Roles of Consonants and Vowels in Takete-Maluma and Bouba-Kiki Phenomenon

Dixuan Gong(✉)

Faculty of Arts, McGill University, Montreal H3A 04G, Canada
dixuan.gong@mail.mcgill.ca

Abstract. Sound symbolism has been widely studied in modern times as a phenomenon that overturns the assumption of the irrelevance of sound and meaning. In recent studies, sound symbolism has come to refer to the association of unarbitrary sounds and meanings by listeners. For example, people associate a figure with a rounded curve with the pseudoword "maluma" and a figure with an uneven sharp corner with the pseudoword "takete." Linguists have varied views on what causes this contentious occurrence. This article will present the origins and development of sound symbolism, introduce the concept of synaesthesia, and analyze the different views and arguments that consonants play a more important influence on sound symbolism and vowels play a more important influence on sound symbolism. This paper may be useful for those who would like to have an overview of the general history and development of the sound symbolism phenomenon, and research related to the causes of sound symbolism.

Keywords: Sound symbolism · consonants · vowels · synaesthesia · speech processing

1 Introduction

The arbitrary link between sound and meaning has been proposed by Saussure almost a hundred years ago, and language studies tend to assume the arbitrariness of signs as a fundamental assumption [1]. However, there had been discussions of the non-arbitrary relation between sound and meaning that started thousands of years ago, such as in Plato's Cratylus dialogue. Over history, as a controversial subject, sound symbolism is not very convincing due to a lack of supporting evidence.

Moving to the modern era, sound symbolism has again been studied extensively over the 20th and 21st centuries as the interface between linguistics and psychology. In the 1920s, the pioneering psychologist Köhler experimented on "phono-symbolism" on Tenerife island, and this result became a piece of essential evidence for supporting the existence of the sound symbolism phenomenon. In the experiment, he provided two different visual shapes and recited the words "maluma" and "takete" (these two words are not real words, but are non-sense words) to the subjects, and asked the participants to choose the picture they felt most similar to the pronunciation. The experimental study found that for certain different pronunciations, participants would choose pictures with different shapes [2].

B. Majoul et al. (Eds.): ICLAHD 2022, ASSEHR 726, pp. 1038–1044, 2023.
https://doi.org/10.2991/978-2-494069-97-8_132

Later in 2001, neuroscientists Vilayanur S. Ramachandran and Edward Hubbard extended the experiment with synaesthesia as the interpreter and implemented it with the bouba/kiki experiment [3]. The experiment was similar in content and format to Köhler's, in which the result was that some vocal sounds could be associated with the visual shape of the object. Since then, researchers have investigated the causes and connections of sound symbolism and discussed the influences of consonants and vowels on sound symbolism [3–5]. This paper will categorize and discuss the different effects of consonants on sound symbolism and vowels on sound symbolism in the previous sequence, and present some other implications related to sound symbolism.

2 The Origin of Sound Symbolism

2.1 The "Takete/Maluma" Experiment

Back in the 1920s, the German psychologist Wolfgang Köhler did some experiments on Tenerife island, where the inhabitants mostly speak Spanish as their first language. In one of these experiments, Köhler showed the inhabitants two silimar shapes: one shape is spiky and the other one is curvy; at the same time, Köhler asked the participants which shape is "takete" and which image is "maluma" (both "takete" and "maluma" are pseudowords) [2]. The result turned out to be that the participants had a strong tendency to connect the spiky shape with "takete" and the round shape with "maluma". This became a vital discovery in the field of both linguistics and psychology. The discovery begins to attract researchers' interest to sound symbolism. Later, a similar pattern has been found in the English environment [6]. In other language environments, this [7].

2.2 The Extension to the "Takete/Maluma" Experiment: The "Bouba/Kiki" Experiment

Synaesthesia, a term related to a condition in which an individual experiences sensations in one modality when a second modality is stimulated, is described in the famous bouba/kiki experiment study [3]. The "bouba/kiki" experiment is conducted in 2001 by Vilayanur S. Ramachandran and Edward Hubbard as an extension to the "takete/maluma" experiment to explore synaesthesia. This experiment is similar to the previous experiment, but changed the shapes (which were easier to identify) and words (from "maluma" and "takete" to "bouba" and "kiki") that are given to the participants. Results showed that the majority of participants chose "bouba" for the round shape and "kiki" for the spiky shape. It is clear that the words "bouba" and "kiki" differed not only in vowel quality but also in consonant voicing and placement. This experiment partly offers the change in phonemic identity as an explanation: the quick and sharp change in the tongue upon palate in the word "kiki" reflects on the sharp shape below, and in contrast, the round and closing lip gesture correspond to the round shape. From this, the experiment might suggest that there might be some natural constraints on the ways vocal sounds are mapped on objects. Furthermore, this relates to brain activity: will certain parts of brain areas work when people perceive vocal sounds or lip and tongue movement? And this goes back to the term "synaesthesia" that the researchers are looking to explain.

3 Reasons Behind: Consonants or Vowels

Previous experiments have caused huge waves in the linguistic community, and it's a great study for linguists to learn exactly what causes this phenomenon of sound symbolism or synaesthesia [2, 3]. In Köhler's original experiment, the words "takete" and "maluma" differ not just in terms of vowel roundness and backness, but also in consonant voicing and position of articulation. The "bouba/kiki" experiment has the same pattern. It is partly for this reason that the discussion of whether vowels or consonants are more of a sound symbolism phenomenon has become increasingly controversial. Some scholars support that the vowels cause the phenomenon [4, 8]. Specifically, the different mouth patterns that produce the vowels may lead to the choice of either round or pointed patterns. Others believe that consonants cause the phenomenon [5, 9, 10]; for example, fricatives give a sharper feeling, while glides or bilabials give a full, closed feeling. Thus people will choose shapes differently according to their feelings when processing the auditory information.

On the other hand, sound symbolism also has important symbolic implications in neuroscience. In Caramazza et al.'s study, it was shown that consonants and vowels are categorically different [11]. This was discovered in an experiment with aphasic patients. The authors discovered that two individuals with aphasia had radically different mistake processes in making vowel and consonant sounds: one patient made a lot of vowel errors and very few consonant errors, whereas the other patient did the exact reverse [11]. This research has a similar focus to synaesthesia; could it be that different areas of the brain process sound (consonants and vowels) and visual information differently, and that in synaesthesia the effect of stimulating one modality can be linked to the other modality?

3.1 Vowels Are More Important

In Caramazza's study, vowels are considered to have a function of identification [11]. People may quickly recognize the speaker's identity when they hear a phrase that solely contains vowels. For example, take the sentence "see you tomorrow" for example, and delete all consonant parts but reserve all vowel parts. It will have [iː] [uː] [ə] [ʌ] [ɒ] (these vowels IPA may vary due to different interpretations and pronunciations). By only reserving and playing the audio of the five vowels of "see you tomorrow", and asking the listeners what is the original sentence. As a result, most of the listeners will be confused and say they don't know what the original sentence is. But if the listeners are asked what the identity of the speaker is, they may have quick and certain answers, such as "male", "female", "young", etc. The author of this paper considers that, to some extent, the vowel's function of identification influences the role of vowels in sound symbolism.

Maurer et al. attribute the phenomenon of sound symbolism to vowels' roundness [4]. In her studies, she used four experimental trials to examine the toddlers' choices towards different shapes when facing those nonsense words. Her experiment results show that the toddlers tend to choose rounder shapes when presented with words including [ah] and [u]; at the same time, the toddlers tend to choose pointed shapes when presented with words including [i], [ej], and [^]. Tracing this in our daily life, we may find out that it's true many angular objects containing high front non-rounded vowels [i] and [e], such

as tip and needle. This finding can also explain why some adults have the ability to guess the word's meaning across languages. Maurer et al. further extended their experiment to support Ramachandran and Hubbard's conjecture that nature-biased sound shapes may have affected language evolution.

Likewise, another supporting research on vowels' properties matters more in sound symbolism is done by Parise and Pavani [8]. The experiment is designed to let participants produce a series of single vowels when they are given images. As for their experiment result, it's found that when compared to dodecagons, vocalizations induced by triangles (which are obviously more angled and spiky than dodecagons) were substantially quieter and had a higher F3 value. Among the formants of vowels, F3 indicates lip roundness; a higher F3 value indicates less lip rounding. This suggests that choices of visual shapes in the sound symbolism phenomenon can be associated with the lip roundness of vowels.

3.2 Consonants Are More Important

Recent studies show another trend to attribute these sound symbolism phenomena to consonants, especially in the phonetic aspect [5, 9, 10].

In 2005, Westbury conducted several experiments on sound symbolism and obtained data that supporting consonants have affected participants' choices of images more [5]. It was shown that the interaction between visual shapes and phonology did exist: stop consonants have a tighter association with spiky shapes and continuant consonants are more associated with curvy shapes in his's experiment. In addition, Westbury further expanded the topic of discussion into the realm of neuroscience and the division of labor in the brain. He explained the processing of visual tasks and auditory tasks in different parts of the brain, such as the left posterior temporal lobe and inferior temporal lobe. Westbury reinforces that there a neurological base exists for the phenomenon of sound symbolism, and different categories of consonants would interfere with choices of spiky shapes or curvy shapes.

Westbury's finding is also consistent with Nielsen and Randall's study: they found that participants match words more closely based on the consonant content of words than the vowel content of words when the inadherent link of vowel-consonant is broken [9]. It may be the reason that consonants are more prone to have a difference in auditory perception [9]. Due to the spectral difference, consonants are easier to become harsh sounding or smooth sounding to humans. Nielsen and Randall also mention these kinds of differences may lead the participants to choose the corresponding image. In their study, doubt has also been raised: will this consonant-based finding weaken the previous effects which are due to vowel-based words and to the synaesthesia linkage between visual perception of image's shapes and the vowel sounds? It is superfluous, in the opinion of Nielsen and Randall, to refute prior conclusions. They say that vowels can also be vital in matching bias when facing different consonants, but their core discussion is that: in their experiments, consonants are in some way more important than vowels when it comes to sound-symbolism-like phenomena.

Another experiment completed by Fort and Peperkamp demonstrates that the influence of consonants is more stable, as they are less affected by the vocalic context; contrary to this, the influence of vowels changes in consonantal context [10]. Researchers who support that vowels are playing more important roles in the sound symbolism phenomenon

may be rejected by this experiment: Fort and Peperkamp found that when listeners are facing different vowels, even if they differ a lot in roundness and backness, their choices still are influenced greatly when these vowels are combined with certain consonants (e.g., /l/, /m/, /t/, /k/ in the "Takete/Maluma" experiment). Thus, listeners' choices associating visual shapes and pseudowords (non-sense words) are more likely to be influenced by consonants. The researchers also conclude that the elements influencing the bouba/kiki effect or sound symbolism phenomenon should be multi-dimensional. Numerous factors including speech stimuli's articulatory, acoustic and phonological properties should all be considered [10]. Furthermore, Fort and Peperkamp assume lexical structures have influences on sound symbolism. In this case, consonants play a crucial role in this conjecture, as evidenced by the previous assumption and conclusions.

Following Fort and Peperkamp's conclusion, and combining it with Caramazza's study, it is not difficult to see that aside from vowels, consonants function as well in speech processing [11, 12]. However, vowels and consonants may have different labor divisions in processing word or sentence meaning. It is shown that in speech processing and language acquisition, the main role of consonants concerns the lexicon [11]. To illustrate consonants' function in identifying lexicon, let's still use the previous example sentence "see you tomorrow". Suppose all vowels are manually deducted and retain all consonants. In this way, by presenting continuous [s] [y] [t] [m] [r] to the listeners, they may come up with the whole sentence. But in most situations, they cannot determine the speaker's identity.

4 Other Implications

Nowadays, sound symbolism is no longer confined to research and study: now it's gradually been implicated in other industries. There is new research shows that many companies use sound symbolism in their brand names to make them fit the company's purposes and needs [13]. Back in the 1920s when the Coca-cola company first entered China market, the first Chinese name translated was "蝌蚪啃蜡" (pin yin: kē dǒu kěn là), which means "tadpoles chewing on wax". It didn't sound very nice to people who want to try the soft drink, for people may easily relate the name and the flavor of the drink together. Later, in order to improve the sales volume, the Coca-cola Chinese company decided to change the Chinese brand name to "可口可乐" (pin yin: kě kǒu kě lè). This means the drink is very tasteful and when you drink it you will become joyful. After changing the brand name, the sales volume climbed up immediately. This is a sound symbolism and translation co-worked implication in the commercial industry's brand names.

5 Conclusion

As a controversial subject, sound symbolism has gained a great deal of research and different conclusions in the last century. In this paper, different researchers examine the role and significance of sound symbolism from different perspectives, including phonology, speech processing, brain composition, and language formation. In these discussions, the arguments for a greater role of consonants or vowels in phonological symbolism

may differ based on experimental design and purpose. However, the author of this paper holds the view that: recent researches have favored the phenomenon that vowels and consonants will work together with phonological symbolism because in most people's lives vowels and consonants are kneaded into each other to produce language. Perhaps in some cases, consonants have more lexical influence and vowels have more syntactic influence, but for the individual phenomenon of speech symbolism, we can be sure that the absence of consonants or vowels does not lead to such a complete and worthwhile research of speech symbolism. In summary, the full picture of sound symbolism and the future role it can play in modern industries deserve further exploration.

References

1. F. de Saussure, C. Bally, A. Sechehaye, and W. Baskin, Course in general linguistics. London: Peter Owen, 1960.
2. W. Köhler, Gestalt psychology. New York: Liveright, 1992.
3. V. S. Ramachandran and M. E. Hubbard, "Synaesthesia -- a window into perception, thought and language", Journal of Consciousness Studies, vol. 8, no. 12, pp. 3–34, 2001.
4. D. Maurer, T. Pathman and C. Mondloch, "The shape of boubas: sound-shape correspondences in toddlers and adults", Developmental Science, vol. 9, no. 3, pp. 316–322, 2006. https://doi.org/10.1111/j.1467-7687.2006.00495.x.
5. C. Westbury, "Implicit sound symbolism in lexical access: Evidence from an interference task", Brain and Language, vol. 93, no. 1, pp. 10–19, 2005. Available: https://doi.org/10.1016/j.bandl.2004.07.006.
6. M. Holland and M. Wertheimer, "Some Physiognomic Aspects of Naming, or, Maluma and Takete Revisited", Perceptual and Motor Skills, vol. 19, no. 1, pp. 111–117, 1964.
7. R. Davis, "The fitness of names to drawings. A cross-cultural study in Tanganyika," British Journal of Psychology, vol. 52, no. 3, pp. 259–268, 1961.
8. C. V. Parise and F. Pavani, "Evidence of sound symbolism in simple vocalizations," Experimental Brain Research, vol. 214, no. 3, pp. 373–380, 2011.
9. A. Nielsen and D. Rendall, "The sound of round: Evaluating the sound-symbolic role of consonants in the classic Takete-Maluma phenomenon." Canadian Journal of Experimental Psychology/Revue canadienne de psychologie expérimentale, vol. 65, no. 2, pp. 115–124, 2011. https://doi.org/10.1037/a0022268.
10. M. Fort, A. Martin, and S. Peperkamp, "Consonants are more important than vowels in the Bouba-Kiki effect," Language and Speech, vol. 58, no. 2, pp. 247–266, 2014.
11. A. Caramazza, D. Chialant, R. Capasso and G. Miceli, "Separable processing of consonants and vowels", Nature, vol. 403, no. 6768, pp. 428–430, 2000. https://doi.org/10.1038/35000206.
12. L. L. Bonatti, M. Peña, M. Nespor, and J. Mehler, "Linguistic constraints on statistical computations," Psychological Science, vol. 16, no. 6, pp. 451–459, 2005.
13. L. J. Shrum, T. M. Lowrey, D. Luna, D. B. Lerman, and M. Liu, "Sound symbolism effects across languages: Implications for global brand names," International Journal of Research in Marketing, vol. 29, no. 3, pp. 275–279, 2012.