The connotative meanings of sound symbolism in brand names:

A conceptual framework

ABSTRACT

Phonetic elements in brand names can potentially convey a range of specific meanings. However, an integrated understanding of the sound symbolism of brand names remains elusive. Here, we classify sound symbolism in brand names in terms of the three key dimensions of the semantic differential (evaluation, potency, and activity). In particular, we demonstrate that the sound symbolism of brand names can be explained in terms of the two dimensions of evaluation and potency (but not activity). The presence of higher-frequency sounds (front vowels, fricative, and voiceless consonants) in brand names tends to be associated with those concepts that are linked to higher evaluation and lower potency, whereas lower-frequency sounds (back vowels, stop, and voiced consonants) tend to be more strongly associated with those concepts that are linked with lower evaluation and higher potency. This research provides an integrative understanding of sound symbolism in brand names in terms of semantic differential meanings.

Keywords: Phonetics; Brand names; Sound symbolism; Semantic meanings; Vowels; Consonants

1. Introduction

According to many commentators, brand names are one of the most important assets that a brand possesses (e.g., Keller et al., 1998; Klink & Wu, 2014). Brand names often represent the first point of contact between the consumer and a given brand, thereby helping to set the consumer's initial impressions and expectations concerning the latter (Keller et al., 1998). For this reason, companies have increasingly been investing their resources (both time and money) in trying to develop the most effective, and hence hopefully successful, new brand names. It has been estimated that approximately half a million businesses open each month in the United States alone. Although brand names are sometimes created on the basis of nothing more that the founders' intuitions, a meaningful brand name is beneficial for most businesses, thereby highlighting the importance of this field of research.

Research has demonstrated that brand names provide a useful means of conveying relevant information concerning product features and/or benefits to consumers (Keller et al., 1998; Pavia & Costa, 1993). A number of major new product failures in the marketplace have been put down to the choice of an inappropriate brand name (e.g., as in the case of the ill-fated Ford Edsel; Wallace, 1975; see also Klink, 2001).

One promising strategy in this regard is to create brand names using sound phonetics, specifically using sound symbolism (Klink, 2001; Spence, 2012; Sprott & Liu, 2016). Sound

symbolism can link phonetic sounds to certain meanings (e.g., soft sounds to pleasant product attributes; e.g., Klink, 2001). Over the past couple of decades, a growing number of consumer researchers have started to investigate the role of phonetics in brand naming (e.g., Klink, 2001; Lowrey & Shrum, 2007; Yorkston & Menon, 2004). The empirical research on the relevance of sound symbolism in brand naming is undoubtedly broadening rapidly (e.g., Roche, Shrum, & Lowrey, 2015; Spence, 2012, for reviews). By systematically manipulating the vowels and consonants in brand names, a growing body of evidence demonstrates that the specific sounds present in brand names (e.g., /i/ or /o/) help to convey specific meanings or to prime particular product attributes (e.g., smallness, sweetness; Klink, 2000; Motoki et al., 2020).

This paper relies on the theory of the meaning of concepts originally proposed by Osgood et al. (1957) to provide an integrative framework with which to understand the sound symbolic meanings that customers are likely to associate with specific brand names. Several studies have demonstrated that the speech sounds that are embedded in (hypothetical) brand names can convey various meanings or attributes (e.g., small, sweet, heavy, friendly, soft, mild, strong, healthy, bitter; e.g., Klink, 2000; Motoki et al., 2020). However, the integrative and theoretical understanding of the role of sound symbolism in the creation of brand names remains a topic that is still comparatively unexplored. Why, and how, exactly do the sounds that may be contained in brand names convey or prime various different attributes? Which psychological mechanisms can explain this phenomenon? One intriguing possibility relates to the connotative

meaning of speech sounds (Sidhu & Pexman, 2018). Relying on the theoretical framework of the semantic differential meaning of concepts (Osgood et al., 1957), the research presented here aims to provide an integrative and theoretical understanding of the role of sound symbolism in brand name development.

We begin by explaining sound symbolism in general and briefly explain the phonetic terms (e.g., vowels, consonants). Next, we review the previous findings in the field of sound symbolism research concerning brand names and develop the theoretical framework behind the phenomenon. Finally, we identify several outstanding issues that can only be addressed by future research in order to further our mechanistic understanding in this area.

2. Sound symbolism

Sound symbolism refers to the claim that the mappings that exist between the phonetic properties of speech sounds and their meanings are non-arbitrary (e.g., Knoeferle, Li, Maggioni, & Spence, 2017; Sidhu & Pexman, 2018). The debate on phonetic sounds and their meaning is by no means new, dating back at least as far as 400 BC (Plato, 1892). Almost a century ago, Köhler and Sapir both demonstrated empirical findings supporting the existence of sound symbolism (Köhler, 1929; Sapir, 1929). Köhler demonstrated that when presented with a choice between a round and an angular shape, people tend to associate the round shape with the name ‘baluma’, while associating the angular shape with the name (‘takete’) instead. Sapir,

meanwhile, demonstrated that people tend to associate the front vowels (e.g., /i/ in the word *Mil*) with a small object and the back vowels (e.g., /a/ in the word *Mal*) with a large object instead. In recent years, a growing body of research has demonstrated the prevalence of sound symbolism in languages and its significant role in cognition, emotions, and human (and consumer) behaviour (Blasi et al., 2016; Knoeferle et al., 2017; Sidhu & Pexman, 2018; see Figure 1). For example, the concepts of *smallness* and *roundness* tend to be associated with /i/ and /r/, respectively, across many languages (Blasi et al., 2016).

(Figure 1)

2.1. The sound symbolic 'meaning' of vowels and consonants

It is important to explain the key phonetic features that are often discussed in the literature (see Table 1). Speech sounds are segregated into vowels and consonants. Vowels are classified as either front (e.g., /i/, /e/) or back vowels (e.g., /o/, /u/) depending on the position of the tongue at the time of their utterance (i.e., front vs. back position of the tongue). Consonants can be categorized into fricatives and stops or voiceless and voiced in terms of the manner of their articulation (i.e., the degree to which the oral tract of the mouth is closed off by the articulators – teeth, tongue, and lips – during their utterance) and the accompanying vibration of the vocal cords; Sidhu & Pexman, 2018; see Table 1 for a summary).

(Table 1)

2.2. Consumer evaluation of sound symbolism in brand names

The large body of research on sound symbolism has potential relevance to the development of more effective brand names. Those who are in charge of naming brands have apparently used the knowledge of sound symbolism to effectively communicate product attributes with consumers via the development of sound-symbolic brand names (e.g., see Abel & Glinert, 2008; Kumagai & Kawahara, 2020; Lowrey & Shrum, 2007). Over the years, a number of studies have demonstrated that consumers tend to associate vowels and consonants incorporated into brand names with different product attributes across a wide variety of product categories, from durable goods (e.g., cars, laptops, computers), daily goods (e.g., toilet paper, cleaner), fashion items (e.g., dresses, cologne) to food and beverage (e.g., ice-cream, beer), pharmaceutical drugs, and even retail store evaluation (e.g., Abel & Glinert, 2008; Ketron & Spears, 2019, 2021; Klink 2000; Lowrey & Shrum 2007; Yorkston & Menon 2004; Park et al. 2020; Pathak et al. 2020). For example, according to research from Abel and Glinert (2008) and Klink (2000), those brand names containing voiceless (vs. voiced) consonants tend to be rated as smaller, sharper, more feminine, faster, and lighter (in terms of weight).

Notably, research in this area has often used crossmodal correspondences as the explanatory mechanism behind these linkages (Knöferle & Spence, 2012; Spence, 2011). Crossmodal correspondences refer to the tendency of people to map seemingly-unrelated stimulus properties from different sensory modalities onto each other in a highly-consistent/consensual

manner (Knöferle & Spence, 2012; Koriat, 2008; Spence, 2011). For example, the majority of people will match high-pitched tones with small, elevated, fast, and light visual stimuli, whereas low-pitched tones are associated with big, low, slow, heavy, and dark visual stimuli instead. Sound symbolism can thus be conceptualized as a subset of all crossmodal correspondences (namely those specifically involving speech sounds; see Spence, 2011, on this suggestion).

3. Conceptual framework of sound symbolism in brand names

Our aim here is to use Osgood et al.'s (1957) theory of semantic differential (evaluation, potency, activity) as the underlying theoretical foundation for developing a conceptual framework relating to the use of sound symbolism research in the development of brand names. Although two decades of research in this area has generated a wide range of empirical findings (e.g., Spence, 2012, for a review), an underpinning theoretical framework and integrative understanding remain elusive. Moreover, to date, research in sound symbolism has not fully explored the connotative meanings of the embedded sounds in names (Sidhu & Pexman, 2018). The framework outlined here provides insights into why it is that certain sounds may be associated with particular attributes. Our framework also aims to provide the underlying psychological mechanisms that will help strengthen the theoretical underpinnings and will enable researchers to explain their findings better in the brand naming research.

3.1. The framework of meanings of concepts

A common semantic space might help to explain the involvement of sound symbolism in the meanings primed/associated with brand names. Potentially relevant here, Osgood and his colleagues proposed the framework of meanings of concepts that is today known as the 'semantic differential technique' (Osgood et al., 1957; Snider & Osgood, 1969). These researchers measured the meanings of a wide array of concepts on a diverse array of bipolar adjectives scales (e.g., good-bad, strong-weak; Osgood et al., 1957). Three dimensions (Evaluation, Potency, Activity) of meanings of concepts were often identified using factor analyses (e.g., Osgood et al., 1957; Osgood & Suci, 1955; see Figure 2). Evaluation is measured by items including positive-negative, good-bad, etc. Potency is measured by using items such as strong-weak, heavy–light, while Activity is measured by items such as active-passive, fast-slow, etc. (Osgood et al., 1957). Note here that Evaluation and Activity are considered to correspond to the two dimensions of core affect (valence and arousal; e.g., Cespedes-Guevara & Eerola, 2018). Moreover, Evaluation, Activity, and Potency are often aligned with Pleasure, Arousal, and Dominance in the PAD emotion model, respectively (see Mehrabian, 1996).

The semantic differential approach has been used in marketing and consumer research for many decades (Clevenger et al., 1965; Kelly & Stephenson, 1967; Park et al., 2020). The semantic differential technique has been applied to a very diverse range of topics relevant to marketing

and consumer research, including retail patronage appeals (Kelly & Stephenson, 1967), corporate images (Clevenger et al., 1965), and assessing brand image to name but a few of the application domains (Kelly & Stephenson, 1967; Park et al., 2020).

(Figure 2)

3.2. Connotative meanings as a potential mechanism underlying sound symbolism in brand names

Connotative meanings have been regarded as one of the potential mechanisms underlying sound symbolism in brand names (Sidhu & Pexman, 2018). Sound symbolic associations might arise due to shared connotative meanings between phonemes (e.g., front vowels) and attributes (e.g., smallness; e.g., Abel & Glinert, 2008; Gallace et al., 2011; Sidhu & Pexman, 2018). Phonetic features (e.g., vowels, consonants) have a range of connotative meanings associated with them (e.g., Klink, 2001; Park et al., 2020), and these connotative meanings might prime the associated consumer behaviour. Several studies empirically support the account of shared connotative meanings (e.g., Gallace et al., 2011; Park et al., 2020). Recently, Park et al. demonstrated that the connotative meanings associated with phonetic features influence consumer evaluation of medicines. These researchers revealed that two of the connotative (or semantic differential) dimensions (potency and activity) associated with the voiced consonants influenced the effect of product-related expectancies in fictional made-up pharmaceutical

brand names. Specifically, the names containing voiced (vs. voiceless) consonants induced higher ratings of potency and activity which, in turn, led to various expectations concerning the attributes of the pharmaceutical product concerned (e.g., expected efficacy, potential side effects). These authors suggest that sound symbolism might convey similar connotative meanings (e.g., 'if it is light, it might be fast' association).

Although extensive research on sound symbolism of brand names has identified the relationship between speech sounds in brand names and individual brand attributes (see Table 1), an integrated understanding of the sound symbolic contribution to brand name development remains unexplored. Relying on the semantic differential framework of the meaning of concepts (Osgood et al., 1957), we explored how the three dimensions of connotative meanings can explain the effects of sound symbolism in brand names. First, we systematically identified the published literature that has investigated the effect of sound symbolism in brand names (see Table 1). Next, we coded the attributes reported in these papers along the three key connotative differential dimensions (evaluation, potency, activity) (see the section below for details on coding) and thereafter analysed the data in order to explore the relationship between vowels/consonants and the three principal dimensions (i.e., evaluation, potency, activity).

4. The connotative meanings of sound symbolism in brand names: A systematic review

4.1. Identifying relevant publications

We firstly identified the relevant publications by using a search term (see Appendix A for details). The studies identified by the search terms are shown in Appendix Table A2. The flowchart of the systematic review is shown in Figure 3.

(Figure 3)

4.2. Data coding

We classified each of the attributes reported by previous research based on the three principal semantic differential dimensions (i.e., Evaluation, Potency, Activity; Osgood et al., 1957). The attributes were selected from the main dependent variables from the identified studies (see Appendix Table 2A). Two raters independently rated evaluation (higher evaluation, lower evaluation, not applicable), activity (more active, less active, not applicable), and potency (more potent, less potent, not applicable) for each of the 41 attributes (see Appendix B for details). When at least one of the raters rated the attributes as 'not applicable', the attributes were excluded from subsequent analyses. The detailed procedures are shown in Appendix B. Finally, 21 attributes were chosen for evaluation (15 attributes of higher evaluations, 6 attributes of lower evaluations), 19 attributes for potency (9 attributes of higher potency, 10 attributes of lower potency), and 17 attributes for activity (14 attributes of higher activity, 3 attributes of lower activity) (see Appendix C). Next, we discuss the results based on vowels and two types of consonants (fricative/stop, voiceless/voiced), because the majority of the

previous studies have used these sounds (see Appendix Table A). It should be noted that each attribute related to evaluation, potency, and activity can overlap. So, for example, an attribute (e.g., sweet) can be classified as evaluation (higher evaluation) and potency (lower potency). Due to this overlap, the total attributes at the starting point (41 attributes) are not equal to the total number of attributes at the end (57 attributes).

4.3. Evaluation

We conducted a binomial test to investigate whether the frequency of the associations between higher (lower) evaluation and higher (lower) frequency sounds differs from that of their counterpart [i.e., lower (higher) evaluation and higher (lower) frequency of sounds)] (see Table 3). The results of the binomial test revealed that higher (lower) evaluation was more associated with a higher (lower) frequency of sounds (39/51, 76.47%) than their counterparts (12/51, 23.53%) ($p < .001$. $g = 0.265$).

(Table 3)

4.4. Potency

A binomial test was conducted to investigate whether the frequency of the associations between more (less) potency and lower (higher) frequency of sounds differ from that of their counterpart [i.e., less (more) potency and higher (lower) frequency of sounds)] (see Table 3). The results

of the binomial test revealed that more (less) potency is more associated with a lower (higher) frequency of sounds (76/78, 97.44%) than their counterparts (2/78, 2.56%) ($p < .001$, $g = 0.474$).

4.5. Activity

A binomial test was conducted to investigate whether the frequency of the associations between more (less) activity and higher (lower) frequency of sounds differed from that of their counterpart [i.e., less (more) activity and higher (lower) frequency of sounds)] (see Table 3). The results of the binomial test did not reveal any significant differences. That is, the associations between more (less) activity and higher (lower) frequency of sounds (27/43, 62.79%) did not differ from that of their counterpart (16/43, 37.21%; $p = .126$, $g = 0.128$). It should also be noted that "non-significant differences" might reflect lower power (i.e., a small N).

It would seem as though there are no meaningful associations with the activity dimension for either vowels or consonants. Some attributes associated with more activity (e.g., faster, sharper, lighter colour, lighter relative to heavier) are consistently linked to higher (vs. lower) frequency speech sounds, whereas others, associated with more activity (e.g., more rugged, arousing, strong), are linked with lower (vs. higher) frequency speech sounds. Activity-related attributes might be explained by the evaluation and potency dimensions rather than activity. For example, 'lighter colour' is classified as both more active and higher evaluation according to our

connotative categorizations. Although previous research shows that a 'lighter colour' is associated with higher (vs. lower) frequency speech sounds, this association might be derived from higher evaluation but not necessarily more activity. Similarly, 'more rugged' is classified as more active, more potent, and lower in terms of evaluation in our connotative categorizations. The observed association between 'ruggedness' and lower frequency sounds might be explained by lower evaluation and more potency but not more activity. This possibility was tested in a follow-up study.

5. The connotative meanings of sound symbolism in brand names: An empirical follow-up test

A follow-up study was conducted in order to empirically test our theoretical framework based on semantic space. Our coding analyses of the semantic differential meanings of previous research revealed that Evaluation and Potency (but not Activity) underlie sound symbolism effects in brand names. Our follow-up study empirically tested for the semantic differential meanings underling sound symbolism effects of brand names by focusing on those attributes associated with the Activity dimension. Even though some attributes are associated with the latter dimension (sharp, light in weight, ruggedness), it is likely that these sound symbolic associations might be explained by the other two connotative dimensions (namely Evaluation and Potency).

5.1. Participants and procedure

The data from 154 participants was obtained (mean age of participants was 42.28 years, SD of age 8.68, males 108, females 46). The sample size was determined by a priori power analysis (Faul et al., 2007). We estimated that a sample size of 147 would be sufficient to detect dz = 0.30) with 95% power at α = 0.05. Based on the calculation, we opened the data collections to recruit 150 participants and finally obtained the data of 154 participants. The participants were recruited on Lancers and the experiment was conducted using the Qualtrics platform. Three pairs of fictitious brand names were created in such a way that each pair contained higher- (f, s, i, e) or lower-frequency (b, d, g, o, u) vowels and consonants (Fise/Gubo, Fensen/Dongon, Selfam/Boldum) (see Klink & Wu 2014; Motoki et al. 2021). Three product categories and their attributes associated with the Activity dimension were used (sharp sound of earphones, the light weight of a laptop, and rugged personality of a beer brand) to cover diverse products (i.e., hedonic and utilitarian products, food and household products).

In six trials, the participants were invited to rate the expected attributes of the product (i.e., sharpness of sound of earphones; see Genuit, 2004, light weight of laptop) and brand personality (i.e., rugged personality of beer brand) for hypothetical brand names (e.g., Selfam/Boldum). The order of presentation of the 'brand name-product category' pairing was counterbalanced between participants and the product categories were randomized on a within-participants basis. The ratings were made on a 7-point Likert scale (1 = "not at all" to 7 = "very

much"). The two expected attributes (i.e., sharpness of sound and light weight of laptop) were measured by a single item. Ruggedness was measured by the mean rating of two items (tough, masculinity; r = 843). Next, the participants evaluated the three dimensions of the connotative meanings of six fictitious brand names (Fise/Gubo, Fensen/Dongon, Selfam/Boldum) on a seven-point bipolar semantic differential scale: Evaluation (nice–awful, good–bad, mild–harsh, happy–sad; α = .852), potency (powerless–powerful, weak–strong, light–heavy, shallow–deep; α = .899), and activity (slow–fast, quiet–noisy, passive–active, dead–alive; α = .241) (Park et al., 2020; Velasco et al., 2016).

The alpha value of the activity dimension showed a low level of reliability. To clarify the details, we conducted additional analyses (see Appendix for details). The results of the principal component analysis identified two components with one associated with potency (powerless–powerful, weak–strong, light–heavy, shallow–deep, quiet–noisy, passive–active) and the other considered to be evaluation (nice–awful, good–bad, happy–sad, slow-fast, dead-alive). Notably, the two items of activity dimension (quiet–noisy, passive–active) were included into the potency component. The other two items of activity dimension (slow-fast, dead-alive) were included into the evaluation component. This supports our theoretical framework and suggests that even items of activity dimensions can be classified as evaluation and potency in the case of sound symbolisms in hypothetical brand names. Although the alpha level of activity

dimension was not reliable, for completeness and based on the EPA framework, we report the results of analyses using the data of activity dimension.

5.2. Statistical analyses

Paired t-tests were used to investigate the effect of the frequency of sounds in brand names on expected product attributes, brand personality, and the three-dimensions of connotative meaning. Given the low reliability of the activity dimension, we also report the results of analyses investigating the effects of the frequency of sounds on each item of activity dimension (see Appendix for details).

Within-participant mediation analysis was also conducted for each product category and its associated attribute (i.e., the sharp sound of the earphones, the light weight of the laptop, and the rugged 'personality' of the beer). For the mediation analyses, MEMORE (Montoya & Hayes, 2017) with 5,000 bootstrapped samples was used. The frequency of sounds (higher- versus lower-frequency) was entered as the predictor variable, three dimensions of connotative meanings (evaluation, potency, activity) as the mediator, and attribute expectation/brand personality rating as the dependent variable.

5.3. Results

5.3.1. Attributes expectation

The participants expected that hypothetical brand names including higher (vs. lower) frequency sounds would have sharper sounds (M_{higher} = 4.89±1.14 vs. M_{lower} = 2.57±1.20; t_{153} = 15.923, p < .001, dz = 1.283), would be lighter in weight (M_{higher} = 5.38±1.00 vs. M_{lower} = 2.53±1.20;t_{153} = 18.498, p < .001, dz = 1.491), and also less rugged in terms of 'personality' (M_{higher} = 3.06±1.18 vs. M_{lower} = 5.61±0.85; t_{153} = -20.709, p < .001, dz = -1.669).

5.3.2. Evaluation, potency, and activity

The rating of evaluation was higher for those hypothetical brand names including higher (vs. lower) frequency sounds for earphones (M_{higher} = 5.07±0.71 vs. M_{lower} = 3.64±0.77; t_{153} = 15.908, p < .001, dz = 1.282), laptop (M_{higher} = 5.03±0.76 vs. M_{lower} = 3.69±0.80; t_{153} = 14.593, p < .001, dz = 1.176), and beer (M_{higher} = 5.06±0.77 vs. M_{lower} = 3.76±071; t_{153} = 14.703, p < .001, dz = 1.184). The rating of potency was lower for those hypothetical brand names that included higher (vs. lower) frequency sounds for the earphones (M_{higher} = 3.33±0.84 vs. M_{lower} = 5.41±0.89; t_{153} = -18.436, p < .001, dz = -1.486), the laptop (M_{higher} = 3.25±0.79 vs. M_{lower} = 5.49±0.88; t_{153} = -20.614, p < .001, dz = -1.661), and beer (M_{higher} = 3.30±0.84 vs. M_{lower} = 5.52±080; t_{153} = -20.482, p < .001, dz = -1.650). Importantly, the rating of activity did not differ in frequency of sounds for the earphones (M_{higher} = 4.22±0.68 vs. M_{lower} = 4.21±0.80; t_{153} = 0.112, p = .911, dz = 0.009), laptop (M_{higher} = 4.17±0.71 vs. M_{lower} = 4.19±0.77; t_{153} = -0.295, p = .769, dz = -0.023), or beer (M_{higher} = 4.18±0.72 vs. M_{lower} = 4.30±0.84; t_{153} = -1.289, p = .199, dz = -0.104).

5.3.3. Mediating role of EPA dimensions on sound symbolic associations

The results of the analyses demonstrated significant indirect effects of evaluation and potency (but not activity) on the expected sharpness of the sound. The results also revealed significant indirect effects of potency (but not of evaluation or activity) on the weight expectation of a laptop. The weight of the laptop might be more related to potency rather than the evaluation dimension simply because the potency dimension happened to include an item ("light/heavy"), that is directly associated with "the weight of the laptop". This might explain the non-significant effect of the Evaluation dimension. Moreover, the results also revealed significant indirect effects of evaluation and potency (but not activity) on ratings of the rugged personality of beer brands. The details of the results are shown in Appendix G.

6. Semantic space of sound symbolism in brand names

Our coding analyses of the semantic differential meanings of previous research and the results of our follow-up study reveal that Evaluation and Potency (but not Activity) underlie sound symbolism effects of brand names. A visual illustration of the putative semantic space of sound symbolism in brand names is shown in Figure 4. This suggests that connotative meanings of sound symbolism in brand names are largely represented in terms of the dimensions of Evaluation and Potency. Specifically, brand names with front vowels, fricative consonants, and voiceless consonants are likely to be regarded as having higher evaluation (e.g., good) and

lower potency (e.g., weak) than ones with back vowels, stop consonants, and voiced consonants. In other words, those brand names with back vowels, stop consonants, and voiced consonants are likely to attract lower evaluation (e.g., bad) and higher potency (e.g., strong) ratings than ones with their counterparts.

7. Discussion

7.1. Summary of findings

The results of the present study demonstrate how connotative meanings are associated with sounds that happen to be present in fictitious brand names. Relying on the three core semantic differential dimensions of meanings (namely Evaluation, Potency, and Activity; Osgood et al., 1957), we demonstrate that vowels and consonants in (hypothetical) brand names are associated with attributes related to Evaluation and Potency, but not to Activity. Specifically, our findings suggest that front (back) vowels, fricative (stop) consonants, and voiceless (voiced) consonants are associated with higher (lower) evaluation and lower (higher) potency. In other words, back (vs. front), stop (vs. fricative), and voiced (vs. voiceless) consonants are associated with lower evaluation and higher potency. Meanwhile, it appears as though there are no consistent associations of vowels and consonants with the activity dimension. Taken together, therefore, the results of the present study reveal Osgood and colleagues' semantic

differential meanings as one of the potential psychological mechanisms underpinning the sound symbolic meaning of brand names.

7.2. Theoretical contribution

A growing body of research has now demonstrated that the speech sounds present in brand names can influence consumers' impression of brands (Klink, 2000; Lowrey & Shrum, 2007; Pogacar et al., 2021; Spence, 2012). Intriguingly, brand names have typically been displayed visually in the majority of the research that has been published to date (e.g., Klink, 2000; Lowrey & Shrum, 2007) while sometimes sounds have been presented auditorily instead (e.g., Pathak et al., 2022). Such research has, for example, shown that the vowels in brand names influence the perception of product attributes, taste/flavour attributes, and brand personality to name but a few (Klink, 2000; Motoki et al., 2020; Park et al., 2020; Pathak & Calvert, 2020). Despite the growing evidence reported so far, the theoretical and integrative underpinnings of these associations remain unclear. Relying on the theory of sound symbolism (Sidhu & Pexman, 2018) and semantic dimensions of meanings (Osgood et al., 1957), our findings demonstrate that connotative meanings can explain the sound symbolism in brand names. Specifically, vowels (front/back) and two types of consonants (fricative/stop, voiceless/voiced) embedded in fictitious brand names are classified into evaluation and potency (but not activity) dimensions.

7.3. Suggested directions for future research

7.3.1. Are there other dimensions than those suggested by the EPA framework?

It is worth considering whether other semantic dimensions might underlie the effect of sound symbolism in brand names. One possibility here concerns the 'shape-attribute' association (e.g., round/spiky with sweet/bitter and higher-frequency/lower-frequency sounds). Our categorizations of EPA dimensions with attributes show certain tendency [i.e., attributes categorized into higher (lower) evaluation and lower (higher) potency], however, there are some discrepancies. For example, 'milder' and "creamier/richer/smoother" is categorized into higher evaluation but is associated with back (vs. front) vowels, though most of the attributes categorized into high evaluation are associated with front (vs. back) vowels. Moreover, "cold" is categorized into lower activity and associated with front (vs. back) vowels. Given that the activity dimension might well not explain sound symbolic associations, other semantic meanings appear to explain the sound symbolic association with "cold". The round/spiky dimension might provide a clue to resolving discrepancies, and higher (lower) frequency of sounds (e.g., front vowel as higher-frequency, back vowel as lower-frequency) might be associated with spiky (round) meanings. Further research can test this possibility.

7.3.2. Do the spontaneous/automatic associations with sounds present in brand names reflect the EPA dimensions?

The spontaneous/automatic associations with the speech sounds that are present in brand names also remain unknown. Typically, research on sound symbolism (including its applications to brand names) shows participants nonsense words/hypothetical brand names and asks them to rate their attributes in a restricted range/scale (e.g., taste, size; see Klink & Wu, 2012; Motoki et al., 2020; Yorkston & Menon, 2004). However, in a real-world setting, consumers see the brand names and spontaneously generate an impression about them (which can be wide-ranging and is obviously not restricted to a bipolar scale as used in an experimental setting). In the case of shape-sound associations, it has been shown that when seeing round (vs. spiky) objects, participants tend to spontaneously generate round-sounding (vs. spiky-sounding) words (Vinson et al., 2021). To the best of our knowledge, no research on this topic has yet been conducted on the sound symbolism of brand names. Given that contexts shape cognitions (i.e., see the theory of grounded cognition; see Barsalou, 2008), spontaneous associations of sounds in brand names appear to be different in different contexts (e.g., food, non-food, social situations, locations). Future research can test how people spontaneously generate impressions toward the sounds present in brand names and/in various contexts.

7.3.3. How, exactly, are the sounds present in brand names associated with emotions?

Affect (or emotional association) is one of the potential mechanisms underlying sound symbolic associations with (hypothetical) brand names. The relationship between phonetic features and affect has been demonstrated previously (Rummer et al., 2014). For example, it

has been reported that those participants who are in a positive mood produce more words containing front vowel /i/, while those who are in a negative mood produced more words containing back vowel /o/ (Rummer et al., 2014), suggesting the association between certain phonetic features (i.e., front vs. back vowels) and affect. Affective dimensions (valence, arousal) would seem to be related to the theory of semantic differential (evaluation, potency, activity; Osgood et al., 1957). It would appear that the valence dimension (negative-positive) refers to evaluation (e.g., bad-good); the arousal dimension closely relates to the activity dimension (Moors et al., 2013), while the potency dimension would appear to be related to the arousal dimension. Although previous research has shown that arousal links shapes to sounds (Aryani et al., 2020), our findings using Osgood's framework do not reveal a consistent role of activity (closely relating to arousal) in the sound symbolism of brand names. Thus, it would appear that arousal is insufficient to link sounds to meaning whereas both the valence and dominance (potency) dimensions might be crucial when it comes to explaining the sound symbolism of brand names. Future research should therefore aim to investigate how valence and arousal explain sound symbolic effect in brand names.

7.3.4. How does the interaction of vowels and consonants influence the connotative meanings of sound symbolisms in brand names?

One other important outstanding issue concerns the interactive effects of vowels and consonants in hypothetical brand names on their sound symbolic associations. The majority of

previous research has investigated the main effects of vowels (front vs. back) or consonants [i.e., affricate (fricative vs. stop), and/or voicing (voiced vs. voiceless; e.g., Klink, 2000, 2003; Motoki et al., 2021; Pathak & Calvert, 2020)] independently. Far less published research has chosen to investigate the interactive effects of vowels and consonants (see Motoki et al., 2020, for one recent exception). The results of the present review suggest that the inconsistent findings of previous research concerning the sound symbolism of brand names in terms of the Activity attribute of Osgood and colleagues' semantic differential are potentially due to the interactive effects. If interactive effects of vowels and consonants are studied, it might potentially reveal the semantic dimension of Activity too. As always, further research is needed in order to investigate the interactive effect of vowels and consonants, especially concerning Osgood et al.'s (1957) semantic differentials.

7.3.5. How do the statistical regularities and structural correspondences explain the connotative meanings of sound symbolism in brand names?

In the research reported here, we tested the connotative meanings of sound symbolism in brand names. However, the literature on sound symbolism (Sidhu & Pexman, 2018) and crossmodal correspondences (e.g., Spence, 2011) also suggests the possibility of regularities and structural correspondences. Naturally-occurring statistical regularities are considered one of the potential explanations underpinning sound symbolism (and crossmodal correspondences; Sidhu & Pexman, 2018; Spence, 2011). In the biological world, larger animals (e.g., lions) tend to emit

lower frequency sounds, whereas smaller animals (e.g., mice) emit higher frequency sounds. Research on crossmodal correspondences has supported this account of naturally-occurring statistical regularities (see Korzeniowska, Root-Gutteridge, Simner, & Reby, 2019). Similarly, recent research has shown that phonemes related to roundedness (e.g., /m/, /u/) are more common in words referring to round objects, whereas phonemes related to angularity (e.g., /k/, /ɪ/) are overrepresented in words referring to spiky objects (Sidhu, Westbury, Hollis, & Pexman, 2021). The naturally-occurring statistical regularities might partially explain the connotative meanings of sound symbolism in brand names. That is, there might be statistical regularities of pairs of sensory stimuli (e.g., lower frequency of sounds and heaviness) that are similar in connotative meaning (e.g., higher potency). Consumers likely internalise such naturally occurring statistical regularities (e.g., low frequency sounds with large animals or large objects) with similar semantic meanings and assume an association of sounds present in brand attributes (e.g., names, jingles) with connotative meanings.

Structural correspondences are also considered one of the potential explanations of sound symbolism (and crossmodal correspondences; Sidhu & Pexman, 2018; Spence, 2011). Structural correspondences suggest that magnitude-related dimensions (e.g., stimulus intensity such as loudness, size; see Spence, 2011) might explain the underlying sound symbolism and crossmodal correspondences (Sidhu & Pexman, 2018; Spence, 2011; though note that Spence & di Stefano, 2022, have recently suggested that 'physiological' might be a better label for

such correspondences, given the other uses of the term structural correspondence in the literature, e.g., see Sebba, 1991). The magnitude-related dimensions are also believed to be ingrained in the brain (see Walsh, 2003 for a detailed explanation of the theory of magnitude and appear to be partially interpreted as activity (and possibly potency) dimensions in the EPA framework. Given that our findings did not reveal the involvement of activity dimensions in sound symbolism in brand names, structural correspondences might well not really explain this association. Hopefully, however, future research can help to clarify this issue.

7.4. Conclusions

In conclusion, the findings reported here summarize the existing findings of sound symbolism of brand names and provide an integrative understanding based on the semantic space of meaning. Higher frequency sounds (front vowels, fricative and voiceless consonants) present in brand names are more associated with concepts linked to higher evaluation (e.g., good, nice, sweet) and lower potency (e.g., small, weak) whereas the lower frequency sounds (back vowels, stop, and voiced consonants) present in brand names are more associated with concepts linked to lower evaluation (e.g., bad, awful, bitter) and higher potency (e.g., large, strong). This systematic review and empirical research study has also helped to identify a number of important issues for future research.

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Table 1. Definitions of linguistic terms (vowels and consonants) used throughout the review

Sounds	Definitions	Examples
Front vowels	Articulated with the tongue relatively in front of the mouth.	/i/, /e/
Back vowels	Articulated with the tongue relatively back of the mouth.	/u/, /o/
Fricative consonants	Involving less closure of the articulators than a stop sound and produced by squeezing the air between a small gap as it leaves the mouth.	/f/, /s/, /v/, /z/
Stop consonants	Produced by complete closure of the articulators, such that all the airflow ceases in the mouth.	/p/, /t/, /b/, /d
Voiceless consonants	Produced without any vibration of the vocal cords.	/f/, /s/, /p/, /t/
Voiced consonants	Produced with the vibrations of the vocal cords.	/v/, /z/, /b/, /d/

Table 3. The relations between semantic meanings and the frequency of the speech sounds.

	Evaluation	
	Higher (lower) evaluation	Lower (higher) evaluation
Higher (lower) frequency	39 (76.47%)	12 (23.53%)
	Potency	
	More (less) potent	Less (more) potent
Higher (lower) frequency	2 (2.56%)	76 (97.44%)
	Activity	
	More (less) active	Less (more) active

Higher (lower) frequency	27 (62.79%)	16 (37.21%)

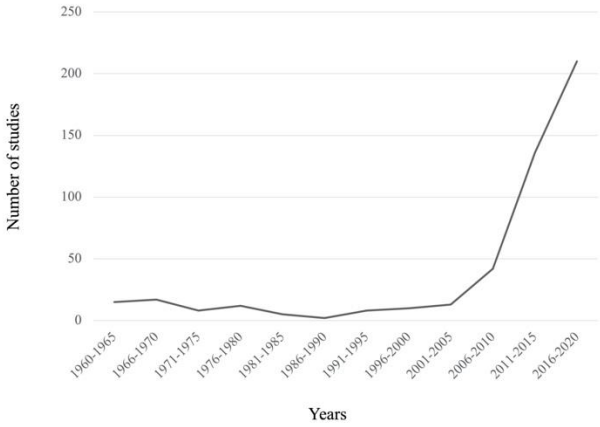

Figure 1. Number of studies on sound symbolism published from 1960 to 2020. Search performed in December 2021, using the term "sound symbolism" or "phonetic symbolism" in the title, abstract, keywords.

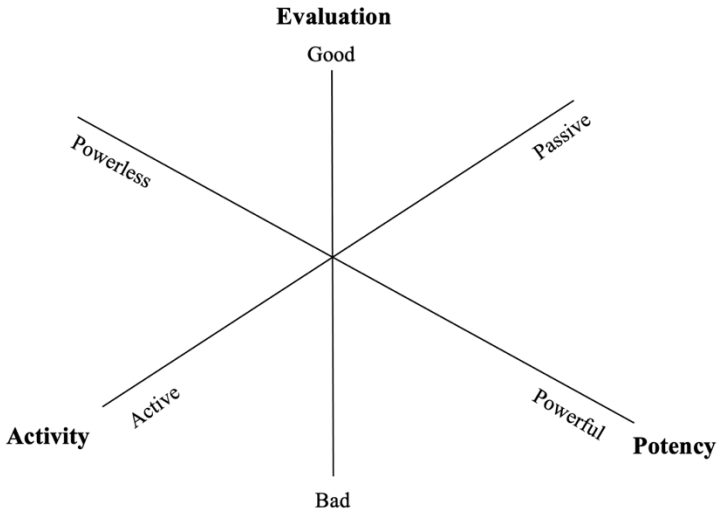

Figure 2. Visual illustration of three dimensions of semantic space based on Osgood et al.'s (1957) EPA framework.

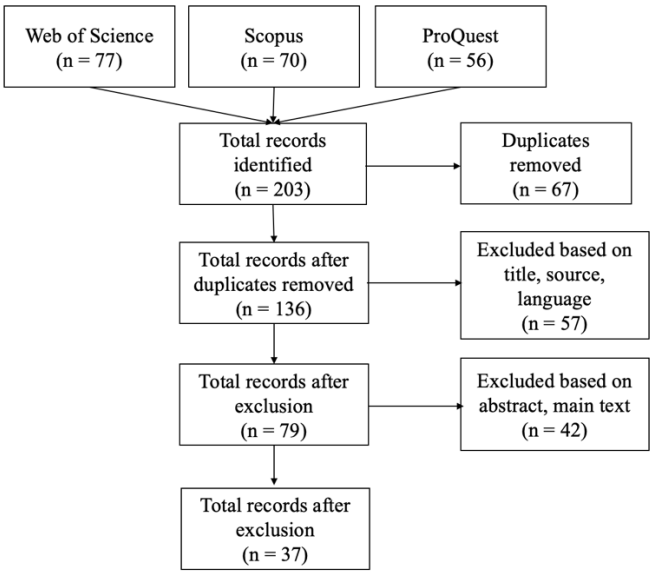

Figure 3. Flow chart of the systematic review.

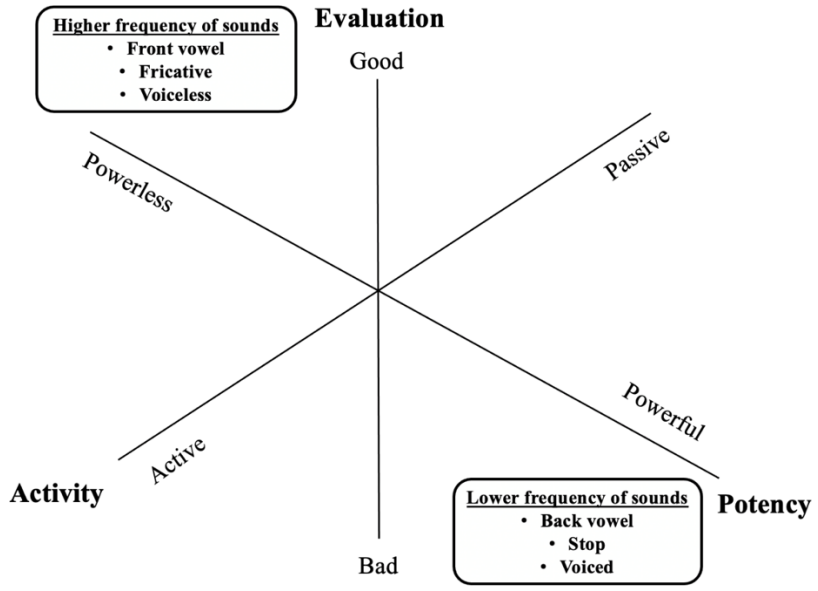

Figure 4. Visual illustration of semantic space of sound symbolism in brand names based on Osgood et al.'s (1957) semantic differential dimensions. Higher frequency sounds (front vowel,

fricative, voiceless) are located between higher evaluation and less potency. Lower frequency sounds (back vowel, stop, voiced) lie between lower evaluation and more potency.