luminosemisms, respectively. This indicates that words beginning with the initial phonaesthemes bl-, gl-, and fl- represent 79% of the English luminosity corpus, while only 21% of words start with other phonemes. Twenty percent of all words in the OED are luminary words, with the majority beginning with the phonaesthemes mentioned above. Their likelihood of occurring outperforms the predictions of these English phonaesthemes in first place by 23, 10, and 54 times, respectively. Twenty percent of all words in the OED are luminary words, with the majority beginning with the phonaesthemes mentioned above. The OED's entire vocabulary only consists of 0.019%, 0.015 %, and 0.016 % of English words beginning with the phonaesthemes bl-, fl-, and gl-. This makes the correlation between luminosity and the initial phonaesthemes bl-, gl-, and fl- even more significant. Words with the phonaesthemes bl-, gl-, and fl-play a crucial role in expressing the concept of "light," according to an analysis of all the luminosemisms in the English language. This finding may point to a relationship between the semantics of words that express the concept under study and these sound nodes; as a result, these phonemes can be referred to as the primary "carriers" of luminosity.

Determining whether this correlation is specific to the English language or if there are other, more universal correlations seemed intriguing. The authors chose to conduct a pilot psycholinguistic associative experiment in order to

investigate the established statistical regularity between the meaning of luminosity and the sounds that were determined above. The experiment involved 100 native English speakers, both male and female, ages 6 to 25 (70 were students in primary school, ages 6-7, and 30 were university students, ages 16 to 25). In the experiment, each participant was shown a glittering object on the screen and asked to "invent" a word to name it. Every participant only provided one response. The authors used a random sample of English words, generated using a Random Number Generator and intended to represent the English language overall, to compare the created words. Subsequently, the identical statistical techniques utilized for the English corpus of luminosity words were implemented. As this parameter was unimportant for the current study, English consonants that were palatalized and those that were not should have been placed in the same group.

Table 4. *The Occurrence of Certain Phonemes in the Non-words Denoting a Luminous Object 'Constructed' by English Respondents*

no	phonemes	*r*	$\bar{x}$	$S_x/\sqrt{n}$	μ		CV_{cs} %	r_{cs}	$\bar{x}_{cs}$	$S_x/\sqrt{n_c}$	μ_{cs}	CV_{cs} %	μ/μ_{cs}
1	**b/ b'**	15	0.023	0.006	0.023 0,012	±	26.0	64	0.020	0.003	0.020±0.006	15.0	0.79<1.15<1.35
2	**f/f'**	9	0.014	0.005	0.014 0,010	±	35.7	26	0.008	0.002	0.008 ± 0.004	25.0	1.00<1.75<2.00
3	**m/ m'**	24	0.037	0.007	0.037 0,014	±	18.9	94	0.030	0.003	0.030±0.006	10.0	0.96<1.23<1.42
4	**l/ l'**	54	0.084	0.010	0.084 0,020	±	12.0	159	0.051	0.004	0.051±0.008	7.8	1.49<1.65<1.76
5	g/ **g'**	15	0.023	0.006	0.023 0,012	±	26.0	81	0.026	0.006	0.026±0.012	23.0	0.79<0,88<0.92
		n = 643						n = 3125					

6. Conclusion

The study's results enable the authors to draw the conclusion that initial phonaestemes like bl-, fl-, and gl-, rather than just the presence of phonemes like /b/, /l/, and /g/, are specifically linked to the concept of luminosity in the examined corpus of English words. The analysis of the results demonstrated the effectiveness of the methodology, just as in earlier research on other semantic groups of English vocabulary. This allows one to speculate that statistical analysis of iconic vocabulary may be an additional criterion of the phonosemantic analysis. Because English words associated with luminosity are so iconic, they are useful in certain specialized fields and jargons to indicate related qualities of objects. For instance, luminosity phonaesthemes are frequently used in American slang to create words that describe attributes like notoriety and fame, inexpensive and overly bright items, etc. More intricate and thorough studies on the material of non-Indo-European languages, or at least of the languages that are not closely related to English, should be conducted in order to reach more general conclusions about the correlation that has been shown.

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