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The Natural Motivation of Sound Symbolism

Nahyun Kwon

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Abstract

This dissertation examines systematic sound-meaning correspondences in sound-symbolic words from a cross-linguistic perspective, investigating whether and to what degree they are naturally motivated. Its aims are to assess empirical evidence for the Explanatory Sound-symbolism Hypothesis (ESH): that sound symbolism is primarily governed by natural motivation, in particular, by a connection between human perceptual and language systems. The languages examined are Korean and English, which are genealogically unrelated.

Chapter One surveys the literature and discusses the iconicity of meaning-bearing elements of Korean ideophones (MEI's) and English phonaesthemes. On a conceptual level, one can argue that Korean MEI's exhibit translucent iconicity, in which natural motivation prevails over arbitrariness, while English phonaesthemes exhibit opaque iconicity (or secondary iconicity). This suggests that the former would be consistent with the ESH and that the latter, in which the naturalness is blocked by arbitrary conventionalisation, would support the alternative, the Conventional Sound-symbolism Hypothesis. Chapter Two reviews previous experimental studies of the iconicity of language, covering not only the traditional explicit paradigms this thesis adopts, but also the recent advancements of implicit methods in sound-symbolic literature. Chapter Three examines methods for calibrating and comparing Korean MEI's and English phonaesthemes to other morphological entities, by applying the methods of Canonical Typology. On a theoretical level, it is proposed that English phonaesthemes sit closer to classic arbitrary morphemes than do MEI's within morphological theory. This coincides with the conceptual characterisation of their iconicity levels in Chapter One, i.e., that phonaesthemes, which have opaque iconicity, exhibit a lower level of natural iconicity than MEI's. Chapters Four through Six examine cross-linguistic interpretations of Korean ideophones and English phonaesthemic words from an empirical perspective. These include two perception experiments, where native speakers of both Korean and English speakers guess the meanings of nonsense words, created based on existing (a) Korean and (b) English sound-symbolic words. To empirically investigate the natural iconicity in Korean MEI's, two different language groups (i.e., Korean and English) listened to nonsense Korean ideophonic pairs and chose their meanings in binary-choice meaning matching tasks. Taking into account the Korean sound discrimination levels of the English-speaking participants, Chapter Four reveals that vocalic MEI's are based on convention, since an above-chance level of correct meaning-matching rates was not achieved across the language groups. In contrast, Chapter Five argues that consonantal MEI's are based on natural motivation, supporting the ESH. To empirically investigate natural iconicity in phonaesthemes, the Korean- and English-speaking participants guessed meanings of

phonaesthemes in sets of aurally presented nonsense core English phonaesthemic words in free-choice and multiple-choice tasks. The results differed depending on testing methods. In the free-choice task, interpretations of phonaesthemes did not converge across the language groups. However, in the multiple-choice task, some phonaesthemes received above-chance level of correct-guessing rates. From this, it is speculated that the natural iconicity of phonaesthemes is recognised only when available contexts have been sufficiently constrained.

The findings show that the translucent iconicity of MEI's gains empirical support only in the case of consonantal MEI's. Contrary to predictions made on a conceptual basis in Chapter One, the vocalic MEI's display opaque iconicity. With respect to phonaesthemes, some exhibit translucent iconicity when available contexts have been constrained, as in the multiple-choice task. Altogether, the dissertation reveals that sound-symbolic phenomena have varying degrees of motivatedness as linguistic signs, and that some instances of sound symbolism are based on arbitrary convention, contrary to the central claim of the ESH. To some extent, this counters the proposition that sound-symbolic phenomena represent a challenge to the near-axiomatic expectation in modern linguistics, that pairings of sounds with simple meanings are arbitrary, and it encourages us to recognise the role of iconicity in language with a caveat.

Declaration by author

This thesis is composed of my original work, and contains no material previously published or written by another person except where due reference has been made in the text. I have clearly stated the contribution by others to jointly-authored works that I have included in my thesis.

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Keywords

sound symbolism, ideophone, phonaestheme, language iconicity, arbitrariness, natural motivation, phonosemantics, canonical typology, Korean, English

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List of Abbreviations used in the thesis

ATR	=	Advancded Tongue Root
BNC	=	the British National Corpus
C	=	Canonical
C_i	=	Criterion
CSH	=	Conventional Sound-symbolism Hypothesis
CV	=	Consonant-Vowel
DVR	=	Deep Voice Resonance
ESH	=	Explanatory Sound-symbolism Hypothesis
F0	=	Fundamental frequency
F1	=	First-formant frequency
F2	=	Second-formant frequency
gl.	=	Glottis
H_0	=	Null hypothesis
I	=	Intermediate
MEI's	=	Meaning-bearing Elements of Ideophones
NC	=	Non-canonical
nPSE's	=	non-Phonaesthemic, Stem-building Elements
n.s.	=	Non-significant
P	=	Phenomenon
RTR	=	Retracted Tongue Root
V	=	Vowel
v.c	=	Vocal cords
VH	=	Vowel Harmony

1 Introduction

1.1 Overview

In many natural languages, there are parts of the lexicon whose sound-meaning associations appear to fall short of full arbitrariness. For example, in Korean 'ideophones', an opposition in vowel quality correlates with an opposition in size-related connotation, so that a small person smiles *sɛŋkɨl* whereas a large person smiles *siŋkɨl*. An opposition in consonant quality correlates with an opposition in intensity-related connotation, so that an object moves with a circling motion *pɛŋpɛŋ*, but with a stronger and more violent motion *pʰɛŋpʰɛŋ* (Kim, 1977; Sohn, 1999). In English 'phonaesthemic words', the consonant cluster *sw-* correlates with a meaning of 'swaying movement' as in *swirl, swivel, swift, swig, sweep, swallow, swarm, swim, swing, swipe, switch, swoosh, swoop, swill*, and *swoon* (Parault, 2006, p. 231) and *gl-* correlates with 'light/vision' as in *gleam, glow, glint, glitter, glimmer,* and *glisten* (Bergen, 2004, p. 290). Descriptively, the existence of such "systematic preferences for certain sound-meaning mappings" may be termed 'sound symbolism', if we use 'sound symbolism' in its broad sense (Monaghan, Mattock, & Walker, 2012). Explanatorily, the question is whether such correlations are primarily based on language-internal arbitrary conventions (Firth 1930), or on natural motivation. The latter hypothesis is 'sound symbolism' in the narrow sense, and for the purposes of this thesis will be formulated as the Explanatory Sound-symbolism Hypothesis (ESH) in (1):

(1) Explanatory Sound-symbolism Hypothesis

> Despite the received view that language is fundamentally governed by arbitrariness (Hockett, 1960, p. 97), many languages contain linguistic signs where natural motivation prevails over arbitrariness in their sound-symbolic vocabularies.

The alternative hypothesis to the ESH is the Conventional Sound-symbolism Hypothesis (CSH): arbitrary convention prevails over natural motivation in sound-symbolic vocabularies. The ESH does not posit that natural motivation alone determines sound-symbolic phenomena. In fact, there are no totally non-arbitrary signs in spoken language. To quote Perniss, Thompson, and Vigliocco (2010, p. 1), "Today, no one would subscribe to the idea of an actual "natural" connection between

linguistic signs and their denotata. The idea that each object could have an inherently "correct" name known from the object itself strikes us as antiquated and arcane".

Thus, while admitting the role of arbitrariness in the sound-symbolic words, the present thesis aims to investigate any possible pervasiveness of natural motivation in cross-linguistic instances of sound symbolism and provide empirical evidence for assessing the validity of the ESH. The languages chosen here for gathering sound-symbolic words are Korean and English, which are historically and linguistically unrelated.

Korean has a rich inventory of sound-symbolic words, referred to as ideophones, in the lexicon (Davis & Lee, 1996; Sohn, 1999) and most of them exhibit highly structured properties correlating with certain semantic features related to perceptual sensory meanings. To put it briefly, they alternate vowels of two semantic classes, 'dark' (/i, ɨ, u, e, ə/) and 'light' (/ɛ, a, o/), to evoke different perceptual connotations in size-related concepts. (Interestingly, the cross-linguistically widespread magnitude associations of high front vowels with smallness and low back vowels with largeness are reversed in Korean – the articulatory and acoustic aspects of this reversed magnitude symbolism will be discussed in detail in Chapters 4 and 5.) Concurrently or individually, they also mutate three different laryngeal settings of the obstruents to connote different degrees of intensity. The examples below in (2) to (4) illustrate each of the cases.

(2) Segmental symbolism involving vowels (i.e., vocalic symbolism)
   a. *pipi / pɛpɛ* 'A state of *bigger/smaller* things being entwined'
   b. *cilcil / calcal* 'Dragging of a *heavier/lighter* object'

(3) Segmental symbolism involving consonants (i.e., consonantal symbolism)
   a. *pɛŋpɛŋ / pʰɛŋpʰɛŋ* 'A *neutral/stronger and more violent* motion of circling'
   b. *tals'ak / t'als'ak* 'A *neutral/stronger* motion of a light object rising and sinking'

(4) Segmental symbolism involving both vowels and consonants
   a. *piŋpiŋ / pʰɛŋpʰɛŋ* 'A *neutral/stronger* motion of circling of a *heavy/light* object'
   b. *kəŋtuŋ / k'aŋtoŋ* 'A *neutral/stronger* motion of jumping with *longer/shorter* legs'
   c. *t'uŋt'uŋ / tʰoŋtʰoŋ* 'A *great/greater* degree of chubbiness of a *tall/short* person'

English phonaesthemic words are similar to Korean ideophones, in that a shared component of forms relates to a shared meaning in multiple words, a relationship termed 'relative iconicity' by Dingemanse (2011, p. 167). However, Korean 'meaning-bearing elements' (i.e., sound-symbolic vowel/consonant quality) in ideophones and English 'phonaesthemes' (i.e., phonological forms

correlated with certain thematic meanings such as *sw-* and *gl-*) in phonaesthemic words are different in roughly three ways. First, Korean meaning-bearing elements are mostly confined to the ideophonic lexicon which depicts perceptual sensory experiences, whereas English phonaesthemes appear throughout the general lexicon (Dingemanse, 2011). Second, the form-meaning mapping of meaning-bearing elements in Korean ideophones is consistent and thus "native Korean speakers can predict the form and connotation of the paired member resulting from the phoneme alternation" (Kim, 1977, p. 67), whereas that of English phonaesthemes is less stable, for example *sn-* is related to the nasal/oral area in *sneer, snore, sniff, snarl* but not in *snake, snow, snail*. Third, presuming that natural motivations in sound symbolism might reflect effects of the perception, acoustics, and articulation of sound on meaning, the naturalness of English phonaesthemes seems to be relatively opaque compared to the meaning-bearing elements of Korean ideophones. That is, it is not difficult to speculate diachronic or synchronic articulatory/acoustic grounds for the meaning-bearing elements of Korean ideophones. For example, the vocalic and consonantal symbolisms of Korean ideophones seem to be grounded in vowel distinctions based in tongue root movements and different glottal gestures, respectively (see Chapters 4 and 5). However, it is not so straightforward to point to natural grounds for English phonaesthemes, except for some particular cases such as *sn-* where the nasal sound /n/ seems to evoke its associated semantic domain, the 'nasal/oral area' (Fordyce, 1988; Schmidtke, Conrad, & Jacobs, 2014). These differences lead to a secondary speculation that the form-meaning correspondences in English phonaesthemic words would exhibit less natural iconicity than those in Korean ideophones.

Investigation into the natural motivation of segmental symbolism, such as the sound-meaning association found in Korean ideophones, has been conducted via numerous behavioural experiments (Bentley & Varon, 1933; Fischer-Jørgensen, 1968; Jespersen, 1933; Newman, 1933; Sapir, 1929; Shinohara & Kawahara, 2010; Taylor & Taylor, 1962; Thompson & Estes, 2011). The psychological reality of a sound-meaning unit, a phonaestheme, has also been examined in several behavioural studies (Abelin, 1999; Bergen, 2004; Hutchins, 1998; Magnus, 2000; Parault & Schwanenflugel, 2006). However, despite numerous experimental studies of segmental symbolism and phonaesthemes, there has been no rigorous discussion of the possible differences in the degree of natural motivation in the sound-symbolic units of Korean and English. Fordyce (1988) is the sole work which examined such differences between English phonaesthemes and Korean meaning-bearing elements in ideophones. However, Fordyce's cross-linguistic investigation is incomplete, in the sense that he examined only the perceptions of sound-symbolic words by participants who were not speakers of the target language. For a close analysis of the naturalness of linguistic signs, the perceptions of both non-native and native speakers of the target languages regarding the sound-symbolic words should be investigated.

This thesis takes such a full view by taking the perceptions of both non-native and native speakers of the target languages into account. Furthermore, it seeks a balance of formal typological analysis and cross-linguistic experimental investigations of the nature of sound symbolism. To be specific, experimentally, it reports two perception experiments, where both native Korean and English speakers guess the meanings of nonsense words, created based on existing (a) Korean and (b) English sound-symbolic words. Theoretically, it discusses the status of Korean meaning-bearing elements in ideophones and of phonaesthemes in English phonaesthemic words in relation to derivational morphology, using the framework of Canonical Typology (Corbett, 2005, 2006, 2007).

Putting these together, this thesis will provide a detailed understanding of the possible employment of natural motivation in language and cast new light on the significance of iconicity in linguistic science.

1.2 Arbitrariness versus naturalness

A question of the presence (and the degree) of natural motivation in language has been of marginal interest in modern linguistics, since its foundational assumption has been that the link between linguistic form and meaning is arbitrary. The principle of arbitrariness of the sign has been widely adopted in mainstream linguistic theory, including Chomsky's (1968) generative grammar, with its explanatory power for why languages can be lexically so different (e.g., 'house' is *maison* in French, *casa* in Spanish, *dom* in Slovak, *mazil* in Arabic and so on.) (Locke, 1975[1690]). In de Saussure's (1966[1916]) structural linguistics, the principle of the arbitrariness of the sign was strongly asserted by relegating the possible naturalness of the sign in onomatopoeia to the linguistic periphery, with the following reasons (p. 69):

> Onomatopoeia might be used to prove that the choice of the signifier is not always arbitrary. But onomatopoeic formations are never organic elements of a linguistic system…As for authentic onomatopoeic words (e.g. glug-glug, tick-tock, etc.), not only are they limited in number, but also they are chosen somewhat arbitrarily, for they are only approximate and more or less conventional imitations of certain sounds (cf. English bow-wow and French oua-oua)

However, in logical terms, the rarity of onomatopoeia does not supply a strong justification for neglecting the role of the naturalness of the sign in linguistic science, because to use it as such a justification entails a fallacy of generalisation, by taking a view of if-not-all-then-none (Wescott, 1980). Indeed, although the number of onomatopoeic words in a lexicon is small, their existence itself can be evidence that the principle of the arbitrariness of the sign is not absolute. In line with

this, it also seems that the emphasis on the conventional facets of English and French, which do not share identical forms to refer to the same animal cry, downplays the apparent cross-linguistic similarities, which possibly are results of naturalness of the signs, observed in the bow-wow and oua-oua example; both share a repeating syllable structure and some consonantal and vocalic segments (i.e. [w] and [a]) (Thompson, 2013, p. 3).

Accordingly, despite the dominant presumption of the arbitrariness of the linguistic sign, the subject of natural motivation in language has long continued to be investigated by several linguists and anthropologists. Among proponents of the motivated linguistic signs, Jespersen (1922, p. 397), raises a question, "…is there really much more logic in the opposite extreme, which denies any kind of sound symbolism (apart from the small class of evident echoisms or 'onomatopoeia') and sees in our words only a collection of wholly accidental and irrational associations of sound and meaning?". Jespersen, then, exposes the fallacy of if-not-all-then-none by noting the possible role of a naturally motivated sign in our intuitive feeling that "the word *roll, rouler, rullle, rollen* is more adequate than the corresponding Russian word *katat', katit"*". Later on, Paget (1929, p. 282) fully embodies the idea of motivated linguistic signs by positing that human speech is analogous to pantomimic body gesture. That is, tongue gestures signify the referent just as body and hand gestures do. The pantomimic articulation movement correlated with semantics develops into speech "as witness the invention of the word 'blimp' to denote the small podgy dirigible balloons which were developed during the War. The word is produced by a small-mouth gesture (producing the sound *bi*) followed by the 'podgy' gesture *mp*, with an intermediate upward flick of the tongue, *l* (as if to suggest an attachment to the middle of the 'bimp'), which completes the word – '*blimp*'". Jakobson and Waugh (1979) embrace the idea of naturally motivated signs more cautiously by stressing the importance of a balanced view on the arbitrariness and naturalness of linguistic signs. They acknowledge the significance of speech sounds in their role to differentiate word meanings, in relation to other speech sounds, and also to their inherent association with meanings.

Perhaps, such an effort to recognise both natural and arbitrary meanings of sounds dates back to Plato (Fordyce, 1988; Jakobson & Waugh, 1979; Magnus, 2000; Perniss et al., 2010; Thompson, 2013). The debate between the near-axiomatic expectation that pairings of sounds to simple meanings are arbitrary versus the idea that linguistic sounds are naturally motivated is well represented in one of Plato's *Cratylus* dialogues, "[r] is said to naturally express 'rapidity' and 'motion', and [o] 'roundness'…Hermogenes then contests this by giving examples of words containing the same sounds, but whose meaning is quite different" (cited in Ahlner & Zlatev, 2010, p. 301). Through a series of dialogues, Socrates argues against both the conventionalist (i.e., *Hermogenes*) and naturalist (i.e., *Cratylus*), and concludes that neither view is tenable to account for the origin of names for things.

If we are to adopt a credible vantage point from which to investigate the ESH, we must begin with the indisputable observation that all linguistic forms undergo certain degrees of conventionalisation, since linguistic signs are communication tools whose interpretation should be agreed by language users. To take an example, even the most iconic linguistic form, onomatopoeia, is subject to conventionalisation, as shown in the bow-wow and oua-oua example above. Thus, throughout this thesis, the Platonic view is retained and an examination is made of the extent to which sound-symbolic words are naturally motivated, while admitting the role of arbitrariness of the sign in sound-symbolic phenomena.

In the following section, various language-specific terminologies for sound-symbolic words are introduced, in order to show how sound symbolism has been characterised in different languages.

1.3 Diverse labels of sound-symbolic words

Many natural languages manifest sound-symbolic phenomena through depictive words of sensory imagery where the speaker's sensory experiences resemble the linguistic signs that denote them (Dingemanse, 2012a; Nuckolls, 1999; Perniss et al., 2010). Although such sound-symbolic words are rare and underdeveloped in Indo-European languages, they are widely attested in human language in general (Diffloth, 1972; Voeltz & Kilian-Hatz, 2001). In the course of research, various terms have been introduced to refer to them in different languages. They include 'expressives' (Diffloth, 1972; Klamer, 2001; Tufvesson, 2011) in South-East Asian languages, 'ideophones' (Childs, 1994; Dingemanse, 2011; Doke, 1935; Nuckolls, 1996) mostly in sub-Saharan African languages and indigenous languages of South America, 'mimetics' (Akita, 2009; Hamano, 1998; Kita, 1997; Mester & Itô, 1989) in Japanese, and phonaesthemic words that contain 'phonaesthemes' (Abelin, 1999; Bergen, 2004; Firth, 1930; Hutchins, 1998) in Indo-European languages.

In order to avoid terminological issues detrimentally affecting the cross-linguistic study, Dingemanse (2012b) employs 'ideophones' as a common reference point which serves as a facilitator "for discussion of language-particular solutions to the generic problem of depicting sensory imagery in words". In detail, Dingemanse (2011, p. 25) defines the term 'ideophone' as "marked words that depict sensory imagery" and posits that this definition is designed to cover semantic-functional and structural similarities found in the phenomenon across languages. Dingemanse's definition of ideophones captures cross-linguistically recurrent properties of sound-symbolic words, namely, "their structural markedness, their syntactic aloofness, or their imagistic semantics" (p. 35). Such a cross-linguistic term is beneficial to avoid possible vagueness in the use of the notions in the linguistic literature and to cross-linguistically investigate the sound-symbolic phenomenon. Notwithstanding the benefits that the cross-linguistic term can bring, it is still important to understand language-internal terms, since they provide a basis for justifying the

claimed cross-linguistically recurrent properties of sound-symbolic words and they also enable us to recognise the specific details of the generally recurrent properties of sound-symbolic words in particular languages.

Thus, the following sub-sections provide a detailed overview of the four major sound-symbolic categories integrated in a number of phylogenetically unrelated languages – expressives (§1.3.1), ideophones (§1.3.2), mimetics (§1.3.3), and phonaesthemic words (§1.3.4). This overview is followed by a discussion of Dingemanse's commonalities, which set these apart from ordinary words in cross-linguistic terms (§1.3.5).[1]

1.3.1 Expressives: South-East Asian languages

Sound-symbolic words are given the term 'expressives' in South-East Asian languages, such as Semai (Diffloth, 1976; Tufvesson, 2011), Bahnar (Diffloth, 1994), Kedah Malay (Collins, 1979), Lao (Crisfield, 1983; Wayland, 1996), and Malay/Indonesian (Carr, 1966).

1.3.1.1 Semantic characteristics: sensory semantics

Expressives convey evaluative and subjective impressions of sensate experiences, such as sounds, smells, tastes, mental states, movements, physical states, visual phenomena, and personality traits (Collins, 1979; Diffloth, 1976; Gasser, Sethuraman, & Hockema, 2005; Klamer, 2002). Often, expressives are semantically differentiated from the ordinary vocabulary in their holistic depiction of multi-channel sense impressions. For example, in Lao, a speaker can picture several aspects of a scene simultaneously with one expressive word, as shown in the underlined expressives in (5) and (6), which depict at once both the size of the dog and the sound it makes (Crisfield, 1983, p. 43).

(5) *maˇa haw* <u>*wòŋ wòŋ*</u>

dog bark sound of a big dog

'A (big) dog is barking'

(6) *maˇa haw* <u>*ŋɛŋ ŋɛŋ*</u>

dog bark sound of a small dog

'A (small) dog is barking'

[1] In Chapter 7, I consider the alternative conceptualisation of sound symbolism in light of the empirical findings of this thesis.

1.3.1.2 Phonological/phonetic characteristics: phonological/phonetic peculiarity

Expressives sometimes have deviant phonotactics and employ unusual segments outside the regular phonological inventory of a language (Collins, 1979; Crisfield, 1983; Klamer, 2002). For example, in Lao, expressives with stop finals and Mid consonant initials[2], use different tone structure from ordinary vocabulary; expressive *kyp* 'snugly' has a level tone although non-expressive words with stop finals and Mid consonant initials would usually have a high-rising tone (Crisfield, 1983, p. 44). To take another example, in Malay, nasal vowels can occur anywhere in most expressives (e.g., *tĩt tĩt* 'of a chick when it is near its mother', *siãp siãp* 'of moving very quickly like lightning') but in ordinary vocabulary, they play a role of allophones by restricting their occurrences to certain environments, such as after nasal consonants, or nasal plus liquid or glide (Collins, 1979, p. 382).

1.3.1.3 Morphological characteristics: special morphological pattern

Expressives are morphologically distinctive, exhibiting reduplication correlated with a certain semantic feature or special types of affixation (Collins, 1979; Crisfield, 1983; Diffloth, 1976; Gasser et al., 2005; Klamer, 2002). In Malay, fully or partially reduplicated expressives typically evoke perceptions of repeated or continuing events (e.g., *kətɛʔ kətɛʔ* 'of the waddle of a duck', *kələtiŋ kələtiŋ* 'of coins rattled in a bottle', *dəbum dəbum* 'of a dog swimming') (Collins, 1979, p. 385). Similarly, in Semai expressives, full reduplication (e.g., *tus tus tus* 'repeated sound of running fast', *kũc kũc kũc* 'noises of swallowing a liquid') evokes perception of "repetition at interval times". Partial reduplication, which is exclusive to expressives (e.g., *dhdŋɔh* 'appearance of nodding constantly'), evokes perception of "prolongation or continuous repetition in time" (Diffloth, 1976, p. 252). As an example of a distinctive affixation system, in Kambera (Austronesian, spoken on the island of Sumba in Eastern Indonesia), verbs are derived from ordinary roots through prefixation or suffixation, but expressive verbs are derived from expressive roots through circumfixation or reduplication (e.g., the circumfix *ka-...-k* for *mbutu* 'thud' (sound) > *ka-mbutu-k* '(fall) with a thud') (Klamer, 2002, p. 262).

1.3.1.4 Syntactic characteristics: syntactic atypicality

Expressives are less well integrated into the regular grammar system and, in fact, they use little of the syntax. For instance, in Kambera, expressive roots surface only in quotative constructions without a proper affixation, showing less embedment within the clause as in (7) below (Klamer, 2002, p. 262).

[2] In Lao, "the Mid consonants come from the old voiceless, unaspirated initials, modern p, t, c, and k, and the old glottalized initials, modern b, d, j, and ʔ." (Crisfield, 1983, p. 28)

(7) *Mbutu wà-na*

thud report-3SG.GEN

‘ “Thud” it did’

To take another example, in Semai, expressives are not at all integrated into the clauses, preceding clauses (8) or noun phrases (9). They cannot appear as the head or the modifier of any grammatical class, indicating that they are syntactically independent.

(8) *pɲpayaɲ bi - yryɛ:r ʔi - sɔ:k*

Expressive it - unfold his - hair

‘His hair is disheveled’

(9) *pɲpayaɲ ʔi - sɔ:k*

Expressive his - hair

‘His hair is disheveled’ (Diffloth, 1976, p. 255)

1.3.2 Ideophones: sub-Saharan African languages

The term ‘ideophone’ is commonly used to refer to a class of sound-symbolic words in sub-Saharan African languages, such as Somali (Dhoorre & Tosco, 1998), Yoruba (Rowlands, 1970), Kisi (Childs, 1988), Zulu (Doke, 1935), Gbeya (Samarin, 1965), Hausa (Newman, 1968), Siwu (Dingemanse, 2011), and in some other non-African languages, such as Korean (Lee, 1992) and Alto Perené (Mihas, 2012).

1.3.2.1 Semantic characteristics: sensory semantics

Ideophones evoke perceptual sensory experiences (e.g., smell, sound, colour, shape, action, manner, state, et cetera). For example, the Somali ideophone *bul* expresses the movement of ‘rush off’ involving ‘both sound and sight as a result of the action’ and *biiq* expresses ‘a long, drawn-out noise (e.g., a fart)’ (Dhoorre & Tosco, 1998). The majority of Somali ideophones are used for sound and movement, but the semantic range that ideophones can cover varies from language to language within the boundary of the fundamental semantic characteristics of ideophones, namely, sensory semantics (Dingemanse, 2012a). For example, Korean extends the range of sensory meanings that ideophones can cover by including the depictions of inner feelings or psychological states (e.g., *siŋsuŋ-sɛŋsuŋ* ‘distracted’, *təlkʰək* ‘mental state of being shocked’) as well as of sound (*sɛkɨn* ‘a

sound of gasping'), movement (*hɨntɨl* 'a motion of swaying), visual patterns (*c'okɨl* 'crumpled'), shapes (*p'icuk* 'a jagged shape'), and textures (*c'ontɨk* 'sticky').

1.3.2.2 Phonological characteristics: phonological/phonetic peculiarity

Ideophones have been characterised as "peculiar" (Newman, 1968, p. 107), "unusual"(Childs, 1988, p. 27), and "highly distinctive" (Beck, 2008, p. 5), since they often use unusual segments outside the regular phoneme inventory and violate certain phonotactic constraints of a given language (Klamer, 2001; Newman, 2001; Tedlock, 1999). For example, a glottalised *ch'* in a Zuni verb stem *ch'uk'i-* 'sounds of eye popping out of its socket' is found only in ideophonic verbs (Tedlock, 1999, p. 119). In Hausa (Newman, 2001), most ideophones are consonant-final, as seen in *tikis* 'shows intensity of tiredness' and *tsit* 'in complete silence', whereas most non-ideophonic words are vowel- or sonorant-final.

Despite such phonological peculiarities, ideophones do not totally disregard the phonological system of a given language. For example, in Hausa (Newman, 2001), ideophones and prosaic words share the same phonotactics regarding the types of syllable-final consonants; in both cases, syllable-final consonants exclude palatalised or labialised consonants, /h/ or /ʔ/, or any phonation contrast. Furthermore, although there exists a certain difference in terms of word-final segments in Hausa, where most prosaic words and ideophones end with vowels and consonants respectively, Hausa loanwords of English (i.e., non-ideophonic words) can share the same phonotactics with the ideophones (e.g., *têf* 'tape' in Newman, 2001, p. 252). On this basis, Dingemanse (2012a, p. 656) posits that the main factors that set ideophones apart from ordinary vocabulary are not the use of peculiar sounds or aberrant phonotactics but "skewed phonotactics distributions, various forms of feature harmony, most common among them vowel harmony (Akita et al., forthcoming [2013]; Blench, 2010), and a restricted number of tonal melodies in tone languages". Indeed, in Korean, stem-internal vowel harmony accompanying an augmentative or diminutive semantic feature occurs only in ideophones.

1.3.2.3 Morphological characteristics: special morphological pattern

Many researchers have claimed that reduplication (i.e., full or partial repetition) or vowel lengthening, which are both used to express different degrees of iteration, distributivity, or intensity of the events depicted, are common in ideophones (Beck, 2008; Dhoorre & Tosco, 1998; Klamer, 2001; Lee, 1992; Mok, 2001; Tedlock, 1999). For example, in Siwu, reduplicated ideophones such as *sàsàsàsàsà* 'pulsatile release of urine', *biribiri* 'sowed at close intervals', *gidigidi* 'running energetically', *nyɛnɛnɛ* 'shivering' and *kpɔrɔkpɔrɔ* 'drizzling rain' convey iteration or distributivity

(Dingemanse, 2011, p. 167). In some languages, retriplication (e.g., *kutu-kutu-kutu* 'rumbling of a car motor' in Gbaya) or requadruplication (e.g., *toi-toi-toi-toi* 'the sound a motorcycle makes' in Ibibio) also commonly occur in ideophones (Childs, 1994, p. 190).

Nevertheless, in general, such expressive use of morphology is not confined to ideophones (see, for example, Wood, 2007 on pluractionality and reduplication more generally). Furthermore, not all ideophones in a language undergo expressive morphological processes. For example, in Korean, there are many cases where non-ideophonic words can be reduplicated (e.g., *maeil-maeil* 'each day' and *cokak-cokak* 'piece by piece') and conversely, ideophones cannot be reduplicated (e.g., *callok* 'narrow in the middle', *p'ic'ək* 'bony'). However, reduplication is cross-linguistically prevalent in ideophones. Furthermore, some languages exist which rarely show reduplicated forms elsewhere, such as Filomeno Mata Totonac (McFarland, 2010). Thus, despite the aforementioned limitation, reduplication remains a noteworthy characteristic of ideophones.

1.3.2.4 Syntactic characteristics: syntactic atypicality.

The syntactic membership of ideophones is language-specific (Ameka, 2001; McFarland, 2010). For example, in Bantu, ideophones (from Niger-Congo family) can occur in the position of interjections, adjectives, adverbs, and particles, whereas in Leggbo, ideophones (from the Benue-Congo family) appear only as adverbs and adjectives (Udoh, 2007). In Somali, ideophones (from the Afro-Asiatic family), on the other hand, are categorised into the class of nouns (Dhoorre & Tosco, 1998).

Not only across languages but also within a particular language, the syntactic membership of ideophones can be vague. For example, in Gbeya (Samarin, 1965), ideophones can be categorised as adverbs because they can enter a verb phrase: *wa / tɛ kəɗərə kəɗərə* 'They come (making a noise)'. However, unlike ordinary adverbs, they also occur as an attributive of a noun: *goŋ goŋ-tuwa* 'spare house'.

Notwithstanding the syntactic variability of ideophones both across and within languages, ideophones possess cross-linguistic atypical syntactic characteristics which can set them apart from ordinary vocabulary. As Dingemanse (2012a, p. 656) phrases it:

> Across languages, ideophones tend to show a great measure of syntactic independence: they tend to occur at clause edges rather than deeply embedded within them; they tend to be aversive to inflectional morphology; and they can be set off from the rest of the clause by a pause (Childs 1994; Diffloth 1972; Dingemanse forthcoming [2012b]; Kunene 1965).

For example, in Siwu, an ideophone can appear on its own, independently of the preceding utterances, as shown in (10) below (Dingemanse, 2011, p. 144).[3]

(10) *Alɛ Kàntɔ kùgɔ ɔ`-sɛ ɔ`-bara ũ a-ra lo. ↑Tsintsintsintsintsin!↑*
like PSN how 3SG-HAB 3SG-do his things FP IDPH.neatly.EM
'Just like Kàntɔ, the way he does his stuff. *Tsintsintsintsintsin!* [neatly]'

Similarly, in Alto Perené , ideophones tend to constitute a separate intonational utterance at clause edges, followed by a pause, as in (11) (Mihas, 2012, p. 316).[4]

(11) *Arika avakyaaro oshira, anaatakero, piche piche.*
arika a-v-ak-ia-ro oshi=ra a-naa-t-ak-e-ro
when 1PL.A-eat-PRF-IRR-3N-M.O leaf=DEM 1PL.A-chew-EP-PRF-IRR-3N-M.O
piche piche
IDEO IDEO
'When we eat that leaf, we chew it, piche piche (action of chewing).'

1.3.3 Mimetics: Japanese

The term 'mimetics' is mainly used in Japanese linguistics (Akita, 2009; Kita, 1997; Mester & Itô, 1989).[5]

1.3.3.1 Semantic characteristics: sensory semantics

Mimetics express various perceptual experiences, "ranging from auditory (e.g., *koN^ (-to)* 'conk', *pariQ^(-to)* 'crack'[6]) to non-auditory experiences, including visual (e.g., *ni^koniko* 'smiling', *pyoN^(-to)* 'hopping') and internal phenomena (e.g., *geNna^ri* 'dispirited', *zu^kizuki* 'feeling one's head/teeth throbbing')" (Akita, 2009, p. 1). According to what they denote, they are categorised into

[3] Dingemanse (2011) states that the abbreviations used here are interpreted as follows: Arrows ("↑"), a markedly high pitch relative to other material in the utterance (Nuckolls 1996; Selting 1994); EM, expressive morphology (i.e., additive reduplication and lengthening); FP, utterance of final particle; PSN, person name; HAB, habitual.
[4] Mihas (2012, p. 339) states that the abbreviations used here are interpreted as follows: 1, 2, 3–first, second, third person; A–subject of transitive verb; DEM–demonstrative; EP–epenthetic; IDEO–ideophone; IRR–irrealis; N-M–non-masculine; O–object; PL–plural; PRF–perfective.
[5] Mimetics were often interchangeably used with ideophones to refer to Korean sound-symbolic words in previous literature, particularly in a Japanese - Korean comparative context (Akita, 2009; Garrigues, 1995; Martin, 1962).
[6] In Akita (2009), the symbol '^' refers to "accent nucleus, pitch fall (basically for sound-symbolic words; the absence of this symbol indicates a flat, unaccented pattern)", 'N' refers to "moraic nasal (only for mimetics)", and 'Q' refers to "first half of the geminate cluster (only for mimetics)".

three sub-classes: *giongo* ‘phonomime’ for depiction of animate and inanimate sound, *gitaigo* ‘phenomime’ for depiction of visual or tactile sensations, and *gizyoogo* ‘psychomime’ for depiction of psychological states or emotions (Akita, 2009; Garrigues, 1995; Ivanova, 2006). However, this conventional semantic classification is less than optimal in practice because the majority of mimetic words transcend the semantic boundaries of the categories by capturing multi-sensory experiences as a holistic picture. For example, *buku-buku* can be classified as both phonomime and phenomime, since it expresses not only the manner (“action” in Garrigues’ terms) but also the sound of water boiling (Garrigues, 1995, p. 362).

1.3.3.2 Phonological characteristics: phonological/phonetic peculiarity

In Japanese, mimetics share several phonological constraints with other prosaic lexical strata – “native (Yamato) vocabulary”, “Sino-Japanese vocabulary”, and “foreign vocabulary” (Itô & Mester, 1999, p. 62). For example, the “nasal cluster voicing constraint” (NT), which prohibits voiceless post-nasal obstruents in clusters like *-nt, -mp, -ŋk*, holds in Yamato and mimetics. Also, a “constraint ruling out voiced obstruent geminates” (DD), which requires obstruent geminates to be voiceless, holds in Yamato, Sino-Japanese, and mimetics. However, although mimetics possess such overlapping constraints with other prosaic lexical strata, they are still differentiated from others due to their distinctiveness in terms of the number and kinds of constraints they can hold, as shown in (12) below.

(12) Constraints applicable to each strata (taken from Itô & Mester, 1996. Retrieved from http://www.blackwellreference.com.ezproxy.library.uq.edu.au/subscriber/tocnode.html?id=g9780631201267_chunk_g97806312012672).

Yamato	P	NT	DD
Sino-Japanese	P	_	DD
Mimetic	_	NT	DD
Foreign	_	_	_

In detail, mimetics contrast with Yamato and Sino-Japanese in that they are not governed by “constraint against single [p]” (P), which only allows /p/ in a geminated or partially geminated condition. Word-initial /p/, which is not permissible in Yamato and Sino-Japanese, is commonly used in mimetic vocabulary (Akita, 2009; Garrigues, 1995; Hamano, 1998, p. 7). Mimetics further contrast with Sino-Japanese in that they only allow voiced post-nasal obstruents in a nasal cluster,

unlike Sino-Japanese (e.g., *sampo* 'walk', *hantai* 'opposite', *kaŋkei* 'relation'). Mimetics also contrast with foreign vocabulary in that they do not allow voiceless post-nasal obstruents in a nasal cluster and voiced obstruent geminates, unlike the foreign stratum (e.g., *kompyuutaa* 'computer', *beddo* 'bed') (Itô & Mester, 1996).

1.3.3.3 Morphological characteristics: special morphological pattern

Reduplication which conveys continuity or repeatability of a sensory event is prevalent in the Japanese mimetic lexicon (e.g., *pa^tipati* 'clapping repeatedly', *zi^waziwa* 'permeating slowly') (Akita, 2009, p. 42). Such reduplication also occurs in the non-mimetic nouns and adjective bases, but it is phonologically different from reduplication of mimetics. That is, in the non-mimetic native Japanese lexicon, the initial consonant of the reduplicated morpheme is voiced if the medial consonant of the morpheme is voiceless (e.g., *toki-doki* 'sometimes', *chika-jika* 'before long'). The same voicing process does not occur in the mimetic lexicon (e.g., *toko-toko* 'short and quick steps', *chika-chika* '(eyes) feel irritate'). On this basis, reduplication without concomitant voicing is considered a principal distinctive feature of the mimetic lexicon (Garrigues, 1995, p. 366).

1.3.3.4 Syntactic characteristics: syntactic atypicality

Japanese mimetics possibly fall into four regular grammatical categories of adverb (13), complex verb (14), nominal-adjective (15), and noun stems (16), as shown in Akita's examples (2009, pp. 46-47) below. [7]

(13) *BataN^*-to tonari-no doa-ga simat-ta
MIM-QUOT next-GEN door-NOM be.shut-PST
'The next door was shut *with a slam*'

(14) Soto-wa *hiNya^ri* *si*-te i-ta
outside-TOP MIM do-CONJ be-PST
'It was *pleasantly cool* outside'

(15) Yopparai-tati-no kaigi-wa *gudaguda*-dat-ta.
drunkard-PL-GEN meeting-TOP MIM-COP-PST
'Drunkards' meeting was *hopelessly disorganised*'

[7] Akita (2009) states that abbreviations used here are interpreted as follows: CONJ, conjunctive; COP, copula; DAT, dative; GEN, genitive; MIM, mimetic; NOM, nominative; PL, plural; PST, past; QUOT, quotative (or complementiser); TOP, topic

(16) Kokoro-ni *iraira*-ga tumot-te i-ta.
hear-DAT MIM-NOM pile-CONJ be-PST
'Irritation was accumulated in [my] heart'

These examples show that Japanese mimetics are syntactically atypical because, unlike other non-mimetic words, they do not possess a particular grammatical membership but range across four different syntactic categories.[8] This syntactic atypicality is also a distinctive characteristic of ideophones. As Ameka (2001, p. 26) puts it, "… they [ideophones] are like deictic words with a particular semantic function but which can fall into different grammatical word classes – nominal, adverb, verb, or adjective etc. – in a particular language".

1.3.4 Phonaesthemic words: Indo-European languages

Phonaesthemic words contain 'phonaesthemes', which is a term widely used to refer to sound-symbolic elements in Indo-European languages, such as English (Bergen, 2004; Firth, 1930; Hutchins, 1998) and Swedish (Abelin, 1999).

1.3.4.1 Semantic characteristics: sensory semantics

Phonaesthemes typically constitute a phoneme or particular sound sequence that could be indicative of certain thematic meanings across a range of words in a language (Healy, 2011; Nygaard, Cook, & Namy, 2009; Parault & Parkinson, 2008). For example, the phonaestheme *gl-* is indicative of 'vision, light' in a set of words (*glisten, glitter, gleam, glow*) and *sn-* is indicative of 'nose, mouth' in *snore, sneeze, snarl, sniff, snort* (Bergen, 2004). The regular form-meaning mapping found for phonaesthemes often involves systematicity between word-initial consonant clusters (e.g., *cr-, gl-, sn-*) or word-final vowel plus consonant sequences (e.g., *-ack, -ash*) and sensory-related meanings, such as sound (e.g., *cr-* 'harsh or unpleasant noise' in *creak, crack, croak*), something visual or nasal/oral (e.g., *gl-* 'vision, light' in *glisten, glitter, gleam, glow*; *sn-* 'nose, mouth' in *snore, sneeze, snarl*), and movement (e.g., *-ack* 'action with abrupt end' in *crack, smack, whack*; *-ash* 'violent action' in *crash, slash, smash*).

The sensory meanings of certain phonaesthemes are in line with the reported semantic characteristics of expressives, ideophones, and mimetics above, but the semantic distinctiveness of phonaesthemes is not as strong as that of other sound-symbolic types because their semantic

[8] (some) non-mimetic words are also "trans-categorial" as shown in *benkyoo* 'study' (Sino-Japanese) -> noun (N) or verb (V) (*benkyoo-suru*); *haikingu* 'hiking' (Foreign) -> N or V (*haikingu-suru*), *buruu* 'blue' (Foreign) -> N, adjective (Adj) (*buruu-na*), or adverb (Adv) (*buruu-ni*) (Kimi Akita, personal communication). However, the trans-categorial nature is exclusive to some Sino-Japanese and Foreign stems and thus, unlike in mimetics, it is seen as an exception rather than a general characteristic in non-mimetics words.

coherency is not always consistent, even within a language (e.g., *sn-* in *snow* 'arbitrary meaning' vs. *snore* 'nasal-related meaning').

1.3.4.2 Phonological characteristics: phonological/phonetic peculiarity

Phonaesthemes constitute a contiguous phonological structure, namely "a phoneme or cluster of phonemes" (Householder, 1946, p. 83), "phonetic groupings" (Abramova, Fernández, & Sangati, 2013; Otis & Sagi, 2008), "phoneme clusters like syllable onsets or rimes" (Schmidtke et al., 2014, p. 2) or "rime and assonance" (Nuckolls, 1999, p. 237). Similar with the other sound-symbolic types, phonaesthemes also use peculiar sounds or skewed phonotactics to some extent. For example, they often permit non-coronal codas in phonaesthemic words (e.g., *clunk, thump, bop, bam, bang*), which are rare in the ordinary English lexicon (Oswalt, 1994, p. 296). In addition, they permit phonological shapes, unlike general English morphemes, i.e., bound prefix morphemes cannot be solely composed of consonants, such as *gl-* or *sn-*.

1.3.4.3 Morphological characteristics: special morphological pattern

Phonaesthemes are similar to regular morphemes in the sense that certain phonological structures are associated with certain meanings. However, phonaesthemes have traditionally been treated as special phenomena in morphology mainly due to the non-compositionality of the stems in which they appear (Abramova et al., 2013; Bergen, 2004; Schmidtke et al., 2014) and to their semantic vagueness (Bolinger, 1950; Healy, 2011) (Chapter 3 engages with these issues in depth). Bergen (2004) noted that phonaesthemic words are not compositional unlike canonical derived words. For example, the meaning of a phonaesthemic word, *glow*, which consists of the phonaestheme *gl-* and the residue *-ow*, cannot display semantic transparency because of its meaningless residue, unlike the non-phonaesthemic word *painter* whose meaning can be computed from the base meaning and the attached affix meaning. Additionally, Healy (2011) and Bolinger (1950) state that the proposed meanings of phonaesthemes are vague, unlike morphemes. For example, *gr-* is used with the meaning 'deep-toned, grumbling inimical or menacing noises' in *grunt, growl, grumble*, but, in *grasp, grip, grab*, it is used with a different meaning 'holding/manual activity' (Hutchins, 1998).

Although phonaesthemes exhibit such distinctive morphological properties, they do not display the noteworthy morphological characteristic of other sound-symbolic categories, namely reduplication correlated with a certain semantic effect. Therefore, in a strict sense, phonaesthemes do not pattern together with expressives, ideophones, and mimetics.

1.3.4.4 Syntactic characteristics: syntactic atypicality

Phonaesthemes in general do not restrict their occurrences to a certain grammatical category, although in English, for example, phonaesthemes appear only in content words (see Appendix A in Hutchins, 1998) such as nouns (e.g., *glass, glimmer, glimpse*) and verbs (e.g., *gleam, glisten, glow, glare*) (Bergen, 2004).

Phonaesthemes are not confined to one syntactic category and thus they are syntactically atypical, just like other sound-symbolic types. However, in a strict sense, they behave differently from expressives, ideophones, and mimetics, in that they are exclusively sub-lexical items which cannot belong to any of the syntactic categories by themselves, and also, in that the words in which they appear can be fully integrated syntactically. For other sound-symbolic types, the sound-symbolic stems themselves are "acategorial" in the lexicon and, in some cases, their grammatical memberships are determined by co-occurring elements, such as a copula and a quotative particle (see examples (13) to (16) in §1.3.3.4). The categorial status of the words that phonaesthemes belong to, however, is not determined by the residues they attach to.

1.3.5 Cross-linguistic characteristics of sound-symbolic words

Several terminologies have been introduced by the areal group of languages to which they have been applied, as seen in §§1.3.1–1.3.4. The language-internal sound-symbolic terminologies share sensory semantics and idiosyncratic formal behaviours, which set them apart from ordinary vocabulary, justifying Dingemanse's cross-linguistic recurrent characteristics of sound-symbolic words. In detail, semantically, they depict perceptual sensory experiences. Phonologically, they are peculiar (e.g., the use of unusual segments or skewed phonotactics for expressives, ideophones, mimetics and phonaesthemes). Morphologically, they display special word structure (e.g., reduplication for expressives, ideophones and mimetics, or sub-morphemic structure for phonaesthemes). Syntactically, they show atypical grammar. For example, syntactic diffusion into a number of word classes and syntactic isolation are the characteristics of expressives, ideophones, and mimetics, while ineligibility of syntactic membership is a characteristic of phonaesthemes. Notably, the fact that sound-symbolic words contain such distinctive characteristics in common across many languages indicates that there is something universal or near-universal at play, thus lending *prima facie* plausibility to the Explanatory Sound-symbolism Hypothesis – that natural motivation prevails in sound-symbolic vocabularies.

However, despite some cross-linguistic commonalities underlying the different language-internal sound-symbolic types, phonaesthemes seem to be less congruent than expressives, ideophones, and mimetics. This is not surprising given that phonaesthemes are sub-morphemic units occurring inside fundamentally arbitrary lexical items, whereas others are independent lexical

items in which perceptual sensory experiences seem to be imitated in the linguistic signs (Dingemanse, 2011). Yet, Bergen (2004) posits that phonaesthemes can be integrated into other sound-symbolic systems. Under Bergen's definition of phonaesthemes as "frequently recurring sound-meaning pairings that are not clearly contrastive morphemes", Japanese mimetics, which often exhibit regular correspondence between voiced initial consonants and larger or more intense connotation (e.g., *gi^ragira* 'glaring' vs. *ki^rakira* 'twinkling') (Akita, 2009, p. 15), *can* be analysed as having the voicing feature that would characterise them as phonaesthemes.[9] Likewise, Bahnar expressives (Diffloth, 1994) and Korean ideophones, where high vowels are associated with largeness and low vowels are associated with smallness (e.g., Bahnar: *bleel-bleel / blɛɛl-bɛɛl* 'large/small flames appearing intermittently but remaining vivid'; Korean: *pipi / pɐpɛ* 'a state of bigger/smaller things being entwined'), *can* be analysed as having different vowel qualities that would characterise them as phonaesthemes.

While this analysis appears to be structurally plausible, it should be noted that there remains a significant difference distinguishing phonaesthemes in English phonaesthemic words from the observed phonaesthemic units in expressives, ideophones, and mimetics. That difference is that they may exhibit different levels of natural iconicity in their form-meaning correspondences. For example, in Japanese mimetics, there appears to be a natural association between the voicing of initial consonants, which yields different sizes of oral cavity, and the sizes of the referent image depicted (Shinohara & Kawahara, 2010). On the other hand, in English phonaesthemes, such natural iconicity is less clear (Hutchins, 1998; Schmidtke et al., 2014); a perceived resemblance between form and meaning seems to appear in only a few phonaesthemes, such as *sn-* and the onomatopoeic *gr-* 'deep-toned noises' in *growl, grunt, gruff*, where the sound /g/ articulated with the back of the tongue raising to touch the velum could be linked to the deep-toned noises coming from the throat.

The following section outlines different types of iconicity introduced in previous sound-symbolic literature and, based on them, specifies iconic systems which could be manifested in the phonaesthemic units within ideophones and the phonaesthemes within phonaesthemic words, drawing on data predominantly from Korean and English.

[9] In this example of Japanese mimetics, contrastive voicing appears to be part of a discontinuous phonaestheme (cf. Hamano, 1998; Ivanova, 2006); the voicing contrast of an initial stop in /k_r_/ (e.g., *kira-kira* 'twinkling', *koro-koro* 'rolling', *kuru-kuru* 'spinning', *kero-kero* 'croaking', *kera-kera* 'cackling') and /g_r_/ (e.g., *gira-gira* 'glaring', *goro-goro* 'rattling', *guru-guru* 'turning around and around', and *gero-gero* 'croaking loudly or vomiting', *gera-gera* 'roaring with laughter') appear to symbolise a contrastive meaning in terms of heaviness/intensiveness of some rolling(ish) movement (Kimi Akita, personal communication).

1.4 Iconicity of phonaesthemic units in ideophones and phonaesthemic words

In order to investigate the iconic status of the phonaesthemes in English phonaesthemic words and the phonaesthemic units within Korean ideophones on a conceptual basis, it is essential to primarily understand the different types of 'lexical iconicity', namely iconicity manifested at the word level (Akita, 2009, pp. 19-20). Dingemanse (2011, Chapter 7) develops three types of lexical iconicity based on Peirce (1932) (see also Haiman, 1980): 'imagic iconicity', 'Gestalt iconicity', and 'relative iconicity'.

Imagic iconicity is at work when speech sound mimics non-speech sound in the external world. Typical examples of this type of iconicity are ideophones, or phonaesthemic words which are onomatopoeic. Specific instances from Korean ideophones include *sɛkɨn* 'a sound of gasping', *cikɨl* 'a sound of sizzling', *pokɨl* ' a sound of water boiling', and *cik'ɨn* ' a sound of snapping'. Instances from English phonaesthemic words include *cl-* words associated with a clicking sound (such as *clang, clank, clash, clap*) and *gr-* words associated with a grumbling sound (such as *grunt, groan, gruff, growl*).

Gestalt and relative iconicity, as sub-types of diagrammatic iconicity, display a less direct mapping compared to imagic iconicity, since they show resemblance not through forms themselves, but through relations among forms. Diagrammatic iconicity involves form-meaning correspondences which are created by relating similar sets of forms with similar sets of meanings (Peirce, 1955, p. 104). Unlike imagic iconicity which uses acoustic signals of speech sound only to mimic acoustic phenomena, diagrammatic iconicity allows a relation between forms to depict different aspects of perceived sensory experiences. In detail, the majority of Korean ideophones display diagrammatic iconicity through vocalic and/or consonantal symbolism. For example, in a Korean ideophonic pair, *pipi / pɛpɛ* 'a state of bigger/smaller things being entwined', the relation between high vowel /i/ and low vowel /ɛ/ is associated with the relation between largeness and smallness. Similarly, as a type of diagrammatic iconicity, English phonaesthemic words reveal relative iconicity. Relative iconicity concerns a mapping of relations among forms in multiple words onto relations among multiple meanings. For example, in a set of phonaesthemic words, *gleam, gloss, glow, glint*, the shared form *gl-* is related to the shared meaning 'vision and light' and the different residues reflect different types of light represented.

Gestalt iconicity involves the mapping of word structure and the perceived event structure. For example, Korean ideophones often reduplicate the ideophonic stem to capture the perceptions of an event's iteration or continuation: *pʰatakpʰatak* 'flapping', *pʰoŋtaŋpʰoŋtaŋ* 'with splash after splash', *kʰuŋc'akkʰuŋc'ak* 'repeated sound of a drum', *əciləcil* 'feel giddy again and again'. The Gestalt iconicity of reduplication is clearly seen when comparing the given examples with their non-reduplicated counterparts, where the unitary form of the word resembles the unitary aspect of the

perceived event: *pʰatak* ‘flap once’, *pʰoŋtaŋ* ‘with one splash’, *kʰuŋc’ak* ‘a sound of a drum’, *əcil* ‘feel giddy’. Similarly, the lengthening of syllable-initial vowels conveys the durative aspect of a perceived event: *k’waŋ vs. k’waaaŋ* ‘boom’, *pʰəlpʰəl* (it always occurs as a reduplicated form) *vs. pʰəəəlpʰəl* ‘snowing intensely’ (Lee, 1992, p. 117). Such iconicity is also found in English phonaesthemic words, prototypically associated with auditory, visual, or tactile sensations. Mostly, they use vowel or approximant lengthening to capture the perceptions of the event’s duration or intensity as in *squeeeeze* (*sq-* phonaestheme ‘something compressed’) and *grrrrowl* (*gr-* phonaestheme ‘deep-toned noise’).[10]

Altogether, Korean ideophones and English phonaesthemic words have in common the fact that they display all of the three types of lexical iconic mappings. However, when attending to the iconicity manifested at the sub-word level (i.e., sub-lexical iconicity), there is a crucial difference between them – compared to English phonaesthemes, Korean phonaesthemic units appear to reflect a relatively strong naturalness of sounds in their regular form-meaning correspondences (see §1 for a brief comparison). Given this, the following sub-sections further discuss the iconicity of meaning-bearing elements in Korean ideophones and that of phonaesthemes in English phonaesthemic words.

1.4.1 Translucent iconicity: phonaesthemic units in Korean ideophones

According to Fordyce’s (1988, pp. 8-38) classification of sub-lexical iconicity developed from observation of sign languages, the vocalic and consonantal symbolism manifested by phonaesthemic units within Korean ideophones exhibit translucent iconicity while phonaesthemes in English phonaesthemic words exhibit opaque iconicity.

In sign language, translucent iconicity is instantiated when the signs hold the bases for the sign-meaning associations that are agreed by non-sign-users. Fordyce posits that translucent signs are prototypically manifested in spoken language as a form of ‘magnitude phonetic symbolism’. Magnitude phonetic symbolism refers to the phenomenon by which certain sounds, particularly vowels, are associated with referents’ sizes (Bentley & Varon, 1933; Fischer-Jørgensen, 1968; Jespersen, 1933; Newman, 1933; Ohala, 1983; Sapir, 1929; Ultan, 1978).

This idea has inspired various psycholinguistic experiments on the potential naturalness of sound symbolism across different world languages (Brackbill & Little, 1957; Brown, Black, & Horowitz, 1955; Brown & Nuttall, 1959; Maltzman, Morrisett, & Brooks, 1956; McMurray, 1960; Taylor & Taylor, 1962). Sapir (1929), for example, claimed that the high, front vowel /i/ is naturally related to smallness and that the low, back vowel /a/ is related to largeness, based on the finding that 80% of his subjects judged a nonsense word pair *mil* and *mal*, as a small and large table,

[10] English prosaic words also make use of vowel lengthening to emphasise the event being described (e.g., *she’s soooo cute!*) (Kawahara & Braver, 2014).

respectively. Similarly, several comparative studies (Berlin, 1994; Jespersen, 1933; Ultan, 1978; Woodworth, 1991) also showed that, in many natural languages, the concept of augmentation is associated with low, back vowels and the concept of diminution is associated with high, front vowels. On this basis, optimal instances of magnitude phonetic symbolism have been limited to the correlations of *high vowel=small (diminutiveness)* and *low vowel=big (augmentativeness)*. For the natural motivations underlying this cross-linguistic sound-symbolic phenomenon, Sapir (1929, p. 235) provided an articulatory justification as shown below.

> In the case of *i* the tongue is high up toward the roof of the mouth and articulates pretty well forward. In other words, the vibrating column of air is passing thorough a narrow resonance chamber. In the case of *a* the tongue is very considerably lowered in comparison, and also retracted. In other words, the vibrating column of air is now passing through a much wider resonance chamber … a spatially extended gesture is symbolic of a larger reference than a spatially restricted gesture.

Ohala (1994), in addition, correlated this kinaesthetic explanation with phonetic substrates by suggesting a biologically motivated theory, namely the 'frequency code hypothesis'. Ohala observed that, in non-linguistic communication, animals create different impressions of their bodily size by manipulating F0. This symbolic use of F0 is based on a physical condition that vocal frequencies correlate inversely with vocal cord size, which in turn relates positively to the overall body size of the vocaliser. The frequency code hypothesis, inspired by observations of nonhuman vocalisations, argues that there is, as well, a biological mechanism underlying the association between the acoustic frequencies of speech sounds and the use of those sounds in expressing the size of referents. Thus, higher F0 is prototypically used in questions where a speaker is considered to be in a 'submissive' position, whereas lower F0 is prototypically used in statements where a speaker is in a 'dominant' position. For the same physical reason, the F2 of individual segments also signals impressions of size (Ohala, 1997). This logic explains the extensively observed cross-linguistic use of high front vowels [i I y e], which have a high F2 and a high intrinsic F0 (a tendency for high vowels to have higher pitch than low vowels), for diminutive concepts, and low back vowels [ɔ ʌ ɑ o], with low F2 and low intrinsic F0, for augmentative concepts (Sapir, 1929; Ultan, 1978). Diminutive /i/, which is articulated with raised tongue, emits high F2 by making a narrow oral aperture, whereas augmentative /a/, which is articulated with lowered tongue, emits low F2 by making a wide oral aperture. To sum up, the near-universal pattern of vocalic symbolism reported in the sound-symbolic literature has been argued to display translucent iconicity, since its

systematic form-meaning association has what appears to be a natural basis, namely plausible articulatory/acoustic grounds.

At this point, recall example (2), which represents phonaesthemic units involving vowels in Korean ideophones in §1. In Korean, vocalic symbolism is manifested in such a way that a high front vowel is associated with augmentativeness and a low back vowel is associated with diminutiveness. This does not conform to the claimed universal pattern of magnitude symbolism, leading Fordyce to the idea that Korean vocalic phonaesthemic units do not possess clear natural grounds and, therefore, they are not translucently iconic but largely conventionalised by the speakers of the target language (p. 38). However, this may be a premature conclusion, since the vocalic symbolism in Korean contains a diachronic articulatory justification which may yet perform as a natural basis, hinging on a link between the pharyngeal cavity size and size-related concepts. Kim (1984, p. 177) has claimed that the contemporary dark (roughly, high) and light (low) vowel classification in Korean ideophones is a historical remnant of a vowel distinction in middle Korean (15^{th}-16^{th} Century), where the dark and light vowels belonged to natural classes divided by a distinctive feature [±Retracted Tongue Root]. Assuming that the dark and light vowels are correlates of [-RTR] and [+RTR] respectively, as previously claimed, we can predict that the dark vowels would have a more expanded pharyngeal cavity than the light vowels (Ladefoged & Maddieson, 1996, p. 300). This suggests that vocalic phonaesthemic units of Korean ideophones could be translucently iconic, much like the near-universal pattern of magnitude symbolism. An empirical investigation of translucent iconicity of Korean vocalic symbolism is conducted in Chapter 4.

Phonaesthemic units involving consonants in Korean ideophones (see example (3) in §1), make use of three different laryngeal settings of syllable-initial obstruents to connote different degrees of intensity. In more detail, within some semantic scales, lenis obstruents connote a ‘neutral’ character whereas the fortis and aspirated series connote ‘intensive’ and ‘para-intensive’ (i.e. extra intensive) characters, respectively (Kim, 1984; McCarthy, 1983). One can find possible articulatory grounds for such a systematic association – by relating plain obstruents to neutrality, fortis obstruents (which involve constricted glottis with greater muscular tension) to intensiveness, and aspirated obstruents (which produce a strong burst of air through the spread glottis) to para-intensiveness (cf. Lee, 1992, p. 99). This mechanism, grounded in articulatory gestures and phonetic aerodynamics, suggests that consonantal phonaesthemic units in Korean ideophones could be translucently iconic, much like their vocalic counterparts. An empirical investigation of the translucent iconicity of Korean consonantal symbolism will be conducted in Chapter 5.

1.4.2 Opaque iconicity: phonaesthemes in English phonaesthemic words

Opaque iconicity is exhibited when the natural basis of form-meaning association is less visible (c.f. "secondary iconicity" in Sonesson, 1997).[11] The representative example of opaque iconicity in spoken language is phonaesthemes in English phonaesthemic words. English phonaesthemes show iconic behaviour through their recurrence across a number of words. However, unlike the examples of translucent iconicity, "it is difficult to attribute motivation to phonemes or clusters of phonemes symbolizing the particular meanings that they do in English" (Fordyce, 1988, p. 23), perhaps because phonaesthemes represent primarily arbitrary and secondarily natural sound-meaning mappings. The secondary naturalness may be blocked by the primary arbitrariness and become opaque in their sound-meaning mappings. An empirical investigation of the opaque iconicity of English phonaesthemes will be conducted in Chapter 6.

1.5 Research aims and questions

Phonaesthemic units of Korean ideophones, which are conceptually reported to be translucently iconic, appear to support the ESH. Phonaesthemes of English phonaesthemic words, on the other hand, appear to support the CSH by displaying a systematic form-meaning mapping that is primarily based on arbitrary convention.

The present thesis empirically assesses the differences in degrees of naturalness in sound-symbolic elements of English phonaesthemes and Korean ideophones, and aims to conduct a detailed cross-linguistic investigation of the central claim of the ESH, that natural motivation primarily governs sound symbolism. Specific research questions to be answered under this aim are:

1. Do the meanings associated with vocalic and consonantal phonaesthemic units in Korean ideophones empirically show translucent iconicity?

   If translucent iconicity exists in phonaesthemic units of Korean ideophones, participants from the two different language groups (i.e. Korean and English) should match a correct meaning to a nonsense ideophonic pair that contrasts the sound-symbolic vowel or consonant quality.

2. Do the meanings associated with phonaesthemes in English phonaesthemic words empirically show opaque iconicity?

[11] Opaque iconicity is termed "secondary iconicity" in Sonesson (1997). It involves a sign whose referent is recognised primarily due to convention and secondarily due to any possible natural motivation underlying it. In secondary iconic signs, "the knowledge about the existence of a sign function between two things is one of the reasons for the perception of an iconic ground between these same things" (p. 741).

If opaque iconicity exists in phonaesthemes in English phonaesthemic words, participants from the two different language groups (i.e., Korean and English) would find it difficult, though not always impossible, to recognise the correct meaning for a phonaestheme manifested in a set of nonsense phonaesthemic words.

1.6 Experimental methods

In order to answer the research question, this thesis consists of two preliminary experiments and two cross-linguistic experiments, as summarised in Figure 1-1 below. The preliminary experiments, 1A and 2A, acted as preparation for the larger experiments, 1B and 2B. The larger experiments tested both native English and Korean speakers' perceptions of nonsense Korean and English sound-symbolic words. The whole series of experiments were conducted online via a University of Queensland online test system, Blackboard.

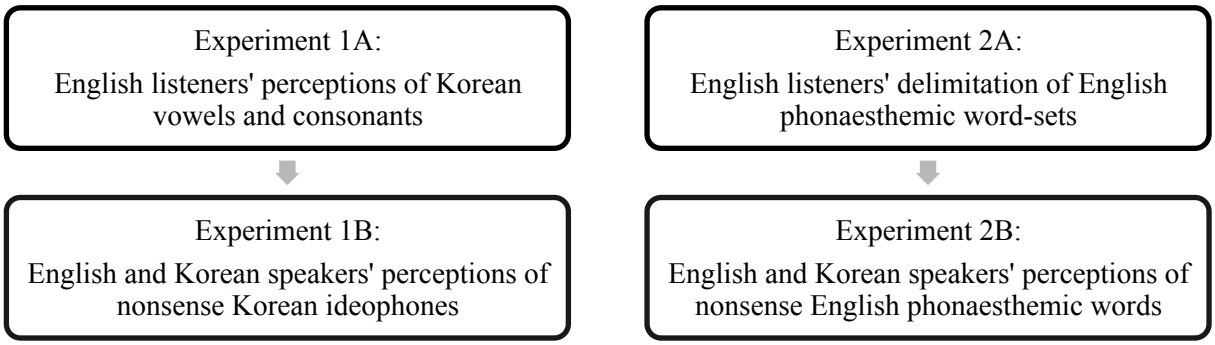


Figure 1-1. Total experiment process

In detail, in experiment 1B, both native English and Korean speakers were asked to listen to audio files of nonsense Korean ideophonic pairs and to choose their connotational meanings in a meaning matching task. A factor here is that if the English-speaking participants were not able to discriminate the sounds involved when they listened to the stimulus items, it would be impossible for them to correlate connotation oppositions with the corresponding sound oppositions in the meaning matching task. Thus, experiment 1A examined whether or not English listeners can actually discriminate the foreign Korean contrastive sounds, which are pervasively used in Korean ideophones. In experiment 2B, both native English and Korean speakers were asked to guess the meanings of phonaesthemes in sets of aurally presented nonsense English phonaesthemic words in two separate tasks: free-choice and multiple-choice tasks. Unlike Korean ideophones (which show clear semantic contrasts accompanied with the consonant/vowel alternations), form-meaning correspondences in English phonaesthemes exhibit less predictability. Thus, experiment 2A

examined native English speakers' judgements regarding the semantic interconnectedness of the candidate phonaesthemic words for the delimitation of English phonaesthemic word-sets. This preliminary experiment gathered empirical evidence for a strong sound-meaning association in the claimed phonaesthemes and helped to choose English stimuli for the cross-linguistic experiment, 2B.

1.7 Chapter outline

The remainder of this thesis is organised in the following order.

Chapter Two reviews previous experimental investigations into naturally motivated sound-symbolic mappings in language. This includes an overview of early experimental works on language users' sensitivity to iconic sound-shape correspondences (Berlin, 2006; Bremner et al., 2013; Köhler, 1929, 1947; Ramachandran & Hubbard, 2001) and to categories of sound-meaning mappings (Berlin, 1994; Brackbill & Little, 1957; Brown et al., 1955; Gebels, 1969; Imai, Kita, Nagumo, & Okada, 2008; Kunihira, 1971; Maltzman et al., 1956; Newman, 1933; Sapir, 1929; Thompson & Estes, 2011). Also covered is further research that has examined the role of iconicity in language processing (Kovic, Plunkett, & Westermann, 2010; Monaghan et al., 2012; Nygaard et al., 2009; Westbury, 2005) and language development (Asano et al., 2015; Imai et al., 2008; Kantartzis, Imai, & Kita, 2011; Maurer, Pathman, & Mondloch, 2006; Ozturk, Krehm, & Vouloumanos, 2013; Peña, Mehler, & Nespor, 2011; Yoshida, 2012).

Chapter Three assesses and clarifies in an innovative manner the theoretical status of meaning-bearing elements of Korean ideophones and English phonaesthemic words within derivational morphology, using the framework of Canonical Typology (Corbett, 2005).

Chapters Four and Five empirically deal with the iconicity of semantically correlated vowel and consonant alternations of Korean ideophones. Chapter Four reports on English listeners' discrimination of non-English Korean vowels, which are prototypically used in Korean ideophones (Experiment 1Aa). Based on the vowel discrimination result, the results of Experiment 1Ba are analysed, showing both Korean and English listeners' perceptual decisions regarding the symbolic use of vowels in Korean ideophones. Similarly, Chapter Five reports on English listeners' discrimination of non-English laryngeal settings of Korean consonants, namely lenis, fortis, and aspirated (Experiment 1Ab). Based on the consonant discrimination result, the results of Experiment 1Bb are analysed, showing both Korean and English listeners' perceptual decisions regarding the symbolic use of consonants in Korean ideophones.

Moving to the iconicity of English phonaesthemes, in Chapter Six, an attempt is made to delimit English phonaesthemic word-sets by examining native English listeners' judgements towards the semantic interconnectedness of the candidate phonaesthemic words (Experiment 2A).

With evidence so obtained for a strong sound-meaning association in the claimed phonaesthemes, an evaluation is made of both English and Korean listeners' perceptions of English phonaesthemic words (Experiment 2B).

Chapter Seven summarises the empirically observed iconic levels of phonaesthemic units of Korean ideophones and phonaesthemes in English phonaesthemic words, and evaluates the validity of the ESH and its alternative, the CSH, by discussing to what extent sound symbolism challenges the near-axiomatic expectation that pairings of sounds to simple meaning are arbitrary.

2 Previous experimental studies on the iconicity of the linguistic signs

This chapter summarises previous attempts to empirically investigate the possible pervasiveness of natural motivation in language by examining language users' sensitivity to iconicity in both explicit and implicit experimental paradigms. To start with, I review the early findings that there are universally accessible sound-shape correspondences, known as the 'bouba-kiki effect', which indicates that speakers cross-linguistically associate *bouba* with a rounded shape and *kiki* with a spiky shape (§2.1). The observed universal sensitivity to sound-shape symbolism suggests that there may also be a strong natural connection between certain sounds and categories of meanings. Thus, I cover cross-linguistic word-matching studies which have examined the possible presence of universal sound symbolism in natural languages by assessing speakers' abilities to guess the meanings of words from unfamiliar languages (§2.2). The latter half of this chapter covers more recent literature concerning the advantage of iconicity in language processing and language learning where they adopt implicit experiment methods. Although not directly related to the current thesis in terms of an experimental paradigm, it is important to pay attention to the recent advancements in implicit experimental methods within sound-symbolic research, as studies of the natural motivation of sound symbolism become increasingly influenced by the idea that "More critical evidence for humans' sensitivity to iconic mapping must come from online studies of language processing that show that iconicity affects lexical processes" (Perniss et al., 2010, p. 7).

2.1 Sound-shape symbolism

The earliest work to show that speakers are sensitive to certain sound and shape correspondences is Köhler (1929). In order to test whether certain sound-symbolic preferences exist in language, Köhler asked Spanish speakers to match novel words 'baluba' and 'takete' with two novel shapes: one, an angular and pointy shape, and the other, a rounded and curvy shape. As a result, a majority of the participants associated 'takete' with the spiky shape and 'baluba' with the round shape. Preferences for certain sound-shape pairings were preserved, even when the novel words underwent slight modifications (the words still contained similar phonemic contrast, however). For example, English-speaking participants reliably paired 'takete' with the spiky shape and 'maluma' with the round shape (Köhler, 1947). In Ramachandran and Hubbard's (2001) work, where the nonce words used were 'bouba' and 'kiki', English-speaking participants also consistently showed sensitivity to the pairings of front vowel (e.g., /i/) and voiceless consonant (e.g., /k/) with an angular shape, and

back vowels (e.g., /u/) and voiced consonant (e.g., /b/) with a curvy shape (95% of them chose 'bouba' as a label for the round shape and 'kiki' for the angular shape). Ramachandran and Hubbard argued that the roundness of the mouth associated with the voiced bilabial consonant (/b/) and back vowel (/u/) naturally evokes the impression of the rounded shape while the tenseness of the mouth associated with the voiceless plosive (/k/) and high front vowel (/i/) evokes the impression of the pointy shape. Consequently, they suggested that the observed 'bouba-kiki effect' results from a direct relation between label and object by providing cross-modal explanation as below:

> …we conjecture that the representation of certain lip and tongue movements in motor brain maps may be mapped in non-arbitrary ways onto certain sound inflections and phonemic representations in auditory regions and the latter in turn may have non-arbitrary links to an external object's visual appearance (as in bouba and kiki). (p. 20)

If the bouba-kiki effect is determined by the cross-modal mappings between spoken sounds and sensory experiences of the external event as proposed, then the preferred sound and shape correspondences should be recognised across cultures. In support of this, Bremner et al. (2013) demonstrated that speakers who have little exposure to Western culture also show similar sensitivity to the bouba-kiki effect, suggesting the universal nature of sound-shape symbolism. In detail, they asked participants, from the Himba of Northern Namibia, who do not use a written language, to pronounce the nonce words 'bouba' and 'kiki' (the experimenter said the words first) and match the words with the angular and rounded shapes. As a result, 82% of the participants showed the expected sound-shape mappings. Such universal sound-shape relations are demonstrated not only in forced-matching tests but also free-choice tests, in which participants create their own labels for objects. For example, Berlin (2006) asked English-speaking adults to freely invent names for two birds of contrasting shapes (one round, the other angular). In line with the result of the aforementioned forced-choice task, the results of the free-choice task conformed to the universal sound-shape pattern: back vowels /u/ and /o/ were predominant in the invented names for the curvy-shaped bird, while front vowels /i/ and /e/, and voiceless stops /p/, /t/, and /k/ were predominant for the angular-shaped bird.

Overall, the observed universal sound-shape symbolism encouraged the idea that there may also be a strongly natural relation between certain sounds and meanings in natural languages. Accordingly, a number of cross-linguistic investigations into universal sound symbolism started to appear in the early 20th Century, as shown in the following section.

2.2 Universal sound symbolism in natural languages

Since Sapir's (1929) pioneering work, which suggested a direct correlation between phonemic contrast (e.g., /i/ vs. /a/) and size contrast (e.g., 'small' vs. 'big'), several empirical attempts have been made to search for supporting evidence for non-arbitrary mappings of sounds and categories of meaning. For example, Newman (1933) asked English-speaking participants to decide whether the first words in nonsense pairs that contrast vowel quality (e.g., *glupa vs. glopa*) are related to largeness or smallness. The result was consistent with Sapir's finding that close vowels are correlated with *small* and open vowels are correlated with *big*. Given this, Newman provided articulatory and acoustic justification for the observed sound-size correspondences by arguing that the lower frequency of vocalic resonance, the posterior tongue position and the larger oral cavity size associated with open vowels evoke the sensory sensation of large size. However, despite the empirical data which favoured the size-sound symbolism, his comparable data (which consisted of existing English words with contrastive size connotations) failed to reflect such sound-symbolic patterns. Still, Taylor and Taylor (1965) argued that size-sound symbolism has supporting lexical evidence, by assuming that the symbolic value of a sound may differ depending on its word position. They focused on the first vowels of the existing English words in Newman's comparable lexical data and found that the words with small connotations contained a significantly greater number of the small vowels (i.e., /i/ and /ɛ/) in a position following a word-initial consonant, compared to the words with big connotations. Thompson & Estes (2011) also claimed that the observed size-sound symbolism is naturally motivated, by demonstrating that it is recognised in a graded manner. They hypothesised that if there is a natural connection between sound and size-related meaning, the size symbolism will display a graded function (e.g., small, medium, and large) just as the size of the real-world entities. In order to prove this, they asked English-speaking participants to match the visually or orally presented nonce words that differed in the number of proposed 'small' phonemes (i.e., /i/, /e/; /t/, /k/) and 'large' phonemes (i.e., /a/, /u/, /o/; /m/, /l/, /w/, /b/, /d/, /g/) with objects of different sizes. As a result, the numbers of large phonemes were increased in the chosen nonsense words as the size of the target objects became bigger, supporting their hypothesis.

The innateness of sound-meaning mappings has also been actively examined in a number of cross-linguistic studies with a premise that, "…if sound symbolism reflects a direct relation between name and referent (i.e., the cross-modal version), then sound symbolism for at least some domains should be universal or at least relatively constant across languages" (Thompson & Estes, 2011, p. 2395). For example, Brown et al. (1955) asked native English speakers to match pairs of English antonyms with their foreign equivalents, after they had translated pairs of English antonyms that conveyed sensual experiences (e.g., warm-cool, heavy-light) into Chinese, Czech and Hindi. As a result, participants showed an above-chance level of correct matching rates. From this, Brown et al.

speculated that universal sound symbolism exists across languages and that speech may have originated from sounds imitative of meanings.

Following Brown et al.'s work, several other experiments supported the hypothesis of a universal sound symbolism. Gebels (1969) showed an above-chance level of correct matching rates by English-speaking participants in matching foreign sense-related antonymic pairs from Old Hebrew, South Malaita, Kiwai, Tongan, and Finnish with their given English equivalents. Berlin (1994) used pairs of bird and fish names from Huambisa (Jivaroan language family) and asked English-speaking participants "In each pair, one word is the name of a fish and one word is the name of a bird. Please check the word in each pair that you believe sounds like the name of a bird". The result was similar to Brown et al. and Gebel's findings: the accuracy rate to distinguish bird names from fish names was greater than chance. Notably, Kunihira (1971) argued that prosodic cues, such as expressive voice tones, do not account for the above-chance level of correct meaning-guessing rates of foreign words. In his cross-linguistic matching experiments, English-speaking participants correctly guessed the meaning of Japanese words at a level above chance, regardless of the presence of expressive voice quality used on Japanese stimulus words. Along similar lines, Imai et al. (2008) also suggested that there are universal sound-meaning associations, with their finding that native English- and Japanese-speakers reliably agreed on the meanings of novel Japanese mimetics. They created possible Japanese mimetics depicting different manners of walking (e.g., *batobato* 'running with heavy steps', *chokachoka* 'fast walking with small steps'). They then asked both English-speaking and Japanese participants to listen to the aurally presented stimulus words and to choose the video that matched the given stimulus word from two video clips that showed the contrastive manners of walking. Their results showed that the correct-guessing rates of both English and Japanese speakers were above chance.

Despite this supporting evidence for universal sound symbolism across a general lexicon of language, there are also studies from this period that provide apparently conflicting reports. For example, Maltzman et al. (1956) conducted word-matching tasks where English-speaking adults were asked to choose the equivalent of a Japanese or Croatian stimulus word from a pair of English response words. The accuracy level was higher than chance in accordance with Brown et al.'s finding. However, when they asked participants to choose the equivalent of a Croatian stimulus word from two Japanese response words (both stimulus and response words were from languages that were unknown to their English-speaking participants), the participants' matching performance fell into chance level. This led Maltzman et al. to cast doubts on the claimed universal intercessory connection between sound and meaning, and to suggest that "…the ability to match foreign equivalents is based upon complex kinds of learning, involving, we would surmise, mediated generalization" (p. 251). In line with this, Brackbill & Little (1957) translated stimuli with the most

frequently used concepts in Indo-European languages into noncognate languages: Hebrew, Japanese, Chinese and English, and requested English subjects to mark the meanings as "same" or "different" in English-Foreign and Foreign-Foreign word pairs. The results revealed that not all English-Foreign and Foreign-Foreign word pairs showed above-chance accuracy. Further item analysis showed that when there were similarities between word pairs in terms of word length, types of vowels and consonants, hyphenation, and connotation, the accuracy level of marking stimuli as to their sameness was increased. Based on the subjects' relatively poor performance and the high influence of objective stimulus characteristics, Brackbill and Little supported Maltzman et al.'s argument that there is no naturally motivated sound symbolism in language.

These apparently conflicting results as to the existence of naturally motivated sound symbolism in language required further investigation. Consequently, a number of psycholinguistic works on sound symbolism were conducted in the 21st century, attempting to find traces of natural iconicity through speakers' online processing of mapping rather than their off-line judgements under the assumption that judgements "are a rather indirect measure of language use, being off-line and susceptible to metacognitive strategies" (Perniss et al., 2010, p. 7).

2.3 Advantage of iconicity in language processing

If certain sounds are directly mapped on to the referents being depicted, there may be benefit from such iconic mapping in the comprehension and production of language. Using an implicit interference task, Westbury (2005) showed that English speakers processed nonce words faster when the stimulus items were presented enclosed by shapes that were congruent with Köhler's (1929) sound-shape symbolic patterns. Inside the spiky or curvy shapes, he visually presented nonce words of different phonological structures, in terms of the number of stops and continuants (e.g., 'kide' and 'lole'), and asked participants to decide whether or not the word was a real word. Reaction times for correct decisions were significantly slower when the stop nonce words appeared in the curvy shapes and the continuant nonce words appeared in the spiky shapes compared to the reversed condition (i.e., congruent sound-symbolic condition). From the findings of the positive sound-symbolic effect on speakers' online lexical decisions, Westbury suggested that sound-shape symbolism has a psychological reality.

Similarly, Kovic et al. (2010) examined the psychological reality of sound-shape symbolism, using an implicit learning categorisation task. During the learning phase, participants in a congruent sound-shape symbolic condition were trained to match rounded shapes with the articulatorily "round-sounding" label 'mot' and angular shapes with the "sharp-sounding" label 'riff'. Participants in an incongruent sound-shape symbolic condition were trained to label the shapes in a reversed way. Subsequently, participants in the two different conditions were asked to determine whether or

not the presented label-shape pairings matched with what they had learnt. The reaction times were significantly faster for the participants in the congruent condition compared to the participants in the incongruent condition. This indicates that speakers are sensitive to sound-shape symbolism and further, that sound-symbolic relationships may benefit the learning of natural languages.

In line with this, Nygaard et al. (2009) provided direct evidence for the effect of sound symbolism on natural language learning in adults cross-linguistically. In learning meanings of novel Japanese words, three groups of English speakers were assigned to three different conditions: the first group learned Japanese words with correct English translations ("the match condition"), the second group learned with English antonyms of the target Japanese words ("the opposite condition"), and the third group learned with randomly selected English words ("the random condition"). Then, in a forced-choice test, all participants were asked to distinguish the English meaning that they had learnt for the given Japanese word from a random meaning. As a result, participants in the match condition were quicker and more accurate in choosing the meanings that they had learnt than the participants in the random and the opposite condition. This suggests that there are non-arbitrary sound-meaning mappings occurring across languages and further, that learners' sensitivities to such mappings facilitate word learning. Additional evidence for such a claim is seen in the participants' performance in the "opposite" condition, which displayed a better learning performance compared to those in the random condition. The authors pointed out that antonyms occur along the same semantic domain with the target words, although they hold opposite semantic value with each other. Therefore, learners can utilise their sensitivity to the same sound-symbolic relationships to some extent, resulting in a slight advantage in online lexical acquisition.

Notwithstanding this, Monaghan et al. (2012) urged caution against uncritically accepting the reported advantage of iconicity in language learning by testing the role of sound symbolism on individual word learning rather than the learning of categories. In their study, English-speaking participants learned the regular co-occurrences between a set of objects that varied in terms of their shapes (angular vs. rounded) and a set of aurally presented words that varied in terms of their consonant quality (plosive vs. continuant) or vowel quality (close front vs. open back) through multiple learning trials. After the learning phase, they heard the nonce word and were asked to choose, from two alternative shapes, the object which it referred to. Participants' correct matching rates were significantly better when the learnt sound-shape mappings were congruent with the previously reported sound-shape symbolism (plosive-angular and continuant-rounded) than when they were in the incongruent condition (plosive-rounded and continuant-angular) demonstrating that sound symbolism facilitates learning. However, the same effect of sound symbolism was not observed when the target and foil objects were from the same shape categories (both rounded or both angular). From the fact that sound symbolism only assists learning of word-category mapping,

Monaghan et al. concluded that "the effect of sound symbolism on language learning, in terms of pairing words and shapes, proved to be far more constrained than has been characterized in previous studies of sound symbolism" (p. 1161). The limitation in the role of sound symbolism in adults' language learning requires further empirical bases to measure the processing efficiency of sound symbolism and thus, the following section adds a review of some more recent studies that examined the sound-symbolic effect on language processing at the earlier stages of lexical development.

2.4 Advantage of iconicity in language development

If certain aspects of sound symbolism are largely based on natural motivation, one might expect such iconic mappings to be recognised right from the onset of language development. However, interestingly, DeLoache (2004, 2005) showed that her 9-month-old participants failed to treat a depicted object symbolically by trying to grasp at the photos of individual objects as if they were real objects. From this, she claimed that, when a symbol bears great resemblance to an object it depicts (i.e., highly iconic symbols), infants have a difficulty to acquire the symbol system. The degree of iconicity also may not correlate with ease of early language development in sign language. Orlansky and Bonvillian (1984) measured the percentages of iconic signs of 10-month-old children of deaf parents until they reached the age of 18 months. As a result, they found that the proportions of iconic signs in their first 10 signs and in their 18-month vocabularies were only 30.8% and 33.7%, respectively, leading to the idea that iconic signs are not necessarily easier to acquire than non-iconic signs in sign language. Nervertheless, such limitations on the advantages of iconicity in acquisition are unlikely in spoken languages. Indeed, Maurer et al. (2006) found that 2.5-year-old English-speaking children are sensitive to sound-shape symbolism. They presented a pair of drawings to their child participants and asked them a question such as, "My friend Mr Green Rabbit drew pictures of his favourite toys. He calls them funny names. One is called Bamu 'baa-moo' and the other is called K[ʌ]t[ej] 'kuh-tay'. Which one do you think is Bamu?". For comparison, English-speaking adults were also tested under the same condition. The results showed that not only the adults but also the children significantly mapped the rounded shapes with nonsense words containing rounded vowels [a] and [u] (e.g., bouba), and the angular shapes with nonsense words containing unrounded vowels [i], [ej], and [ʌ] (e.g., k[ej]ki).

The sound-shape symbolism is also recognised by prelinguistic infants. Asano et al. (2015) presented preverbal 11-month-old infants with angular and round shapes with spoken nonsense words that were either sound-symbolically congruent (e.g., a round shape with a nonsense word 'moma') or incongruent (e.g., a round shape with a nonsense word 'kipi'). They then measured the differences in their infant participants' brain activity between sound-symbolically congruent and incongruent conditions using Electroencephalogram (EEG). The results showed increased gamma-

band amplitude, intensified large-scale phase synchronisation of neural oscillations, and increased event-related potential (ERP) amplitude in the incongruent condition compared to the congruent condition. From the finding that the incongruent condition required more processing effort from infants, the authors concluded that 11-month-olds' brains are sensitive to sound-shape symbolism. Ozturk et al. (2013) also tested whether 4-month-old infants could distinguish sound-symbolically congruent sound-shape mappings (i.e., pairings between angular shape with voiceless consonants and front vowels, and between rounded shape with voiced consonants and back vowels) from sound-symbolically incongruent sound-shape mappings. The experimenters paired two nonsense words 'bubu' and 'kiki' with angular or curvy shapes and presented them sequentially to 4-month-old infants to examine any difference in the infants' looking time between the congruent and incongruent conditions. The results showed that infants looked longer at incongruent pairings ('bubu' with angular shape and 'kiki' with curvy shape) than at congruent pairings, at a statistically significant level. From this, Ozturk et al. suggested that sound-shape symbolism is a result of inherent relationships between sound and meaning, rather than arising from possible statistical regularities in a given language. Along a similar line, Peña et al. (2011) demonstrated that infants as young as 4 months are sensitive to size-sound symbolism. They created monosyllabic nonce words containing either high front vowels (i.e., [i], [e]) or low back vowels (i.e., [o], [a]) and examined infants' preferences for certain vowel and size mappings, using eye tracking. Infants from Spanish-speaking environments directed their first gaze and looked longer at a small object when they heard words with high front vowels. Conversely, they directed their first gaze and looked longer at a large object when they heard words with low back vowels. (Although infants looked longer at congruent pairings than at incongruent pairings, unlike Ozturk et al.'s finding, both studies drew the same conclusion – that infants can differentiate between congruent and incongruent sound-meaning mappings). These differences in looking times support the hypothesis of naturally motivated size-sound symbolism, developed by Sapir (1929).

In line with this, other experiments demonstrated that such iconic sound-meaning correspondences influence some aspects of children's language learning. Imai et al. (2008) presented pairs of video clips that showed either sound-symbolically congruent or incongruent actions with each of six novel Japanese mimetics for walking to Japanese 2-year-olds and asked them to point to the video that the aurally presented nonsense mimetic referred to. The results showed an above-chance level of correct guessing rates, indicating that Japanese sound symbolism is "biologically grounded" and thus recognised at an early stage of lexical development. An additional verb-learning task showed that 3-year-old Japanese children succeeded in generalising the meaning of novel sound-symbolic mimetics but not of non-sound-symbolic verbs to situations of the same action, but with different actors. This led the authors to further suggest that the iconic

sound-action mappings bootstrap early verb learning. Kantartzis et al. (2011) provided cross-linguistic evidence for the sound-symbolic effect on early verb learning by showing that Japanese sound symbolism helps English-speaking children to learn new verbs. In their verb generalisation task, English-speaking 3-year-olds were taught to learn the nonce sound-symbolic Japanese mimetics that were used in Imai et al.'s (2008) study to refer to different manners of walking, and also arbitrary verbs that do not possess any sound-symbolic relations to the referent actions of walking. The experimenters asked the participants to match the newly taught words in both sound-symbolically matching and non-matching conditions with video clips that showed the referent actions that they had learnt. For each testing verb, participants were given two video clips from which to choose: one with a different actor carrying out the same action as they had learnt ("same-action"); and the other with the same actor carrying out a different action from the one they had learnt ("same-actor distractor"). Consistent with Imai et al.'s (2008) findings, English-speaking children failed to generalise the non-sound-symbolic nonce verbs to a new instance in which the different actor performed the same referent action that they had learnt. However, they succeeded in the generalization task when the testing verbs were the nonce sound-symbolic Japanese mimetics, demonstrating that there is universal sound symbolism that children are sensitive to, and that it aids early verb learning across languages.

Yoshida (2012) supported Kantartzis et al.'s findings by showing that there is no significant difference in utilising sound symbolism for verb learning between Japanese- and English-speaking children. She found that Japanese-speaking children have more exposure to sound-symbolic forms compared to English-speaking children, since their parents use more iconic words (in which "the sound of the word itself feels as if it represents the action" such as "bang" or "zig-zag" in English) when describing actions. Given this, she tested whether 1- to 3-year-old Japanese-speaking children were better at using sound symbolism for their verb learning compared to 2- to 4-year-old English-speaking children. The participants in both language groups learnt novel sound-symbolic verbs, derived from the sound-meaning correspondences in existing Japanese mimetics (e.g., *shugshug* for 'gliding back and forth' and *bingbing* for 'popping up and down'), and verbs that are arbitrarily related to the referent actions (e.g., *morphing* for 'popping up and down' and *spogging* for 'gliding back and forth'). Subsequently, they were asked to decide whether the aurally presented nonce verbs matched with the action events in video clips of four different types: same-action with same-actor, same-action with different-actor, different-action with same-actor, different-action with different-actor. The results showed that children in both language groups were significantly better at making correct decisions when the novel verbs were sound-symbolic compared to when they were non-sound-symbolic. In line with Kantartzis et al.'s study, this finding suggests that there is

universal iconicity to which children show sensitivity, regardless of their exposure to such forms, and that this iconicity has advantage in early verb learning.

Overall, the majority of previous psycholinguistic studies of sound symbolism have shown the psychological reality of iconic form-meaning mappings, such as sound-shape symbolism (§2.1) and size-sound symbolism (§2.2). Notwithstanding this apparent language users' sensitivity to the iconicity of the linguistic signs, it is noticeable that the results from several of the word-matching tasks in §2.2 failed to reach agreement as to the natural iconicity of form-meaning mappings across natural languages. This is perhaps because these studies tested universal sound symbolism within normal vocabulary. In line with this, Imai et al. (2008), Kantartzis et al. (2011), and Yoshida (2012) in §2.4 showed that only sound-symbolic words bootstrap children's language processing: Japanese- and English-speaking children learn Japanese mimetics better than non-sound-symbolic verbs. Altogether, these studies lend *a priori* assumption that naturally motivated form-meaning mappings operate only at the margins of the lexicon, i.e., in sound-symbolic vocabularies, and this makes the investigation of the Explanatory Sound-symbolism Hypothesis (that natural motivation prevails over arbitrariness in sound-symbolic vocabularies) worth pursuing in the following chapters.

3 Phonaesthemes and meaning-bearing elements of ideophones in morphological theory

This chapter assesses the status of the meaning-bearing elements of Korean ideophones (MEI's) and of phonaesthemes in English phonaesthemic words in relation to derivational morphology. The aim of this chapter is the elucidation of dimensions along which the properties of several instantiations of sound symbolism can be calibrated and compared to the Structuralists' arbitrary morphemes. The focus begins with phonaesthemes, and then expands to encompass MEI's. Sections 3.1 to 3.5 of this chapter also appear in Kwon and Round (2015).[12]

The status of phonaesthemes has always been fraught with difficulty within a typology of word-formation strategies, because the properties that characterise individual phonaesthemes and those that characterise individual morphological units are neither sufficiently distinct nor sufficiently overlapping. Thus, the question of whether phonaesthemes are part of morphology is not answerable except by fiat, that is, by privileging some observations and discounting others. While individual approaches to morphology may perform this privileging operation for us, the resulting answers typically either follow directly (and uninterestingly) from theoretical axioms, or they require additional arbitrary exclusions of data, and shed little light on the relationship between phonaesthemes and other word-building elements. In response, a different question can be posed: according to what criteria, if any, do phonaesthemes distinguish themselves from non-phonaesthemic, stem-building elements (nPSE's)? This more open-ended approach leads us to identify one core property which most clearly differentiates the two, plus a penumbra of others which either unite them, or which unite phonaesthemes with only some nPSE's, in distinction from others. Having identified phonaesthemic canonicity, we examine whether the defined status of a phonaesthemic phenomenon within morphological theory holds cross-linguistically by conducting a companion analysis of the phonaesthemic units in Korean, the meaning-bearing elements of ideophones (MEI's). We integrate the comparison of phonaesthemes and other stem-building morphology with the comparison of phonaesthemes and MEI's. By doing so, we identify which criteria provide a strong point of differentiation among English phonaesthemes, nPSE's and MEI's, and clarify how MEI's and English phonaesthemes are alike or different vis-à-vis morphology. The methodology used to arrive at this finding is Canonical Typology (Corbett 2005, 2006, 2007, 2010;

[12] In this chapter, 'we' is used to refer to the co-authors of this paper.

Brown et al. 2012). The theoretical characterisation of Korean MEI's and English phonaesthemes made within Canonical Typology in this chapter will complement the later experimental investigation of the natural motivation of the relevant sound-symbolic entities in Chapters 4-6. Consequently, they will provide a balance of formal and empirical bases to cross-linguistically test the ESH, the Explanatory Sound-symbolism Hypothesis.

This chapter is organised as follows. In §§3.1–3.2, cross-linguistic instances of phonaesthemes are introduced, along with their salient empirical properties, and their difficult relationship to morphology more generally. Section 3.3 introduces Canonical Typology and provides an initial comparison between English phonaesthemes and canonical derivational morphology. A canonical analysis of English phonaesthemes is provided in §3.4, followed by a companion analysis of nPSE's from the viewpoint of phonaesthemic canonicity in §3.5. In §3.6, we conduct a canonical analysis of MEI's, based on the canonical criteria of English phonaesthemes. Implications of the comparisons of the canonical analyses of phonaesthemes, nPSE's, and MEI's appear in §3.7, where we propose a coherent place for English phonaesthemes and Korean MEI's within morphological theory and discuss avenues for further enquiry. Conclusions are shown in §3.8.

3.1 Phonaesthemes

Firth (1930) first uses the term 'phonaestheme' to refer to recurrent pairings of sound and meaning such as the English examples *sl-, tw-* and *-irl/url* in (17)–(19).

(17) *sl-* 'pejorative' *slack, slouch, slush, sludge, slime, slosh, slash, sloppy, slug*
(Firth, 1930, p. 184)

(18) *tw-* 'twisting' *twist, twirl, tweak, twill, tweed, tweezer, twiddle, twine, twinge*
(Bolinger, 1950, p. 133; Firth, 1930, p. 186)

(19) *-i/url* 'circular' *twirl, curl, furl, burl, knurl, whirl, hurl, swirl, purl*
(Bolinger, 1950, p. 133)

In Firth (1930), the lexicon is characterised as a densely linked network. Within it are a range of sub-networks, which link the many instantiations of units such as 'phoneme', 'etymeme' (a concept close to many modern linguists' 'morpheme') and 'phonaestheme'. Thus for example, the phoneme /s/ is a network which links together its many instantiations in the lexicon; likewise for the etymeme *slack*, which links the words *slack, slacker, slackers* etc., and so too, the phonaestheme /sl-/ which links the words listed in (17). Perhaps due to this uniformity of representation, the question of whether phonaesthemes are 'a type of etymeme' did not arise for Firth. For later

linguists though, the question of whether phonaesthemes are part of morphology has been one that is worthy of pursuit.

In Hockett's 'duality of patterning' (1960; 1958; 1963) and Martinet's 'double articulation' of language (1960), a firm distinction is made between a 'first articulation' of linguistic units into meaningless phonological atoms, and a 'second articulation' into units that may be associated with a meaning, and whose forms are composed of units from the first articulation. Within this binary division, phonaesthemes undeniably resemble other morphological units, such as the Structuralist's 'morpheme': they are associated with meanings and are often composed of multiple phonological units. Despite this, however, phonaesthemes have regularly been regarded as a phenomenon distinct from morphemes (Blust, 2003; Bolinger, 1950; Waugh, 1992). The reasons which lead scholars to draw this distinction are explored next.

3.2 Current state of the debate

Here we attempt a broad characterisation of the debate over whether phonaesthemes are part of morphology. The question we address has typically been expressed as 'are phonaesthemes morphemes?', but we regard the underlying question to be of general relevance to morphological theory, irrespective of whether one's theory is morpheme-based or not. To do this, we consider the role of theoretical assumptions in §3.2.1, of empirical phenomena and their inclusion or exclusion from the data base in §3.2.2, and choices over what data to take as representative of the class of phonaesthemes, or the class of nPSE's, in §3.2.3.

3.2.1 The role of theoretical assumptions

If the question is, are phonaesthemes a part of morphology?, then the answer will be sensitive to one's definition of morphology. In research on phonaesthemes, morphology is typically discussed in terms of its units, which are overwhelmingly termed 'morphemes', though the implicit or explicit definition of 'morpheme' can and does vary (see Anderson forthc. for a recent overview of the morpheme in linguistic theory). The common point of departure is that morphemes are (perhaps always, perhaps only prototypically) Saussurean signs, this is, they are pairings of form and meaning. Beyond that, three, more precise notions are particularly common in the phonaestheme literature.

The first notion of 'morpheme' places especial emphasis on the exhaustive decomposition of words into morphemes. The central axiom is that if a word decomposes exhaustively into *n* smaller units, then any single one of those units can be a morpheme only if all are. According to this view, phonaesthemes such as Firth's *sl-* in (17) cannot be morphemes, for although *sl-* itself is a pairing of form and meaning, its neighbours – or 'residues' – such as *-ack* in *slack*, and *-ush* in *slush*, are not

pairings of form and meaning, hence not morphemes; and since the residues *-ack* and *-ush* are not morphemes, neither is *sl-*. Such reasoning is applied for example by Bolinger (1950), Rhodes (1994)[13], and Bergen (2004).

The second common notion of 'morpheme' within the phonaestheme literature (e.g., Silverstein, 1994; Waugh, 1992) relaxes the role of taxis and emphasises Saussurean signs. On this view phonaesthemes are, if not morphemes, then at least very similar, since both units indisputably link form to function.

A third calculus is proposed by Blust (1988, p. 5), who identifies three criteria which between them refer to both taxis and meaning: (i) the element in question can appear independently; (ii) it has a recurrent meaning; (iii) its residue has a recurrent meaning. On Blust's view, morphemes will meet at least one of criteria (i) and (iii), and perhaps (ii) also, whereas phonaesthemes meet only criterion (ii).

One might imagine that with taxonomic principles such as these in hand, questions over phonaesthemes and their relationship to morphemes would be an open and shut case, but other factors come into play.

3.2.2 The empirical nature of phonaesthemes and morphemes

We next survey the empirical observations that figure most prominently in the literature on phonaesthemes. We also compare them where possible with parallel observations about morphemes, with the aim of clarifying whether the traits ascribed to phonaesthemes are uniquely phonaesthemic or not. Doing this will lead naturally into the discussion of representative data, in §3.2.3.

3.2.2.1 Meaningless residues

The majority of phonaesthemic words in English decompose into a phonaestheme such as *sl-*, and a residue such as *-ack*, a piece of form with no meaning to which it is paired recurrently throughout the lexicon. As we saw in §3.2.1, the existence of such residues is sufficient for some researchers to deem *sl-* as non-morphemic. Compare, however, a residue such as *cran-* which appears beside *-berry* in English (Bloomfield, 1933; Uhlenbeck, 1996). If the axiom of exhaustive decomposition were applied here, then the morphemic status of *berry,* at least in the word *cranberry*, might be disputed.[14] A separate issue is that some phonaesthemic words do decompose exhaustively into phonaesthemes, such as *twirl* (Bolinger, 1950, p. 133) comprised of *tw-* (18) and *-irl* (19). Applying the axiom of exhaustive decomposition or Blust's calculus to *twirl* would indicate that, as least in the word *twirl*, the phonaesthemes *tw-* and *-irl* are in fact morphemes. In sum, residues

[13] As it happens, Rhodes (1994) uses this argument to claim that certain phonaesthemes are morphemes, since stems decompose into them exhaustively. Grounds for skepticism regarding Rhodes' claims are in §3.7.4

[14] On Blust's view, *cran-* is a morpheme, because its residue *–berry* has a recurrent meaning.

which lack a recurrent pairing of sound and meaning are very common in phonaesthemic stems, but they are also found in non-phonaesthemic stems, and they are not found in all phonaesthemic stems.

3.2.2.2 Semantic vagueness, sound symbolism and image iconicity

Phonaesthemes are often characterised as possessing meanings which are vague, unlike many morphemes whose meanings are more 'concrete' (Bolinger, 1950). Similarly, some theorists draw attention to the sound-symbolic and image-iconic nature of phonaesthemes (Rhodes, 1994; Silverstein, 1994; Waugh, 1992). However, morphemes with vague, sound-symbolic and iconic meanings certainly exist; and conversely, phonaesthemes with non-iconic meanings have been confirmed as psychologically real (e.g., Abelin, 1999; Fordyce, 1988; Hutchins, 1998; Magnus, 2000), and some phonaesthemes possess relatively precise meanings, such as "moving light" in (20) or "resonant sounds cut short" in (31).

(20) *fl-* 'moving light' *flash, flare, flame, flicker, flimmer*

(Bloomfield, 1953, p. 159)

3.2.2.3 Departures from one-to-one sound-meaning pairings

Some studies note that a single phonaesthemic form may correspond to multiple meanings, as in (21).

(21) *sl-*	'falling or sliding movement'	*slide, slither, slip, slouch, slump*
	'a falling blow'	*slay, slaughter, slit, sling, slash, slap, slam, slog*
	'slimy/slushy matter'	*slime, slush, slop, slough, slobber, sludge, slosh, sloppy*

(Marchand, 1969, p. 416)

Traditionally, morphemes which exhibit one-to-many form-to-meaning correspondences may be classed as cases of homonomy or polysemy, which raises the question as to whether the phonaesthemes such as in (21) are homonymous or polysemous (Householder, 1946). Responses are varied. Bolinger (1950, pp. 120-125) for example finds conceptual problems with the notion of polysemy specifically when applied to phonaesthemes, a fact which sets them apart from morphemes, whereas Waugh (1992, pp. 23-30) problematizes the distinctness of polysemy and

homonymy in general, and so does not distinguish between phonaesthemes and morphemes in this respect.

Morphemes with single meanings may have multiple forms, or allomorphs. Abelin (1999, p. 7) posits the existence of 'allophonests' (sic), that is, multiple forms of a semantically unitary phonaestheme, after observing that the Swedish *bj-, pj-* and *fj-* all share the meaning 'pejorative'.[15]

In sum, while it can be a nontrivial task to distinguish between two meanings versus one, it seems true to say that both phonaesthemes and morphemes may pair multiple meanings with a one form, and arguably, multiple forms with a one meaning.

3.2.2.4 Constraints on phonological content

Some studies remark upon the phonotactic shape and phonemic content of phonaesthemes (see also §1.3.4.2). The most celebrated phonaesthemes of English are syllabic onsets, as in *sl-, gl-, tw-* or rhymes as in the *-ash* of *bash, crash, smash*, and perhaps the syllabic nuclei which differentiate *drip, drop*. This is a more limited range of shapes than is permitted for English morphemes in general, and the syllabic onsets are distinctively phonaesthemic.[16,17] Oswalt (1994, p. 296) notes the abundance of non-coronal phonemes in the codas of English phonaesthemic words such as *clunk, thump, bop, bam, bang*, in contrast to the general lexicon in which such codas are rarer.

3.2.2.5 Organisation into paradigms

In English, relatively few phonaesthemes enter into paradigmatic oppositions, in the way that the vowels *i, o* do in *drip-drop; ding-dong; plink-plonk*, whereas in languages such as Wasco (Silverstein, 1994) or Korean (Kim, 1977; Sohn, 1999) the paradigmatic organisation of phonaesthemic units is pervasive, to the extent that productive substitution of one for the other is a constant possibility across large swathes of the lexicon (Silverstein, 1994).

Paradigms of phonetically similar phonaesthemes can give rise what Peirce (1955, p. 104) termed diagrammatic iconicity (see also §1.4). In this case two scales, one phonetic and one semantic, align with one another such that two stems whose form differs in a certain phonetic

[15] A question not answered by Abelin is whether such phenomena should always involve a high degree phonological similarity, in contradistinction to morphemic allomorphy. If this were the case, then perhaps the forms in question could be analysed as unitary, given a sufficiently abstract phonological analysis. For example, the *bj-, pj-* and *fj-* variants might reduce to a single form, [labial obstruent]+*j*, and the form *vj-* could be correctly excluded, if we accept the argument that Swedish /v/ functions phonotactically as a continuant rather than an obstruent (Riad, 2013, pp. 57, 70; Round, 2007) .

[16] Other possibilities are attested cross-linguistically. For example, phonaesthemes in Austronesian languages may be single segments, specific CVC syllables, or combinations of specific segments with overall word shapes (Blust, 2011).

[17] Abelin (1999, p. 6) appears to argue the opposite for Swedish, asserting that the shape conditions on Swedish phonaesthemes are comparable those on bound morphemes, though we find the argument unconvincing. For it to hold true, one would need to attend solely to the CV shape of phonaesthemes and ignore both the specific consonants which fill those slots, and the place in the syllable where they occur, since like English, Swedish bound morphemes will either contain vowels or be codas, usually (though not exclusively) coronal; there are no bound morphemes such as *sl-* or *bj-*.

fashion (due to their containing differing phonaesthemes from the same paradigm) will differ in a corresponding semantic fashion. For example in Korean, phonetic consonant strength relates semantically to the intensity or strength of motions in (22).

(22) *pɛŋpɛŋ /pʰɛŋpʰɛŋ* 'A neutral/stronger and more violent motion of circling'

tals'ak /t'als'ak 'A neutral/stronger motion of a light object rising and sinking'

The existence of phonaesthemic paradigms also raises the question of how one should decompose a word such as *drip* into its parts: is it /dɹɒp/ plus a replacive phonaestheme /ɒ/ → /ɪ/; a template /dɹ–p/ plus /ɪ/; an underspecified representation /dɹVp/ plus the missing distinctive features of the vowel; or some other combination? Silverstein (1994) entertains the notion of phonaesthemes being simultaneously present with a morpheme, which one might indicate diagrammatically for English *drip* and *slack* as in (23).

(23)

phonaestheme	i	sl
word	d r i p	s l a c k
morpheme	drip	slack

Whatever solution one adopts however, the essential representational problem here is not one which is limited to phonaesthemes, but rather one which confronts any case of what Martinet (1960/1964, pp. 93-94) termed 'amalgams', where a bipartite meaning corresponds to a form which is difficult to segment. For example, Silverstein's solution could just as well be applied to the representation of *sing* within the paradigm *sing-sang-sung* or *send* within *send-sent*, as in (24).

(24)

	i	d
word	s i ng	s e n d
	sing	send

3.2.2.6 Residues of phonaesthemic paradigms

Phonaesthemes within a phonaesthemic paradigm share a common residue, for example *dr–p* in *drip, drop*. In this case, the residue is not recurrent in the lexicon outside of its phonaesthemic paradigm, although within the paradigm it does recur, with the same meaning across multiple items.[18] In order to express what is common to residues, whether they are like *dr–p* in *drip, drop* or *-ack* in *slack*, one could state the following: residues combine with a set of phonaesthemes which contains one or more members, for example the paradigmatic set *i, o* for the residue *dr–p* and the singleton set *sl-* for the residue *-ack*; other than this, residues do not recur in the lexicon with the same meaning. For expository convenience, we will refer to residues like *dr–p*, which combine with paradigmatic sets, as 'multivalent' and residues like *-ack*, which combine with singleton sets, as 'monovalent'. In English, the majority of phonaesthemic residues happen to be monovalent like *-ack*, while only a minority of residues are multivalent like *dr–p*. However, the relative prevalence of monovalent versus multivalent residues within a phonaesthemic lexicon is clearly subject to cross-linguistic variation. In Korean, for example, the majority of residues, such as *–ɛŋ–ɛŋ* and *–als'ak* in (22), are multivalent. To reflect this fact, we will assume in the discussion which follows that phonaesthemic stems might equally contain monovalent or multivalent residues; we do not assume that either type is more normal. We also note that cross-linguistically, there is no necessary connection between a residue being multivalent and its phonaesthemes being infixal. Although multivalent residues in English such as *dr–p* combine with infixal, vocalic phonaesthemic paradigms such as *i, o*, in Korean for example, the residue *–als'ak* (22) combines with a prefixal, consonantal paradigm *t, t'*, and likewise, Blust (1988, pp. 42–44) identifies Austronesian residues such as *–ak* 'pound, slap' and *–uk* 'pound, hit' which combine with prefixal paradigms such as *b, p* 'action producing a louder/softer sound'.

3.2.2.7 Productivity, lexical access and psychological reality

Hutchins (1998), Abelin (1999), and Magnus (2000) demonstrate in psycholinguistic experiments that subjects were able to access phonaesthemes in English and Swedish and use them productively, when tested on the recognition and production of phonaestheme-containing neologisms. Bergen (2004) finds that if they are frequently attested in the lexicon, then phonaesthemes in English contribute to lexical priming, just as morphemes do (Meunier & Segui, 1999). These results suggest that phonaesthemes are similar to morphology, insofar as they possess a psychological reality for speakers, at both the conscious and subconscious levels.

[18] Note that according to Blust's calculus, this would entail that *i*, *o* and *dr–p* are morphemes, not phonaesthemes.

To sum up §3.2.2, most properties which characterise at least some phonaesthemes also characterise at least some morphemes, including accompaniment by meaningless residues, productivity, lexical priming, semantic vagueness and iconicity, departures from a one-to-one sound-meaning pairing, shape conditions, potential organisation into paradigms, and non-concantenative combinations of form.

3.2.3 The choosing of a representative data set

Arguments in the literature, either for or against the proposition that phonaesthemes are morphology, are made by comparing phonaesthemes with nPSE's, typically 'morphemes'. More specifically, whether implicitly or explicitly, they are made by comparing certain phonaesthemes, regarded as sufficiently representative of the entire class, with certain morphemes, also regarded as sufficiently representative of the entire class. In the previous section we saw that most properties which characterise at least some phonaesthemes also characterise at least some morphemes. As a consequence, it becomes possible to argue in either direction, just by varying one's 'representative' phonaesthemes and morphemes. For example, Bergen (2004) adopts a notion of morpheme centred on exhaustive decomposition; phonaesthemes are deemed not to be morphemes, since typical phonaesthemic words fail to decompose exhaustively while typical morphemic words do. Atypical phonaesthemic exhaustive parsings such as *tw-irl* and atypical morphological phenomena, such as *cranberry* morphs, are mentioned, but for reasons unexplained are not factored into the argument. As a consequence, even though the remainder of the paper demonstrates that phonaesthemes and morphemes behave exactly alike in their ability to trigger lexical priming, Bergen concludes that phonaesthemes are not morphemes, because "the overwhelming majority of words containing phonaesthemes are not compositional" (2004, p. 294). Clearly though, one could alternatively take atypical data into account and say that phonaesthemes *are* morphemes, and that both are only sometimes compositional.

The debate which results is largely dominated by positions that are determined by their prior commitment to or rejection of exhaustive decomposition, and by the selections made among several possible and equally defensible, 'representative' data sets. Meanwhile, little insight has been generated into what the relationship between phonaesthemes and nPSE's is fundamentally like, or what phonaesthemes can contribute to morphological theory.[19]

In pursuit of that end, we next attempt to revitalise the comparison of phonaesthemes and nPSE's using the framework of Canonical Typology. In the sections that follow, our broader typological context is provided by the sketches in §3.2. In its specifics, however, we will illustrate

[19] Bergen's (2004) unconvincing attempt to do so in discussed in §3.7.3.

our approach primarily with data from English and then from Korean, the target languages of investigation in this thesis.

3.3 Canonical Typology

To pursue the question of how phonaesthemes and nPSE's are alike or different, we now apply the methods of Canonical Typology (Brown & Chumakina, 2012; Corbett, 2006). Canonical Typology provides the kind of tools we seek, since it offers explicit mechanisms for organising and interrogating multiple, potentially uncorrelated dimensions of comparison between instances of a given linguistic phenomenon.

3.3.1 The Canonical Typology framework

The canonical method involves three concept parts: the canonical base, canonical criteria, and the canonical core (Brown & Chumakina 2012). The base is a definition or description of a phenomenon P, which is sufficiently broad to delineate a domain that encompasses what the linguists would assess as being both canonical and non-canonical instances of P (Bond, 2012). This broad space is then given a coherent internal structure by a set of criteria. Each criterion C_i defines a dimension within the space, giving the space a more canonical and less canonical end, with respect to C_i. Specific instances of the phenomenon under investigation can then be measured against C_i and assessed as being either more canonical or less with respect to it, and this can be done for each criterion C_1, C_2, C_3..., independently of the others. Finally, amongst all of the instances of phenomenon P assessed in this manner, a small group will constitute the canonical core. These will be highly canonical along many dimensions, and they represent the best, most indisputable cases of P (Corbett, 2007, p. 9).

High canonicity is not to be confused with prototypicality, which may focus on the most visible and frequent instance of the given domain (Corbett, 2005). An analogy to canonicity is the system of cardinal vowels, which are maximally peripheral within the space where specific vowels can be populated (Baerman & Corbett, 2012). On the other hand, an analogy to the prototype is Venus, which is the most visible planet but does not hold special status among other ones (Corbett, 2010). In reality, the canonical ideal, just like cardinal vowels, may rarely if ever be matched by observed instances of the phenomenon under study, nevertheless its role in canonical methodology is essential because it sets a logical end point and enables us to unambiguously demarcate the space of theoretical possibility for instances within the phenomenon.

3.3.2 A canonical core and canonical base for English phonaesthemes

A canonical core contains the indisputable instances of a phenomenon. In the existing literature on English phonaesthemes, there is broad agreement about what a canonical core would contain, along the lines of (25).

(25) A characterisation of the canonical core for phonaesthemes

The most canonical phonaesthemes are:

a. sound-symbolic pairings of sound and meaning;

b. identifiable by virtue of their frequent occurrence in the lexical stems of a language.

Stems containing the most canonical phonaesthemes:

c. have a transparent formal composition;

d. are comprised of the phonaestheme, plus a 'residue' which does not recur as a sound- meaning pairing elsewhere in the lexicon.

Non-canonical instances of phonaesthemes may violate almost all of the specific details in (25a–d), with the exceptions that they always constitute a pairing of sound and meaning, and always contribute to the composition of a lexical stem.

The canonical base (Bond 2012, p. 21) is a description of a phenomenon P, broad enough to encompass both its canonical and non-canonical instances. Ideally, it will also indicate what ought to be considered canonical within that domain. Thus, we propose a base as in (26).

(26) A base for canonical phonaesthemes

A phonaestheme is a sound-meaning pairing which occurs as part of a lexical stem. The most canonical instances are as in (25).

The definitions in (25)–(26) establish a domain that we wish to investigate, and furnish a guide as to where inside that domain the most canonical instances reside. By way of comparison, Bergen (2004, p. 290) defines phonaesthemes as 'frequently recurring sound-meaning pairings that are not clearly contrastive morphemes'. The part of this formulation referring to 'sound-meaning pairings' is reflected in our definition of the base in (26), whereas 'frequently recurring' is part of our canonical core in (25). The latter part of Bergen's definition, 'not clearly contrastive morphemes' does not figure in either our base or canonical core. The reason is that although 'not clearly contrastive morphemes' ought to assist one to judge certain phenomena as non-canonical (namely 'clearly

contrastive morphemes'), it would fail to assist in the task of deciding which, amongst the remaining phenomena, are more canonical or less. Moreover, as we detailed in §3.2, the question as to what constitutes a 'clearly contrastive morpheme' is unresolved in the literature. In contrast, in (25)–(26) we have couched our definitions in terms which can be evaluated empirically, or which rest on theoretical notions about which there is consensus.

3.3.3 A comparison with canonical derivational morphology

Setting aside the issue of the canonical core, the base which we define in (10) describes a domain which is more or less identical to that of compounding and derivational morphology: those aspects of morphology implicated in building lexical stems. While Canonical Typology has been applied widely to inflectional phenomena such as agreement, periphrasis, syncretism, suppletion, and overdifferentiation within inflectional morphology (Baerman, Brown, & Corbett, 2005; Comrie, 2003; Corbett, 2003, 2005, 2006, 2007; Polinsky, 2003), its application to non-inflectional morphology is relatively underdeveloped to date. Corbett (2010) is the sole investigation of synchronic derivational morphology from the viewpoint of Canonical Typology. In his study, Corbett provides the following five criteria.

> Criterion 1 (p. 142): Canonical derived words consist of a base[20] and at least one derivational marker, each of which can be substituted to yield another derived word.
>
> Criterion 2 (p. 144): The meaning of a canonical derived word can be computed regularly from the meaning of the base and the additional meaning of the derivation.[21]
>
> Criterion 3 (p. 145): The form of a canonical derived word is transparent: its structure, consisting of base and derivational marker(s), is evident.
>
> Criterion 4 (p. 146): A derived word has a separate lexical index.
>
> Criterion 5 (p. 146): A derived word includes an additional semantic predicate in comparison with its base.

To provide an initial sense of where phonaesthemes sit with respect to canonical derivational morphology, we asses them against Corbett's criteria. With respect to criteria 1 and 2, typical phonaesthemes differ from canonical derivational morphology. For example, a canonical derived word, *painter*, has two parts; the base *paint*, also found in *painting*, and the affix *–er*, also found in

[20] Note that 'base' here refers to a morphological form, not to the 'canonical base' we referred to in §3.3.2.
[21] The prototypical derivation may include additional idiosyncratic meaning (e.g., many *–er* nouns do not work like *painter*), but not the canonical one.

singer, hunter, runner, and *swimmer* (criterion 1; Corbett 2010, p. 142). The meaning of *painter* is a sum of the base meaning and the attached affix meaning (criterion 2). In contrast, in a phonaesthemic word such as *glow*, the combination of phonaestheme *gl-* (which also appears in *gloss, glitter, glisten,* and *glint*) and the residue *-ow* does not display semantic transparency because the residue possesses no clear meaning (criterion 2), and it does not recur in other forms (criterion 1). With respect to criteria 3 and 5, typical phonaesthemes adhere to the derivational morphological canon. A phonaesthemic word *gl-ow* is segmentable (criterion 3), and irrespective of whether one counts *gl-* or *-ow* as the 'base', the addition of either to the other adds a semantic predicate (criterion 5). Criterion 4 is inapplicable, since neither *gl-* nor *-ow* possesses a lexical index, from which the index of *glow* might differ.

When we view phonaesthemic words through the lens of canonical derivation, they are inconsistent: they appear alternatively as canonical, non-canonical or undefined depending upon the criterion in question. This inconsistency relates back to disagreements in the literature regarding their taxonomic analysis. Those who set phonaesthemes apart from nPSE's by and large focus on something like criteria 1 and 2, relative to which phonaesthemic words are non-canonical; those who lump phonaesthemes and nPSE's together follow something like criteria 3 and 5. We take this as a positive sign. Even at this cursory level, we see that the canonical approach naturally begins to tease out and transparently separate the pivots of disagreement which are much more opaquely embedded within traditional, taxonomic arguments. However, Corbett's criteria were not designed with the intention of evaluating phonaesthemes, and hence they do not cover all points which are of interest. To fill those gaps, we proceed now to canonical criteria designed specifically for investigating phonaesthemes.

3.4 Canonical criteria for phonaesthemes

Here we formulate seven canonical criteria for phonaesthemes, and consider instances which are more canonical and less so, with respect to each criterion. For simplicity, we limit discussion to bipartite lexical stems. A comparison of nPSE's follows in §3.5. The seven criteria are summarized in Table 3-1 below. Following Corbett (2007, p. 11), they are characterized in relative terms: a > b "a is more canonical than b". Each will be explained in turn below.

Table 3-1. Criteria for the canonicity of phonaesthemes

Recurrence	1	The phonaestheme occurs in many lexical stems > in few
	2	It occurs in many parts of speech > in few
Form & meaning	3	It is strongly image-iconic > weakly > not image-iconic
	4	Its form is paired with only one meaning > with many
	5	Its meaning is paired with only one form > with many
Distribution	6	It combines only with non-recurring residues > also with recurring residues > is able to occur alone
Transparency	7	It combines agglutinatively with residue > non-agglutinatively

3.4.1 Frequency among lexical stems

Criterion 1: Occurs in many lexical stems > in few

Phonaesthemes occur not just once in the lexicon, but are recurrent (Bergen, 2004; Blust, 2003; Healy, 2011; Householder, 1946; Nygaard et al., 2009; Parault & Parkinson, 2008). To reflect this within our canonical analysis, criterion 1 states that if a phonaestheme is frequently attested among the lexical stems of a language, this is more canonical than if it is infrequent. With respect to criterion 1, the two examples in (27)–(28) are of differing canonicity: the phonaestheme *cl-* is found in many more stems than phonaestheme *spr-*, and thus with respect to criterion 1, *cl-* is more canonical.

(27) *cl-* 'denoting sound' *cluck, click, clap, clack, clash, clutter, clang, clank, clamber, clamour, clam, clump, clip* (Marchand 1969, p. 410)

(28) *spr-* 'spread' *sprout, spread, spring, sprawl, sprinkle* (Marchand 1969, p. 406)

3.4.2 Frequency among parts of speech

Criterion 2: Occurs in many parts of speech > in few

Phonaesthemes do not in general restrict their occurrences to a single grammatical category. Criterion 2 states that if a phonaestheme is attested among more parts of speech, this is more canonical than if it is restricted to fewer.[22] In English, phonaesthemes are reported only in content words (see Appendix A in Hutchins 1998), such as *gl-* which is found only in nouns (e.g., *glass,*

[22] It is good practice for criteria to be logically independent (Brown, Chumakina, & Corbett, 2012, p. 10). Empirically, one might expect criterion 2 to correlate with criterion 1, though we would note that there is no logical necessity that this would be so.

glimmer, glimpse) and verbs (e.g., *gleam, glisten, glow, glare*). However, we suspect that this is an artifact of a descriptive tradition, in which morphological partials such as the *wh-* in question words such as *where, why*, *whether*, or *th-* in demonstratives such as *that, this*, *thus*, are labelled as 'submorphemes' rather than phonaesthemes (Bloomfield, 1933, p. 47; Jakobson & Waugh, 1979, p. 58). While a full exploration of non-phonaesthemic 'submorphemes' is beyond the scope of the present study, we note that *wh-* and *th-*, which occur in function words, are otherwise highly canonical against most of the criteria we propose here.[23]

Measured against criterion 2, it appears that fully canonical phonaesthemes, which would appear in all parts of speech, are rare and possibly non-existent. As pointed out in §3.3.1, the non-existence of canonical instances is not problematic for the canonical method, because logically extreme instances may hardly occur in actuality (cf. Daniel Jones's cardinal vowels). Notwithstanding this, phonaesthemes can differ from one another on criterion 2. For example, the more canonical *gl-* in (29) occurs in nouns, verbs and adjectives, while the less canonical *-ask* in (30) appears in nouns only.[24]

(29) *gl-*	'visual salience of activity: ... darkness or ponderous activity'	*gloom, gloat, glower, glum*	(Fordyce 1988, pp. 28-29)
(30) *-ask*	(no definition given)	*cask, flask*	(Bloomfield 1953, p. 163)

3.4.3 Image iconicity

Criterion 3: Is strongly image-iconic > weakly > not image-iconic

Since phonaesthemes are sound-symbolic phenomena, and since image iconicity is arguably the most canonical manifestation of sound symbolism (involving, as it does, a resemblance in sound between the signifier to the signified; Feist, 2013), we propose that phonaesthemes are most canonical when they are strongly image-iconic. Criterion 3 states that if a phonaestheme is strongly image-iconic, it is more canonical than if it is weakly so, or not at all image-iconic. Highly canonical examples with respect to criterion 3 include the final velar nasals, stops and nasal+stop

[23] It is also interesting to note that the 'submorphemes' *wh-* and *th-* in English behave partly like non-paradigmatic phonaesthemes and partly like paradigmatic ones. In some stems containing *wh-* and *th-*, such as *who, why, whether, which, this, thus* the residues are monovalent, however in others such as *where, there; when, then; whither, thither*, the residues are multivalent, combining with a paradigm *wh-, th-* or even *wh-, th-, h-*. Submorphemes may therefore be a fruitful target for further investigation.

[24] For some English speakers, *cask* is also a verb. Due in part to the ubiquity of zero derivation in the English lexicon, we are unable to identify other English phonaesthemes which are found solely in stems of one word class. However, if we take Swedish, whose phonaesthemes are similar in most respects to those of English, but in which noun-to-verb and verb-to-noun zero conversion is rare, examples do occur such as *fn-*, found solely in the verbs *fnissa* 'to giggle', *fnittra* 'to giggle', *fnysa* 'to snort' (Abelin 1999, p. 127).

clusters in (31)–(33). Final nasals appear in lexical stems denoting resonant sounds, nasal+stop clusters in stems denoting resonant sounds cut short, and stops in stems denoting abruptly terminating sounds. Oswalt (1994) argues that such phonaesthemes are strongly image-iconic, in that their acoustic properties mirror the acoustics of their denotata, a claim which appears to be supported by the appearance of identical meanings associated with identical sounds, namely final /ŋ/ and /k/, in Austronesian roots (Blust 1988, p. 45).

(31) *-ng*	'resonant sounds'	*bong, clang, ding, twang, boing*	(Oswalt, 1994, pp. 303-304)
(32) *-nk*	'resonant sounds cut short'	*bonk, clank, clunk, clink, boink*	(p. 304)
(33) *-ck*	'abruptly terminating sounds'	*whack, thwack, tick*	(pp. 295, 300)

In contrast, a phonaestheme such as *gl-* in *gloss, glitter, glisten* does not display any image-iconicity (Fordyce 1988, p. 25). An intermediate case may be the phonaestheme s*n-* in *snarl, sneer, sneeze, sniff, sniffle, snore* whose 'nasal' meaning is reflected in the phonetic nasality of /n/.

3.4.4 One meaning per form

Criterion 4: Form is paired with only one meaning > with many

Given that few researchers make explicit mention of the alternatives, we assume that it is canonical for phonaesthemes to possess a strictly one-to-one correspondence between form and meaning, with no polysemy, homophony or allomorphy. A canonical phonaestheme in this respect is *tr-* in (34), meaning 'tread'.

(34) *tr-*	'tread'	*tread, tramp, trample, trip, trudge, trot*	(Marchand 1969, p. 408)

Less canonical with respect to criterion 4 is the phonaestheme *sl-* in (35), which pairs with multiple meanings.

(35) *sl-*	'falling or sliding movement'	*slide, slither, slip, slouch, slump*
	'a falling blow'	*slay, slaughter, slit, sling, slash, slap, slam, slog*
	'slimy/slushy matter'	*slime, slush, slop, slough, slobber, sludge, slosh, sloppy*

Marchand (1969, p. 416)

3.4.5 One form per meaning

Criterion 5: Meaning is paired with only one form > with many

Criterion 5 states that a canonical phonaesthemic meaning will be instantiated by just one form. In practice, this criterion becomes difficult to evaluate if one tries to compare very similar meanings — for example, it is clear that the two forms *blue* and *house* are not paired to one meaning, because their meanings are perfectly distinct, but for the forms *big* and *large*, one might make the argument either way (cf. Waugh 1992, p. 30). Setting aside such issues, it still seems possible to distinguish between differing levels of canonicity with respect to criterion 5. A relatively canonical example is *sw-* in (36). Less canonical examples would include Abelin's 'allophonests', such as Swedish pejorative *pj- ~ bj- ~ fj-* (Abelin 1999, p. 7), and examples such as the English 'grasping' phonaesthemes *cl-* and *gr-* (37)–(38).

(36) *sw-* 'swing, sway' *sweep, swing, swag, swap, swirl, swagger, swat* (Marchand 1969, p. 413)

(37) *cl-* 'grasp' *clutch, claw, cling, close, clasp* (Fordyce 1988, p. 181)

(38) *gr-* 'grasp' *grasp, grip, grab, grapple, grope* (Hutchins 1998, Appendix A)

3.4.6 Non-recurrent residues

Criterion 6: Combines only with non-recurring residues > also with recurrent residues > able to occur alone

Criterion 6 refers to a phonaestheme's residue, and whether the residue is 'recurring', that is, whether the phonaestheme's residue appears with the same meaning in the wider lexicon. In §3.2.2.6 we established that, as a matter separate from recurrence, residues can be multivalent (as when *dr–p* combines with a paradigmatic set of phonaesthemes *i, o* in *drip, drop*) or monovalent (as when *-ow* combines with a singleton set *gl-* in *glow*). In both cases, aside from its combination with the members of its phonaesthemic set, the residue (such as *dr–p* or *-ow*) does not recur with the same meaning in the wider lexicon. Accordingly, in *drip, drop* and in *glow*, the phonaesthemes *i* and *o* and *gl-* are behaving canonically with respect to criterion 6, because their residues are non-recurring. To assess a phonaestheme thoroughly with respect to criterion 6, the question is asked, whether all residues are non-recurring like this; and whether the phonaestheme can stand on its own. Thus for example, according to criterion 6, the phoneastheme *gl-* (39) is canonical, since none of its residues (*-ow, -ance, -are, -eam*, etc.) is recurring.

(39) *gl-* 'visual phenomena' *glow, glitter, glare, glare, glaze, gleam*, etc.

(Bolinger 1950, p. 131)

Likewise, the phonaesthemes *i* and *o*, with a sound-symbolic meaning of 'higher pitched' and 'lower pitched' (40), are canonical with respect to criterion 6 because their residues (*dr–p*, *cl–p*, *d–ng*, etc.) do not recur with the same meaning in the wider lexicon.

(40) *i, o* 'higher, lower pitched' *drip, drip; clip, clop; ding, dong; plink, plonk; tick, tock*

The phonaestheme *sn-* (41) is less canonical with respect to criterion 6, because in *sneer* it is accompanied by a residue whose meaning is recurrent, namely the *–eer* phonaestheme of (42).

(41) *sn-* 'nasal/oral' *snaffle, snap, snarl, sneer, sneeze, snicker, sniff, sniffle,* (Blust 2003, p. 188)

(42) *-eer* 'expression of contempt' *sneer, leer, jeer* (Bergen 2004, p. 294)

Less canonical yet is a phonaestheme which can appear without any residue at all, such as *owl*, which appears in list (43) by Bolinger, or *irk* in list (44) by Hutchins.[25]

(43) *-owl* 'sinister' *owl, prowl, foul, scowl, growl, howl, rowel, bowel, yowl, jowl, cowl*

(Bolinger 1950, p. 123)

(44) *-i/urk* *irk, lurk, shirk, murk* (Hutchins 1998, Appendix A)

3.4.7 Transparency of form

Criterion 7: Combines agglutinatively with residue > non-agglutinatively

[25] Blust (1988, p. 2) notes that among Austronesian 'roots', the only elements which can stand alone are onomatopeotic. The Austronesian 'onomatopes' are a little different to English *irk* and *owl*, in that the meaning of the free-standing element appears to be exactly the same as the meaning imputed to it in bipartite stems (cf. Blust 1988, pp. 33–34). In English, the meaning of the word *owl* for example is not merely "sinister", but carries an addition semantic predicate. Notwithstanding our uncertainty over the status of Austronesian 'roots', this is a point where broader typological research may be informative.

Criterion 7 states that a canonical phonaestheme will concatenate with its residue in a simple, agglutinative fashion to form a stem. Most phonaesthemes of English are canonical in this regard. Non-canonical instances in English are the vocalic phonaesthemes which sit within a discontinuous residue, such as *i, o* within *dr–p* in *drip, drop*. As we mentioned in §3.2.2.6, despite there being a strong correlation in English between a phonaestheme's organisation into a paradigm and its non-agglutinative combination with residues, this is not universal. In Korean, paradigmatic phonaesthemes may combine agglutinatively (§3.2.2.6), and in Semai, the phonaestheme *-m-* 'massiveness' is infixal (Diffloth 1976, p. 259), despite being a singleton element which does not enter into a phonaesthemic paradigm.

3.4.8 A criterion which we do not include

Several researchers emphasise that the ability to discern the sound-meaning pairing of a phonaestheme is dependent on the appearance of the pairing across multiple lexemes (e.g., Bolinger 1950, Blust 1988, 2003). This is in contrast to cases where a meaning is locally computable, for example, as when one infers the meaning of *defibrilate* from the meaning of *defibrilator*, coupled with a general knowledge of English word formation. Because of this, we were at first motivated to propose a criterion stating that the meaning of a canonical phonaestheme should be 'diffuse', that is, discernable only across a large number lexemes. However, upon consideration we find two reasons for refraining from claiming that diffuseness is canonical.

Firstly, it would appear that an expectation of diffuseness is valid only in the case of non-paradigmatic phonaesthemes. As mentioned in §3.2.2.5, paradigms of phonetically similar phonaesthemes can possess diagrammatic iconicity, such that a scale of meaning aligns with some phonetic scale. Such diagrammatic iconicity should cause the meaning of at least some novel phonaesthemes to be locally computable, since the novel meaning could be projected diagrammatically from the phonetics.

A second challenge to any simple notion of diffuse meaning relates to what we might term unexpectedness.[26] It is notable that almost all English phonaesthemes are comprised of multiple segments, either phonotactically as in *sl-, gr-, -ash*, *-irk* or paradigmatically as in *i,o* and arguably *-ng, -nk, -ck*, and this may be no coincidence. If a putative phonaestheme consisted of just one segment, then the alignment of its form and meaning is likely to be perceived as mere chance. We illustrate this for the non-phonaestheme **t-* 'pointed' in (45), noting that although there is numerically more evidence for **t-* than for many of the English phonaesthemes we have cited elsewhere, it simply does not feel convincing to a native English speaker. Possibly, it is only when

[26] I thank an anonymous reviewer of Kwon and Round (2015) for raising this issue.

we encounter a semantic coherence associated with a sufficiently rare string or paradigm of sounds (or perhaps with a rare single sound) that we as speakers or language learners take note.

(45) **t-* 'pointed' *tip, toe, tong, tine, tail, tooth, tack, tusk, taper, tee, torch, tonsil, tower, tube, turret*

For these reasons, we refrain from proposing that diffuseness of meaning, in any simple sense, is canonical for phonaesthemes. However, we do suggest firstly, that something like unexpectedness may be a precondition for phonaesthemes to take on a psychological reality, whether as single phonaesthemes or in paradigms; and secondly, that once a phonaesthemic paradigm is established, it might be extensible for precisely the opposite reason: because the relationship between phonetic form and semantics has been established as expected, and therefore can be exploited. Both of these properties of phonaesthemes require further investigation.

3.4.9 The multidimensionality of phonaesthemic canonicity

In §§3.4.1–3.4.7 we established seven dimensions along which to measure the canonicity of a phonaestheme, and observed more canonical and less canonical instances with respect to each. As with other work in Canonical Typology, a noteworthy outcome of this process is that canonicity with respect to different criteria can at times point in opposing directions (Brown, Chumakina, & Corbett, 2012, p. 6). For example, *cl-* in (27) is more canonical with respect to criterion 1 than *gl-* in (29), because it appears in more lexical stems, yet *gl-* is more canonical with respect to criterion 2 because it appears in more parts of speech. Opposing assessments of relative canonicity such as this are easily multiplied, as between *cl-* (27) and *-i/urk* (44) with respect to criteria 1 versus 6 and so forth.

Because canonical criteria often point in different directions, any attempt to define a set of 'representative phonaesthemes' based on a single criterion, or on a subset of our criteria, or something like them, will predictably lead to results which conflict with similar attempts based on alternative criteria. This conflict is not a consequence of the criteria *per se*, but of the fact that there is variation among phonaesthemes; the criteria merely make important variation apparent. Nevertheless, this conflict, arising out of variation, would appear to be what ultimately underlies ongoing disagreements over what should count as 'representative' in the phonaestheme literature (§3.2.3). Problematic for that debate is the fact that although each researcher's choices may be logical and principled, so too are the choices that underlie opposing interpretations, and so the debate is able to shift from one side to another, without truly progressing. In the next section, we apply our canonical criteria in second manner, in an attempt to find a path forwards.

3.5 The phonaesthemic canon applied to roots and affixes

The debate over phonaesthemes vis-a-vis morphology might progress if it can be demonstrated that some canonical criteria are objectively more important than others when it comes to characterising phonaesthemes in an insightful way — although *a priori* it is not obvious that it will actually be possible to discriminate among the criteria in this fashion. Thus, with a favourable outcome not guaranteed ahead of time, we return to our criteria and attempt to rank them. To do so, we apply our seven criteria to the assessment of non-phonaesthemic stem-building elements (nPSE's), to discover which criteria if any emerge as providing a particularly strong point of differentiation between phonaesthemes and other stem-building morphology.

In §3.3 we defined the base for canonical phonaesthemes as covering sound-meaning pairings which occur as part of a lexical stem. As we observed, not only does this extend sufficiently far to capture non-canonical cases of phonaesthemes, but it also encompasses stem-building morphology more broadly, including roots and derivational morphology. In this section we assess those non-phonaesthemic phenomena against our seven criteria of §3.4, to highlight the similarities and differences between phonaesthemes and non-phonaesthemic morphology, of both typical and atypical types. By doing so, we aim to make a concrete contribution to the comparison of phonaesthemes and other stem-building morphology, which moves beyond the debate we surveyed in §3.2. We are also interested to observe which criteria distinguish most clearly between phonaesthemic and non-phonaesthemic phenomena. As we do so, we are mindful of the fact that not all instances of these phenomena will be assessed in the same way, and that variations within phonaesthemes, or within nPSE's, may be just as informative as variations between them, for our understanding of phonaesthemes vis-à-vis morphology.

3.5.1 Frequency among lexical stems

Criterion 1: Occurs in many lexical stems > in few

Roots and derivational processes will occupy a range of positions relative to criterion 1. For example, the English root *radish* is found in only two lexical stems, *radish* and *horseradish*, and therefore is non-canonical with respect to criterion 1, whereas *head* occurs in many dozens and is highly canonical. Likewise, the suffix *-een* in *velveteen* is rare and hence highly non-canonical, while derivational *-ing* occurs abundantly and is highly canonical. We saw in §3.4.1 that criterion 1 distinguishes canonical phonaesthemes, with greater attestation, from non-canonical with weaker attestation, and here it separates other stem-building morphology similarly. Importantly, evaluations with respect to criterion 1 do not set apart phonaesthemes from other stem forming morphological elements. An element which is highly canonical, or non-canonical, with respect to criterion 1 could just as well be a phonaestheme as not.

3.5.2 Frequency among parts of speech

Criterion 2: Occurs in many parts of speech > in few

In §3.4.2, phonaesthemes were found to exhibit a range of canonicity values with respect to criterion 2. The same is true of derivational processes such as affixation. For example, while the prefix *be-* in the noun *behalf,* verb *belabour,* and the preposition *below* occurs in stems with many parts of speech and hence is highly canonical, the suffix *-ness* is non-canonical because it occurs solely in nouns (recall that we are considering bipartite words only). Roots, however, behave differently. In English, roots combine readily with class-changing affixes and as a consequence can typically be found in bipartite words of many parts of speech. For example, the root *tight* is found in nouns *tightrope* and *tightness*, the verb *tighten*, adjective *tighter* and adverb *tightly*. Consequently, when measured against criterion 2, phonaesthemes and derivational affixes typically pattern more closely together than either does with roots.

3.5.3 Image iconicity

Criterion 3: Is strongly image-iconic > weakly > not image-iconic

Both phonaesthemes (§3.4.3) and roots can be more iconic or less so. For example, *chirp* exhibits a strong resemblance between the signifier to the signified, while *sing* does not. Affixes, it strikes us, are unlikely to be image-iconic. Thus, when measured against criterion 3, phonaesthemes and roots pattern together, insofar as they can be highly canonical, while affixes cannot.

3.5.4 One form, one meaning

Criterion 4: Form is paired with only one meaning > with many

Criterion 5: Meaning is paired with only one form > with many

With respect to criterion 4, we suspect that there may be little difference in the incidence of polysemy/homophony between phonaesthemes, roots and affixes, though ultimately this is an empirical question whose answer may require a significant corpus of considerable semantic sophistication. With respect to criterion 5, it may often be the case that affixes exhibit greater allomorphy than either roots or phonaesthemes.[27] Thus, criterion 4 does little to differentiate phonaesthemes from other stem-building morphology, and criterion 5 may group phonaesthemes with roots, in distinction from affixes.

[27] Though of course, this will depend in any particular case both on the morphophonological facts of the language and on one's analysis of them, since a significant aim of abstract morphophonological analysis is to explain away apparent allomorphy.

3.5.5 Non-recurrent residues

Criterion 6: Combines only with non-recurring residues > also with recurring residues > able to occur alone

In §3.4.6, most phonaesthemes were found to be fully canonical with respect to criterion 6. In a bipartite stem, they were accompanied by a non-recurring residue, and they did not appear alone. Some phonaesthemes were exceptional, such as *sn-* and *-eer* in *sneer*, or *-i/urk* in *irk,* however even these exceptions represented only a minority of the stems in which the phonaestheme in question appeared.[28] This is quite unlike English roots, which regularly appear alone in a stem, and unlike derivational affixes which typically must appear alongside a root, which will have a recurrent sound-meaning pairing of its own. Indeed, even for roots and affixes which sometimes appear with non-recurring residues, such as *berry* which appears with *cran-* in *cranberry*, and *-less* which appears with *reck-* in *reckless*, such appearances are the exception rather than the rule. Consequently, criterion 6 appears to provide a strong point of differentiation between phonaesthemes and other stem-building morphology.

3.5.6 Transparency of form

Criterion 7: Combines agglutinatively with residue > non-agglutinatively

In English, most phonaesthemes concatenate agglutinatively with their residues, and thus are canonical with respect to transparency of form. The same is true of roots and derivational processes, though in all cases exceptions exist, such as the *i, o* phonaesthemes in *drip, drop* (§3.4.7), and the vowel alternation in *sing* and *song*, or *long* and *length*.[29] Thus, criterion 7 does little to differentiate phonaesthemes from other stem-building morphology.

To summarise, criteria 1, 4, and 7 do little to differentiate phonaesthemes from other stem-building morphology. Criterion 2 groups phonaesthemes together with derivational processes such as affixation and apart from roots, while criteria 3 and 5 group phonaesthemes together with roots and apart from derivational processes. Criterion 6, which is concerned with accompaniment by non-recurrent residues, is the sole criterion which clearly differentiates phonaesthemes from other stem-building morphology.

[28] See, however §3.7.4 regarding the controversial view, that potentially large numbers of English stems are exhaustively composed of multiple, recurrent phonaesthemes.

[29] So-called 'zero derivation', such as between (*to*) *walk* and (*a*) *walk* involves meaning but no phonological substance, and hence falls outside of the base which was established in (26) and limits the phenomena under investigation to sound–meaning pairings.

3.6 The phonaesthemic canon applied to meaning-bearing elements in Korean ideophones

In §3.5, criterion 6 was found to be the sole criterion which clearly differentiates phonaesthemes from other stem-building morphology. In this section, in order to examine whether the status of this result holds cross-linguistically, we assess the phonaesthemic units in Korean, the meaning-bearing elements of ideophones (MEI's), against the seven criteria in §3.4, and highlight the similarities and differences in the assessments of phonaesthemes and other stem-building morphology in §3.5 with the assessment of MEI's.

Ideophones, cross-linguistically speaking, are stems whose meanings relate to sensory imagery, and whose phonological structures and morphosyntactic properties often diverge from those of the non-ideophonic lexicon (Dingemanse, 2012a; see also §1.3.2). For languages which possess them, ideophonic stems can often be structurally analysed as containing phonaesthemes, particularly phonaesthemes arranged into paradigms (Blust, 1988, pp. 37-45; Dingemanse, 2011, pp. 173-174; Tufvesson, 2011). Examples of phonaesthemic units within ideophones in Korean (MEI's) include the paradigms in (22) above (based on consonant strength), and in (46) (based on vowel quality).

(46) *piŋkɨl / pɛŋkɨl* 'Twirling of a bigger/small object'

McCarthy (1983) considered that the MEI's based on the three different laryngeal settings of syllable-initial obstruents, lenis, fortis, and aspirated, in Korean ideophones as in (22) are composed of different values of distinctive features ([±stiff v.c] and [±spread gl.]). According to his autosegmental theory of morphology, the specific values of [stiff v.c] and [spread gl.] become autosegmentally associated with the phonologically unspecified consonant slots in ideophones and evoke connotational differences in intensity of perceptual core meanings.[30] On this basis, McCarthy (1983) coined a special terminology for MEI's, "feature-sized morpheme", by positing that "a morpheme can consist of as little as a single phonological distinctive feature, while morphemes composed of segments (as in the familiar languages) are a special case in which the feature bundles happen to be fully specified". The morphological function of distinctive features is also found in the MEI's based on vowel quality; the feature [±low] is linked to the empty vowel slot of *pVŋkɨl* 'twirling of an object' in (46) by autosegmental association and produces designated connotational shifts (e.g., size of the referent) relative to a core, perceptual meaning. Within this autosegmental theory which attends to the underlying form of the MEI, MEI's allow the exhaustive decomposition of an ideophone. The underlying form of an MEI, namely a feature-sized morpheme, corresponds to

[30] Such morphologically-governed operations are also found in the formation of the sound-symbolic lexica of other languages such as Japanese mimetics (Akita, 2009, p. 15) and Semai expressives (Tufvesson, 2011).

several closely related meanings, as shown in (47)-(48), and its multivalent residues, such as *pVŋkɨl* in (46) and *PɛŋpPɛŋ* (capital letter indicates consonant slot unspecified for laryngeal features) in (22), arguably also correspond to perceptual, core meanings.

(47) dark [-low] ‘darkness, heaviness, dullness, slowness, deepness, and thickness’

light [+low] ‘brightness, sharpness, lightness, smallness, thinness, and quickness’

(Sohn, 1999, p. 96)

(48) lenis [–stiff v.c, +spread gl.] ‘slowness, gentleness, heaviness, and bigness’

fortis [+stiff v.c, -spread gl.] ‘compactness, tightness, hardness, smallness, and extra swiftness’

aspirated [+stiff v.c, +spread gl.] ‘flexibility, elasticity, crispness, and swiftness’

(Sohn, 1999, p. 97)

Such compositionality, however, does not occur when attending to the surface form of an MEI. An MEI constitutes one or more phonological features which can produce various surface forms, depending on the pre-specified feature, such as [high], [back], and [round] for the vowel slots in the templates, and thus it is not possible to point to individual segments which belong entirely to the MEI. Given this, we assume that the canonicity of an MEI may be different depending on whether one attends to its underlying or surface form, and thus we measure their canonicity separately against our seven criteria in this section.

The issue of the underlying versus surface form, which possibly yields different outcomes of the canonicity of an MEI, did not arise for the canonical analysis of English phonaesthemes in §3.4. However, English phonaesthemes can also reveal different canonicity values depending on whether one attends to a paradigmatic or non-paradigmatic phonaestheme. For example, measured against criterion 7 (which states that canonical phonaesthemes combine agglutinatively with residues) in §3.4.7, non-paradigmatic phonaesthemes are canonical whereas paradigmatic phonaesthemes are non-canonical. In order to assess how much the differences between phonaesthemes and nPSE’s (see §3.5) are due to the fact that most English phonaesthemes are non-paradigmatic, we also conduct a separate canonical analysis of paradigmatic and non-paradigmatic phonaesthemes here. By comparing the canonical analyses of English phonaesthemes, of both paradigmatic and non-paradigmatic types, and MEI’s, of both the surface and underlying forms with that of other stem-

building morphology against our seven criteria in §3.5, we aim to clarify in a detailed manner which criteria provide a strong point of differentiation between phonaesthemes and MEI's, in respect to nPSE's.

For the assessment of MEI's within the framework of canonical typology, we choose to establish canonical cores anew for the underlying and surface forms of an MEI, instead of using the canonical core for English phonaesthemes described in §3.3.2 because we *a priori* assume that the canonical underlying and surface forms of an MEI may be different from canonical phonaesthemes. Based on previous literature on paradigmatic phonaesthemic units of Korean ideophones, a canonical core for the underlying form of MEI's would contain the characteristics shown in (49).

(49) A characterisation of the canonical core for the underlying forms of MEI's

The most canonical underlying forms of MEI's are:

a. sound-symbolic pairings of form and meaning;

b. identifiable by virtue of their paradigmatic alternation in the ideophonic stems of a language.

Stems containing the most canonical underlying forms of MEI's:

c. have a transparent, bipartite composition;

d. are comprised of the MEI's, plus a 'residue' which is not an isolate, but which recurs as a sound-meaning pairing in the ideophonic lexicon.

A canonical core for the surface form of an MEI, on the other hand, would contain the characteristics shown in (50).

(50) A characterisation of the canonical core for the surface forms of MEI's

The most canonical surface forms of MEI's are:

a. identifiable by virtue of their paradigmatic alternation in the ideophonic stems of a language.

Stems containing the most canonical surface forms of MEI's are:

b. comprised of the MEI's, plus a 'residue' which is not an isolate, but recurs as a sound-meaning pairing in the ideophonic lexicon.

Non-canonical instances of the underlying form of an MEI may violate at least one detail in (49a-d), except that they always constitute a pairing of sound and meaning and that they always contribute to the composition of a lexical stem. Non-canonical instances of the surface form of an MEI may violate at least one detail in (50a-b), except that they always contribute to the composition of a lexical stem. Interestingly, this suggests that the canonical base for the underlying form MEI is the same as the canonical base for English phonaesthemes, seen in (26), which captures instances of not only paradigmatic and non-paradigmatic phonaesthemes but also compounding and derivational morphology. Thus, for a brief assessment of the aspects in which the underlying form of an MEI is like or not like nPSE's when compared to phonaesthemes (both paradigmatic and non-paradigmatic ones), we measure the underlying form of an MEI against Corbett's criteria for derivational morphology below (also see §3.3.3).

> Criterion 1: Canonical derived words consist of a base and at least one derivational marker, each of which can be substituted to yield another derived word.
> Criterion 2: The meaning of a canonical derived word can be computed regularly from the meaning of the base and the additional meaning of the derivation.
> Criterion 3: The form of a canonical derived word is transparent: its structure, consisting of base and derivational marker(s), is evident.
> Criterion 4: A derived word has a separate lexical index.
> Criterion 5: A derived word includes an additional semantic predicate in comparison with its base.

As a result, it appears that a typical underlying form of an MEI adheres to the derivational morphological canon with respect to criteria 1, 2, 3, and 5. For example, the meaning of a typical ideophone *piŋkɨl* is computable from the meaning of the multivalent residue *pVŋkɨl* 'twirling of an object' and that of the MEI [-low] 'augmentative' (criterion 2), and both the multivalent residue and MEI recur in other forms within the ideophonic paradigm (criterion 1). Furthermore, an ideophone *piŋkɨl* 'twirling of a big object', is transparently decomposed into its parts *pVŋkɨl* 'twirling of an object' plus the MEI [-low] (criterion 3), and the affiliation of the MEI to the empty vowel slots in the residue adds augmentative connotation to the core, perceptual meaning (criterion 5). Criterion 4 is inapplicable, since neither the feature-sized morpheme, vowel/consonant quality, nor the residue such as *pVŋkɨl* possesses a lexical index, from which the index of ideophone such as *piŋkɨl* may differ.

The paradigmatic English phonaesthemes show the same behaviour as Korean MEI's with respect to canonical derivational morphology. For example, both the phonaestheme *i* and the multivalent residue *dr–p* in a word *drip* recur in other forms within the phonaesthemic paradigm, yielding word pairs such as *drip-drop*, *ding-dong*, and *plink-plonk* (criterion 1). The phonaesthemic word *drip* displays semantic transparency in the sense that its meaning is a sum of the base meaning 'water falling' and the phonaestheme meaning 'high pitched' (criterion 2). *Drip* is segmentable, regardless of which analysis one adopts to decompose *drip* into parts – as noted in §3.2.2.5, *drip* can be analysed into /dɹɒp/ plus a replacive phonaestheme /ɒ/ → /ɪ/, a template /dɹ–p/ plus /ɪ/ or an underspecified representation /dɹVp/ plus the missing distinctive features of the vowel (criterion 3). Furthermore, the addition of *i* to *dr–p* adds a semantic predicate (criterion 5). Criterion 4 is inapplicable, since none of *i*, *o* or *dr–p* possess a lexical index. In contrast with Korean MEI's and paradigmatic English phonaesthemes, non-paradigmatic phonaesthemes adhere to canonical derivational morphology words with respect to criteria 3 and 5, as shown in §3.3.3. The result of this initial canonical analysis is summarised in Table 3-2 below.

Table 3-2. The result of the initial canonical analysis

	Derivational morphology	Non-paradigmatic phonaestheme	Paradigmatic phonaestheme	Underlying form of MEI
criterion 1	√	x	√	√
criterion 2	√	x	√	√
criterion 3	√	√	√	√
criterion 4	√	–	–	–
criterion 5	√	√	√	√

From this initial stage of canonical analysis, we see that paradigmatic English phonaesthemes and the underlying form of MEI's pattern identically vis-à-vis morphology, distinct from non-paradigmatic English phonaesthemes. The criteria that set non-paradigmatic English phonaesthemes apart from derivational morphology are criteria 1 and 2, while there are none that set paradigmatic English phonaesthemes and Korean MEI's apart from derivational morphology (The status of the underlying form of MEI and phonaesthemes of both paradigmatic and non-paradigmatic types within canonical derivational morphology is undefinable with respect to criterion 4). The fact that, even at this cursory level, there are differences as to where paradigmatic and non-paradigmatic phonaesthemes sit relative to Korean MEI's in canonical derivational morphology, makes our

attempt to conduct multidimensional comparisons between phonaesthemes (both paradigmatic and non-paradigmatic ones) and MEI's in morphology worth pursuing. Thus, we now proceed to our seven canonical criteria for phonaesthemes, against which not only the underlying form of an MEI but also paradigmatic phonaesthemes are evaluated. As a parallel observation, we also measure the canonicity of the surface form of an MEI.

3.6.1 Frequency among lexical stems

Criterion 1: Occurs in many lexical stems > in few

The underlying form of an MEI occurs in most ideophones and its use can even be extended to a restricted number of prosaic (i.e., non-ideophonic) words[31] since, as Garrigues (1995, p. 368) puts it, it is "a characteristic feature of the Korean language as a whole". The MEI's based on vowel quality trigger a designated connotational shift in a verb stem, *hupi- / hopi-* 'to scoop out/to scoop out acutely' (Kim, 1984, p. 173), deictic term, *jəki / joki* 'here/here (closer to speaker) (Lee, 1993, p. 258), and colour term, *nuɾəh- / noɾah-* 'dark yellow/yellow' (Lee, 1992, p. 136). The MEI's based on consonant strength also occur in the wider lexicon. Thus, with respect to criterion 1, the underlying form of an MEI is highly canonical. In contrast, it is not possible to measure the surface form of an MEI against criterion 1 because it does not possess invariable individual segments, from which their occurrence in the lexicon can be measured.

Sections 3.4.1 and 3.5.1 showed that phonaesthemes and stem-building morphology behave similarly, as both possess canonical and non-canonical examples. However, the analysis primarily focused on a typical non-paradigmatic phonaestheme. When taking a paradigmatic phonaestheme into account, a different range of canonicity values is revealed – the occurrence of paradigmatic phonaesthemes among the lexical stems is rare and they therefore do not contain canonical instances, unlike non-paradigmatic phonaesthemes. Consequently, with respect to criterion 1, non-paradigmatic phonaesthemes, roots, and affixes pattern closely together, distinct from paradigmatic phonaesthemes and the underlying form of an MEI (see Table 3-3).

Table 3-3. Canonicity values of the three units relative to criterion 1 (C=canonical, NC=non-canonical)

Phonaestheme		nPSE's		MEI	
Non-paradigmatic	Paradigmatic	Root	Affix	Underlying form	Surface form
C, NC	NC	C, NC	C, NC	C	-

[31] Prosaic words that contain MEI's are considered to be "ideophonic prosaic words" (Lee, 1992, p. 135) rather than ideophones because they do not possess perceptual sensory meanings attributed to ideophones.

3.6.2 Frequency among parts of speech

Criterion 2: Occurs in many parts of speech > in few

In Korean, ideophonic stems that contain MEI's are generally described as adverbs (Larsen & Heinz, 2012; Sohn, 1999, p. 101) or adjectives (Fordyce, 1988, p. 142; Kim, 1977). However, they are not confined to one particular syntactic category. Indeed, many ideophonic stems can combine with various class-changing suffixes and, as a result, MEI's occurring inside ideophonic stems can be found in any part of speech (Lee, 1992, p. 93). For example, the vowel/consonant alternation correlating with certain connotational shifts is found in verbs, when ideophonic stems combine with the suffix *-kəɾita* 'keep doing'(e.g., *piŋkɨl- / pɛŋkɨl-kəɾita* 'a bigger/small object keeps twirling'), in adjectives, with the attachment of *-hata* 'be' (e.g., *tuŋkɨl- / toŋkɨl-hata* 'a bigger/small object is round'), and in nouns, with the attachment of *-i* 'something that produces that manner' (e.g., *t'uŋt'uŋ- / t^{h}oŋt^{h}oŋ-i* 'a tall/short person who has a great/greater degree of chubbiness) (Sohn, 1999, p. 101). The morphological processes (such as suffixation) that can alter ideophonic stems into many other parts of speech, however, are excluded from current consideration (recall that we limited discussion to bipartite lexical stems in §3.4). Nevertheless, the occurrences of MEI's among different parts of speech are still observed, since the use of MEI's can be extended to prosaic words, as seen in §3.6.1. In prosaic words, MEI's can appear as a part of a noun (e.g., *puciɾən / paciɾən* 'greater/lesser diligence', *kasi / k'asi* 'neutral/stinging thorn') and verb stems (e.g., *hupi- / hopi-* 'to scoop out/to scoop out acutely', *pok- / p'ok-* 'to stir-fry in a neutral/intensive force'). MEI's can even appear as a form of non-ideophonic demonstratives (e.g., *kɨ / ko* 'that/that (closer to speaker)). From this, it appears that MEI's only contain canonical instances with respect to criterion 2. However, this finding only applies to the underlying form of an MEI, which possesses a certain distinctive feature from which their occurrence among parts of speech can be measured. For the surface form of an MEI, its canonicity is not measurable against criterion 2, just as with criterion 1 above.

In §3.4.2, it was seen that non-paradigmatic phonaesthemes possess both canonical and non-canonical examples. However, paradigmatic phonaesthemes only possess canonical instances with respect to criterion 2, since most of them restrict their occurrences to content words, such as nouns and verbs. For example, *i* and *o* appear in verbs or nouns only, as in *drip, drop; clip, clop; ding, dong; plink, plonk; tick, tock*, as do *i* and *a*, as in *click, clack* and *pitter, patter*. Consequently, when measured against criterion 2, it appears that the underlying form of an MEI is grouped together with roots while a non-paradigmatic phonaestheme is grouped together with an affix. Paradigmatic phonaesthemes, on the other hand, stand alone (see Table 3-4 below).

Table 3-4. Canonicity values of the three units relative to criterion 2

Phonaestheme		nPSE's		MEI	
Non-paradigmatic	Paradigmatic	Root	Affix	Underlying form	Surface form
C, NC	NC	C	C, NC	C	-

3.6.3 Image iconicity

Criterion 3: Is strongly image-iconic > weakly > not image-iconic

The surface form of an MEI can be more strongly image-iconic or less so. In Korean, ideophones can be classified into two semantic subcategories: *uysenge* (phonomime 'depiction of sound') and *uythaye* (phenomime 'depiction of visual/tactile information' or psychomime 'depiction of mental states') (Lee, 1992, p. 88; Sohn, 1999, p. 98). According to Akita's (2009, p. 20) "lexical iconicity hierarchy" (which refers to a hierarchy for iconicity at the word level), image-iconicity (which contains a direct resemblance between form and function) is best represented in phonomime where a sound in the extralinguistic world is imitated by a linguistic sound. Phenomime and psychomime are less iconic than phonomime, since their form-meaning relationship involves a link between acoustic/auditory properties and non-acoustic/non-auditory experiences, such as visual, tactile, or psychological. Those located at the lowest end of the iconicity hierarchy are undoubtedly prosaic words, which exhibit arbitrariness of the signs. On this basis, when measured against criterion 3, highly canonical MEI's include those that occur in phonomimes (51). An intermediate case is the MEI's that occur in phenomimes or psychomimes (52). A non-canonical case is the MEI's that occur in prosaic words (53). In contrast with this, the underlying form of an MEI, which is not phonetically realised, cannot possess any canonical values against criterion 3, given that image iconicity is measured based on the degree of resemblance between the phonetic properties of sounds and the acoustics of their denotata.

(51) *tʰalkak /talkak* 'a sound of strong/neutral rattling'

cikɨl/cakɨl 'a sound of stronger/weaker sizzling'

(52) *p'ancil/pancil* 'great/neutral greasiness'

pintuŋ/pɛntuŋ 'higher/lower frequency of the state of idling around'

(53) *jəki/joki* 'here/here (closer to speaker)'

nuɾəh-/noɾah- 'dark yellow/ yellow'

It was seen in §3.4.3 that non-paradigmatic phonaesthemes possess both canonical and non-canonical examples. Paradigmatic phonaesthemes similarly exhibit different canonicity values with respect to criterion 2. For example, the phonaesthemes *i* and *a* in onomatopoeic words such as *click, clack; pitter, patter* exhibit higher canonicity than those in non-onomatopoeic words such as *snitch, snatch*. Consequently, when measured against criterion 3, the surface form of an MEI patterns closely together with non-paradigmatic and paradigmatic phonaesthemes, and roots, in distinction from affixes (see Table 3-5 below).

Table 3-5. Canonicity values of the three units relative to criterion 3 (I=intermediate)

Phonaestheme		nPSE's		MEI	
Non-paradigmatic	Paradigmatic	Root	Affix	Underlying form	Surface form
C, I, NC	C,N	C, NC	NC	-	C,I, NC

3.6.4 One form, one meaning

Criterion 4: Form is paired with only one meaning > with many

Criterion 5: Meaning is paired with only one form > with many

A single underlying form of an MEI corresponds to several closely related meanings, as shown in (47) and (48). Which of these is instantiated in a given ideophone depends on the meaning of its multivalent residue. For example, the feature contrast, [±low], corresponds to a big/small meaning contrast with the residue *cVk'ɨn*, as in *cik'ɨn / cak'ɨn* 'the snapping of a big/small object', but with the residue *cVk'ɨl*, it corresponds to strong/weak meaning contrast, as in *cikɨl / cakɨl* 'a strong/weak sound of sizzling'. Thus, with respect to criterion 4, the underlying form of an MEI cannot achieve full canonicity. On the other hand, with respect to criterion 5, the underlying form of an MEI is found to be fully canonical, since a canonical phonaesthemic meaning contrast corresponds to just one form (i.e., a size contrast is instantiated by a vocalic MEI [±low] and an intensity contrast is instantiated by a consonantal MEI, the combination of [±stiff v.c] and [±spread gl.]).

As for the surface form of an MEI, it is often the case that a vocalic and consonantal MEI is polysemous/homophonous. For example, *i* and *a* match with multiple meanings, such as big, small (e.g., *cik'ɨn / cak'ɨn* 'the snapping of a big/small object') and strong, weak (e.g., *cikɨl / cakɨl* 'a strong/weak sound of sizzling'). Similarly, most MEI's exhibit great allomorphy. For example, the meaning contrast big/small is represented by *i, ɛ* in *piŋkɨl / pɛŋkɨl* 'twirling of a big/small object',

but by *u, o* in *tuŋkɨl /toŋkɨl* ‘roundness of a big/small object’. Thus, measured against both criteria 4 and 5, the surface form of an MEI is fully non-canonical.

Paradigmatic phonaesthemes are fully canonical with respect to criterion 4 but fully non-canonical with respect to 5. For example, the phonaesthemes *i* and *o* correlate with only one meaning, as in (54), but the meaning contrast, higher versus lower pitched, is instantiated by multiple forms, as in (55).

(54) *i/o* ‘higher/lower pitched’ *ding, dong; clip, clop; drip, drop*

(55) *i/o* ‘higher/lower pitched’ *ding, dong; clip, clop; drip, drop*
i/a ‘higher/lower pitched’ *click, clack; splish, splash; pitter, patter*
i/u ‘higher/lower pitched’ *clink, clunk*

Altogether, criterion 4 places non-paradigmatic phonaesthemes and other stem-building morphology together, in distinction from paradigmatic phonaesthemes and the underlying and surface forms of an MEI, while criterion 5 groups non-paradigmatic phonaesthemes and root together, and separates them from paradigmatic phonaesthemes, affixes and the underlying and surface forms of an MEI (see Table 3-6 below).

Table 3-6. Canonicity values of the three units relative to criterion 4 & 5

	Phonaestheme		nPSE’s		MEI	
	Non-paradigmatic	Paradigmatic	Root	Affix	Underlying form	Surface form
Criterion 4	C,NC	C	C,NC	C,NC	NC	NC
Criterion 5	C,NC	NC	C,NC	C,NC (more)	C	NC

3.6.5 Non-recurrent residues

Criterion 6: Combines only with non-recurring residues > also with recurring residues > able to occur alone

The underlying and surface forms of an MEI always co-occur with other elements which do not recur with the same meaning in the wider lexicon. Thus, they are fully canonical with respect to criterion 6. This is quite similar to most English phonaesthemes, of both paradigmatic and non-paradigmatic types (as shown in §3.5.5) but dissimilar to most roots, which occur alone, and most affixes, which occur with recurring elements.

To summarise, when measured against criterion 6, non-paradigmatic and paradigmatic phonaesthemes and the underlying and surface forms of an MEI pattern together, insofar as most or all of them can be highly canonical, while roots and affixes cannot (see Table 3-7 below).

Table 3-7. Canonicity values of the three units relative to criterion 6

Phonaestheme		nPSE's		MEI	
Non-paradigmatic	Paradigmatic	Root	Affix	Underlying form	Surface form
C (most), I, NC	C	C, NC (most)	C, I (most)	C	C

3.6.6 Transparency of form

Criterion 7: Combines agglutinatively with residue > non-agglutinatively

Non-concatenative morphology involves morphemes stringing together in a non-sequential manner, which may involve either interdigitation, or (partial or full) overlap. Elaborating on the same concepts which underlie his "feature-sized morpheme" analysis of Korean MEI's, McCarthy (1989) argued that underlyingly, morphemes have no linear ordering relations with respect to one another; the relative linear order of morphemes is determined only once they are concatenated phonologically, or otherwise linked autosegmentally to ordered strings of timing slots/nodes within a surface phonologically representation.

In this sense, criterion 7 is inapplicable to the underlying form of an MEI, for which the distinction between concatenative or non-concatenative morphology has no interpretation. On the other hand, the surface form of an MEI exhibits a range of canonicity values with respect to criterion 7. For example, *t, t'* is linked in order with the residue *-als'ak* in (22) and thus it exhibits high canonicity. A non-canonical instance is *i, ɛ*, which is linked with its residue *p–ŋkɨl* 'twirling of an object' in a non-linear order in (46). Regarding paradigmatic phonaesthemes in English, they are found to be fully non-canonical, as seen in §3.4.7.

Consequently, this places non-paradigmatic phonaesthemes, roots and affixes together, distinct from paradigmatic phonaesthemes and the surface form of an MEI (see Table 3-8 below).

Table 3-8. Canonicity values of the three units relative to criterion 7

Phonaestheme		nPSE's		MEI	
Non-paradigmatic	Paradigmatic	Root	Affix	Underlying form	Surface form
C	NC	C	C	-	C, NC

3.6.7 Comparisons among phonaesthemes, MEI's, and derivational morphology

In §§3.4-3.6, an assessment was made of phonaesthemes (of non-paradigmatic and paradigmatic types), derivational morphology, and (the surface and underlying forms of) MEI's against the seven canonical criteria for phonaesthemes, from which we derived the canonicity values of the three word-building units with respect to each criterion in Table 3-9.

Table 3-9. Canonicity values of the three units relative to the seven criteria for phonaesthemes

Criterion	Phonaestheme		nPSE's		MEI	
	Non-paradigmatic	Paradigmatic	Root	Affix	Underlying form	Surface form
1	C, NC	NC	C, NC	C, NC	C	-
2	C, NC	NC	C	C, NC	C	-
3	C, I, NC	C,N	C, NC	NC	-	C,I, NC
4	C, NC	C	C, NC	C,NC	NC	NC
5	C, NC	NC	C, NC	C,NC (more)	C	NC
6	C (most), I, NC	C	C, NC (most)	C, I (most)	C	C
7	C	NC	C	C	-	C,NC

In §3.5, it was seen that only criterion 6 clearly differentiates non-paradigmatic phonaesthemes from other stem-building morphology (both roots and affixes). However, when comparing paradigmatic phonaesthemes and nPSE's, the clear differentiators include not only criterion 6 but also criteria 1, 2, 4, and 7. As for the comparison between the underlying form of an MEI and nPSE's, the clear differentiators appear to be criteria 1, 4, 5, and 6. The surface form of an MEI is, on the other hand, strongly differentiated from nPSE's with regard to criteria 4, 6 and 7.

Counting the number of clear differentiators of phonaesthemes (paradigmatic and non-paradigmatic types) versus nPSE's, and of MEI's (the surface and underlying forms) versus nPSE's, phonaesthemes and MEI's can be ranked in order of their closeness to nPSE's, as in (56) (a > b "a is closer to nPSE's than b").

(56) nPSE's > non-paradigmatic phonaesthemes > the surface form of an MEI > the underlying form of an MEI > paradigmatic phonaesthemes

3.7 Discussion

In §3.6.7 we found that where phonaesthemes and MEI's sit with respect to canonical derivational morphology are not identical; non-paradigmatic phonaesthemes are placed closest to nPSE's followed by the surface form of an MEI, the underlying form of an MEI and paradigmatic phonasethemes. By virtue of our methodology, this finding emerges out of the empirical nature of variation among phonaesthemes, nPSE's, and MEI's and not, for example, because we were committed *a priori* to a definition of morphology based on exhaustive decomposition. Indeed, as we noted in §3.5, it was not evident ahead of time that our methodology would lead to any criterion possessing this property. However, in light of the finding which has emerged, we now discuss implications of it for the place of phonaesthemes (§3.7.1) and of MEI's (§3.7.2) in morphological theory. Then, we review the novelty of our claims (§3.7.3) and consider potential counter-examples (§3.7.4).

3.7.1 The place of phonaesthemes in morphological theory

The most pertinent property that sets typical English phonaesthemes (i.e., non-paradigmatic phonaesthemes) apart from nPSE's is phonaesthemes' canonical accompaniment by non-recurrent residues (criterion 6). Here we ask how morphological theory might accommodate phonasethemes in light of this. Our proposal is as follows.

We assume that any viable theory of morphology will need to find some way to accommodate lexical stems which are composed of a recurring, sound-meaning pairing plus a non-recurrent residue.[32] Given that, it is precisely this class of morphological object where the overwhelming majority of English phonaesthemes occur. In turn, this suggests that a productive method for investigating phonaesthemes will be to ask the more general question, of what the implications are of this whole class of lexical stems for our theory. For example, given current explanations of how compositionality relates to productivity, predictability, innovation, and so forth, what do we predict

[32] Precisely this suggestion is made by Waugh (1992, p. 15), though a motivation for Waugh is to accommodate elements like *cran-* in *cranberry*. The fact that the same construct also accommodates phonaesthemic stems appears to be a fortunate coincidence, whereas for us, it has a clear, empirically grounded motivation independent of cases like *cran-*.

for words composed of a sound-meaning pairing plus a residue? Questions such as these begin to define a research program which may provide insights, not merely into the taxonomic classification of phonaesthemes, but into natural language morphology more generally. To take a concrete example, Blust (2003) has argued that phonaesthemes have the curious property of persisting as patterns across time, despite the individual forms that instantiate them being frequently unreconstructible using the standard comparative method. How this fact relates to the nature of compositionality and its diachronic evolution is a genuinely interesting question, with the potential to shed light on the nature of morphological and lexical semantic systems in general. That is to say, once the question of phonaesthemes and their place in morphology has been framed in a manner such as we propose here, then observations about them, such as Blust's, become integrated into wider theory, and their significance, previously elusive, becomes a coherent input into a broader program of research.

3.7.2 The place of meaning-bearing elements of ideophones in morphological theory

There are a number of properties that set MEI's apart from nPSE's, unlike the case of non-paradigmatic phonaesthemes vs. nPSE's. Particularly, in the case of the underlying forms of MEI's, the most pertinent properties are MEI's' frequent occurrence among lexical stems (criterion 1), MEI's' one-to-many form-to-meaning correspondences (criterion 4), MEI's' canonical pairing with one form per meaning (criterion 5), and MEI's' accompaniment by residues that recur only in a paradigm (criterion 6). It is useful to now examine how morphological theory can accommodate MEI's in the light of this.

It is assumed that a viable theory of morphology should also be able to accommodate lexical stems where a recurring element in a paradigm combines with a residue which otherwise does not occur. Since all MEI's occur in such stems, they will be productively investigated when finding implications of this whole word class for our theory. For example, considering compositionality which relates to predictability, questions such as 'what do we predict for ideophones composed of a paradigmatic sound-meaning pairing plus a residue?' would provide insights into natural language morphology generally. To take a concrete example, Kim (1984, p. 177) argued that the dark and light vowel distinction and its phonosemantic effects in ideophones result from an RTR (retracted tongue root) contrast-based vowel distinction of middle Korean (15^{th}-16^{th} Century), which has been disrupted and changed to the three-way tongue-height-based system of Modern Korean. Vocalic MEI's have retained the phonological character of middle Korean vowels across time in ideophones, despite the majority of other lexical stems that instantiate the vowels having lost such a character. Relating this historical stability of vocalic MEI's to the nature of compositionality has the potential to shed light on both the nature of morphological and lexical semantic systems in general.

Once MEI's are placed in morphological theory, as proposed here, further research can cast a broader typological net by implementing a canonical analysis of phonaesthemes in Wasco (Silverstein, 1994) or Semai (Tufvesson, 2011), where the paradigmatic organisation of phonaesthemic units is pervasive, together with the current canonical analysis of English paradigmatic phonaesthemes, whose appearance is exceptional. By doing so, one can better understand the nature of singleton versus paradigmatic phonaesthemes.

3.7.3 The novelty of integrating phonaesthemes and MEI's into morphology

We are not the first to claim to have integrated phonaesthemes into morphology. Most notably among recent research, Bergen (2004) purports to have investigated "the psychological reality of phonaesthemes, thereby providing an indication of the appropriate place for phonaesthemes in theories of morphology" (p. 291). We regard Bergen's study as significant for its findings into the psychological reality of phonaesthemes. On the other hand, we find its claims regarding morphological theory unconvincing. Bergen argues that a network-based or connectionist theory of the lexicon is required, in order to account for the existence of frequency effects which are tied not just to form, or just to meaning, but to form-meaning pairings. We do not disagree with that. However arguments to that effect have been previously made elsewhere (e.g., Bybee, 1985, 1988; Meunier & Segui, 1999) and their validity does not depend upon the nature of phonaesthemes. Conversely, although Bergen emphasises that phonaesthemes are not morphemes according to the axiom of exhaustive decomposition, no explanation is offered as to how a connectionist lexicon would be superior to other models[33] when tasked with accounting for observations other than lexical priming — for example, Blust's historical observations.

Regarding the integration of MEI's into morphology, there have been no studies which pay attention to the possible difference that the separate analysis of the underlying and surface form of an MEI will bring into the accommodation of MEI's into morphological theory. However, we stress that it is important to attend to the underlying versus surface form of an MEI when attempting to compare MEI's with derivational morphology, since one can give different canonicity values to a defining criterion such as "is it decomposable?" if one looks at the surface versus the underlying form (on the surface, an ideophonic stem is not decomposable because one cannot point to individual segments which belong entirely to the MEI, even though in an underlying manner, one can say that a certain feature belongs to it) and hence generate a different idea as to its relationship with non-sound-symbolic morphemes.

[33] In fact, we find it curious that while purporting to make claims about morphological theory, Bergen considers only classic item-and-arrangement morphology as an alternative to a connectionist model, despite the shortcomings of item-and-arrangement morphology having been recognised, and addressed by subsequent theories, over several decades (Anderson, 1992; Aronoff, 1994; Bauer, 1999; Mathews, 1974).

In sum, Bergen's (2004) theoretical conclusions are little influenced by phonaesthemes, and there has been little consideration given to characterising the surface forms of MEI's only offering minor insight into their theoretical status. In contrast, this chapter has been able to identify where it is that phonaesthemes and MEI's of different forms can be integrated into morphology, by using a method whose outcomes were not predetermined by its initial assumptions. Most significantly, this clarification allows for existing and future knowledge about phonaesthemes and MEI's to inform morphological theory more generally, and for knowledge about other aspects of morphology to inform research into phonaesthemes and MEI's.

3.7.4 Pervasive phonaesthemes without residues?

Before concluding, we address a contentious line of research by scholars such as Householder (1946), Rhodes and Lawler (1981) and Lawler (2006), which proposes either that a large proportion of the lexicon is phonaesthemic, or that many phonaesthemic words decompose exhaustively into phonaesthemes and thus lack residues, or both. Householder (1946) proposes nine meanings for a phonaestheme *-a-*, which is then claimed to occur in three fourths of all English monosyllables whose nucleus is /ʌ/. Lawler (2006) assigns phonaesthemic meanings to sixty-two of ninety-six syllabic rhymes which between them cover more than half of all English monosyllables. Rhodes and Lawler (1981) identify twenty-seven meaningful syllable onsets and many meaningful rhymes, which permit a large proportion of the English monosyllabic lexicon to be exhaustively decomposed in phonaesthemes. To the extent that they are correct, these findings would undermine the proposals we make in this chapter, by falsifying what we have taken to be canonical. However, we suspect that these findings are the results of a flawed research design, whereby an enormous search space is scanned, with the identification of any volume of positive evidence being taken as confirmation of a hypothesis, while ignoring the very large effective volume of negative evidence — a semantic analogue of so-called 'p-hacking' in statistics (Simmons, Nelson, & Simonsohn, 2011). Ultimately though, the veracity of such claims can be investigated empirically, in psycholinguistic studies which painstakingly remove the biases held by researchers and pay appropriate regard to the 'problem of multiple comparisons' (Miller, 1966). In contrast to studies such as those just mentioned, we do find convincing experimental studies such as Abelin (1999), Bergen (2004), Fordyce (1988), Hutchins (1998), Magnus (2000) whose results imply that non-paradigmatic phonaesthemes considered in this chapter, and which have informed our canonical typological approach, have a very real psychological existence. As a consequence of that fact, it is imperative that phonaesthemes be accorded a coherent place in morphological theory, as we have now proposed.

3.8 Conclusion

In this chapter, we used canonical typology that engages directly with the variation that can be found among cross-linguistic instances of sound symbolism and other stem-building elements. Measured against seven canonical criteria for phonaesthemes, we found that only one criterion distinguished itself as a particularly clear differentiator of non-paradigmatic English phonaesthemes versus nPSE's: criterion 6, which pertains to the canonical accompaniment of phonaesthemes (as singletons or as paradigms) by non-recurrent residues.

In contrast, the underlying and surface forms of MEI's were greatly differentiated from nPSE's by exhibiting different canonicity values with each other on criteria 1, 4, 5, and 6 and criteria 4, 6 and 7, respectively. The relatively small number of clear differentiators of typical English phonaesthemes (i.e. non-paradigmatic type) versus nPSE's, compared to MEI's of both underlying and surface forms versus nPSE's, suggests that non-paradigmatic phonaesthemes sit in a space closer to nPSE's than MEI's. This is in line with our initial prediction in §1.4.2, that typical English phonaestheme, which has opaque iconicity, is more arbitrary than MEI's. (Paradigmatic phonaesthemes exhibited different canonicity values from each other on the greatest number of criteria - criteria 1, 2, 4, 6, and 7. However, the occurrence of paradigmatic phonaesthemes is exceptional in English and thus its least resemblance to nPSE's is not of importance). As we have argued, this result is a genuine finding, and not a predetermined outcome of our initial assumptions. Looking upon the result from the viewpoint of morphological theory more broadly, we assume that any viable theory must find a place for lexical stems which are composed of a recurring, sound-meaning pairing plus a non-recurrent residue. Most English phonaesthemes will occur in such stems. Also, a viable theory of morphology must accommodate a lexical stem where a recurring element in a paradigm combines with a residue which otherwise does not occur. Most MEI's will occur in such stems. Once this is established, theoretically interesting questions can then be asked about these two classes of lexical stems, and coherent, theory-internal comparisons can be made among phonaesthemes, MEI's and other morphological phenomena. Whether we wish to regard phonaesthemes and MEI's as 'part of morphology' or not, they may now contribute coherently to the development of morphological theory.

4 The translucent iconicity of Korean vocalic symbolism

Several studies of magnitude phonetic symbolism have considered the relations of HIGH FRONT VOWEL = SMALL (DIMINUTIVENESS) and LOW BACK VOWEL = BIG (AUGMENTATIVENESS) to be near-universal characteristics of the symbolic use of vowels. For the motivations underlying this cross-linguistic phenomenon, Sapir (1929) used the kinaesthetic explanation that the closed vowel /i/ makes the vocal tract smaller than the open vowel /a/, and thus it feels smaller. Relating to this, Ohala (1983) suggested the frequency code hypothesis, by considering acoustic frequency as a crucial factor: high F2 (a high front vowel) is associated with smallness and low F2 (a low back vowel) is associated with largeness, analogous to his observation that low F0 is related to a large vibrating membrane, in turn suggesting large body size and the connotation of largeness (see §1.4.1 for more details). Notwithstanding this cross-linguistic symbolic use of vowels, which appears to possess clear natural bases, some languages, such as Korean (Kim, 1977), Bahnar (Diffloth, 1994), Rengao (Gregerson, 1984), and Nembe (Maduka, 1988), exhibit the opposite form-meaning mapping in sound-symbolic words, leading to the idea that their magnitude symbolism may be based on arbitrary convention rather than natural motivation.

In this chapter, I argue that the natural correspondence between acoustic speech signal, articulatory gesture and auditory perception may also apply, under the right conditions, to the *reversal* of this near-universal pattern of magnitude symbolism. To take concrete examples, languages such as Rengao (Austroasiatic), Nembe (Niger-Congo), and Korean (Altaic) which are widely separated (yet which all share the systematic correlations of *high vowel = big* and *low vowel = small* in their sound-symbolic vocabulary) are claimed to share an association between their higher vowels and an advancement of the tongue root (+ATR or –RTR 'non-retracted tongue root'), thereby expanding the pharyngeal cavity (Casali, 2008). Just as oral cavity size is acoustically associated with frequencies of the second formant, so the pharyngeal cavity size is associated with frequencies of the first formant: a constricted pharyngeal cavity leads to a higher F1 and an expanded cavity to a lower F1 (Halle & Stevens, 1969). Given this, the apparent counter-examples to the near-universal pattern of magnitude symbolism appear to conform to the naturally motivated frequency code theory, only in an unusual manner, by hinging on F1/pharyngeal cavity rather than F2/oral cavity. I refer to this as the Extended Frequency Theory.

This chapter aims to empirically test the applicability of the Extended Frequency Theory in Korean ideophones, where the most aberrant instances of counter-universal magnitude symbolism are manifested – although the contradictory mapping is well established in Korean ideophones (Kim, 1984; Lee, 1992; McCarthy, 1983; Sien, 1997), articulatory and acoustic correlates of the feature ATR are not as well established as for the other two languages mentioned (i.e., Rengao and Nembe). In detail, I investigate Korean- and English-speaking listeners' perceptions of the connotations of nonsense Korean ideophonic stem pairs, which contrast vowels of different heights (i.e., /i~ɛ/, /ɨ~a/, /u~o/) or frontness/backness (i.e., /i~a/) (Experiment 1Ba). By measuring the translucent iconicity of Korean vocalic meaning-bearing elements of ideophones (Korean vocalic MEI's), I provide empirical assessment of whether the magnitude symbolism manifested in Korean ideophones can be explained by the Extended Frequency Theory. If so, then it offers supporting evidence for the ESH, the Explanatory Sound-symbolism Hypothesis. If not, then it offers supporting evidence for the CSH, the Conventional Sound-symbolism Hypothesis.

This chapter is organised as follows. Section 4.1 summarises previous literature on the pharyngeal effect of symbolic vowels in Rengao (Gregerson, 1984), a North Bahnaric language of Vietnam, and Nembe (Maduka, 1988), a New Benue-Congo language of Nigeria. Section 4.2 raises a preliminary question about the applicability of the Extended Frequency Theory to Korean magnitude symbolism by characterising the articulatory and acoustic properties of the symbolic vowels in Korean. In preparation for the cross-linguistic perceptual experiment 1Ba, §4.3 measures the psychological reality of the possible extra phonosemantic effects of vowel harmony (VH), which prevalently governs magnitude symbolism in Korean ideophones. The results showed that there was no significant difference in the Korean participants' meaning-guessing performance between the harmonic and disharmonic condition. The finding that the possible phonosemantic effects of VH in ideophones do not have a detectable psychological reality leads to the exclusion of harmonic ideophones from a final stimulus set for the simplicity of Experiment 1Ba. Proceeding from this, §4.4 reports English-speaking listeners' discrimination of non-English Korean vowels, which are widely used for a manifestation of magnitude symbolism in Korean ideophones (Experiment 1Aa), and §4.5 examines English- and Korean-speakers' perceptions of the nonsense disharmonic Korean ideophonic stem pairs, which contrast the vowels of different heights and/or frontness/backness (Experiment 1Ba). Then, §4.6 discusses the translucent iconicity of Korean magnitude symbolism and the implications of the Extended Frequency Theory in counter-universal magnitude symbolism of Korean ideophones and provides a conclusion.

4.1 Previous literature on the pharyngeal effect of symbolic vowels

4.1.1 Rengao ideophones[34]: Mon-Khmer language family

Many Mon-Khmer languages divide their vowels into two series based on tongue root position (Gregerson, 1984). Henderson (1952) first coined the term 'voice register' to describe this dichotomy between the two vowel sets, as shown in Table 4-1 below.

Table 4-1. Vowel features of Mon-Khmer languages cited in Gregerson (1976, p. 323)

	Written initial consonants	Voice quality	Vowel quality	Pitch
First register	surds	normal, head, clear, tense	more open, onglided	relatively higher
Second register	sonants	deep, breathy, sepulchral, chest, relaxed	close, centring, diphthongs	relatively lower (larynx also lowered)

To take a close look, the first register correlates with a retracted tongue root, which contracts the pharyngeal cavity. The second register, on the other hand, correlates with the opposite tongue-root movement, advanced tongue root, which expands the pharyngeal cavity (Gregerson, 1976; Lindau, 1979). In terms of tongue body height, first-register vowels are lower than corresponding second-register vowels (Miller, 1967). Gregerson (1976) provides a physio-articulatory account of the correlation between perceived vowel height and tongue-root position by quoting Perkell (1969, p. 65) :

> The concavity in the pharyngeal region could be caused by the upward and forward pull of the lower fibers of the genioglossus and by the upward pull of the styloglossus…On the other hand, the convexity could be caused by contraction of the posterior fibers of the hyoglossus in conjunction with anterior fibers of the genioglossus to pull and squeeze the tongue body posteriorly. Acoustically, this concavity in the lower pharyngeal region for high vowels causes an increase in volume in the posterior portion of the vocal tract, and thus contributes to a

[34] There is no firm agreement, between authors or across languages, on the term for a particular class of lexemes which show sound symbolism (see §1.3 for more details). For example, this class is called 'expressives' in South-East Asian languages (Diffloth, 1976) but 'ideophones' in other non-western languages (Doke, 1935), such as Korean (Lee, 1992), Chinese (Mok, 2001) or Gbeya (Samarin, 1965). In this chapter, following Dingemanse (2012b), I use the term 'ideophones' as a common label to refer to sound symbolic vocabularies in Rengao, Nembe and Korean, on the basis that they share similar marked formal and semantic characteristics which separate them from other arbitrary words. This common reference point will provide the unifying ground for the discussion of the frequency theory associated with the claimed counter-examples of magnitude symbolism in specific languages.

lowering of the first formant frequency, which is the principal acoustic characteristic of high vowels.

The reported register effects in Mon-Khmer languages, which can be summarised as in Table 4-2, are clearly exemplified in Rengao, a North Bahnaric language of Vietnam.

Table 4-2. Mon-Khmer register effects

	Tongue-root movement	Pharyngeal cavity size	Vowel height	Acoustic signal
First register	retracted tongue root [RTR]	constricted	low	high first formant
Second register	advanced tongue root [ATR]	expanded	high	low first formant

The symmetric vowel system of Rengao shown in Table 4-3 below indicates that ATR vowels are somewhat higher than the corresponding RTR vowels, conforming to Perkell's (1969) physiological explanation (above) that it is a natural tendency for ATR vowels to advance and raise the tongue.

Table 4-3. Rengao vowel system (Gregerson, 1984, p. 211)

Second register [ATR]		First register [RTR]	
i	u	ei	ou
e	o	ɛ	ɔ
ə		a	

Now, consider the selected Rengao ideophonic pairs, which exhibit the ATR/RTR contrasts for the semantic oppositions associated with the physical size of referents in Table 4-4.[35]

Table 4-4. Rengao ideophonic pairs (Gregerson, 1984, p. 222)

[35] Note that the Rengao ideophonic examples in Table 4-4 display 'vowel harmony' by not allowing vowels from different registers to co-occur within an ideophonic stem.

Vowel contrast (ATR/RTR)	Ideophonic examples	Glosses
i / ɛ	*təngil / tangɛl*	sight of *large/small* head
	təhnin / tahnɛn	sight of *large/small* animal baring its teeth
e / ɛ	*təʔe / taʔɛ*	sight of *large/small* hand
	chəʔnget / chaʔngɛt	sight of *large/small* green object
ə / a	*chəgrə / chagra*	sight of *large/small* prone body
	təpəw / tapaw	sight of *large/small* person crouching
o / ɔ	*həhrot / hahrɔt*	sight of *large/small* person running
	rəhoʔ / rahɔʔ	sight of *large/small* person with broken teeth
u / ɔ	*hədrul / hadrɔl*	sight of tree laden with *large/small* fruit
	ʔjrun / ʔjrɔn	*large/small* person standing

From the examples above, it is readily noticeable that Rengao ideophones exhibit the opposite correlations to *high vowel = small (diminutiveness)* and *low vowel = big (augmentativeness)* and that they therefore contradict the claimed universal principle of magnitude symbolism – note that Rengao also has a number of examples that conform to the universal pattern of magnitude symbolism, such as *ragɛw* 'tall and very skinny'~ *ragaw* 'tall and thin'. However, those examples that recognise oral cavity factors appear *only* when Rengao's more usual symbolic vowel contrasts also occur in the same register (cf. *rəgəw* 'tall and big' ~ *ragaw* 'tall and thin' ~ *ragɛw* 'tall and very skinny') (Gregerson, 1984, p. 217). The Rengao ideophonic pairs presented here, in turn, challenge not only Sapir's (1929) articulatory justification associated with the oral cavity size effect, but also Ohala's (1994) F2 effect on the symbolic use of vowels. Having presumed that language users make use of physical articulatory gestures and acoustic properties for semantic purposes, this suggests that Rengao magnitude symbolism, which is apparently contradictory to the near-universal magnitude symbolism, may be largely based on arbitrary convention rather than natural motivation.

However, given that Mon-Khmer high vowels are produced by advanced tongue-root movement, which expands pharynx cavity, Rengao magnitude symbolism also can receive articulatory justification by linking pharynx cavity size (instead of oral cavity size) to their symbolic use of vowels. Furthermore, from the fact that the pharyngeal cavity size is acoustically related with F1 characteristics (Casali, 2008; Halle & Stevens, 1969), Rengao magnitude symbolism can also be accounted for by the frequency theory, which claims that low frequencies invoke the impressions of large referential concepts, by hinging on F1 not F2.

Altogether, it is indicated that Rengao magnitude symbolism can hold clear natural bases, just as with the widely held universal magnitude symbolism, as an instance of the Extended Frequency Theory while attending to the pharyngeal cavity instead of the oral cavity, and focusing on the acoustic correlate of ±ATR, the first formant frequency.

4.1.2 Nembe ideophones: Niger-Congo language family

Nembe instantiates a dichotomous vowel system, where nine contrastive vowels are divided into two separate sets by a pharyngeal cavity size feature, [±wide] (Maduka, 1988,1990) (see Table 4-5 below).

Table 4-5. Nembe vowel system (Maduka, 1992, p. 75)

[+wide]		[-wide]	
i	u	I	ʊ
e	o	ɛ	ɔ
		a	

As in Rengao, the Nembe vocalic sets, in which each relates to a different pharynx size, tongue body height, and F1 value, are used to express different size-related senses – note that [a] in [-wide] vocalic set has no [+wide] counterpart and therefore, as an exception, it does not have the contrastive phonosemantic value. For example, consider some Nembe size-related ideophones in Table 4-6 below.

Table 4-6. Nembe ideophonic pairs (Maduka, 1988, p. 110)

Vowel contrast (ATR/RTR)	Ideophonic examples	Glosses
e / ɛ	*degeree / dɛgɛrɛɛ*	*not too low/low* house
i / I	*garakii / garakII*	(standing) strong and erect*/but of smaller object*
	gbalagigbalagi / gbalagIgbalagI	coiling, winding, twisting*/but of smaller object*
o / ɔ	*gororoo / gɔrɔrɔɔ*	straight and *wide/narrow*
u / ʊ	*kagulukagulu / kagʊlʊkagʊlʊ*	crooked */but smaller in size*
	kaguluu / kagʊlʊʊ	twisted, rugged*/but of smaller object*

Nembe ideophones show exactly opposite pairings to the claimed universal principle of magnitude symbolism. However, similar to Rengao ideophones, they correlate higher [+wide] vowels with largeness and their lower [-wide] correspondents with smallness, suggesting that Rengao magnitude symbolism can be also seen to hold clear natural bases, as an instance of the Extended Frequency Theory, regulated by ± ATR equivalent to ±wide.

4.2 Articulatory and acoustic properties of Korean symbolic vowels in ideophones

Korean ideophones alternate vowels between 'light' and 'dark' categories, and create two variants that are different in terms of the speaker's feeling towards the referent size and size-related concepts opposite to the claimed universal of magnitude symbolism (see Table 4-7).

Table 4-7. Korean vowel system in ideophones

Dark	Augmentative	i	ɨ	u
		e	ə	o
Light	Diminutive	ɛ	a	

In detail, the systematic vowel alternation evokes semantic oppositions in various size-derived senses, such as "heavy-light, dark-bright, deep-shallow, murky-clear, thick-thin, hard-soft, far-near, estranged-intimate, loose-tight, large-small, numerous-few, wide-narrow, slow-fast, and long-short" (Nam 1965, p. 51 cited in Garrigues, 1995), with alternations occurring along a height axis (e.g., /ɨ~a/, /u~o/, /i~ɛ/, /ə~a/) as well as a combined height and backness axis (e.g., /i~a/), as shown in the Korean ideophones in Table 4-8. In some cases, the vowel alternation correlating with a

connotation shift in size and size-related concepts extends to non-ideophonic prosaic words, such as *puciɾən ~ paciɾən* ‘diligent ~ diligent even for small matters’ (Lee, 1992, p. 138). However, unlike in ideophones, the semantic contrast, augmentative vs. diminutive, is not clearly exhibited in non-ideophonic pairs: non-ideophonic pairs generally contain one base form with neutral connotation (e.g., *puciɾən* ‘diligent’) and a derived form with either augmentative or diminutive connotation (e.g., *paciɾən* ‘diligent even for small matters’) (Lee, 1992). Some authors (Garrigues, 1995; Kim-Renaud, 1976; Kim, 1984) claimed that ideophones also have a base form, usually dark, from which light variants are derived. However, unlike the base forms in prosaic words, the dark base form in an ideophone does not necessarily convey neutral connotation (e.g., *siŋ.kɨl ~ sɛŋ.kɨl* ‘smiling of a large person ~ smiling of a small person’). Thus, it could be said that vowel alternation which entails semantic contrast in diminutiveness vs. augmentativeness is exclusive to ideophones in Korean.

Table 4-8. Korean ideophonic pairs

Vowel contrast (dark/light)	Ideophonic examples	Glosses
ɨ / a	*nɨs'in / nals'in*	thinness of a *taller/smaller* thing
u / o	*k'umul / k'omul*	*bigger/smaller* motion of wriggling
	tuŋkɨl / toŋkɨl	roundness of a *bigger/smaller* object
i / ɛ	*piŋkɨl / pɛŋkɨl*	twirling of a *bigger/smaller* object
i / a	*cik'ɨn / cak'ɨn*	snapping of a *bigger/smaller* object
ə / a	*pəlt'ək / palt'ak*	*bigger/smaller* motion of springing to one’s feet

Korean ideophones behave similarly to Rengao and Nembe ideophones in terms of their symbolic use of vowels; they exhibit the phonosemantic correlation of high vowels with augmentativeness. However, unlike the other two languages, the symbolic characteristics of the Korean vowels are not readily explained by the pharyngeal effect (i.e., the Extended Frequency Theory), because the dark and light vowel sets are not natural classes that can be distinguished clearly by a distinctive feature, such as [±ATR] or [±wide].

Previously, several researchers have attempted to find a possible ground for this unnatural distinction of vowel sets by introducing semantically based features [dark/bright] (Kim-Renaud, 1978), acoustic features [Deep Voice Resonance] (Kim, 1984), tongue-height based features [±low] (McCarthy, 1983), and tongue-root based features [ATR/RTR] (Cho, 1994; Kim, 2000; Lee, 1992,

1993, 2001). However, there have been no concrete bases for such parameters, other than a diachronic explanation for the ATR/RTR distinction, in that the two vowel classes in Korean ideophones [36] are a historical remnant of an RTR contrast-based vowel distinction of the middle Korean vowel system (15th-16th Century) (Kim, 1984, p. 177). If it is true that the dark and light vowels are correlates of [-RTR] and [+RTR] respectively, as previously claimed, then it is predicted that the dark vowels would have a more expanded pharyngeal cavity than the light vowels (Ladefoged & Maddieson, 1996, p. 300). Thus, it could be said that the counter-examples of the near-universal magnitude symbolism in Korean are also affected by the associated pharyngeal cavity size, as in Rengao and Nembe. However, Yang's (1999) MRI study, which measured the pharyngeal cavity sizes for Korean vowels in each set from the mid-sagittal images, contradicts that expectation. In fact, his study shows that dark /e/ and /ə/ vowels have pharyngeal widths similar to light /o/ and /a/ vowels, respectively. This indicates that the dark and light vowel distinction in ideophones is synchronically incompatible with the claimed articulatory correlates of the feature [±RTR] (see Table 4-9). Therefore, the hypothesised pharyngeal effect on Korean magnitude symbolism loses its synchronic articulatory justification.

Table 4-9. Korean vowel distinction by pharyngeal cavity size

Wide pharyngeal cavity	i	ɨ	u
Narrow pharyngeal cavity	e	ə	o
	ɛ	a	

The acoustic correlates of Korean symbolic vowels also support the status of Korean magnitude symbolism against the Extended Frequency Theory. In another of Yang's (1992, p. 2281) studies, each vowel in both dark and light sets was produced by 30 female speakers in a /h(V)ta/ context, and its formant frequencies (i.e., F1 and F2) were measured subsequently. As a result, it was seen that F1 does not successfully separate the two vowel sets, opposing the prediction made by the Extended Frequency Theory – the dark vowel /ə/ has higher F1 value than the light vowels /ɛ/ and /o/. Figure 4-1 below illustrates the averaged formant frequencies of vowels in Yang's (1992) study and Table 4-10 shows their standard deviation (s.d.) of the Korean female speakers.

[36] The vowel distinction is also used in a specific case of verbal morphology in modern Korean. However, stem-internal vowel alternation between the two vowel classes is present only in ideophones (Kim, 2000, p. 255).

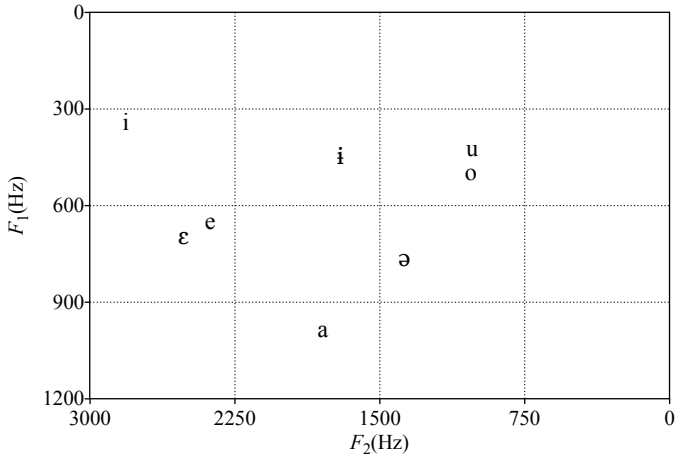


Figure 4-1. Plotting of Korean vowels based on Yang's (1992) production data.

Table 4-10. Average formant frequencies of the Korean monophthongs and their standard deviation (Yang, 1992, p. 2281)

Vowel	F1	s.d. F1	F2	s.d. F2
a	986	107	1794	108
ɛ	677	109	2285	169
e	650	113	2377	77
i	344	48	2814	168
o	499	60	1029	143
u	422	83	1021	139
ə	765	125	1371	108
ɨ	447	68	1703	106

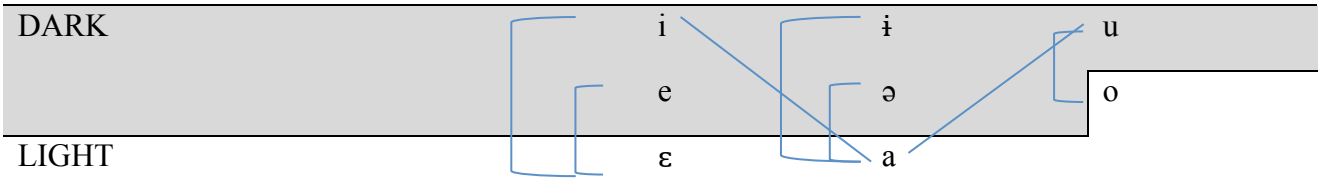
In combination, the evidence shows that the phonological feature [±RTR] for Korean ideophonic vowels that has been widely accepted in the previous literature has neither a strong articulatory nor acoustic basis. This leads to a preliminary conclusion that, unlike Rengao and Nembe, synchronic Korean magnitude symbolism would not be explained by the pharyngeal effect of the Extended Frequency Theory, and thus would not support the ESH. This would be further assured if there is psycholinguistic evidence which empirically confirms that Korean magnitude symbolism does not hold translucent iconicity. In this research, therefore, I conducted perceptual experiments on English- and Korean-speaking listeners' perceptions of nonsense Korean ideophonic pairs that contrast the two semantic classes of vowels (Experiment 1Ba).

Prior to this, the possible influence of vowel harmony on the phonosemantic strength of magnitude symbolism in Korean ideophones was measured, in order to determine if clearer translucent iconicity (if any) in harmonic ideophonic pairs could be predicted compared to disharmonic pairs in the following experiment, 1Ba.

4.3 The phonosemantic effect of vowel harmony in Korean ideophones

To recall, Korean vowels are divided into two semantic categories, *dark* and *light*.[37] According to previous research on the Korean sound-symbolic vowel alternation (Kim-Renaud, 1976; McCarthy, 1983; Kim, 1984; Cho, 1994; Sohn, 1999; Kim, 2000; Lee, 2001; Finley, 2006), light vowels, consisting of /ɛ, (ø), a, o/, carry a diminutive connotation (such as lightness, smallness or fastness) whereas dark vowels, consisting of /i, e, (y), ɨ, ə,u/, carry an augmentative connotation (such as heaviness, largeness, or slowness). Most of the vowel alternations between these two classes occur in the same vertical (vowel height) series. However, there are also some cases where the alternation occurs diagonally, involving a change in the frontness/backness feature (Kim, 1977; Lee, 1993). This results in seven possible alternating patterns, as shown in Table 4-11.[38]

Table 4-11. Korean Vowel Alternation



To take a concrete example, together with Table 4-8, Table 4-12[39] shows existing Korean ideophonic stem pairs that alternate the vowels of the two semantic classes vertically and diagonally in initial syllables while exhibiting the size-related connotative oppositions.

Table 4-12. Korean ideophonic stem pairs that contrast the dark and light vowels

Direction of alternation	Vowel contrast	Ideophonic stem pair	Gloss

[37] Larsen and Heinz (2012) stated that the terms 'dark' and 'light' were used interchangeably with the terms 'dark' (Ying) and 'bright' (Yang) in previous literature.

[38] The two vowels, /ø/ and /y/, which were diphthongised as /wi/ and /we/ respectively in young speakers of the standard dialect of contemporary Korean (Sohn 1999; Finley 2006; Larsen and Heinz 2012), were excluded from investigation following some previous studies (Kim 1977; Lee 1992; Lee 1993).

[39] The /e/~/ɛ/ alternation was excluded in Table 2 because its semantic distinction seems to be disappearing with the ongoing phonological merger between /e/ and /ɛ/ in Korean since World War II (Ingram and Park 1997).

Vertical alternation	i ~ ɛ	*k'i.cək / k'ɛ.cak*	*rougher/smoother* sound of scribbling
		si.k^{h}ɨm / sɛ.k^{h}om	*stronger/weaker* degree of sourness
		ci.k'əl / cɛ.k'al	chattering sound with a *louder/softer* voice
	ɨ ~ a	*kɨ.ɾəŋ / ka.ɾaŋ*	brimming with *more/less* liquid
		kɨk.cək / kak.cak	*rougher/smoother* motion of scrawling text
		tɨl.s'ək / tal.s'ak	state of *heavier/lighter* object being pulled off easily
		tɨm.səŋ / tam.saŋ	*greater/lesser* degree of looseness and sparseness
		k'ɨ.tək / k'a.tak	*heavier/lighter* nodding
	ə ~ a	*k'əŋ.c^{h}uŋ / k'aŋ.c^{h}oŋ*	skipping with *longer/shorter* legs
		həl.t'ək / hal.t'ak	*heavier/lighter* panting
		kəŋ.tuŋ / kaŋ.toŋ	hopping with *longer/shorter* legs
		pəl.t'ək / pal.t'ak	*bigger/smaller* motion of springing to one's feet
		təl.ɾəŋ / tal.ɾaŋ	jingling of *bigger/smaller* bell
	u ~ o	*cuŋ.əl / coŋ.al*	muttering in a *lower/higher* voice
		p^{h}uŋ.təŋ / p^{h}oŋtaŋ	plopping sound of a *bigger and heavier/smaller and lighter* object
		k'ul.t'ək / k'ol.t'ak	swallowing of a *larger/smaller* amount of food
Diagonal alternation	i ~ a	*cil.ɾuk / cal.ɾok*	shape which is *more/less tightly* narrow at some point
		c^{h}il.ɾəŋ / c^{h}al.ɾaŋ	*stronger/weaker* sound of trembling water about to flow
		cil.kəŋ / cal.kaŋ	*rougher/smoother* chewing
		c^{h}i.ɾəŋ / c^{h}a.ɾaŋ	dropping of a *longer/shorter* object
	u ~ a	*mul.kəŋ / mal.kaŋ*	*more/less* squishiness
		p^{h}ul.c'ək / p^{h}al.c'ak	something *big/small* is jumping
		p^{h}ul.s'ək / p^{h}al.sak	plopping down onto the seat *wildly/lightly*

Interestingly, unlike in Table 4-8, Table 4-12 shows that the vowel alternations which create a series of semantic minimal pairs occur not only in initial syllables but also in second syllables, and the vowels within an ideophonic lexical item agree in the semantic features, dark and light (Finley, 2006). This is not surprising because Korean displays vowel harmony (VH) within ideophones by restricting the co-occurrence of dark and light vowels within a word (Cho, 1994; Sohn, 1999; Larsen and Heinz, 2012) .

Indeed, this featural vowel harmony was more active and regular in middle Korean (15^{th}-16^{th} Century). It governed not only ideophones but also the entire vocabulary, because of the presence of a strict dark/light vowel distinction based on a single phonological feature, RTR [Retracted Tongue Root] (Kim 1984). However, due to a historic vowel shift and a number of borrowings from Chinese, the clear RTR-contrast-based harmonic system was disrupted (Kim-Renaud, 1976; Larsen and Heinz, 2012). Consequently, the strict VH in middle Korean has disappeared and left its trace in only a few limited cases in modern Korean: verbal suffix VH, and ideophone VH (Kim, 2000). VH in verbal morphology is different from ideophone VH above, however, in terms of its vowel classification. It only involves /o/ and /a/ for the dark category and considers the rest of the vowels as light vowels. Thus, the suffix initial light vowel /ə/ changes to /a/ only when the final vowel of the preceding verb stem is a dark vowel /o/ or /a/ (see Table 4-13).

Table 4-13. Verbal suffix VH (Cho, 1994, p. 2)

VH class	Stative /-ə/	Past tense /-əs'/	Imperative /-əla/	Gloss
Dark VH	*nah-a*	*nah-as'*	*nah-ala*	'to bear'
	po-a	*po-as'*	*po-ala*	'to see'
Light VH	*s'ip-ə*	*s'ip-əs'*	*s'ip-əla*	'to chew'
	se-ə	*se-əs'*	*se-əla*	'to count'

VH in verbal morphology is different from ideophone VH, not only for the participating vowels in the dark and light vowel classes, but also in terms of its morphological and semantic behaviours: verbal morphology VH occurs stem-externally and does not convey any semantic information, whereas ideophone VH occurs stem-internally and accompanies either an augmentative or diminutive semantic feature, depending on the class of participating vowels in VH. This indicates that although a verbal suffix displays VH, it does not involve any sound-symbolic effect (unlike ideophone VH). Accordingly, VH in verbal morphology will not be discussed further.

Moving on to the ideophone VH system, some of the vowels in the dark category can be classified into an additional vowel category called "neutral" in a certain condition (Garrigues, 1995). For example, dark vowels /i/ and /ɨ/ in non-initial syllables co-occur with either dark or light vowels in initial syllables (Kim-Renaud, 1976; Lee, 1992; Cho, 1994; Sohn, 1999; Larsen and Heinz, 2012), creating disharmonic patterns in ideophones, as exemplified in Table 4-8 and also (57) below.

(57) *siŋ.kɨl / sɛŋ.kɨl* 'smiling of a large/small person'
t'ɨ.k'ɨm / t'a.k'ɨm 'strong/weak pain'
tuŋ.kɨl / toŋ.kɨl 'round involving a large/small circle'
cil.k'ɨn / cal.k'ɨn 'strong/weak tightening'
pul.k'ɨn / pal.k'ɨn 'burst into/in a fit of rage'

Similarly, /u/ becomes neutral when in non-initial syllable position. However, unlike /i/ and /ɨ/, its neutrality is not consistent (Lee, 1992; Cho, 1994; Kim, 2000). Example (58) shows the inconsistent neutral behaviour of /u/ in non-initial syllables.

(58) Neutral /u/	*sil.c'uk / sɛl.c'uk*	'a more/less sulky face'
	p'i.cuk / p'ɛ.cuk	'a more/less jagged shape'
Dark /u/	*kəŋ.tuŋ / kaŋ.toŋ*	'hopping with longer/shorter legs'
	cil.ɾuk / cal.ɾok	'shape which is more/less tightly narrow at some point'

The light vowel /a/ also exhibits similar inconsistent neutrality in non-initial syllables (see examples in (59) below).

(59) Neutral /a/	*t'uk.t'ak / t'ok.t'ak*	'sound of light/lighter hammering'
	p'i.t'ak / p'ɛ.t'ak	'a more/less tilted shape'
Light /a/	*kɨk.cək / kak.cak*	'rougher/smoother motion of scrawling text'
	k'ul.t'ək / k'ol.t'ak	'swallowing of a larger/smaller amount of food'

However, Larsen and Heinz (2012), who examined the VH distribution in a corpus of 3972 di- and tri-syllabic Korean ideophonic stems, found that /a/ is harmonic in statistical terms to a greater extent in non-initial syllables (Larsen and Heinz did not provide the specific ratio) than the traditionally neutral vowels, /i/ and /ɨ/, and the partially neutral /u/, which show a more or less equal

distribution of dark and light vowels in the preceding syllables. Following Larsen and Heinz's (2012) categorisation, neutral vowels are here restricted to /i/, /ɨ/, and /u/, that is, to those which enter freely into disharmonic patterns in an ideophonic word.

As mentioned in §4.2, the dark and light vowel sets which serve a basis to the VH ideophone system in modern Korean are not a natural class that can be distinguished by any widely-accepted universal distinctive feature (Finley, 2006; Larsen and Heinz, 2012). Nevertheless, previous efforts to account for the harmonic and disharmonic patterns in Korean ideophones from a phonological perspective using several features, such as [±low] (Kim, 1977; McCarthy, 1983; Sohn, 1986), [±Advanced Tongue Root] or [±Retracted Tongue Root] (Lee, 1992; Lee, 1993; Cho, 1994; Kim, 2000; Lee, 2001), and [±Deep Voice Resonance] (Kim, 1984), are worth noting, since they aid understanding of McCarthy's (1983) idea of the feature-sized morpheme. McCarthy (1983) considered that the ideophonic pairs in Table 4-12 have different connotations, because they contain different morphemes that are as small as distinctive features (see §3.6 for more details). Finley (2006, 2009) also viewed the vowel alternation in Korean ideophones as a morphological process and accordingly, she accounted for harmonic/disharmonic ideophones by making use of the floating features ([+ATR] for dark, and [-ATR] and [-HIGH] for light) in correspondence constraints. In a similar vein, some other authors discussed the vowel alternation and VH in ideophones under autosegmental theory with two mechanical processes: linking and spreading of a feature-sized morpheme. For example, Lee (1993) explained that the two dark vowels in *həlt'ək* 'heavier panting' are changed to their light counterparts in *halt'ak* 'lighter panting' because a feature-sized light morpheme Retracted Tongue Root [RTR] (cf. [+low] in McCarthy, 1983; Sien, 1997; [+DVR] in Kim, 1984) is linked to the first moraic segment and spreads to a non-glide vocalic segment adjacent to the trigger. This phonological operation produces not only harmonic surface forms, such as *halt'ak*, but also disharmonic ones such as *sɛŋkɨl* 'smiling of small person' from *siŋkɨl* 'smiling of big person' where the traditional neutral vowel /ɨ/ cannot receive the feature [RTR].

In this section, I investigate whether the phonological analyses that were reviewed above sufficiently characterize language users' sound-symbolic system, as argued by McCarthy (1983). If there is a psychological reality to the degree of recurrence, in surface forms, of the diminutive morphemic feature [RTR], then the disharmonic surface form, *sɛŋkɨl* should have less apparent diminutive sense than the harmonic correspondent, *halt'ak*. On the other hand, if the psychological reality resides purely in the presence of the underlying autosegmental morpheme, then what happens on the surface should make no difference.

In order to find evidence which distinguishes these two scenarios, I measure a possible difference in the phonosemantic strength between harmonic and disharmonic ideophones by examining how Korean listeners match the relevant connotations of nonsense Korean ideophonic

pairs in two different conditions – harmonic and disharmonic. If there is any extra phonosemantic effect of those harmonic ideophones, which contain more surface evidence of the feature-sized morpheme than disharmonic ones, the Korean participants should exhibit significantly better correct guessing rates on harmonic stimuli, compared to disharmonic stimuli.

4.3.1 Experimental method

4.3.1.1 Participants

Fourteen university students, enrolled in an introductory Korean linguistics course at Kunsan National University in Korea, served as participants on a voluntary basis. All participants were native Korean speakers with no literacy/hearing problems.

4.3.1.2 Selection of existing Korean ideophonic stem pairs

Existing harmonic and disharmonic Korean ideophonic pairs were collated from the Great Standard Korean Dictionary (http://stdweb2.korean.go.kr/main.jsp), developed by the National Institute of the Korean Language. To account for all of the possible variants of vowel alternation occurring in Korean ideophones, the collated stimulus set for disharmonic/harmonic vowel alternations included six items each for a representative vowel contrast in each vertical axis (/i~ɛ/, /ɨ~a/, /u~o/ x 6 items x 2 conditions = 36) and one representative vowel alternation in a different axis (/i~a/ x 6 items x 2 conditions =12) at initial syllables, yielding a total of 48 stimulus pairs.

Searches were made manually through using the detailed search function by typing in three separate key words, -하는 소리, -하는 느낌, -하는 모양 ‘sound, sensation, state’ (author’s translation). This helped select a word that conformed to any of the traditional semantic subcategories of Korean ideophones (Sohn, 1999): *uysenge* (phonomime ‘depiction of sound’) and *uythaye* (phenomime ‘depiction of visual/tactile information’ or psychomime ‘depiction of mental states’). The words then underwent additional semantic and structural checks, so that only those words that exhibited the size-related connotation correlating with a certain vowel alternation (i.e., /i~ɛ/, /ɨ~a/, /u~o/, /i~a/) were included. The word pairs selected by their structural patterns were then classified into harmonic or disharmonic ideophones. Most of the selected ideophones in both harmonic and disharmonic conditions appeared to reduplicate ideophonic stems (e.g., *t’ak’ɨm-t’ak’ɨm* ‘painful repeatedly’) or combine the stems with a verb *hata* ‘do, be’ or verbal suffix *kəɾita* ‘keep doing’ (e.g., *t’ak’ɨm-hata* ‘be painful’ and *t’ak’ɨm-kəɾita* ‘keep being painful’) (Larsen and Heinz, 2012). However, since in this experiment the focus is only on the vowels of sound-symbolic roots, the additional reduplicated parts or verbs were discarded and only the underlying stems (e.g., *t’ak’ɨm* ‘painfully’) were retained. The (harmonic and disharmonic) ideophonic stems were

restricted to di-syllabic forms, in order to control for the syllable count and to keep the experiment simple (ideophones based on monosyllabic stems are rare in Korean). For the harmonic ideophonic stems, however, at least one di-syllabic reduplicated pair based on a one-syllable stem (*tʰuŋ-tʰuŋ/tʰoŋ-tʰoŋ* 'plumpness of something taller/shorter) was included in the stimulus set, because the di-syllabic reduplicated word is similar to a di-syllabic harmonic stem in the sense that both exhibit VH within a morpheme.[40] In terms of the definition of each stimulus item (which is crucial for a meaning matching task), it was taken directly from the Great Standard Korean Dictionary and translated into English by the author. Notably, many of the ideophonic items were homophones. For example, *t'ɨk'ɨm* had three possible meanings: (1) burning sensation when one suddenly touches a fire; (2) enthusiasm when one is under inspiration of someone/something; and (3) pain when one is being beaten or pricked. In this case, a meaning presented to participants in the experiment was chosen randomly between (1) and (3) (both of which evoke relatively separate perceptual sensations); (2) was excluded from the choice as it seemed a metaphorical extension of (1) (both touching a fire and being under inspiration evoke burning sensation). This decision followed the intuition of the author, a native Korean speaker.

4.3.1.3 Creation of nonsense Korean ideophonic stem pairs

The collated harmonic and disharmonic ideophonic stem pairs exhibited the phonetic shape $C_1V_1(C_2).C_3V_2C_4$. The first consonants in the first syllables were manually replaced with random Korean consonants, [m], [n], and [h] to minimise Korean listeners' attempts to use their prior knowledge of Korean. As a result, a maximum of three candidate nonsense word pairs were generated for each existing ideophonic pair, for example, *mɨ.k'ɨm* / *ma.k'ɨm*, *nɨ.k'ɨm* / *na.k'ɨm*, and *hɨ.k'ɨm* / *ha.k'ɨm* for *t'ɨ.k'ɨm* 'stronger pain' and *t'a.k'ɨm* 'pain'. Among those three candidate nonsense pairs, only one pair (that neither violates Korean phonotactics nor appears in the Korean vocabulary) was included in the final stimulus set. All of the chosen nonsense words were additionally evaluated for their nonsensicality by three other native Korean speakers, who did not have any background information about this project (the question asked here was "have you seen these words before?"). Consequently, 24 nonsense pairs each for disharmonic and harmonic condition were created with the relevant definitions (see Appendices A and B for full lists of nonsense disharmonic and harmonic ideophone pairs, respectively).

[40] It should be noted that total vowel identity in the reduplicated word can be also viewed as a consequence of copying one vowel to another (rather than the spreading of a feature-sized morpheme) in the reduplication process. In this regard, it would be difficult to pinpoint the cause of a possible extra phonosemantic effect (if any) of the total vowel identity in the reduplicated word. However, such an ambiguity disappeared in the process of creating the corresponding nonsense stimulus items in §4.3.1.3, where word-initial consonants of the existing sound-symbolic items changed; the apparent reduplication was no longer observed in the nonsense di-syllabic reduplicated words (e.g., *pipi / pɛpɛ* 'a state of smaller/bigger things being entwined' became *nipi / nɛpɛ*).

4.3.1.4 Recordings

A total of 48 di-syllabic nonsense ideophonic pairs were recorded in random order by the author, a female native speaker of Korean, who was born and raised in Seoul where a standard dialect of Korean is spoken. She read the stimuli, written in Korean Hangul orthography, with as little emotional prosody as possible. The recording was digitally made in a quiet room with a Shure SM10A microphone connected to a Marantz PMD660 portable recorder at a sampling rate of 48 kHz.

4.3.1.5 Procedure

In order to test the hypothesis that phonosemantic effect would be stronger in harmonic ideophones than in disharmonic ones in Korean, participants were asked to match connotative oppositions, augmentative vs. diminutive, with the relevant nonsense Korean ideophonic pairs in both disharmonic and harmonic condition. The task required participants to choose which words in each pair were the augmentative words. By doing so, the remaining member of each pair received the opposed connotation automatically, and this minimised the difficulty of the meaning matching task. If, as hypothesised, the phonosemantic effect was stronger in harmonic ideophones than disharmonic ones, participants could be expected to find it easier to choose a word which contained augmentative connotation in harmonic pairs than in disharmonic pairs (where the feature-sized morphemic contrasts between the words are not as apparent).

The Korean spellings for stimulus items were not provided so that the participants relied entirely on the sounds of the stimulus items. The experiment was run on a University of Queensland online test system, Blackboard, with no time limit. There were no minimum requirements for the listening condition, such as a request to wear earphones/headphones. Since all of the procedures were conducted online, participants had freedom to choose a time and place convenient and comfortable for them to participate in the experiment. As well, they were able to listen to the stimulus sound files multiple times if they wished. On the online blackboard system, the disharmonic and harmonic stimuli were mixed together and presented with the relevant questions based on the word definitions (e.g., 'Both words describe a sulky face. Which word describes a more sulky face?" for *mɛl.c'uk* / *mil.c'uk*) in random order for each participant. The word arrangements of semantic opposition were counterbalanced in each contrast in both disharmonic and harmonic conditions (e.g., three *augmentative-diminutive* items and three *diminutive-augmentative items* for /i~ɛ/). Consequently, participants ticked against either 'first word' or 'second word' to indicate which word in the pair they felt contained more augmentative connotation. Prior to their actual participation, all of the participants completed a practice question to make sure

that they understood the online instructions correctly (see Appendix C for instructions). The questions for each nonsense pair and the instructions were all written in the participants' native language, Korean.

4.3.2 Results

All of the participants' judgements of the stimuli were converted to binary numbers (0 = wrong guess, 1 = correct guess). Then, a binomial test was applied to examine whether the probability of the subjects' correct guess was statistically different from chance (H_0= true probability of success is equal to 0.5) in each vowel contrast in the disharmonic and harmonic conditions, separately (Dalgaard, 2008). The overall mean scores of each vowel contrast in the two different conditions are shown in Figure 4-2 below. In the disharmonic condition, Korean participants guessed the meanings of the Korean ideophonic pairs following the Korean symbolic pattern in /u~o/ but arbitrarily in the remaining contrasts (/i~ɛ/, p = .326, n.s.; /ɨ~a/, p = .585, n.s.; /u~o/, p = .001**; /i~a/, p = .326, n.s.). Likewise, in the harmonic condition, they showed a sensitivity to the Korean symbolic pattern only in /u~o/ at a statistically significant level (/i~ɛ/, p= .445, n.s.; /ɨ~a/, p = .585, n.s. ; /u~o/, p< 0.01**; /i~a/, p = .326, n.s.).

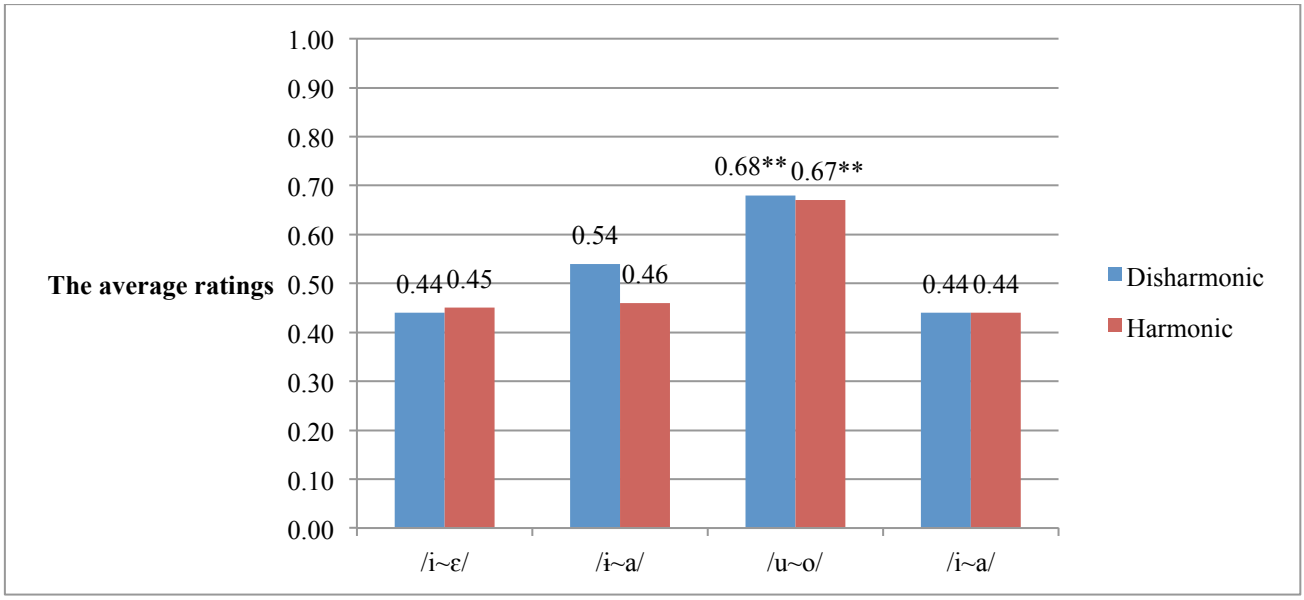


Figure 4-2. The averaged means of stimulus items in each vowel contrast in disharmonic and harmonic conditions.

For a comparison of the participants' guessing performances, a separate McNemar's test (Pallant, 2011) was applied in each vowel contrast. As a result, it was shown that no vowel contrast exhibited a significant change in the proportion of correct answers in the harmonic condition when compared

to the proportion in the disharmonic condition (/i~ɛ/, p = 1.000, n.s.; /ɨ~a/, p = .418, n.s.; /u~o/, p = 1.000, n.s.; /i~a/, p = 1.000, n.s.).

4.3.3 Discussion

The result obtained in §4.3.2 does not support the prediction that the expected semantic contrast would be more easily recognised in a harmonic ideophone pair than in a disharmonic one. There was no significant difference in the participants' performances of guessing meaning between the harmonic and disharmonic conditions. This indicates that the spreading of a feature-sized morpheme from initial to non-initial syllables does not detectably reinforce the phonosemantic effect of vowel alternation in the Korean listeners' mental lexicon.

This raises the question of why the VH in nonsense Korean ideophones does not present additional phonosemantic effect. One possible explanation is that perhaps non-initial syllables do not play a major role for lexical processing, compared to initial syllables, and thus it may be only the segments in root-initial syllables, which undergo the same alternations in both harmonic and disharmonic conditions, that influenced the participants' perceptual decisions. Indeed, the evidence of psychological salience of initial phones or initial syllables is found in several perceptual tasks relating to lexical retrieval or access. For example, Beckman (2013) surveyed several previous psycholinguistic studies in which speakers retrieved target words more slowly and less accurately when stimuli differed from target words in their initial, rather than final, segments (Browman, 1978; Brown & McNeill, 1966; Bruner & O'Dowd, 1958; Cole, 1973; Fay & Cutler, 1977; Horowitz, White, & Atwood, 1968; Marslen-Wilson, 1975; Mattys & Samuel, 2000; Nooteboom, 1981; Taft & Forster, 1976). Evidence of psycholinguistically "privileged positions" seems to appear in the sound-symbolic phenomenon as well. Previously, Kawahara, Shinohara, and Uchimoto (2008) examined the influences of phones in initial syllables on sound symbolism, with special reference to the mapping between voiced obstruents with negative meanings in Japanese. They conducted experiments with Japanese speakers to determine whether the reported sound-symbolic mapping was more strongly recognised in initial syllables than in non-initial syllables. Their results showed that the positional effect exists in sound symbolism, and that initial syllables play a central role for speakers to associate a certain form with a certain meaning. On this basis, it seems plausible to claim that the spreading of a feature-sized morpheme to vowels in non-initial syllables in harmonic ideophones does not affect the participants' sensitivity to the sound-symbolic pattern due to the psycholinguistic insignificance of non-initial syllables.

A second explanation for this failure of spreading to enhance the semantic strength of sound symbolism in Korean ideophones, is that what matters is not the surface recurrence of light vowels, but merely the presence of an underlying auto-segmental morpheme, irrespective of whether it is

realised at the surface of one or two syllables. A difference between this hypothesis and the pyscholinguistic explanation above is that it accords no special status to the first syllable; it merely accords importance to the presence of a light vowel.

These two explanations generate differing hypotheses, and warrant further research seeking clear empirical evidence of a (lack of) positional effect in Korean vocalic symbolism. For example, one could construct two different artificial stimulus sets, where one has dark vowels in initial syllables and light vowels in non-initial syllables, and the other has the dark (excepting the neutral vowels) and light vowels in a reversed order. Korean speakers could then be asked to rate the augmentativeness of the stimuli on a scale, and their ratings in the two stimulus sets could be compared, similar to Kawahara, Shinohara, and Uchimoto's study (2008). If privileged position affects vocalic symbolism as it affected consonantal symbolism in Kawahara, Shinohara, and Uchimoto's study, Korean speakers could be expected to rate the stimuli where dark vowels appeared in initial syllables as more augmentative than the stimuli where dark vowels appeared in non-initial syllables. If this result occurred, it would strengthen the argument that VH does not produce extra phonosemantic effect in sound symbolism because V_1s are psycholinguistically stronger than V_2s.

With the necessity of further investigation, a concluding question can be raised as to why then the Korean participants did not recognise the expected Korean symbolic pattern in the high-low vowel contrasts, such as /i~ɛ/, /ɨ~a/, and /i~a/, unlike in the high-mid vowel contrast, /u~o/ as shown in Figure 4-2 above. Previously, Shinohara and Kawahara (2010) conducted a cross-linguistic experiment where Chinese, English, Japanese, and Korean listeners associated different vowels with images of different sizes in nonce words which focused on the structural contrasts of interest such as *ibib* and *abab*. Their results showed that subjects from all language groups perceived back vowels /a, u, o/ as larger than front vowels /i, e/, suggesting that Korean listeners also follow the near-universal pattern of magnitude symbolism, particularly in the /i~a/ contrast. From this, I generate a possible interpretation of the current result, that the Korean listeners may have followed the universal pattern and cancelled out their sensitivity to the Korean symbolic pattern when they accessed the nonsense stimulus pairs derived from existing Korean ideophones in the current meaning guessing task. As for the /u~o/ contrast, the participants may have followed the Korean symbolic pattern, since it does not possess sufficient acoustic and articulatory differences for the universal pattern to come into effect. The cancelling effect of the near-universal magnitude symbolism on the Korean magnitude symbolism will be further discussed in the larger experiment, 1Bb below.

4.3.4 Limitations

Before concluding, an issue to deal with is the possible influence of the lack of control in amplitudes in the playback condition on the current null result. If amplitudes are not controlled, they could cause the inconsistencies in the language users' perception of the phenomenon related to magnitude symbolism. However, even if amplitudes are controlled, they could impede the investigation of language users' natural responses to the sound-symbolic effect, in the sense that they manipulate the intrinsic amplitude related to a low vowel being louder than a high vowel, making the audio stimuli artificial. Given this dilemma, I posit that the lack of control in the amplitudes of the stimuli in the current experiment does not generate a serious methodological weakness.

Related to the issue of the experiment set-up, as explained above, there was no minimum requirement for the listening condition, such as a request to wear earphones/headphones. This generates a concern that background noise may have affected the current null results. However, given that the present experiment was designed to measure the Korean listeners' perceptions of the stimuli, not from an acoustic perspective but from a psycholinguistic perspective, the potential influence of background noise on the participants' current judgements should be low. Some may also question the lack of control over repeated listening versus non-repeated listening. There was no restriction in the repeated listening of the stimulus sound files and this may have generated different guessing performances between the participants, who listened to the stimuli either multiple times or only once, contributing to the current null result. This possible effect of repeated listening on a language user's sensitivity to the phonosemantic effect needs further investigation. For example, one could recruit two groups of participants and ask one group to listen to harmonic and disharmonic stimulus pairs multiple times and another group to listen to them only once, and then compare their guessing performances. If repeated listening increases a language user's sensitivity to the phonosemantic effect of VH, it would require the refinement of the interpretation of the present experiment.

Some may also raise a concern about the number of Korean participants involved in this experiment. Given the small number of the participants, it is likely that the current null result is only weakly valid. I admit this limitation of this experiment and see a need to run more studies with a greater number of participants before it is possible to argue for null results with some statistical confidence.

4.3.5 Conclusion

The aim of this experiment was to examine the psychological reality of VH in Korean magnitude symbolism. By conducting a perceptual experiment with Korean listeners, this experiment showed

that VH in ideophones does not create extra phonosemantic effect in Korean vocalic symbolism. This contradicts the assumption that, since harmonic ideophone pairs display clearer phono-morphemic contrasts than disharmonic ideophone pairs, their meaning contrasts should be more clearly recognised. This experiment concluded that the current findings may result from the influence of the psycholinguistic prominence of initial syllables on vocalic symbolism, in accordance with Kawahara, Shinohara, and Uchimoto's (2008) finding regarding the positional effect on consonantal symbolism in Japanese. The question of whether this null result was due to the positional effect on Korean vocalic symbolism, however, should be more thoroughly answered by conducting further empirical research, as discussed in §4.3.3.

To sum up, no psychologically real difference was detected in the phonosemantic strength between harmonic and disharmonic ideophones. Also, although it needs further research, it is plausible that non-initial syllables are psycholinguistically insignificant based on Kawahara et al.'s (2008) finding that speakers pay heavy attention to phones in syllable initial positions when determining sound symbolism. Given this, for the following experiment, 1Ba, I included disharmonic ideophone pairs only in a final stimulus set and restricted the relevant Korean vowel alternations correlating with size-related connotation shifts in nonsense ideophonic stimulus pairs to initial syllables.

4.4 Experiment 1Aa: English-speaking listeners' discrimination of non-English Korean vowels

Under the assumption that English-speaking participants may be unable to correlate connotation change with the corresponding vowel alternations in Korean ideophones unless they can discriminate the vowels involved, Experiment 1Aa was designed to investigate English-speaking listeners' discrimination levels of the relevant foreign vowel contrasts (see §1.6 for a brief overview of methodology). As well, it was designed to examine their discrimination of vowels in words of different syllable count (i.e. monosyllabic and disyllabic word stimuli) to examine a possible influence of syllable count on English-speaking listeners' discrimination performance.

4.4.1 Participants

English-speaking students, who were over 18, enrolled in an introductory linguistics course at the University of Queensland served as participants. They were mostly speakers of Australian English. The number of participants was 122, including eight native English speakers who had some

knowledge of Korean[41] and two native Chinese speakers. All participants were given course credit for participation.

4.4.2 Stimuli

As can be seen in Table 4-11 above, certain vowel changes such as /i~ɛ/, /e~ɛ/, /ɨ~a/, /ə~a/, /u~o/, /i~a/, and /u~a/ cause a size-related connotation shift in Korean ideophones. Given that most of the study's participants were speakers of Australian English, the analysis of the English vowel system that was used followed Australian English and does not have /ɛ/, /ɨ/, and /o/[42] in its vowel inventory (Mitchell and Delbridge [1965] cited in Fromkin et al., 2012, p. 198). Consequently, this experiment examined whether a group of English-speaking listeners could discern /ɛ/ from /i/[43], /ɨ/ from /a/, and /o/ from /u/. In addition, it also examined their discrimination of /ə~a/, because English /ə/ is different from Korean /ə/ in that it does not occur in monosyllabic words, produced in isolation.

Admittedly, a potential shortcoming of the current sound discrimination experiment is that it only took into account the phonemic contrasts of Australian English and Korean vowels. Regardless of the size of the inventory of vowel phonemes in Australian English, the participants may be able to perceive more phonetic vowel qualities, partly through exposure to other dialects. For example, they may not have a phoneme /ɨ/ but they may be able to identify it as an index of New Zealand English. In terms of phonetic values, the allophonic ranges of Australian vowels appear to clearly cover /ɨ/ (see Figure 4-3 below).

[41] Due to unforeseen technical difficulties, it was not possible to discard these confounding data. However, given their limited number, their influence on the current result is considered to be minimal.
[42] American English contains /ɛ/ and /o/.
[43] English discrimination for /e~ɛ/ was excluded here, since the height distinction for the two front vowels seems to be disappearing even for Korean native speakers.

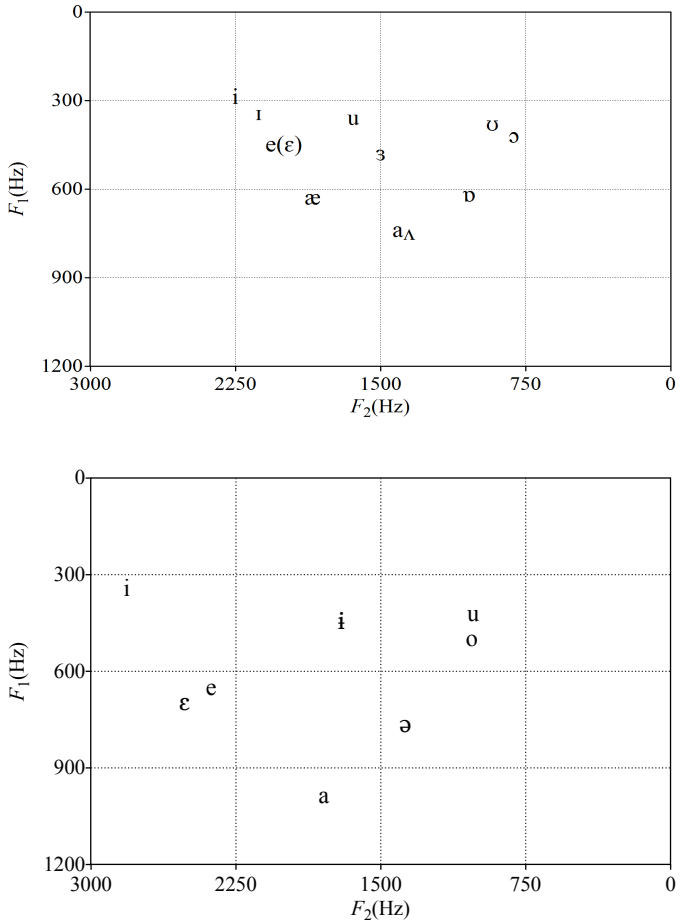


Figure 4-3. Plotting of Australian vowels based on Bernard's (1967) production data (above) and plotting of Korean vowels (below, also see Figure 4-1)

4.4.3 Procedure and design

Two separate sets of four vowel contrasts were recorded by the author, a female native speaker of the Korean language. The sets of sound files contained two repetitions of four monosyllabic (e.g., *pi* 'rain' - *pɛ* 'pear') and four disyllabic (e.g., *ki.da* 'to crawl' - *kɛ.da* 'to fold') Korean minimal pairs of contrastive vowels, which were considered to be foreign to the English phonemic set, at initial syllables. The two sets of monosyllabic and disyllabic minimal pairs were randomly mixed together with three additional distractors (i.e., pairs of the same words which contained non-English Korean vowels at initial syllables, such as *ɨm* 'sound' - *ɨm* 'sound'), yielding a total of 11 stimulus items, and distributed to two sub-groups of the participants: group A and group B. Consequently, 56 participants in group A and 66 participants in group B listened to 5 and 6 items respectively, and

answered yes-no questions for discrimination of each minimal pair on Blackboard with no time limit.[44] The instruction, which was given to the participants, was as follows[45]:

> In this experiment, you will listen to Korean pairs of words. You will be asked to click sound files which are hyperlinked to each yes-no question and tick on
>
> 'Yes' if you think they are the same words with the same sounds or
>
> 'No' if you think they are different words with different sounds
>
> Each pair will be repeated twice at a 3-seconds interval in the sound file. Make sure to tick on 'Yes' or 'No' before you move on to the next question. Do not replay it as I am interested in your initial impression of foreign sounds.

4.4.4 Results

Each participant's same-different judgement of the stimuli was converted to binary numbers (i.e., 0 = wrong guess, 1 = correct guess). Then, a binomial test was applied to examine whether the probability of subjects' correct guesses was statistically different from chance (H_0 = true probability of success is equal to 0.5) (Dalgaard, 2008).

Table 4-14 and Table 4-15 show the percentages of correct guesses on each Korean vowel contrast in mono- and disyllabic minimal pairs, respectively. In monosyllabic words, no sound contrast received a significantly wrong discrimination (see Table 4-14).

Table 4-14. Percentage of correct guesses on the Korean vowel contrasts in monosyllabic minimal pairs

Backness category	Height feature (e.g., highest /i/, mid /e/, lowest /ɛ/)		
	highest vs. lowest	mid vs. lowest	highest vs. mid
front	92%***	NA	NA
central	86%***	98%***	NA
back	NA	NA	98%***

$p < .05$ '*' $p < .01$ '**' $p < .001$ '***'

[44] One limitation of this online experiment is that I did not set minimum requirements for the listening condition, such as a request to wear earphones/headphones, which may be important for a sound discrimination task (see §4.3.4).

[45] The instruction may suggest the participants to regard as same those sounds that fall into the same phoneme category in English.This causes a shortcoming in that the experiment tests their phonemic perception rather than phonetic perception as noted in §4.4.2.

The participants' discrimination levels of the vowels decreased to a small extent when the same vowel contrasts were presented in disyllabic word pairs. Here, the /u~o/ contrast (in a word pair, /mul.sal/ 'current of water' vs. /mol.sal/ 'slaughter') received a wrong discrimination at a statistically significant level (see Table 4-15). The poor discrimination of the /u~o/ contrast may have resulted from their phonetic similarity as can be seen in Figure 4-1 and Table 4-10.

Table 4-15. Percentage of correct guesses on the Korean vowel contrasts in disyllabic minimal pairs

Backness category	Height feature		
	highest vs. lowest	mid vs. lowest	highest vs. mid
front	89%***	NA	NA
central	85%***	95%***	NA
back	NA	NA	29%**

$p < .05$ '*' $p < .01$ '**' $p < .001$ '***'

A Chi-square test (in Table 4-16 below) showed that the discrimination level for the /u~o/ contrast was significantly different when it was presented in words of different syllable counts.

Table 4-16. Comparison of subjects' discrimination of the vowel contrasts in mono- and disyllabic minimal pairs

Backness category	Height feature		
	highest vs. lowest	mid vs. lowest	highest vs. mid
front	χ^2=0.0917, df=1	NA	NA
central	χ^2=0.0013, df=1	χ^2=0.2593, df=1	NA
back	NA	NA	χ^2=55.5575, df=1***

$p < .05$ '*' $p < .01$ '**' $p < .001$ '***'

The finding that English-speaking listeners showed significantly poor discrimination for the /u~o/ contrast when it occurred in disyllabic forms suggests that their judgements on the semantic minimal pairs of /u/ and /o/ (which correspond to augmentativeness and diminutiveness, respectively, in Experiment 1Ba, where all of the nonsense Korean ideophone stimuli are disyllabic) should be interpreted with caution.

4.5 Experiment 1Ba: English- and Korean-speaking listeners' perceptions of Korean magnitude symbolism

In order to examine how listeners from English and Korean language backgrounds perceive the phonosemantic aspects of Korean vocalic MEI's, English-speaking participants were asked to participate in a binary meaning-matching task, where they guessed the meanings of nonsense disharmonic Korean ideophone stem pairs which contrasted dark and light vowels in syllable initial position. Their performance was compared with the corresponding Korean listeners' performance, which was reported in the previous experiment for the phonosemantic effect of vowel harmony in §4.3.

4.5.1 Experimental method

4.5.1.1 Participants

A total of 94 students from an introductory linguistics course at the University of Queensland in Australia, who had not participated in Experiment 1Aa above, served as the English-speaking participants. They were given course credit for their participation. All of them were native English speakers with no prior knowledge of Korean and with no reported hearing problems.

4.5.1.2 Stimuli

Stimuli were the same as the disharmonic stimuli used in the experiment for the phonosemantic effect of vowel harmony in §4.3. The stimulus set consisted of 24 nonsense disharmonic Korean ideophone stem pairs that contrasted vowels of different height (i.e., /i~ɛ/, /ɨ~a/, /u~o/ x 6 items) and/or frontness (i.e., /i~a/ x 6 items) at initial syllables only (refer to Appendix A for full lists of nonsense disharmonic ideophone pairs).

4.5.1.3 Procedures

The procedure matched that used in the experiment for the phonosemantic effect of vowel harmony (in §4.3), except that the stimuli were divided into two different sets, and participants were divided into two groups – one for /ɨ~a/ and /u~o/ contrasts and the other for /i~a/ and /i~ɛ/ contrasts – and distributed to the two sub-groups of participants, Groups A-1 and A-2, respectively. The division of the stimulus set was intended to reduce the risk that the participants would become fatigued from listening to a number of nonsense words that matched foreign Korean phonotactics. Consequently, 42 participants in Group A-1 and 52 participants in Group A-2 listened to 12 stimulus pairs, respectively, in random order.

4.5.2 Results and discussion

The scoring matched that used in the experiment for the phonosemantic effect of vowel harmony (in §4.3).

According to the averaged mean score of all of the stimulus items in each vowel contrast (shown in Figure 4-4 below), English-speaking participants appeared to guess the meanings of the Korean ideophonic pairs following the near-universal pattern of magnitude symbolism, i.e., HIGH VOWEL = DIMINUTIVENESS and LOW VOWEL = AUGMENTATIVENESS, excepting for the /u~o/ contrast (/i~ɛ/, $p < .001$; /ɨ~a/, $p < .001$; /u~o/, $p = .570$, n.s.; /i~a/, $p < .001$).

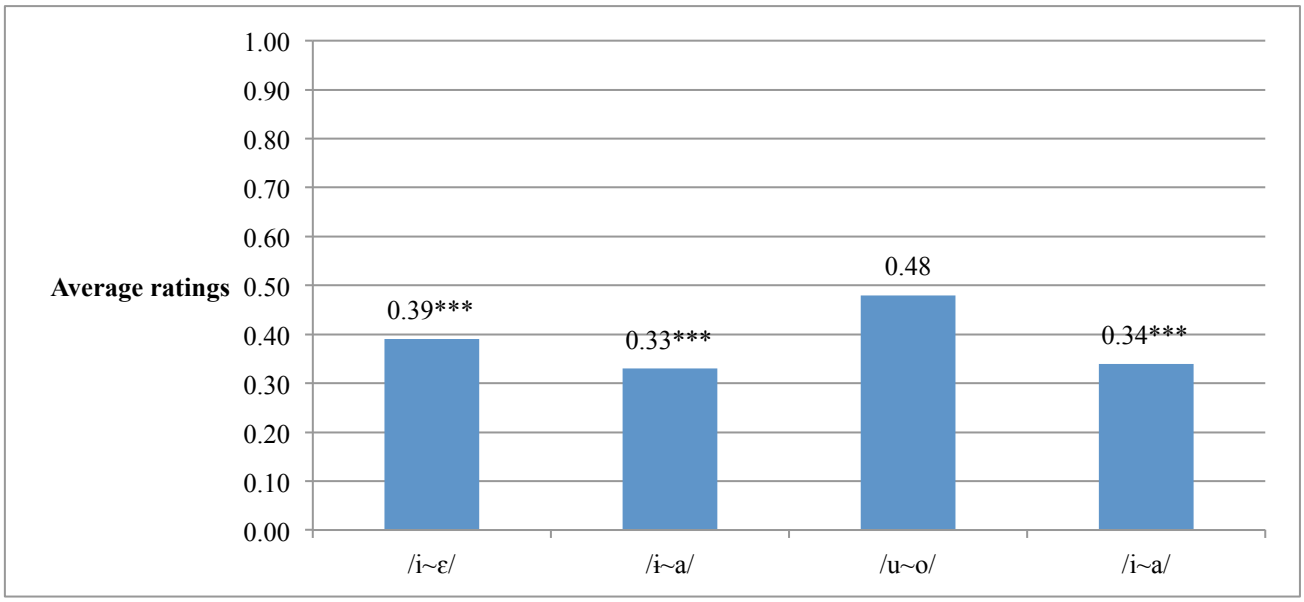


Figure 4-4. English-speaking subjects' averaged mean score for each vowel contrast

To discover the significance of the differences between /u~o/ and the remaining three vowel contrasts, separate within-group (Wilcoxon signed rank test) and between-groups (Mann-Whitney U test) statistical tests were applied. The two separate tests were necessary because one group of participants assessed the /u~o/ contrast with /ɨ~a/, and another assessed /i~a/ and /i~ɛ/. The Wilcoxon signed rank test (Pallant, 2011) indicated that the mean scores of /ɨ~a/ and /u~o/ within subjects were significantly different ($z = -3.421$, $p = .001$). The Mann-Whitney U test between subjects with a Bonferroni adjusted alpha level of .025 indicated that the difference between /i~a/ and /u~o/ ($z = -3.378$, $p = .001$) was also significant; the difference between /i~ɛ/ and /u~o/ ($z = -2.046$, $p = .041$) was close to significance. This shows that the /u~o/ contrast (Mean = 0.48, SD = 0.48) was judged as having no apparent phonosemantic contrast, significantly different from /ɨ~a/, /i~a/, and /i~ɛ/. The aberrant behaviour of the /u~o/ contrast in the English-speaking listeners'

meaning-guessing results is not surprising given the result of Experiment 1Aa, where English-speaking listeners could not discriminate the difference between /u/ and /o/ vowels at a statistically significant level. Clearly, these listeners are *not* judging the vocalic contrast to associate with any semantic correlate, rather they are unable to make a phonosemantic judgement.

This is in contrast to the Korean-speaking listeners' meaning-guessing performances on the same stimuli which were reported in §4.3.2. According to the averaged mean of the stimulus items for each contrast in Figure 4-5 below, Korean participants appeared to guess the meanings of the nonsense Korean ideophonic pairs following the Korean symbolic pattern for the /u~o/ contrast, but only arbitrarily for the other pairs (/i~ɛ/, p = 0.3261, n.s.; /ɨ~a/, p = 0.5856, n.s.; /u~o/, p = 0.001; /i~a/, p = 0.3261, n.s.).

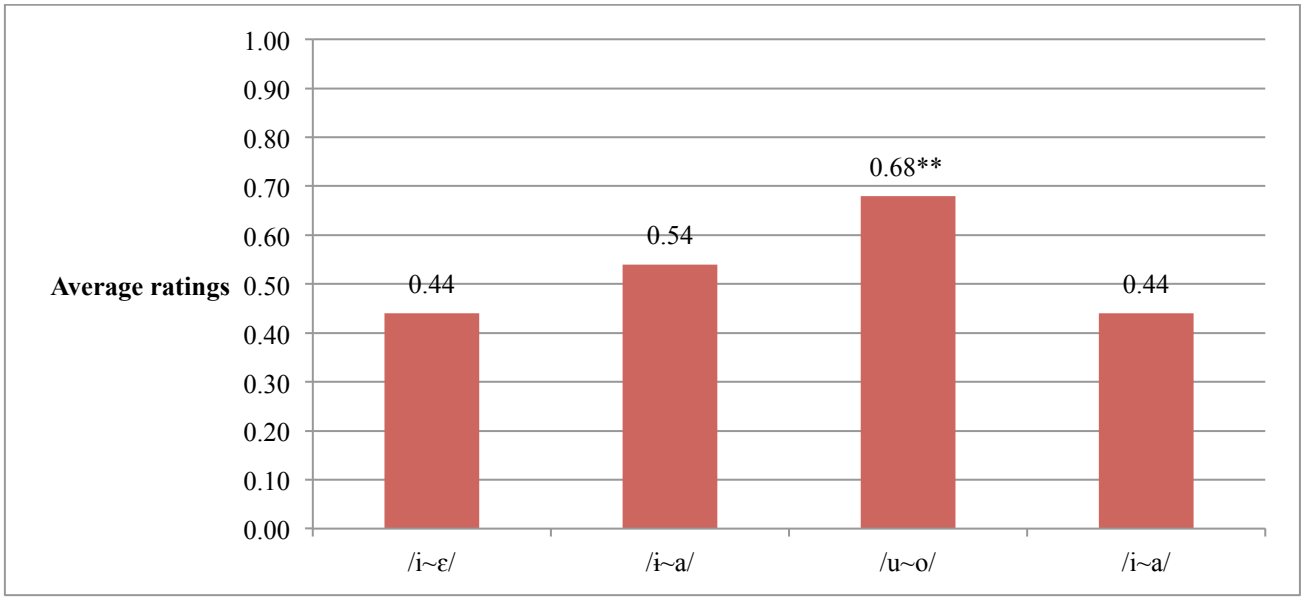


Figure 4-5. Korean-speaking participants' averaged mean score in each vowel contrast (see also Figure 4-2)

The Friedman test (non-parametric repeated measures ANOVA) (Pallant, 2011) indicated that the mean scores of the four vowel contrasts were significantly different from each other (χ^2 (3, n=84) = 12.76, p = .005). Post-hoc tests, which involved a Wilcoxon signed rank test with a Bonferroni adjusted alpha value of 0.017, further indicated that the /u~o/ contrast (Mean = 0.68, SD = 0.48) was significantly different from /i~ɛ/ (z = -2.887, p = 0.004) and /i~a/ (z = -2.887, p = 0.004); the difference between /u~o/ and /ɨ~a/ was close to significance (z = -2.121, p = 0.034, n.s.). From this, it is clear that the Korean-speaking participants' meaning-guessing performances in the high-low vowel contrasts, such as /i~ɛ/, /ɨ~a/, and /i~a/, were significantly different from those in the high-mid vowel contrast, /u~o/. I speculate that the chance level of guessing rates at the /i~ɛ/, /ɨ~a/, and

/i~a/ contrasts in the current meaning guessing task may have been due to the oral cavity size effect, which was also observed in the English-speaking listeners' meaning-guessing performance in the corresponding vowel contrasts above. The oral cavity size effect may have cancelled out the existing Korean symbolic pattern, which does not possess synchronic articulatory/acoustic justification, in the Korean-speaking listeners' mental lexicon when they accessed the nonsense stimulus pairs – recall that Korean vocalic symbolism, which establishes a possible link between the pharyngeal cavity size and the size-related concepts, does not hold synchronic articulatory and acoustic justifications; universal vocalic symbolism, on the other hand, is grounded on a synchronic articulatory gesture, oral cavity size, and acoustic property, second formant frequency.

Interestingly, such a cancelling effect of the universal magnitude symbolism did not occur at the /u~o/ contrast. This may be because the oral cavity size differences, which provide a natural articulatory base for the universal magnitude symbolism, are not obvious in high-mid vowels compared to high-low vowels. Also, see the formant plots of Korean vowels in Figure 4-1. The plots showed that the phonetic contrast between /u/ and /o/ is small. Corroborating that, it could be explained that Korean speakers accord the Korean-specific meaning (HIGH=BIG, LOW=SMALL) to them, while English speakers accord no phonosemantic meaning to them (since the English-speaking participants could not differentiate /u/ from /o/). For all other pairs, there is enough acoustic difference for the universal pattern to come into effect. Thus, the English speakers follow the universal pattern, and the Korean speakers have "competition" between the Korean symbolic pattern and the observed universal pattern, resulting in the current chance-level of correct guessing rates.

To sum up, English-speaking listeners clearly attended to the universal pattern of magnitude symbolism to guess the phonosemantic values of Korean vocalic MEI's at the /i~ɛ/, /ɨ~a/, and /i~a/ contrasts. By contrast, Korean-speaking listeners' phonosemantic judgements were not different from chance at the /i~ɛ/, /ɨ~a/, and /i~a/ contrasts. Here, although not to the same extent as in the case of the English-speaking listeners' guessing performance, one can detect some hint of the Korean-speaking listeners' sensitivity to the universal pattern of magnitude symbolism, which possibly cancelled out the existing Korean symbolic pattern. At the /u~o/ contrast, English-speaking listeners were not able to make any phonosemantic judgement, since they were unable to discriminate the difference between /u/ and /o/. By contrast, Korean-speaking listeners' judgements followed the Korean symbolic pattern at a significant level. Given the Korean listeners' significantly high sensitivity to the Korean symbolic pattern at the /u~o/ contrast, some may question whether the pharyngeal effect is applicable to the corresponding vowel contrast, and thus whether the semantic correlates of the /u~o/ contrast in Korean ideophones are based on natural motivation unlike those of other vowel contrasts. However, although the Korean participants

responded at a level different from chance for /u~o/, I do not attribute this to the pharynx effect; the universal perception of the Korean magnitude symbolism manifested in the /u~o/ contrast is not measurable given that the English-speaking listeners did not perceive the difference between /u/ and /o/. It is possible that running an experiment with speakers of American English, who may be able to discriminate /u/ from /o/ (since the American English system does contain /o/), would clarify whether the psychological reality of the Korean symbolic pattern at the /u~o/ contrast is attributed to arbitrary convention or to natural motivation.

Altogether, leaving aside the unanswerable question about the underlying mechanism of the Korean magnitude symbolism appearing at the /u~o/ contrast, Experiment 1Ba provides empirical evidence that Korean magnitude symbolism mostly fails to manifest itself in nonsense Korean ideophones. This is contra to what one would expect if it was naturally motivated in accordance with the Extended Frequency Theory, as predicted in §4.2. Consequently, Experiment 1Ba does not provide support for the ESH, but rather for the CSH, the Conventional Sound-symbolism Hypothesis.

4.6 Conclusion

Experiment 1Ba examined how Korean and English speakers correlate connotation changes with corresponding vowel alternations in nonsense Korean ideophones. English-speaking listeners preferred the association between high vowel and diminutiveness, and between low vowel and augmentativeness, conforming to the claimed universal pattern of magnitude symbolism. Such a tendency did not appear at /u~o/, due to their poor discrimination on the corresponding vowel contrast. In the case of Korean listeners, they did not show any preference for a certain vowel-meaning correspondence, except for /u~o/, probably due to the cancelling effect of the universal magnitude symbolism on their existing knowledge of Korean symbolic pattern. Despite the need for further research on the universal perception of the Korean magnitude symbolism manifested at the /u~o/ contrast, the results of experiment 1Ba suggest that the Korean vocalic MEI's do not hold translucent iconicity and, therefore, they provide support for the CSH (i.e., that arbitrariness prevails over natural motivation in sound-symbolic vocabularies).

This indicates that the underlying mechanism of Rengao and Nembe magnitude symbolism fails to explain Korean magnitude symbolism, although they all share the *high vowel = big* and *low vowel = small* phonosemantic relationship. In other words, the Extended Frequency Theory cannot successfully account for all of the contradicting instances of the widely held universal magnitude symbolism in different languages. How then can we account for symbolic use of vowels in Korean ideophones? An explanation may be found if we define the parameters for the possible grounds of magnitude symbolism in different languages with two end points: a phonetically motivated end for

either the oral cavity/F2 or the pharyngeal cavity/F1 effect, and a synchronically unmotivated end for no underlying effect. Languages such as Rengao and Nembe, which conform to the Extended Frequency Theory, and languages such as English (e.g., *clink* < *clunk*), which conform to the frequency theory, can all be placed at the phonetically motivated end of the parameter space. To be more specific, the generally accepted magnitude symbolism (*high* = *small*) is parameterised to the frequency theory and the reversal of the universal magnitude symbolism (*high* = *big*) is parameterised to the Extended Frequency Theory. Other instances of the reversal of the universal magnitude symbolism, such as Korean ideophones, on the other hand, would be placed at the other end of the parameter space because they have no strong synchronic articulatory/acoustic correlates of magnitude symbolism. This theoretical parameterisation, however, requires further empirical support from perceptual experiments on Rengao and Nembe magnitude symbolism, which could provide psycholinguistic evidence that the idiosyncratic reversal of the universal magnitude symbolism in Rengao and Nembe ideophones is translucently iconic.

5 The translucent iconicity of Korean consonantal symbolism

Korean exhibits phonemic contrasts among different laryngeal activities, namely lenis, fortis, and aspirated, in syllable-initial voiceless stops. In ideophones, the mutation of the three-way laryngeal setting of stops (and also the alternation of the two-way laryngeal setting, namely lenis and fortis, of alveolar fricative /s/) in syllable initial position triggers a connotational change in different degrees of intensity within some semantic scales instead of a denotational shift of a word.[46] According to previous studies, Korean ideophones use syllable initial lenis stops to connote a "neutral" character and fortis and aspirated series to connote "intensive" and "paraintensive" characters, respectively (Kim, 1984; McCarthy, 1983). There are, however, inconsistencies in the relative phonosemantic values in fortis and aspirated series attributed by different scholars. For example, Sohn (1999, pp. 96-102) reverses the mappings of *fortis = intensive* and *aspirated = paraintensive* by associating fortis with paraintensiveness and aspirated with intensiveness. Some others (Fordyce, 1988; Kim, 1977; C.-W. Kim, 1965; Lee, 1992) consider that the connotational difference between fortis and aspirated is subtle or none, by associating both fortis and aspirated with intensiveness. Among the various views about semantic correlates of the laryngeal settings of Korean stops in ideophones, I predict that the sound-symbolic mappings of *lenis = neutral* and *fortis/aspirated = intensive* are naturally motivated, since they appear to contain relatively plausible articulatory and acoustic grounds compared to other mappings (see §5.1).

In order to empirically test the prediction, both Korean and English speakers were asked to match connotative meanings containing different degrees of intensity with the relevant nonsense Korean ideophonic pairs (Experiment 1Bb). In detail, I purposely implemented McCarthy's (1983) sound-symbolic mappings, which differentiate the phonosemantics between fortis and aspirated (*lenis = neutral, fortis = intensive, aspirated = paraintensive*). I then measured participants' correct guessing rates when associating the three separate laryngeal pairs (i.e., lenis-fortis, lenis-aspirated, and fortis-aspirated) with the relevant connotative differences at three different places of articulation (bilabial, alveolar, and velar) according to McCarthy's mappings. If the proposed mappings of *lenis = neutral* and *fortis/aspirated = intensive* are largely motivated by certain articulatory gestures and phonetic aerodynamics as predicted, then both Korean and non-Korean

[46] In some cases, prosaic words also contain consonant mutation which triggers a connotational shift. For example, compare *kampaŋ* 'prison' with *k'amp'aŋ* 'prison with pejorative connotation' and *sacaŋ* 'boss' with *s'acaŋ* 'boss with derogatory connotation' (Lee, 1992, p. 139). However, the prosaic variants created by consonant mutation do not denote perceptual sensory experiences, such as intensity, and thus, they can be differentiated from ideophones.

listeners should be able to correctly match the different laryngeal pairs with their relevant connotative differences except in the fortis-aspirated contrast.

The organisation of this chapter is as follows. Section 5.1 summarises several studies which reported multiple acoustic and articulatory characteristics for the three contrastive laryngeal settings in Korean stops, to show which of the previously reported Korean sound-symbolic mappings appears to have a relatively strong natural basis. Section 5.2 examines English-speaking listeners' discrimination of the foreign non-English three-way laryngeal contrast of Korean stops (Experiment 1Ab) prior to the main cross-linguistic perceptual experiment, 1Bb. Sections 5.3 and 5.4 report Korean and English-speaking listeners' perceptions of the McCarthy's sound-symbolic mappings in nonsense Korean ideophones, respectively (Experiment 1Bb). Section 5.5 compares the perceptual performances between Korean and English-speaking participants and determines whether the proposed naturally motivated sound-symbolic mappings of *lenis* = *neutral* and *fortis/aspirated* = *intensive* in Korean ideophones are translucently iconic. A conclusion is provided in §5.6.

Through cross-linguistic perceptual experimentation, this chapter provides detailed empircal information about where the Korean consonantal symbolism is naturally motivated, and hence supports the ESH, the Explanatory Sound-symbolism Hypothesis.

5.1 Acoustic and articulatory characteristics of the laryngeal contrasts in Korean stops

Acoustically, the build-up of glottal intensity at the voice onset is fastest following a fortis stop, intermediate following an aspirated stop, and slowest following a lenis stop (Han & Weitzman, 1970). For the duration of stop closure, both fortis and aspirated have longer duration than lenis (Cho & Keating, 2001). These indicate that fortis and aspirated are acoustically stronger than lenis, particularly in terms of their temporal magnitude and the rapidity of the acoustic modulation, providing plausible grounds for the sound-symbolic mappings between lenis series and neutral force, and between fortis/ aspirated series and intensive force.

The acoustic properties for fortis and aspirated also have articulatory correlates, which additionally provide a potential articulatory basis for the proposed Korean sound-symbolic patterns. In detail, focusing on the non-labials, the amount of contact between the tongue and the hard palate (i.e., linguopalatal contact) is greater for aspirated and fortis than for lenis (Cho, Jun, & Ladefoged, 2002; Cho & Keating, 2001). The greater linguopalatal contact results in a greater degree of oral constriction, which is related to the aforementioned acoustic characteristics, greater pressure and a faster build-up of intensity for aspirated and fortis. The laryngeal activities of aspirated and fortis are also differentiated from that of lenis by an articulatory feature of "tension" (C.-W. Kim, 1965; Son, Kim, & Cho, 2012). The higher muscular tension in the vocal cords for aspirated and fortis is

related to greater laryngeal pressure and faster subglottal pressure build-up, providing further natural grounds for the mappings of *lenis* = *neutral* and *fortis/aspirated* = *intensive* in Korean ideophones.

In sum, one can find possible articulatory and acoustic grounds for a systematic association by relating lenis stops to neutrality, and fortis and aspirated stops, which involve greater amplitude of pressure and higher muscular tension, to intensiveness. Finding strong natural grounds to determine the phonosemantic distinction between aspirated and fortis series is not straightforward, however, because the acoustic and articulatory characteristics that appear to distinguish aspirated and fortis point in opposing directions, supporting either Sohn's (1999) or McCarthy's (1983) sound-symbolic mappings. Recall that the intensity build-up duration after the onset of voicing is shorter for fortis than for aspirated, thus the intensity build-up duration entails higher intra-oral pressure for fortis than for aspirated, suggesting paraintensiveness for fortis. On the other hand, the articulatory feature 'aspiration' acoustically entails a noisier burst of air through the spread glottis for aspirated than for fortis, suggesting paraintensiveness for aspirated.

5.2 Experiment 1Ab: English-speaking listeners' discrimination of a three-way laryngeal contrast of Korean stops

Following §4.4 in the previous chapter, where English-speaking listeners' discrimination of non-English Korean vowels was examined, I investigate English-speaking listeners' discrimination of non-English Korean consonants, in particular stops, which are widely used in Korean ideophones (see §1.6 for a brief overview of methodology). I also examine their discrimination of stops in not only monosyllabic, but also disyllabic word forms, and measure the effect of syllable count on their performance.

5.2.1 Participants

The participants were the same as those in Experiment 1Aa in §4.4.

5.2.2 Stimuli

English stops in initial position show a two-way laryngeal contrast, namely plain voiceless unaspirated and voiceless aspirated (J. Beckman, Jessen, & Ringen, 2013; Helgason & Ringen, 2008). Korean stops in initial position, on the other hand, exhibit contrast among three different laryngeal activities, namely lenis, fortis, and aspirated[47] at three different places of articulation: bilabial, alveolar and velar (see Table 5-1).

[47] The three-way contrast becomes neutralised in syllable final position. For example, the fortis /k'/ and aspirated /k^h/ are neutralised to [k] when they appear in coda as in *pak'* [pak] 'outside' and *puək^h* [puək] 'kitchen'. Also, although they do not show a voicing contrast, lenis stops become voiced when they appear in inter-vocalic position.

Table 5-1. Three-way contrastive stops in Korean

Place category	Laryngeal feature		
	fortis	lenis	aspirated
bilabial	/p'/	/p/	/p^h/
alveolar	/t'/	/t/	/t^h/
velar	/k'/	/k/	/k^h/

Given these differences, this experiment examined whether a group of English-speaking listeners could discern all of the possible contrastive pairs of the three Korean stop categories within the same place of articulation (3 laryngeal contrastive pairs x 3 places of articulation) in monosyllabic and disyllabic forms.

5.2.3 Procedure and design

Two separate sets of nine monosyllabic (e.g., *ki* 'energy' – *k'i* 'meal') and nine disyllabic Korean minimal pairs (e.g., *p'ita* 'to sprain' - *p^{h}ita* 'to bloom'), which contrast laryngeal features in word initial stops, were recorded by the author. The sets of sound files contained two repetitions of each stimulus item. The two sets of monosyllabic and disyllabic minimal pairs were randomly mixed together with six additional distractors (i.e., pairs of the same words which contained non-English Korean stops at initial syllables such as *p'ul* 'horn' – *p'ul* 'horn'), yielding a total of 24 stimulus items, and distributed to the participants in Group A and Group B (from Experiment 1Aa).

Consequently, 56 participants in Group A and 66 participants in Group B listened to 14 and 10 items respectively, and answered yes-no questions for discrimination of each minimal pair on Blackboard with no time limit. Participants were able to listen to the stimulus sound files multiple times if they wished. There were no minimum requirements for the listening condition, such as a request to wear earphones/headphones. The instruction, which was given to the participants, was the same as that in Experiment 1Aa.

5.2.4 Results

Scoring matched that used in Experiment 1Aa.

Tables Table 5-2 and Table 5-3 show the percentages of correct guesses on each Korean stop contrast in mono- and disyllabic minimal pairs, respectively. In monosyllabic words, all sound contrasts received significantly correct discrimination, except for /k~k'/.

Table 5-2. Percentage of correct guesses on the Korean stop contrasts in monosyllabic minimal pairs

Place category	Contrastive pairs of laryngeal features		
	lenis vs. fortis	fortis vs. aspirated	lenis vs. aspirated
bilabial	88%***	95%***	88%***
alveolar	82%***	89%***	75%***
velar	42%	93%***	86%***

$p < .05$ '*' $p < .01$ '**' $p < .001$ '***'

When the same sound contrasts were presented in disyllabic forms, not only /k~k'/, but also /t~t^h/ and /p~p'/ were judged poorly either at a significant level or a chance level.

Table 5-3. Percentage of correct guesses on the Korean stop contrasts in disyllabic minimal pairs

Place category	Contrastive pairs of laryngeal features		
	lenis vs. fortis	fortis vs. aspirated	lenis vs. aspirated
bilabial	46%	96%***	83%***
alveolar	75%***	83%***	18%***
velar	50%	98%***	69%**

$p < .05$ '*' $p < .01$ '**' $p < .001$ '***'

According to the Chi-square test, the increase of syllable count negatively affected the English-speaking listeners' discrimination of the /p~p'/, /t~t^h/, and /k~k^h/ contrasts at a significant level (see Table 5-4 below).

Table 5-4. Comparison of subjects' discrimination of the stop contrasts in mono- and disyllabic minimal pairs

Place category	Contrastive pairs of laryngeal features		
	lenis vs. fortis	fortis vs. aspirated	lenis vs. aspirated
bilabial	χ^2=23.9988, df=1***	χ^2=0, df=1	χ^2=0.2833, df=1
alveolar	χ^2=0.4773, df=1	χ^2=0.5789, df=1	χ^2=34.4974, df=1***
velar	χ^2=0.4876, df=1	χ^2=0.8374, df=1	χ^2=4.4384, df=1*

$p < .05$ '*' $p < .01$ '**' $p < .001$ '***'

The current discrimination results suggest that English-speaking listeners would have some difficulty guessing the semantic minimal pairs of the /k~k'/ contrast in monosyllabic Korean ideophones. The Chi-square test further indicates that, as the syllable count increases, they would also have difficulty guessing the semantic pairs of the /p~p'/, /t~tʰ/, and /k~kʰ/ contrasts. Altogether, these indications lead to a prediction for the result of Experiment 1Bb: English-speaking listeners would have difficulty guessing the semantic correlates of the lenis and fortis, which correspond to neutrality and intensiveness, respectively, at the bilabial and velar places of articulation, and of the lenis-aspirated pairs at the alveolar place. Given that the stimulus items in Experiment 1Bb are all disyllabic, however, it is expected that the negative effect of syllable count on the discrimination of the /k~kʰ/ contrast would not disturb (to any great extent) English-speaking listeners' ability to guess the semantic correlates of the lenis-aspirated pairs at the velar place (the discrimination level for the /k~kʰ/ contrast dropped significantly as the syllable count increased but its correct discrimination level was still significantly high in disyllabic forms).

5.3 Experiment 1Bb: Korean-speaking listeners' perceptions regarding Korean consonantal symbolism

This experiment was conducted to examine the psychological reality of consonantal symbolism, which can be manifested in Korean ideophones by examining native Korean listeners' meaning guessing performance on the nonsense Korean ideophones, which contrasted the laryngeal settings in word-initial stops.

5.3.1 Participants

The participants were the same as those in the experiment for the phonosemantic effect of vowel harmony in Korean ideophones (in §4.3).

5.3.2 Materials

The targeted consonant alternations, which accompany connotation shifts in Korean ideophones, involved the three-way laryngeal contrast in word-initial stops at three different places of articulation – bilabial, alveolar, and velar.

Stimuli consisted of six Korean ideophonic stem pairs for each of the three laryngeal contrasts (i.e., lenis-fortis, lenis-aspirated, and fortis-aspirated) at each place of articulation, except for /k~kʰ/ where only one existing disyllabic ideophonic stem pair was available. This yielded 49 existing Korean ideophonic pairs in total (3 places of articulation for each of 3 laryngeal contrasts, times 6 items each, minus 5 items for /k~kʰ/). Ideophonic stems were restricted to disyllabic forms in order to control for the syllable count and to keep the experiment as simple as possible (monosyllabic

ideophone stems were not used, since they are rare in Korean). These were then used to create a final stimulus set, which was composed of nonsense ideophonic pairs. Nonsense pairs were used to minimise the listeners' attempts to use their prior knowledge of Korean, as in the experiment for the phonosemantic effect of vowel harmony in Korean ideophones (in §4.3).

5.3.2.1 Selection of existing Korean ideophonic stem pairs

Existing Korean ideophonic pairs were collated from the Great Standard Korean Dictionary (http://stdweb2.korean.go.kr/main.jsp), developed by the National Institute of the Korean Language. Previous research has not yielded consensus regarding the phonosemantic value correlating with the fortis-aspirated alternation in Korean ideophones. Despite this, for the purposes of the experiment, McCarthy's (1983) claim for the three-way semantic contrast correlating with the three-way laryngeal contrast was used. The dictionary, from which the ideophones had been taken, also relates fortis to intensiveness and aspirated to paraintensivenss. For example, the dictionary defines *p'əlɾəŋ-kəɾita* as STRONGER AND VIOLENT manner of hurriedness and *p^{h}əlɾəŋ-kəɾita* as a STRONGER AND MORE VIOLENT manner of hurriedness.

As in the experiment for the phonosemantic effect of vowel harmony (discussed in §4.3), the words were first selected according to their semantic definitions, which conformed to the traditional semantic subcategories of Korean ideophones (Sohn, 1999). They underwent additional semantic and structural checks, so that only those words that exhibited the desirable connotation shift correlating with a certain consonant alternation (/p~p'/, /p~p^{h}/, /p'~p^{h}/, /t~t'/, /t~t^{h}/, /t'~t^{h}/, /k~k'/, /k~k^{h}/, /k'~k^{h}/) were included. From the selected ideophonic words, only the underlying stems (e.g., *p'əlɾəŋ* from *p'əlɾəŋ-kəɾita* 'strong and violent manner of hurriedness') were retained, since in this experiment the focus was only on the consonants of sound-symbolic roots. The definition of each stimulus item was taken directly from the Great Standard Korean Dictionary and translated into English by the author. Notably, many of the sound-symbolic items that showed the consonantal symbolism were homophones. For example, *təmpəŋ* had two possible meanings: (1) a plopping sound when a big and heavy object drops in the water; and (2) a motion of one doing work carelessly and hurriedly. In this case, the meaning presented to participants in the experiment was chosen randomly between (1) and (2), which evoked separate perceptual sensations.

5.3.2.2 Creation of nonsense Korean ideophonic stem pairs

The first vowel of the first syllable[48] in each of the 49 existing Korean ideophone pairs was manually replaced with random Korean vowels, /i/, /u/, /a/, and /o/. As a result, a maximum of four candidate nonsense word pairs were generated for each existing ideophonic pair, for example, /pin.cil/~/p'in.cil/, /pun.cil/~/p'un.cil/, /pan.cil/~/p'an.cil/, /pon.cil/~/p'on.cil/, for /pən.cil/~/p'ən.cil/ 'lesser/greater greasiness'. Among those candidate nonsense pairs, only one pair (that neither violated Korean phonotactics nor appeared in the Korean vocabulary) was included in the final stimulus set (recall that there was only one available existing ideophonic pair for /k-k^{h}/, so the number of nonsense pairs was restricted in the corresponding contrast). Consequently, 49 nonsense pairs were created with the relevant definitions (see Appendix D for a full list of the nonsense ideophone pairs that show consonantal symbolism). All of the chosen nonsense words were additionally evaluated for their nonsensicality by three other native Korean speakers from the experiment for the phonosemantic effect of vowel harmony in §4.3 (the question asked here was also "have you seen these words before?").

5.3.3 Recording

The recording method matched that used in the experiment for the phonosemantic effect of vowel harmony in Korean ideophones (in §4.3).

5.3.4 Procedure

The recorded nonsense stimulus pairs were presented to each Korean participant in random order, with the relevant questions made based on the definitions of the existing correspondents (e.g., "Both *timpəŋ* and *t^{h}impəŋ* describe a plopping sound. Which word describes a STRONGER AND MORE VIOLENT plopping sound?"). The nonsense word arrangements of semantic opposition were counterbalanced in the six stimulus pairs of each contrast (e.g., 3 neutral-intensive items and 3 intensive-neutral items for the lenis-fortis contrast).

The remaining procedure matched that used in the experiment for the phonosemantic effect of vowel harmony in Korean ideophones (in §4.3).

[48] Kimi Akita (in personal communication) noted that modification of the first syllable may cause a greater phonosemantic difference than that of second syllable. However, the same vowel replacement applied to both word items in a stimulus pair, resulting in a minimal pair that shows a segmental contrast in C1 only. Since both words in a pair were affected by the same V1 replacement (which possibly brings a phonosemantic change), the phonosemantic difference would reside only in C1 and, thus, the modification of the first syllable does not damage the purpose of this experiment.

5.3.5 Results and discussion

The scoring matched that used in the experiment for the phonosemantic effect of vowel harmony (in §4.3).

The overall mean scores for the three laryngeal pairs at three different places of articulation are shown in Figure 5-1 below.

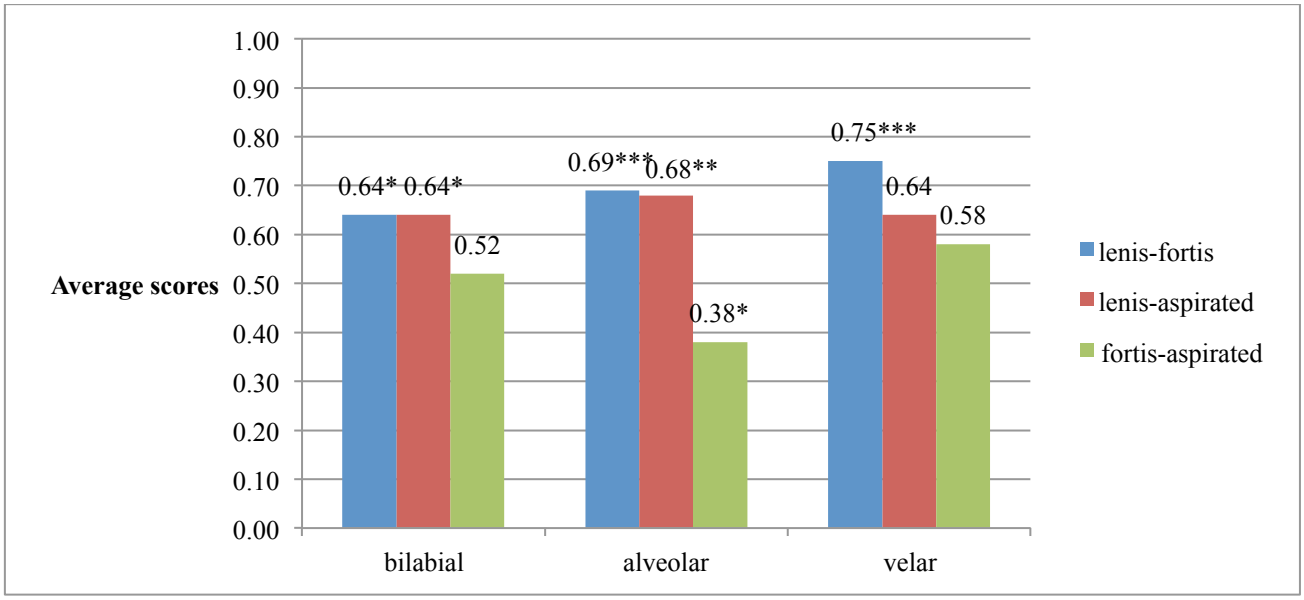


Figure 5-1. Mean scores of the Korean participants' phonosemantic judgements

According to Figure 5-1, at the bilabial place of articulation, the lenis-fortis ($p < 0.05$) and lenis-aspirated contrasts ($p < 0.05$) received a significantly high level of correct guessing rates, but the fortis-aspirated contrasts received only a chance level of correct guessing rates (n.s.). Similarly, at the alveolar place, a significantly high level of correct guessing rates was observed in both lenis-fortis ($p < 0.001$) and lenis-aspirated contrasts ($p < 0.01$). However, unlike at the bilabial place, the correct guessing rates at the fortis-aspirated ($p < 0.05$) were significantly low. At the velar place, only the lenis-fortis ($p < 0.001$) was correctly guessed at a statistically significant level. Note that the limited number of nonsense stimulus items for the /k~k^{h}/ contrast prevented the result from reaching significance, even when the raw figure exhibited strong tendencies, and in light of this uninformativeness, it will not be discussed further.

In sum, the data analysis above suggests that the Korean-speaking participants responded to the mappings of *lenis = neutral, aspirated = intensive,* and *fortis = paraintensive* at the alveolar place and the mappings of *lenis = neutral force* and *fortis/aspirated = intensive force* at the bilabial and velar places. Given that it is difficult to reach significance with a limited number of participants, the

current statistically significant experimental results, which were obtained with only 14 participants, are noteworthy.

In the next section, in order to determine whether the detected psychological reality of the Korean consonantal symbolism primarily results from natural motivation, I measure English-speaking listeners' phonosemantic judgements towards the Korean consonantal symbolism in parallel. According to the original prediction made in the introduction of this chapter, it was expected that these participants' meaning-guessing performances would agree with those of the Korean participants', except for the mappings of *aspirated = intensive* and *fortis = paraintensive* at the alveolar place.

5.4 Experiment 1Bb: English-speaking listeners' perceptions regarding Korean consonantal symbolism

English-speaking listeners participated in the same meaning matching task as in §5.3. If the detected psychological reality of the Korean consonantal symbolism in §5.3 is due to natural motivation, it would follow that listeners who have no knowledge of Korean should be able to recognise the mappings of *lenis = neutral, aspirated = intensive,* and *fortis = paraintensive* at the alveolar place and the mappings of *lenis = neutral force* and *fortis/aspirated = intensive force* at the bilabial and velar places, confirming their translucent iconicity (conditional, of course, on the extent to which they can discriminate the sounds involved).

5.4.1 Participants

The English-speaking participants were the same as those in Experiment 1Ba (discussed in §4.5).

5.4.2 Materials and recordings

The materials and recording procedure were the same as those used in Experiment 1Bb (in §5.3).

5.4.3 Procedure and design

The recorded stimuli were divided into two different sets – one for alveolar and velar stops, and the other for bilabial stops – and distributed to the two sub-groups of English-speaking participants, Groups A-1 and A-2, respectively. The division of the stimulus set was intended to reduce the risk that the participants would become fatigued from listening to a number of nonsense words that matched foreign Korean phonotactics. Consequently, 42 participants in Group A-1 and 52 participants in Group A-2 listened to 31 and 18 stimulus pairs, respectively, in random order.

The remaining procedure matched that used in Experiment 1Bb (in §5.3).

5.4.4 Results and discussion

Scoring matched that used in Experiment 1Bb (in §5.3).

Prior to reporting the results of Experiment 1Bb with the English-speaking participants, it is necessary to recall the results of English-speaking listeners' discrimination of the laryngeal contrasts of the Korean stops (see §5.2.4). If the English-speaking participants were not able to discriminate the sounds involved when they listened to the stimulus items, it would have been impossible for them to correlate connotation change with the corresponding consonant alternations in the meaning matching task. According to Experiment 1Ab, English-speaking listeners cannot discriminate the /p~p'/, /t~t^{h}/, and /k~k'/ contrasts in disyllabic forms. This suggests that the naturalness of the corresponding sound-symbolic mappings cannot be meaningfully examined. As for the remaining laryngeal pairs (which were found to be discernable by English-speaking listeners), if the meaning-guessing performances between the English and Korean-speaking participants concurred with each other, one can infer that the corresponding sound-symbolic mappings have a detectable psychological reality due to natural motivation. If no concurrence occurred, that is, if only the Korean-speaking participants' meaning guessing rates reached significance, or if their guesses pointed in the opposing direction from the English-speaking participants' guesses at a significant level, one can infer that the corresponding sound-symbolic mappings have a detectable psychological reality which results from language-internal convention. When only the English-speaking participants' meaning guessing rates reached significance, one can infer that the corresponding sound-symbolic mappings are conventionalised in a highly arbitrary manner in Korean, and that their arbitrary sound-symbolic links block Korean-speaking listeners' natural sound-symbolic interpretation for novel words.

Moving on to the main results, the prediction based on the English-speaking listeners' sound discrimination level and the hypothesised naturally motivated mappings (i.e., *lenis* = *neutral* and *fortis/aspirated* = *intensive*) in Korean consonantal symbolism was partly borne out; the participants did not respond to McCarthy's sound-symbolic mappings (i.e., *lenis* = *neutral*, *fortis* = *intensive* , and *aspirated* = *paraintensive*) in /p~p'/, /p'~p^{h}/, /t'~t^{h}/, /k~k'/, and /k'~k^{h}/[49].

In detail, the overall mean scores for the three laryngeal pairs at three different places of articulation are shown in Figure 5-2 below.

[49] Poor matching rate (Mean = 0.38, SD = 0.49) was also observed in /k-k^{h}/. However, due to the restricted number of stimulus items involved, this result was not discussed here, as for the Korean result in §5.3.

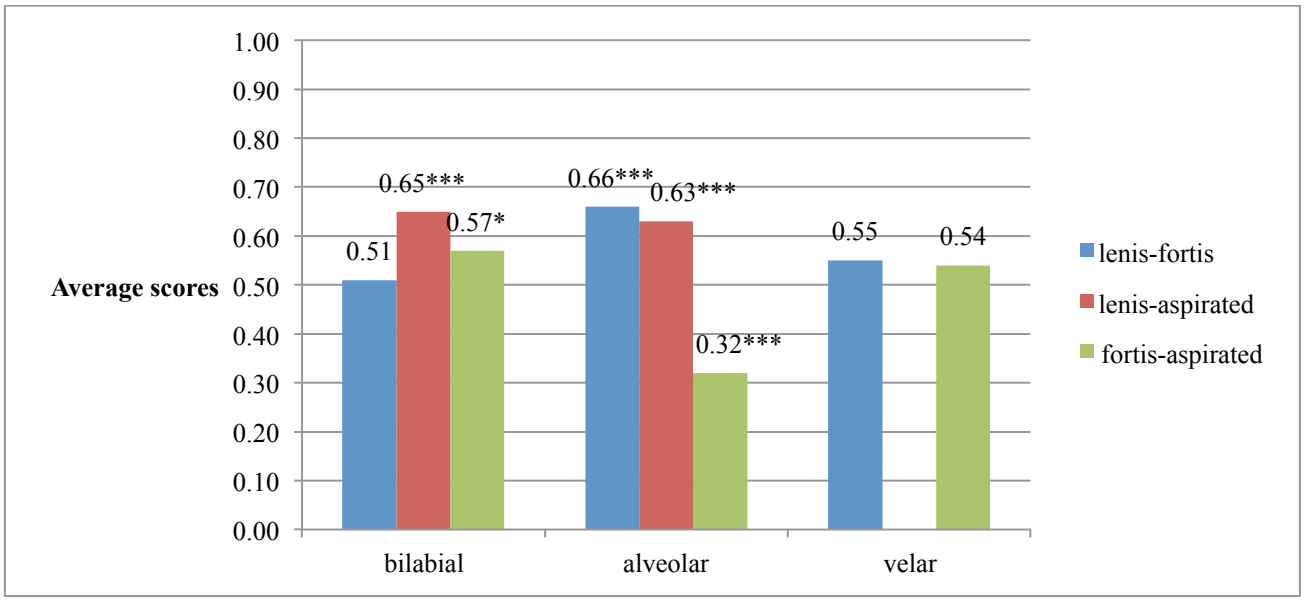


Figure 5-2. Mean scores of the English-speaking subjects' phonosemantic judgements

At the bilabial place of articulation, the lenis-aspirated ($p < 0.001$) and fortis-aspirated contrasts ($p < 0.05$) were judged more towards McCarthy's sound-symbolic mappings in comparison to the lenis-fortis (n.s.), which did not appear to display any systematic form-meaning mapping. At the alveolar place, McCarthy's sound-symbolic pattern was recognised in both lenis-fortis ($p < 0.001$) and lenis-aspirated contrasts ($p < 0.001$), in comparison with the fortis-aspirated ($p < 0.001$), where McCarthy's sound-symbolic pattern appeared in a reversed manner. At the velar place, none of the contrasts displayed any sound-symbolic patterns.

In order to examine whether the English-speaking participants' guessing performance at the fortis-aspirated contrast and at the /p~p'/, /t~t^h/, and /k~k'/ contrasts was significantly different, compared to other contrasts at each place of articulation (as expected by the hypothesised naturally motivated mappings of *lenis = neutral* and *fortis/aspirated = intensive* and their sound discrimination results discussed in §5.2.4), separate Friedman tests (Pallant, 2011, p. 235) were applied. The results revealed that the scores for the three laryngeal pairs were significantly inconsistent at the bilabial and alveolar places of articulation (bilabial, χ^2 (2, n = 312) = 14.14, p = 0.001; alveolar, χ^2 (2, n = 312) = 74.19, $p < 0.005$). The further post-hoc tests (with Bonferroni adjusted alpha value of 0.017) showed that, at the bilabial place, a significant difference was found between lenis-fortis and lenis-aspirated ($z = -3.692$, $p < 0.005$) but not between lenis-fortis and fortis-aspirated ($z = -2.121$, $p = 0.034$), indicating that the English-speaking listeners failed to respond to /p~p'/ and /p'~p^h/ differently, in distinction from /p~p^h/. This supports the prediction that English speakers may recognise the phonosemantics of lenis-aspirated better than that of lenis-fortis and fortis-aspirated at the bilabial place of articulation. At the alveolar place, on the other

hand, there were significant differences in lenis-fortis vs. fortis-aspirated ($z = -7.484$, $p < 0.005$) and lenis-aspirated vs. fortis-aspirated ($z = -6.911$, $p < 0.005$). This suggests that /t'~t^h/ is the odd one out, instead of /t~t'/, contradicting the prediction that English-speaking listeners may not recognise the phonosemantics of lenis-aspirated and fortis-aspirated and thus differentiate them from lenis-fortis at the alveolar. Here, fortis-aspirated revealed significantly wrong guessing rates (according to McCarthy's characterisation), instead following Sohn's (1999) mapping of *fortis = paraintensive* and *aspirated = intensive*, in distinction from other pairs which revealed a significantly high level of correct guessing rates. At the velar place, no significant difference was found, perhaps because the potentially odd /k~k^h/ was not taken into consideration.

At this point, it is informative to return to the binomial test results that showed a chance (or close to chance) level of correct guessing rates in /p~p'/, /k~k'/, /p'~p^h/[50], and /k'~k^h/. The English-speaking listeners' poor sensitivity to McCarthy's sound-symbolic mappings in the fortis-aspirated pairs at the velar place (there were enough velar fortis-aspirated data to make this claim) and their weak sensitivity at the bilabial place are not surprising, since it was expected due to the acoustic and articulatory characteristics of fortis and aspirated (a similar insensitivity was also found in Korean-speaking listeners' perceptions of the phonosemantics of the fortis-aspirated contrast in §5.3). The chance level of correct meaning matching rates on /p~p'/ and /k~k'/ could be explained with respect to the English-speaking listeners' low level of correct discrimination for the corresponding laryngeal pairs in Experiment 1Ab (in §5.2). However, if sound discrimination level affects the current meaning matching performance, why did the participants show higher sensitivity to the phonosemantics of /t-t^h/, which received significantly low correct discrimination? One can posit a naïve explanation that the participants may have guessed the articulatory difference (not the acoustic one) between /t/ and /t^h/ where /t/ has a smaller linguopalatal contact (apico-dental contact) than the aspirated counterpart /t^h/ (apico-lamino-postalveolar contact) (Kim, 2005) and may have associated the non-discriminable sounds with the intended connotative opposition. However, on logical grounds, it is still difficult to clearly explain how they succeeded in correlating different connotations with a sound contrast which they could not discern.

Regardless, the data analysis above suggests that, at the alveolar place of articulation, English-speaking listeners are sensitive to Sohn's mappings of *lenis = neutral, aspirated = intensive,* and *fortis = paraintensive*, not to the hypothesised naturally motivated mapping of *lenis = neutral* and *fortis/aspirated = intensive.* The hypothesised naturally motivated patterns were seen at the bilabial place, however (the chance level of correct guessing rates at the /p~p'/ contrast can be explained by

[50] The proposed pattern was seen weakly in the /p'~p^h/ pairs; the binomial test revealed that the English-speaking listeners' sensitivity to Korean symbolic pattern was significant for /p'~p^h/ ($p < 0.05$). However, the Friedman test showed that a significant difference was not found between /p~p'/ and /p'~p^h/ ($z = -2.121$, $p = 0.034$).

the English-speaking listeners' low discrimination level of the corresponding sound contrast). In terms of velar stimuli, a strict statistical comparison among the three pairs was not achievable, due to the inconsistent number of stimulus items across the pairs (recall that /k~k^{h}/ only had one stimulus item). Nevertheless, the findings at the velar place are partly similar to those at the bilabial, as the binomial test above suggested that the English-speaking listeners were not sensitive to McCarthy's sound-symbolic pattern in the lenis-fortis pairs (n.s.) and in the fortis-aspirated pairs (n.s.). Their chance level of correct guessing rates on the lenis-fortis could be explained by their inability to discriminate the corresponding sound contrast and that on the fortis-aspirated pairs could be explained by a lack of natural bases for the relevant phonosemantic distinction.

Given this, the following section discusses a further investigation of the comparative meaning matching performance of Korean-speaking listeners versus English-speaking listeners in Experiment 1Bb, which measures the translucent iconicity of Korean consonantal symbolism.

5.5 Comparison of Korean- and English-speaking listeners' meaning guessing performance on Korean consonantal symbolism

This section compares the meaning matching performances of Korean-speaking and English-speaking listeners at each place of articulation.

Firstly, at the bilabial place of articulation, the Korean-speaking listeners showed sensitivity to McCarthy's sound-symbolic mappings in the lenis-fortis and lenis-aspirated pairs, while the English-speaking listeners showed sensitivity in the lenis-aspirated pairs and the fortis-aspirate pairs (see Figure 5-3).

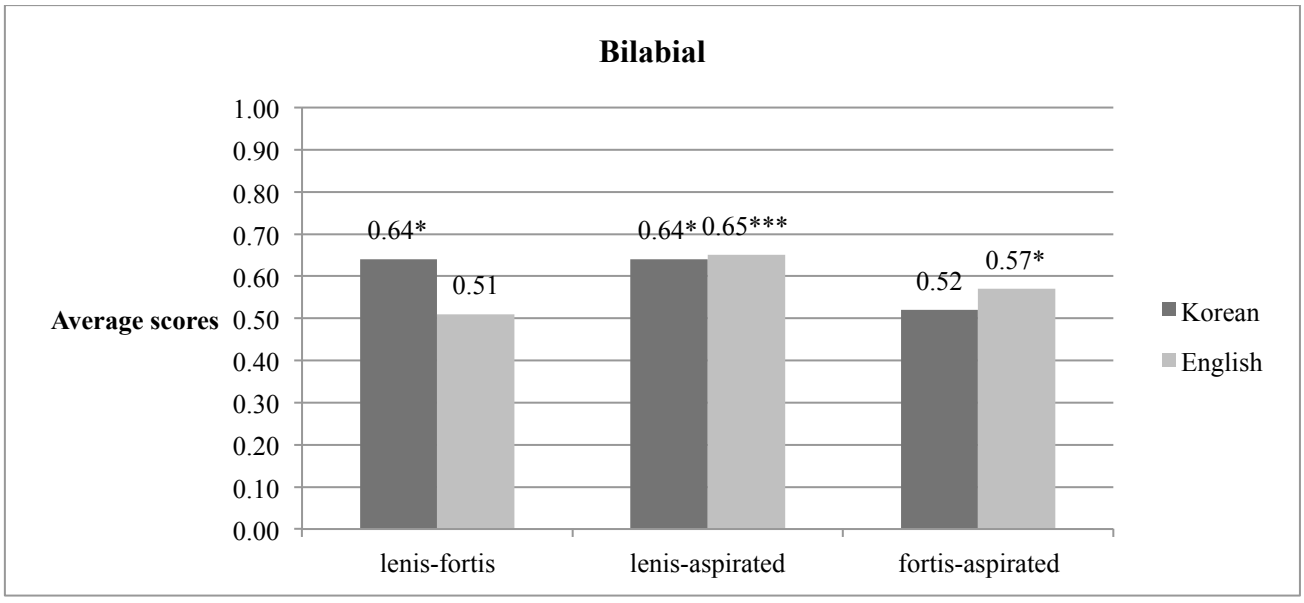


Figure 5-3. Korean- and English-speaking listeners' guessing performances at the bilabial place of articulation

A Chi-square test (Pallant, 2011) revealed that the correct matching rates of the Korean-speaking listeners were significantly different from those of the English-speaking listeners in the lenis-fortis pairs (χ^2 (1, n = 396) = 4.42, $p < 0.05$). For the lenis-aspirated (χ^2 (1, n = 396) = 0, p = 1) and fortis-aspirated pairs (χ^2 (1, n = 396) = 0.42, p = 0.52), there were no statistically significant differences in the participants' correct guessing rates.

Taking account of the English-speaking listeners' poor discrimination of /p~p'/ in §5.2, their statistically poor meaning guessing performance in the bilabial lenis-fortis does not seem to rule out the possibility that the mappings of *lenis = neutral* and *fortis/aspirated = intensive* are naturally motivated and thus hold translucent iconicity. The hypothesis is not only intact but also supported in the lenis-aspirated pairs and the fortis-aspirated pairs. Both language groups showed equally high correct guessing rates in the lenis-aspirated pairs. As well, they showed equally weak correct guessing rates in the fortis-aspirated pairs (which do not have strong acoustic and articulatory bases for their phonosemantic distinction). Altogether, the hypothesis that the sound-symbolic mappings of *lenis = neutral* and *fortis/aspirated = intensive* in Korean ideophones appears to gain promising evidence at the bilabial place.

Moving on to alveolar stimuli, both Korean- and English-speaking listeners showed strong sensitivity to McCarthy's sound-symbolic mappings in the lenis-fortis and lenis-aspirated pairs. Notably, both recognised the phonosemantic value of the fortis-aspirated pairs, but in a reversed manner relative to McCarthy's sound-symbolic mappings. The significantly wrong meaning-guessing rates for fortis-aspirated indicate that they respond to the sound-symbolic mappings of *aspirated = intensive* and *fortis = paraintensive* (see Figure 5-4 below).

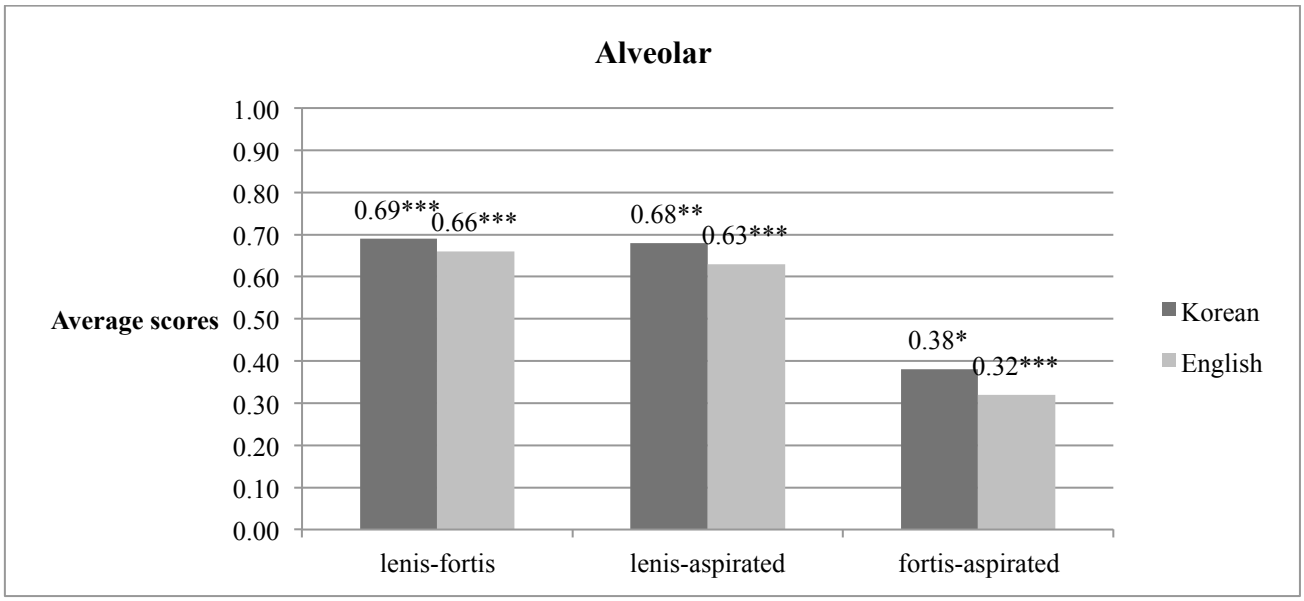


Figure 5-4. Korean- and English-speaking listeners' guessing performances at the alveolar place of articulation

In statistical terms, there were no differences in the Korean-speaking and English-speaking listeners' guessing performances for the three different laryngeal pairs (lenis-fortis, χ^2 (1,336) = 0.22, p = 0.64; lenis-aspirated, χ^2 (1,336) = 0.35, p = 0.55; fortis-aspirated, χ^2 (1,336) = 0.88, p = 0.35). This suggests that Sohn's (1999, p. 97) phonosemantic mappings (*lenis = neutral, aspirated = intensive,* and *fortis = paraintensive*) hold translucent iconicity at the alveolar place and that, therefore, they are naturally motivated, contradicting the original hypothesis that the natural sound-symbolic mappings are *lenis = neutral* and *fortis/aspirated = intensive* in Korean ideophones.

Lastly, at the velar place, Korean-speaking listeners recognised McCarthy's sound-symbolic mappings in the lenis-fortis pairs at a statistically significant level, while English-speaking listeners did not do so in any of the pairs (see Figure 5-5 below).

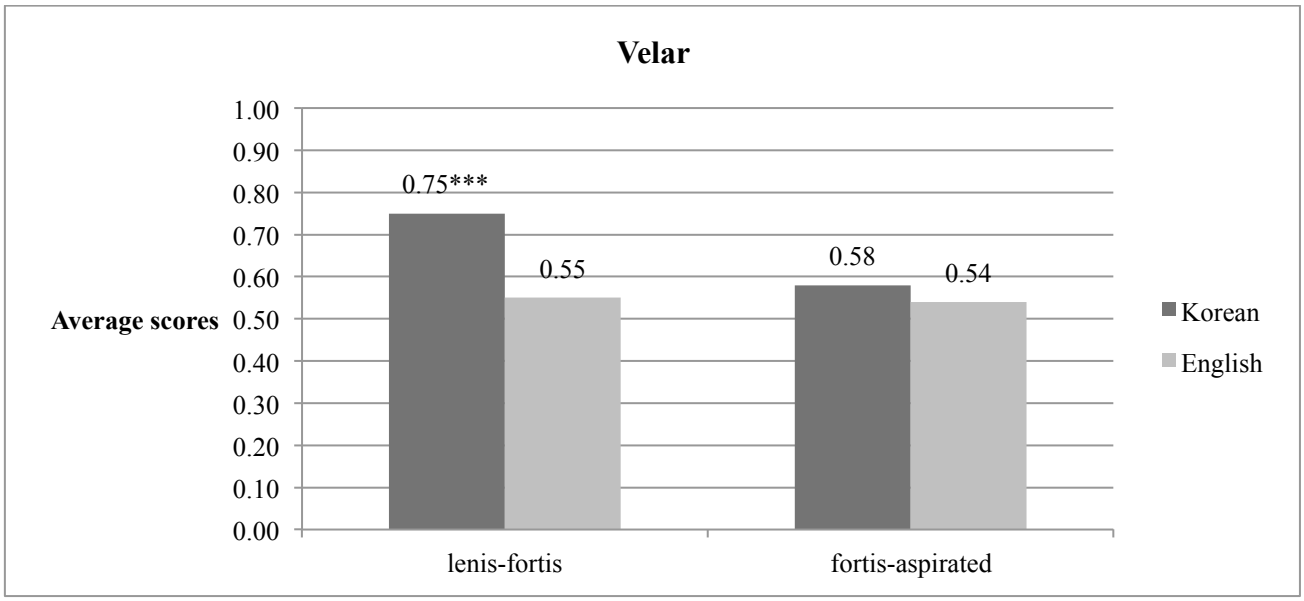


Figure 5-5. Korean- and English-speaking listeners' guessing performances at the velar place of articulation

Statistically, the difference in correct guessing rates between the two language groups was significant in the lenis-fortis pairs (χ^2 (1, n = 336) = 10.29, p = 0.001) but not in the fortis-aspirated pairs (χ^2 (1, n = 336) = 0.33, p = 0.57). Similarly to the bilabial case, taking account of their poor discrimination of /k~k'/ in §5.2, the English-speaking listeners' statistically poor meaning guessing performance in the velar lenis-fortis does not seem to rule out the possibility that the mappings of *lenis = neutral* and *fortis/aspirated = intensive* are naturally motivated. The hypothesis receives further supporting evidence in the fortis-aspirated pairs; both language groups showed equally weak correct guessing rates in the fortis-aspirated pairs, which do not have strong acoustic and articulatory bases for their phonosemantic distinction.

Taken together, the results from different places of articulation support the hypothesis that the sound-symbolic mappings (*lenis = neutral force, fortis/aspirated = intensive force*) in Korean ideophones are naturally motivated. However, at the alveolar place, the hypothesis was somewhat contradicted, since the additional phonosemantic distinction between fortis and aspirated (*fortis = paraintensive, aspirated = intensive*) exhibited translucent iconicity.

The current results are in line with Fordyce's (1988) finding that listeners from an English-speaking background showed an above-chance level of correct guessing rates for the phonosemantics of the lenis-fortis contrast in Korean ideophones. However, Fordyce (1988) generalised the result drawn from only three items, which were different from each other in terms of both manner of articulation and place of articulation. In this regard, a question still remains as to whether all of the six stimulus items in each of the relevant laryngeal pairs coherently measure the translucent iconicity of the Korean consonantal symbolism. Thus, before concluding, in order to

examine how consistent the current finding is, the level of internal consistency for all of the six items in each of the laryngeal pairs, where the English-speaking listeners seemed to recognise their semantic information relatively well (i.e., lenis-fortis at alveolar; lenis-aspirated at bilabial and alveolar, and fortis-aspirated at alveolar), was assessed with mean inter-item correlation (Pallant, 2011, p. 97). It estimated whether it is statistically valid to generalise from the current finding to the entire ideophonic lexicon. The results showed that none of the relevant contrasts reached Briggs and Cheek's (1986) optimal range for the inter-item correlation of 0.2 to 0.4 (/t-t'/, 0.024; /p-p^h/, 0.137; /t-t^h/,-0.042; /t'-t^h/, 0.003). This indicates that within the sets of items that represent each pair, the individual items comprising each set have low internal consistency, and thus the current finding may not extend to the larger ideophonic lexicon. However, running such a correlation for only six items per pair seems to be an underpowered analysis. Thus, the present possibility of the translucent iconicity of the Korean consonantal symbolism is not severely threatened but this still casts an important caveat against putting an extreme emphasis on the role of natural motivation in the Korean consonantal symbolism.

5.6 Conclusion

Experiment 1Bb examined whether Korean and English speakers are sensitive to the sound-symbolic mappings of *lenis = neutral* and *fortis/aspirated = intensive*, which appear to contain plausible articulatory and acoustic grounds, by measuring their meaning guessing performance in nonsense Korean ideophonic pairs that contrast the three laryngeal activities of stops in word-initial position.

Section 5.3 shows that Korean-speaking listeners correctly guessed the semantic contrasts of the lenis-fortis and lenis-aspirated pairs across different places of articulation at a statistically significant level. They also correlated fortis with paraintensive and aspirated with intensive at a statistically significant level at the alveolar place of articulation. Taking their discrimination levels into consideration, English-speaking listeners' correct meaning matching rates were not different from the Korean participants', as shown in §5.4; they were sensitive to the sound-symbolic mappings of *lenis = neutral* and *fortis/aspirated = intensive* across different places of articulation. At the alveolar place, they correlated fortis with paraintensive and aspirated with intensive at a statistically significant level. The comparison of the meaning-guessing performance between the two language groups in §5.5 shows that the sound-symbolic mappings of *lenis = neutral* and *fortis/aspirated = intensive* in Korean ideophones, which possess plausible natural acoustic (intensity build-up duration and closure duration) and articulatory (linguopalatal contact and tension) grounds, are translucently iconic, supporting the ESH. At the alveolar place, the translucent iconicity further extends to Sohn's (1999) sound-symbolic mappings of *fortis = paraintensive* and

aspirated = *intensive* in Korean ideophones. This is surprising, given that the phonosemantic distinction between aspirated and fortis series does not possess strong natural grounds; their acoustic and articulatory characteristics either overlap or point in opposing sound-symbolic directions (intensity build-up duration following the voice onset provides natural grounds for Sohn's sound-symbolic mappings, whereas the articulatory feature 'aspiration' suggests paraintensiveness for aspirated).

As a concluding remark, the current finding indicates that the sound-symbolic mappings of *lenis* = *neutral* and *fortis/aspirated* = *intensive* at the bilabial and velar places of articulation and the mappings of *lenis* = *neutral*, *fortis* = *paraintensive*, and *aspirated* = *intensive* at the alveolar place that can be possibly manifested in Korean ideophones are largely grounded in natural motivation, supporting the ESH. However, this conclusion should be interpreted with caution because the heterogeneity of the stimuli (as indicated by the consistency test) casts some doubt on its generalisability.

6 The opaque iconicity of English phonaesthemes

Unlike Korean, which has a number of ideophones that form a distinctive sound-symbolic word class (i.e., *uysenge* 'phonomime' and *uytaye* 'phenomime/psychomime') in the lexicon, there is no clear ideophonic word class in the relatively "un-sound-symbolic" languages, such as English (Ciccotosto, 1991, p. 134). However, even such languages manifest sound symbolism through sub-morphemic sound-meaning correspondences, termed "phonaesthemes" ("phonesthemes" in Householder, 1946; "root-forming morphemes" in Bloomfield, 1933; "submorphemic differentials" in Bolinger, 1950; "phonaesthemes" in Firth, 1930; "sound symbols" in Marchand, 1969; "psychomorphs" in Markel & Hamp, 1960) across the general lexicon.

As briefly mentioned in Chapter 3 (§3.2.2.7), several behavioural and corpus-based studies (Abelin, 1999; Abramova et al., 2013; Bergen, 2004; Hutchins, 1998; Magnus, 2000; Otis & Sagi, 2008) demonstrated that phonaesthemes are psychologically real. For instance, in Hutchins' (1998) study, her monolingual English-speaking subjects performed significantly well in selecting a correct definition for a nonsense English phonaesthemic word (i.e., a word that contains a phonaestheme) and conversely, a correct nonsense phonaesthemic word for a given definition in multiple-choice tests. In Magnus's (2000) study, subjects (most of whom were native English speakers) had no limitation in their choice of definitions, yet on average 80% of the definitions were narrowed down to a fairly restricted range of interrelated semantic domains for each nonsense word. To take an example, "the word 'drulk' seemed overwhelmingly to evoke definitions concerning weariness, unpleasantness, sorrow and hindrances" (p. 140). Regarding the production of phonaesthemes, there was also a strong tendency for subjects to prefer certain phonemes to others when they invented a word for a given definition. Abelin's (1999) study on Swedish phonaesthemes is in line with those behavioural experiments on English phonaesthemes, in the sense that it demonstrated the psychological reality of Swedish phonaesthemes through subjects' production and perception of neologisms. In her experiment, 15 native Swedish speakers were asked to provide neologisms for given definitions and conversely, provide definitions for any given neologisms in the free-choice and multiple-choice tasks. Additionally, 13 subjects were asked to match two different neologisms with two different meanings in the matching task (e.g., "Which word best describes a thing that is wet and which word best describes a thing that is dry: *fnottig* or *skvottig*?" (p. 220)). As a result, the free- and multiple-choice tasks for both production and interpretation of the phonaesthemes

revealed high percentages of expected answers for the majority of the phonaesthemes. The matching task also showed above 80% correctness in all of the five questions. Given the findings, she concluded that Swedish phonaesthemes have a psychological reality.

Following the previous findings that phonaesthemes exist in the mental lexicon of language users, Bergen (2004) examined the priming effects of English phonaesthemes in lexical processing. In order to investigate whether pairs of words sharing a phonaestheme are processed faster than those sharing only form or meaning, he conducted a lexical decision task where English-speaking subjects were asked to listen to a prime word and to decide whether a second word was an English word or not within a fixed time limit. The results showed that phonaesthemic priming had a significant processing advantage over form or semantic priming alone. He stated that this phonaesthemic priming effect is not equal to the combination of phonological and semantic priming effect, because when a word pair sharing both form and meaning had low frequency (i.e. "pseudo-phonaestheme"), the same phonaesthemic priming effect was not observed. Through this observation, he confirmed his hypothesis that phonaesthemes have their own cognitive status and, accordingly, defined phonaesthemes as "form-meaning pairings that crucially are better attested in the lexicon of a language than would be predicted, all other things being equal" (p. 293). In relation to Bergen's (2004) study, Abelin (2012) tested the priming effects of Swedish phonaesthemes in lexical processing using priming and lexical decision tasks. She asked native Swedish speakers to listen to pairs of words in the condition 'phonaestheme', where a prime and a target word share a phonaestheme (e.g., *flaxa – fladdra* 'flap – flutter'), the condition 'baseline', where prime and target are non-sound-symbolic words that do not share any phonaestheme (e.g., *lada – rysch* 'barn – frill'), and the condition 'isolation', where the target was presented with no priming. The participants decided whether or not the target word was a real Swedish word in the three conditions, and their lexical decision speed was measure accordingly. As a result, it was found that Swedish phonaesthemes are primed, in line with Bergen's study on English phonaesthemes.

The psychological reality of phonaesthemes was determined not only in behavioural experiments but also in corpus-based studies. For instance, Otis and Sagi (2008) extracted 47 distinct sets of words sharing different phonaesthemes from the Gutenberg corpus and calculated the semantic interrelatedness of words in each set, based on Latent Semantic Analysis. The results showed that the sets of words which share phonaesthemes are more semantically related than the sets of randomly chosen words. In line with Otis and Sagi, Abramova et al. (2013) calculated semantic relatedness of the words sharing a phonaestheme using the British National Corpus, which is more recent than the Gutenberg Corpus. Their result supported Otis and Sagi's finding by showing a significantly high level of semantic relatedness for 16 out of the 22 sets of words sharing syllable-initial phonaesthemes. Taken together, they suggested that words sharing phonaesthemes

are more semantically interrelated than random words, from which one can clearly find statistical evidence that phonaesthemes are real.

Structurally, English phonaesthemes resemble derivational bound morphemes, given the fact that they show recurrent form-meaning associations across the general lexicon. However, in Chapter 3, it was found that they are strongly differentiated from other stem-building morphology, in the sense that their residue does not have a recurrent meaning (Abramova et al., 2013; Schmidtke et al., 2014). They have also been treated distinctively from morphemes because, unlike morphemes, some phonaesthemes are shared in not only cognate words but also non-cognate ones across language borders (Bergen, 2004; Blust, 2003; Schmidtke et al., 2014). For example, in the Austronesian language family, the phonaestheme /ŋ-/, which is correlated with the meaning 'mouth/nose', is shared in non-cognate words of different languages such as *ŋaliwŋiw* (Amis), *ŋuruŋur* (Pazeh), *ŋesŋes* (Toba Batak), and *ŋaŋara* (Arosi) which all refer to 'complain, murmur, gripe' (examples from Blust, 2003, p. 198). The fact that phonaesthemes, which involve systematic mappings of a relation between multiple forms onto a relation between multiple meanings (i.e., relative iconicity), show both morpheme-like and non-morpheme-like language universal behaviours leads to the idea that they would not fit into the dichotomy of naturalness and arbitrariness of the signs. This is not surprising because, as mentioned in §1.2, even one of the most iconic linguistic forms, onomatopoeia, where acoustic events are depicted through the means of acoustic sounds, involves a mixed nature of naturalness and arbitrariness. For example, rooster cries in different languages, e.g., *cock-a-doodle-doo* in English, *kikiriki* in German, and *cocorico* in French (examples taken from Perniss, Thomson, and Vigliocco, 2010), have a common element in possessing an imitative character (i.e., /k/). However, they also have arbitrarily chosen elements which make the words different from one language to another (Marchand, 1969).

Previously, there were conflicting opinions as to which property (natural motivation or arbitrariness) played a significant role in the establishment of the relative iconicity of phonaesthemic words, breaking into two schools of thought – one group was in favour of naturalness (Bolinger, 1950; Jakobson & Waugh, 1979; Rhodes, 1994), while the other group was in favour of arbitrariness (Firth, 1930; Fordyce, 1988; Markel & Hamp, 1960). For example, Bolinger (1950) placed emphasis on the natural form-meaning mapping in the denotations of phonaesthemes after he observed that phonaesthemes (in his term, "sub-morpheme differentials") such as *fl-* (e.g., *flow, flush, flood*) give the impression of 'phenomena of movement' to native English speakers without involving apparent etymology. Jakobson and Waugh (1979) claimed that native speakers intuitively feel the phonetic groupings of similar meanings for which "… the patent or latent role played by the 'intrinsic value', *videlicet* by the spell of the speech sounds, is undeniable" (p. 198). Rhodes (1994) also stressed the role of natural motivation, particularly in

onomatopoeic phonaesthemes such as *cl-* (e.g., *clank, clang, click*) and *cr-* (e.g., *crack, creak, crunch*) by relating the abrupt increase in amplitude of stop /k/ to their noise-associated meanings.

While Bolinger (1950), Jakobson and Waugh (1979), and Rhodes (1994) emphasised the natural relation between sound and meaning in phonaesthemes, other scholars (Firth, 1930; Fordyce, 1988; Markel & Hamp, 1960) paid more attention to their conventional nature. In Firth (1930), for example, the phonaestheme *sl-* was considered to be correlated with the meaning 'pejorative' in *slack, slouch, sluch, sludge, slime, slosh* due to the regular and habitual sound-meaning pairing occurring in the lexicon. He claimed that there is no intrinsic value of *sl-*, that could suggest the associated meaning, and that phonaesthemes in general are merely an output of "phonetic habit" of language users. In a similar vein, Markel and Hamp (1960) suggested that the term phonaestheme should be labelled psycho-morph – "a non-morphemic unit of one or more phonemes for which a cultural meaning can be established" in which "cultural meaning" indicates an arbitrary or conventional relationship between form and meaning. Fordyce (1988) empirically supported the conventional basis of phonaesthemes by showing that phonaesthemes are language-specific, through his psycholinguistic experiment; his Arabic and Japanese subjects could not guess the meanings of English words containing phonaesthemes, such as *sn-, gl-, cl-,* and *fl-*, at a significant level. Furthermore, the responses of subjects from the two different language groups showed significantly low correlation value, r = .14.

Acknowledging this heated debate about the naturalness of English phonaesthemes, I hypothesise that the role of natural motivation in English phonaesthemes would be insignificant (i.e., opaque iconicity), following the arguments made by the conventionalist (see §1.4.2 for details). This chapter takes as its specific aim to empirically determine whether English phonaesthemes hold opaque iconicity as hypothesised and, therefore, support the CSH (the Conventional Sound-symbolism Hypothesis) rather than the ESH and its claim that naturalness prevails over arbitrariness in sound-symbolic vocabularies. This determination is made through examining the perceptions of native and non-native speakers of English for typical English phonaesthemes occurring in nonsense English phonaesthemic words. The essential prerequisite to achieving this aim is the delimitation of the phonaesthemic word-sets. The membership of a phonaesthemic word family is "fuzzy" (Fordyce, 1988, p. 178). For example, it is not clear whether to include *snob* (Blust, 2003, p. 188), *snooty* or *snoop* (Fordyce, 1988, p. 177) in a *sn-* 'nasal/oral area' phonaesthemic word family; they are somewhat related to the notion of nasality but not as apparently as *sneeze, snuff,* and *sniffle* are (Fordyce, 1988, p. 177). Such fuzziness causes difficulties when one wishes to build a rigorous data-set to investigate the nature of form-meaning pairings in English phonaesthemes. Previously, Fordyce (1988) attempted to draw a clear-cut line between the core and peripheral members in a phonaesthemic word-set using native English speakers' intuitions. Fordyce found that native

English speakers were able to choose the lexical items that are strongly interconnected with each other in the five lists of English words containing the phonological component of the phonaesthemes, *dr-, cl-, fl-, sl-,* and *str-*, and to express the shared meanings of the chosen words. To take an example, more than 90% of his subjects rated that *cling, clutch* and *claw* are the lexical items that are central to the semantic domain of *cl-* word family and agreed that they share the meaning related to 'grasping motion with the hands' and 'closeness'. Given this finding, he suggested that there are lexical items that are central to a phonaesthemic word-set and the core members should reveal a greater degree of naturalness than the members that are located far from the centre of the semantic domain of a phonaestheme. Regardless of this finding, no previous studies including Fordyce (1988) have taken into account such potential differences in the level of natural iconicity lying between the core and peripheral phonaesthemic members when investigating the nature of English phonaesthemes. Consequently, this has made their results rather inconclusive. For example, Fordyce's (1988) study showed that English phonaesthemes are based on arbitrary convention. However, in the sense that he examined the basis of phonaesthemes without removing peripheral phonaesthemic members in his stimulus set, it is possible that the role of arbitrary convention in phonaesthemes was exaggerated by the phonosemantically vague peripheral items, which contributed weak relative iconicity. This warrants further investigation, as Fordyce pointed out (p.237) "the slight overall trend toward better than expected correct matching, though not significant, suggests the need for further research into possible sound symbolism [in my terms, natural motivation] among English phonesthemes".

In this chapter, I test whether the hypothesised opaque iconicity of English phonaesthemes is exhibited even in their core members, in order to strengthen the argument that the role of natural motivation in phonaesthemes is insignificant. To do so, I first delimited the phonaesthemic word-sets through a preliminary experiment where native English speakers used intuition to choose English phonaesthemic examples that show high semantic interconnection to a proposed key word of the given phonaestheme (Experiment 2A). Then, with the selected core exemplars, I created nonsense phonaesthemic words and asked both English and Korean speakers to guess their shared meanings to determine the possible naturalness of phonaesthemes (Experiment 2B). If the role of natural motivation in phonaestheme is insignificant, it can be expected that even the purported meanings of phonaesthemes occurring in the core members should not be correctly guessed by both language groups, and this would support the CSH.

The organisation of this chapter is as follows. Prior to the main perceptual experiment (2B), §6.1 examines English-speaking listeners' delimitation of English phonaesthemic word-sets. Section 6.2 reports the English-speaking listeners' perceptions of the core phonaesthemic members in the free- and forced-choice tasks. As a parallel observation, §6.3 reports the Korean-speaking

listeners' perceptions of the same stimulus items in the corresponding tasks. Sections 6.4 and 6.5 then compare the correct meaning matching rates between the Korean- and English-speaking participants in the free- and forced-choice tasks, respectively, to examine whether the selected phonaesthemes occurring in the core exemplars hold opaque iconicity. Section 6.6 discusses the results and provides a conclusion.

6.1 Experiment 2A: Preliminary experiment for a selection of core English phonaesthemic words

The aim of this preliminary experiment is to identify words that belong to the semantic core of phonaesthemic word-sets in English speakers' mental lexicon. In Fordyce's experiment on native speakers' delimitation of English phonaesthemic words, subjects were asked to cluster semantically related words and to give the shared meaning for a set of words which contained the phonological component of a phonaestheme. However, in this experiment, subjects were asked to rate how closely individual candidate phonaesthemic words were related to a key word supplied by the author, for which the purported meaning of a phonaestheme is clear. This method aimed to greatly ease the fatigue experienced by the subjects, as it involved only a single rating task. In terms of stimulus items, Fordyce randomly selected words that shared the phonological component of a phonaestheme from Webster's Dictionary. Instead, this experiment used words that had been assigned to the phonaesthemic category by Hutchins (1998). This was expected to narrow down the semantic domain of stimulus items and thus help to extract words that conformed to the proposed meaning of a phonaestheme in a semantically strict manner for the experiment to follow (Experiment 2B).

A prediction which can be made in this experiment is as follows: if an English phonaestheme possesses both a semantic core and a periphery, then a list of phonaesthemic words should reveal gradual ratings to its different exemplars.

6.1.1 Method

6.1.1.1 Participants

English-speaking students, who had participated in Experiments 1Aa and 1Ab (in Chapters 4 and 5) served as participants. The number of participants was 122.

6.1.1.2 Stimuli

Hutchins' (1998) study compiled phonaesthemes from proposals made in previous literature over a period of 70 years. From that study, 20 candidate phonaesthemes were chosen out of 30 initial consonant clusters. The selected phonaesthemes had at least six example words, after Hutchins' lists of phonaesthemic words had been controlled in terms of word frequency level and syllable count. The selected candidate phonaesthemes were instantiated by a varied number of example words within the range of maximum 25 and minimum 6 (see Appendix E). The number of example words for each phonaestheme could not be equalised, as her original list exhibited a different number of example words for each phonaestheme.

6.1.1.2.1 Frequency

The frequency rate for Hutchins' lists of example words of word-initial phonaesthemes was controlled by eliminating the two extreme ends of frequency. Highly frequent words, in which the frequency of the lemma was more than 100 times per million words, were eliminated. Words that occurred less than 50 times in the entire 100-million word cases from the British National Corpus (Leech, Rayson, & Wilson, 2001) were also removed from the word stimuli, since that indicated a rounding down to zero per million words. The BNC was taken as a source of frequency measure in this experiment because it contains both written and spoken words, 88 million and 12 million respectively (Brysbaert & New, 2009), and its orthography and word use fit Australian experiments better than the alternatives – recall that participants were students from an Australian university. Thus, it was expected to deliver better frequency measures than an American corpus, such as Thorndike-Lorge or Kucera-Francis.

6.1.1.2.2 Syllable count

In order to make the rating task relatively easy for participants, the word samples included only monosyllabic words. Controlling for phone and letter length was not attempted because it would have considerably reduced the number of the stimulus items.

6.1.1.2.3 Location of phonaestheme

This experiment solely focused on word-initial phonaesthemes, in order to control any possible positional factors, which could influence participants' ratings on semantic relatedness of word samples for each phonaestheme.

6.1.1.3 Keyword

A key word is a representative word for a phonaestheme in terms of the sense that it denotes. The function of a key word here was to ensure that semantic interconnection between example words for

a phonaestheme was objectively measured with one common reference point. In order to qualify as a key word, the example words of a phonaestheme in Hutchins' study underwent three stages in the selection process. First, if an example word appeared in Hutchins' semantic gloss of a candidate phonaestheme, it became a key word (Hutchins listed the semantic glosses for the phonaesthemes of interest by combining different researchers' descriptions of them). For instance, *blow* was chosen as a key word for a list of words sharing *bl-* because it appeared in Hutchins's definition of the phonaestheme *bl-* 'to blow, swell, or inflate; or to be round, swollen, or globular in shape'. Second, if the gloss did not contain any words bearing the sound pattern of interest, an example word which had the most occurrences of synonym sharing the sound pattern of interest in WordNet (http://wordnet.princeton.edu/wordnet/download/current-version/) was chosen as a key word. For example, *clang* became a key word for *cl-* because it had the largest number of synonyms sharing word-initial *cl-* (e.g., *clangour, clank* and *clash*). Third, if there were multiple example words having the same number of synonyms bearing the sound patterns of interest, the most frequent word among them became a key word. Under this criterion, *squeeze* with the frequency of the lemma, 8.189, became a key word for *sq-*.

6.1.1.4 Procedure and design

In order to minimise participant fatigue, the 20 lists of 258 English sample words were divided into two different sets and distributed to two sub-groups of the participants: Group A and Group B. Consequently, 56 participants in Group A and 66 participants in Group B read 10 lists, totalling 131 and 127 sample words respectively. They rated one by one how closely each word on their list was related to a key word on a 5-point Likert scale, ranging from strongly related (5) to not related (1). For this rating task, they were specifically told that some words on the list could have various possible meanings (i.e., homonymy/polysemy). For example, *close* can mean shutting or completing (a verb) and nearness (an adjective). For such a case, they were asked to select and rate the most closely related meaning to the given key word, disregarding part of speech. For the case of encountering a word that they did not know, they were told to select the 'Don't know' option instead of consulting dictionaries (see participants' instructions in Appendix F for further details).

The experiment was run on a University of Queensland online test system, Blackboard, with no time limit. On this system, the presentation order of the stimulus items for each list was automatically randomised for each participant.

6.1.2 Results

The participants' ratings for the individual words on each phonaestheme's list were averaged after any 'Don't know' responses were excluded (see Table 6-1).

Table 6-1. Mean ratings of individual words in each phonaestheme's list (key words in parenthesis)

cl- (clang)	Mean	fl- (flow)	Mean	gl- (gleam)	Mean	sk- (skim)	Mean	st- (stiff)	Mean
clank	4.06	float	3.59	glow	4.14	skid	2.7	stick	2.4
clash	3.96	flush	2.88	glint	3.93	skip	2.58	stump	1.81
clap	3.12	flee	1.92	gloss	3.57	skate	2.48	stanch	1.69
clack	3.02	flail	1.9	glare	2.94	skimp	2.24	steep	1.66
cling	2.93	flop	1.79	glaze	2.83	scud	1.96	stall	1.55
click	2.74	flap	1.75	glee	2.06	scour	1.78	stuff	1.31
cluck	2.14	fleet	1.71	glad	1.95	skirt	1.68	stir	1.3
clamp	1.88	flit	1.66	glimpse	1.95	scope	1.67	stamp	1.28
clip	1.82	flag	1.57	glance	1.9	skin	1.61	sting	1.25
clod	1.75	flex	1.55	gloom	1.82	sketch	1.58	stomp	1.23
clog	1.69	fling	1.55	gloat	1.5	skew	1.45	stash	1.12
clam	1.68	flare	1.5	glum	1.39	scat	1.4		
clinch	1.64	flash	1.5	glide	1.25	scoff	1.25		
clutch	1.62	flip	1.48	globe	1.21	scare	1.15		
clasp	1.62	flick	1.44	glove	1.08	skull	1.1		
clump	1.55	flat	1.41						
clench	1.51	flaunt	1.4						
claw	1.47	fluster	1.35						
clay	1.34	fleck	1.27						
cloy	1.33	flirt	1.25						
		flinch	1.24						
		flake	1.21						

Table 6-1. (continued)

str- (straight)	Mean	sw- (swing)	Mean	sp- (spit)	Mean	tr- (tread)	Mean	bl- (blow)	Mean
stripe	3.05	swish	2.97	spat	4.73	trudge	3.72	blast	3.65
strip	2.53	swoop	2.71	spew	3.61	trot	3.25	blurt	2.08
stretch	2.35	swipe	2.47	spurt	3.42	tramp	2.98	blaze	1.84
streak	2.29	sweep	2.3	spout	2.4	trip	2.48	bleat	1.36
strait	2.14	swirl	2.26	spurn	1.56	troll	1.69	blob	1.31
string	2.1	swat	2.08			trap	1.3		
strap	1.97	swoon	1.71						
stream	1.82	switch	1.6						
stride	1.69	swag	1.56						
strive	1.57	swap	1.51						
strut	1.5	swell	1.48						
strum	1.38	swill	1.44						
strength	1.36	swim	1.43						
strain	1.33								
stroll	1.31								
strife	1.3								
strange	1.24								
strew	1.23								
stress	1.21								

Table 6-1. (continued)

cr- (crook)	Mean	dr- (drag)	Mean	gr- (growl)	Mean	sl- (slide)	Mean	sn- (snout)	Mean
creep	2.68	drift	2.72	grunt	4.1	slip	3.95	sniff	3.89
crack	2.26	droop	2.7	groan	3.86	slope	3.63	snort	3.84
crick	2.19	drape	2.28	gruff	3.15	slant	2.84	sneeze	3.36
cramp	2.11	drawl	2.25	grim	2.13	slick	2.58	snore	3.24
crutch	2.03	drown	2.03	grouse	2.05	slink	2.29	snuff	2.85
creak	1.94	dregs	1.86	grudge	2.02	sleek	2.22	snarl	2.58
crouch	1.84	drug	1.77	grasp	1.5	slime	2.13	sneer	2.18
cross	1.82	drain	1.74	grope	1.4	sleet	2.05	snoop	2.16
cringe	1.79	droll	1.69	grab	1.38	sludge	1.94	snub	2.05
crane	1.74	drench	1.53	grip	1.35	slosh	1.93	snob	1.95
croak	1.68	drool	1.47	graft	1.09	slope	1.89	snack	1.48
crimp	1.66	drip	1.37			slouch	1.67	snap	1.31
crag	1.57	dry	1.32			slough	1.46	sneak	1.2
crow	1.53	drum	1.24			slash	1.45	snatch	1.15
crash	1.51	dram	1.21			slow	1.44	snag	1.07
crawl	1.49					sling	1.41	snip	1.07
crunch	1.47					slack	1.38		
crush	1.38					slam	1.37		
crib	1.36					slay	1.37		
crate	1.35					slit	1.37		
crump	1.3					sloth	1.3		
crab	1.15					slap	1.24		
crumb	1.15					slog	1.23		
						slave	1.23		
						slang	1.11		

Table 6-1. (continued)

wh- (whack)	Mean	sq- (squeeze)	Mean	tw- (twist)	Mean	wr- (writhe)	Mean	skr- (screech)	Mean
whip	3.34	squash	3.74	twirl	4.08	wring	2.41	scream	4.57
whoosh	1.93	squirt	2.89	twine	3	wrap	1.85	scrape	2.4
whoop	1.89	squirm	2.52	tweak	2.33	wrath	1.83	scratch	2.13
whisk	1.59	squelch	2.45	twitch	1.51	wry	1.55	scrawl	1.47
whizz	1.57	squeal	1.93	twang	1.38	wrench	1.5	scrub	1.26
whirl	1.44	squeak	1.8					scrounge	1.21
whine	1.42	squawk	1.49					screw	1.2
wheeze	1.26	squid	1.26						
whit	1.09	squall	1.22						

The prediction was borne out by these results; the graded mean ratings indicate that certain words are closer to the core meaning of a phonaestheme than others, and that the gradience hinders one from locating a point where the core category stops and the peripheral category starts, as expected. However, in a histogram, where the strengths of semantic interconnection between example words

and the relevant key word is visually arranged as in Figure 6-1, the point at which a relatively steep drop of the meaning rating occurred was more clearly seen (mean percentage of steep drop = -23%, SD = 10%) and provisionally, this enabled us to identify what constitutes the core and peripheral category in this experiment.

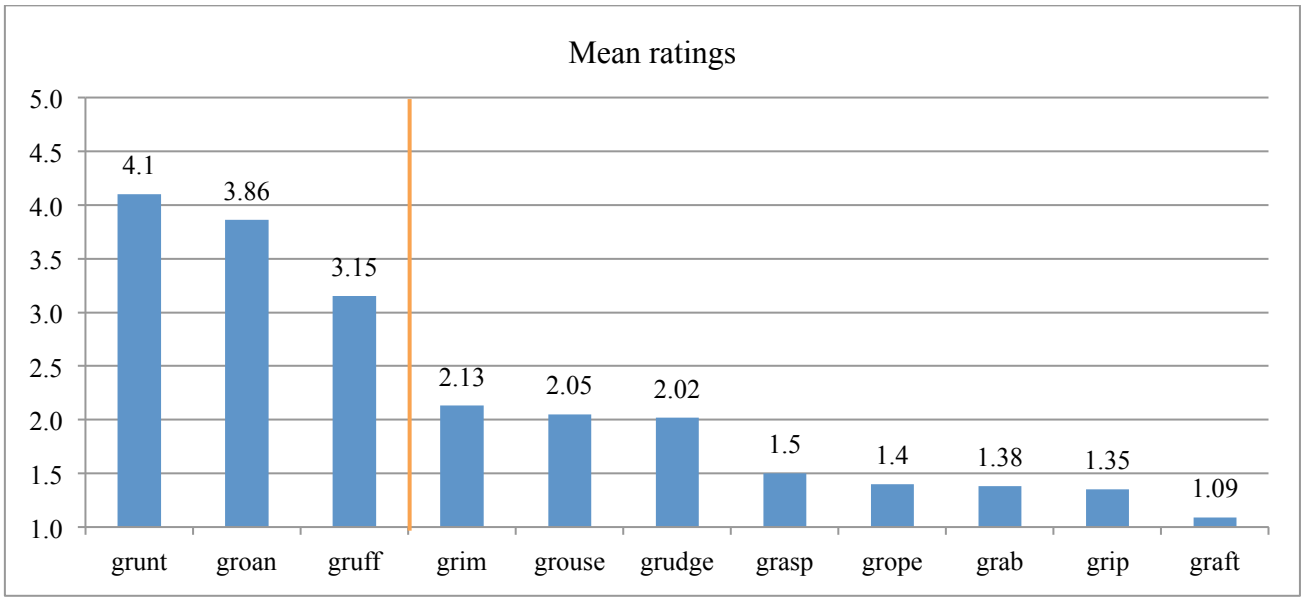


Figure 6-1. Mean ratings for example words of *gr-* phonaestheme (key word *growl*).

For example, for the *gr-* phonaestheme in Figure 6-1 above, the biggest drop (see the orange line) occurred between *gruff* and *grim*. Thus, only the three words, *grunt, groan* and *gruff*, and the key word, *growl,* were considered to be the core words central to the purported semantic domain of *gr-*, and any words below the orange line were considered to belong to the peripheral category.

This sorting process made it possible to discard any lists with less than three core example words, which therefore appeared to have only loose form-meaning correspondences and which, therefore, were less likely to be based on natural motivation. Consequently, only ten lists of phonaesthemes, with a total of 54 example words, were retained for the following experiment (the selected phonaesthemes and their core example words are shown in bold in Appendix E).

6.2 Experiment 2B: English-speaking listeners' perceptions of English phonaesthemes

Experiment 2A above showed that words which contain a certain phonaestheme are different from each other in terms of their distance from the semantic core of the phonaesthemic category. The words that are located in a central part of the phonaesthemic category have a strong bond between the phonaestheme and its suggestive meaning, leading to the idea that the phonaestheme occurring

in the core members may display the naturalness of the linguistic signs to a great degree. Experiment 2B examines whether or not the selected example words in Experiment 2A contain strong natural motivation, by assessing the universality of the interpretations for the ten phonaesthemes that the sets of core example words share.

6.2.1 Method

In order to examine whether English and non-English speakers could perceive semantic aspects of the ten selected English phonaesthemes occurring in the core members of the phonaesthemic categories, English-speaking listeners were asked to participate in two separate tasks: a free-choice task and a multiple-choice task. Examination of Korean-speaking listeners' perceptions of the phonaesthemes in the corresponding tasks follows in §6.3. Since English phonaesthemes do not exhibit clear binary phonosemantic contrasts (unlike meaning-bearing elements of Korean ideophones, as discussed in Chapters 4 and 5), the additional free-choice task was necessary to increase the participants' perceptual freedom, which might be blocked in a forced-choice task (Bentley & Varon, 1933).

6.2.1.1 Participants

A total of 61 students from an introductory linguistic course at the University of Queensland, who had not participated in any of the experiments in the previous chapters, served as English-speaking subjects. They were given course credit for their participation. According to the language-background questionnaire that they had completed prior to the experiment, there were 13 non-native English speakers (10 Chinese, 1 Indonesian, 1 Bengali, 1 Thai), one native English speaker with some exposure to Korean, and one native English speaker with mild auditory processing problems. To facilitate a strict measurement of English-speaking listeners' interpretation of the phonaesthemes, I retained only the responses of those participants who had no extensive knowledge of a second language and no hearing problems. This reduced the actual number of the participants to 46.

6.2.1.2 Stimuli

In order to block the participants' attempts to use their prior knowledge of English, nonsense English phonaesthemic words were created, by using 54 core phonaesthemic words drawn from the preliminary experiment above with a multilingual pseudoword generator, Wuggy (http://crr.ugent.be/programs-data/wuggy). The program generated multiple candidate pseudowords that matched the letter length, transition frequencies, and word-initial phonaesthemes of the input words (Keuleers & Brysbaert, 2010). The best nonsense English phonaesthemic word for each input word was then selected, on the criteria that it should have the smallest difference from the input

word in terms of the neighbourhood size and its density, which were calculated by Wuggy. Since Wuggy does not provide a pronunciation guide for the generated pseudowords, their pronunciations, particularly in regard to vowels, were unclear. In order to overcome this limitation, two native English speakers were asked to check the pronunciation of each pseudoword. This pronunciation checking process helped to discard any pseudohomophones and to replace them with the next best candidate pseudowords available. It also ensured that all of the pronunciations sounded natural and were in accord with native English speakers' intuition. The ten lists of the selected nonsense phonaesthemic words are shown in Table 6-2 below.

Table 6-2. The lists of nonsense phonaesthemic words

Proposed semantic gloss	Phonaestheme	Nonsense word
Two things coming together or separating often producing a noise; the result of such an action	*cl-*	clant, clane, cland, clat, clabs, climp, clins
Having to do with light or with vision; or something visually salient	*gl-*	glear, gloy, glind, glose, glore, glard
Pertaining to the surface, edges, or thinness; or superficial, not deep	*sk-*	sked, skig, skake, skind, skir
To oscillate, undulate, or move rhythmically to and fro	*sw-*	swibs, swoos ,swime swees, swigh, swar, swire
Bring to a point or send out from a point; or to reject	*sp-*	spad, spow, spuce, sput
A path, or to walk in a line; or to locomote by foot; or to step forcefully	*tr-*	trudes, trit, trass, tris, trood
Deep-toned, complaining, or threatening noises	*gr-*	grent, groon, gruce, grofs
Related to the nose, or breathing; or by metaphorical extension to inquisitiveness	*sn-*	snice, snoft, sneese, snire, snump, snorl, snous
Something soft, spongy, or compressed; or to constrict, compress, or contract something	*sq-*	squave, squird, squibe, squelps, squeece
To turn, distort, entangle, or oscillate; or the result of such an action	*tw-*	twibe, twing, tweal, twire

6.2.1.3 Procedure and design

The ten lists of 54 nonsense phonaesthemic words were recorded by a male native speaker of Australian English. The stimuli were pronounced consistently in rise-fall intonation to control any possible meaning-related prosody or intonation cues.

For the free-choice task, the participants were asked to hear a list of words that shared a word-initial phonaestheme and to write down the image that the words in the list brought to mind. They were explicitly told that the nonsense words in each list all shared one general meaning with each other and that there were no 'right' or 'wrong' answers. The experiment was again run on a University of Queensland online test system, Blackboard, with no time limit. Since all of the procedures were conducted online, participants had freedom to choose a time and place convenient and comfortable for them to participate in the study. As well, they were able to listen to the stimulus sound files multiple times if they wished. There were no minimum requirements for the listening condition, such as a request to wear earphones/headphones. The lists were automatically shuffled on the system and presented in a random order for each participant. Prior to the actual task, they had an opportunity to attend to a sample practice question, to make sure that they understood the instructions (see Appendix G for the instructions).

Immediately after the free-choice task, which was designed to examine the participants' knowledge of the meaning of each list in a semantically free condition, the participants were further asked to attempt a multiple-choice task, which involved listening to the same lists of nonsense English phonaesthemic words. The multiple-choice task was designed to limit the participants' semantic judgements of the phonaesthemic words, allowing specific phonosemantic information for their perceptual decisions to be observed. Here, they chose the description that they felt was the best fit for each phonaesthemic list, among the ten proposed definitions in Table 6-2 above. The semantic glosses for the ten phonaesthemes in Table 6-2 were taken from Hutchins' (1998) study. Hutchins developed the semantic glosses of several English phonaesthemes by compiling the meanings of the phonaesthemes cited by previous literature (e.g., Bolinger, 1950; Firth, 1930) and selecting their common semantic features. Some of her definitions contained words that shared the phonological patterns of the phonaesthemes of interest. For example, the phonaesthemes *sn-* and *sq-* (seen in Table 6-2 above) were defined as 'related to the nose, or breathing; or by metaphorical extension to *snobbishness*, inquisitiveness' and 'something soft, spongy, *squishy*, or compressed; or to constrict, compress, contract, or *squeeze* something', respectively. In these cases, the words that contain *sn-* and *sq- – snobbishness*, *squishy*, and *squeeze* – were excluded from the semantic glosses in the current multiple-choice task, in order to prevent the participants from having their perceptual decisions influenced by the existence in the definition of word that contained the sound symbol of interest.

The participants' instructions for the multiple-choice task were as follows:

> This time, don't worry about the descriptions that you gave for each list of nonsense words in the previous task. Take a deep breath and just go through the

> descriptions that appear on the screen. Your task is to hear the same lists of nonsense words again and select an appropriate description for each list. There is no right or wrong answer. So, use your own intuition freely. You may replay each sound file as often as you want. Participation in this experiment has no time limit.

Each list was presented on a separate page and the presentation order of the lists was randomised on the Blackboard system. The order of the definitions was, however, fixed across the lists. This contained a potential confound; participants may assume that they cannot choose again the definition which they have previously chosen and this may restrict subjects' choices toward the end of the lists. However, despite this concern, 96% of the subjects had duplicate answers in their own responses, indicating that the fixed presentation order of the definitions was not likely to have affected the subjects' responses.

6.2.2 Results

6.2.2.1 Free-choice task result

The participants' invented descriptions for the lists of nonsense phonaesthemic words in the free-choice task are exemplified in Table 6-3 below (For full lists of descriptions, see Appendix H).

Table 6-3. English-speaking listeners' invented descriptions for a group of nonsense words starting with *cl-*

Subject ID	*Descriptions for a group of nonsense words starting with cl-*
001	Hard objects methodically struck together. The words sound onomatopoeic.
002	Picture of a large field with plants and African animals running across it squashing the plants
003	Pottery for plants
004	Plants, flowers, but carnivorous ones like the Venus flytrap
005	A particularly busy art class
006	Throwing wet clay onto the floor
007	Grabbing something or someone
008	Clay
009	Playing golf on a rocky course

010	Fell, splat, tap
011	Something heavy making a lot of noise
012	A person in gardening
013	Something sticking to another object
014	Things that hold things together
015	A horse trotting
016	Medical supplies
017	Finding something, sharpness, stabbing
018	A group of people use objects to make something
019	Smooth grey pebbles sliding across each other
020	Parts of a house/building
021	The parts of old wooden buildings
022	Things clumped together
023	A person limping
024	The natural environment - flora
025	Clamp - crabs
026	Beach, sand, waves
027	A short glimpse of something being clamped in mid-air
028	<Unanswered>
029	Makes me think of tribal instruments/activities
030	Something loud
031	Collecting shells on the beach
032	An orange clam clapping its shell together making a clapping sound
033	The various directions crabs can go
034	An army of medieval people prepping for battle
035	Things on a farm
036	A busy cafe
037	A construction line
038	Noisily making its way up a steel stairwell
039	A person clapping

040	Some clapping instrument that makes a lot of sound
041	The glint and prestige of armour
042	A loud gathering of people
043	Sea creature
044	An open space like a meadow
045	Gustav Klimt's painting of The Kiss. Or, words that describe the sound of bells.
046	The ground - earth, and plant growth.

Since participants had no semantic limitation as to their descriptions of images that a list of nonsense words, which shared a phonaestheme, could possibly bring, there were several ambiguities in interpreting their answers. For example, in Table 6-3, certain descriptions seemed clearly to match the purported meaning of the phonaestheme *cl-*, 'two things coming together, separating often producing a noise' (e.g., "hard objects methodically struck together. The words sound onomatopoeic." – subject 001; "an orange clam clapping its shell together making a clapping sound" – subject 032). However, others seemed to match the key meaning less clearly; the description created by subject 004, "plants, flowers, but carnivorous ones like the Venus flytrap" seemed to relate to the given meaning only via a metaphorical extension – that the Venus flytrap is associated with the shutting motion of its trap. Subject 005's description "a particularly busy art class" and subject 036's "a busy cafe" are more problematic as to their conformity with the key meaning, because only the most inventive interpretation (e.g., a busy place may involve people bumping each other; a busy art class may involve clattering sounds of paintbrushes, canvases, chisels, etc.; a busy café may involve clattering sounds of cups) gives the impression that they *somehow* match the meaning. If it was clear why the participants provided such answers, it would be straightforward to decide whether the provided responses fall into the semantic domain of the phonaestheme of interest. However, the experiment did not ask the participants to justify their answers. This was designed to minimise the participants' fatigue but, by simplifying the experiment, it created potential ambiguities in the interpretation of the subjects' responses.

In order to minimise subjectivity in the evaluation of the participants' responses in comparison with the purported meaning of the phonaestheme, four naïve native English speakers' judgements as to the relatedness of the responses were collected (given that they would not be aware of the original phonaestheme stimulus and would only see the responses from the first group of subjects, it was expected that they could rank each pair as to their similarity fairly objectively). Two native English speakers judged the subjects' responses for the first five phonaesthemes – *cl-, gl-, sk-, sw-,*

and *sp-* – and the other two judged the remaining five phonaesthemes – *tr-, gr-, sn-, sq-,* and *tw-*. The purported meaning of each list was broken down to a small number of yes-no questions and the naïve raters read each subject's response on the list carefully, and answered 'yes' or 'no' based on their judgement of whether each description was related to each small part of the purported meaning of the phonaestheme. It was necessary to break down the purported meaning to small parts in order to judge the subjects' responses, taking into account of polysemy/homonymy of phonaesthemes. If subjects' responses fell into at least one part of the key meanings of a phonaestheme, it was considered that they fitted into the semantic category of the target phonaestheme. For example, the meaning of *cl-* was broken down to three parts: two things coming together; two things separating; and a noise. Two raters read subject 001's response, "hard objects methodically struck together. The words sound onomatopoeic" and answered 'yes' or 'no' based on its relatedness to each part of the purported meaning. Their 'yes/no' answers to each mini-question were then changed to two categorical variables (i.e., 0 = no, 1 = yes) and merged into one. For each rater, if there was at least one 'yes' (i.e., 1) in the mini-questions, it was considered that the description conformed to the key meaning of the phonaestheme and thus, a total score of '1' was given. When a subject did not provide any description (as subject 028 in Table 6-3) a score of '0' was given by the author before sending to the raters. Then, the consistency of the ratings between the two raters was measured using Cohen's Kappa coefficient of inter-rater agreement, which takes into account chance agreement (Pallant, 2011, p. 224). As a result, it appeared that the level of inter-rater agreement was not high, except for *gl-, sn-,* and *tw-*, confirming the expected ambiguities of assessing the relatedness of the responses (see Table 6-4 below for values of Kappa in all of the phonaesthemic lists).

Table 6-4. Cohen's Kappa coefficient of inter-rater agreement for English results

Phonaesthemes	Kappa	Phonaesthemes	Kappa
cl-	0.252	*tr-*	0.428
gl-	0.727	*gr-*	0.478
sk-	0.283	*sn-*	0.653
sw-	0.135	*sq-*	0.480
sp-	0.118	*tw-*	0.597

Note: A value of above 0.5 for Kappa indicates significant agreement.

Despite this low level of inter-rater agreement, however, the naïve raters' judgements of similarity were still helpful in eliciting the percentage of cases where both raters identified a response as being related to the key meaning. For example, they showed that out of the 46 responses in total for *cl-*, 31 were rated as being related to the key meaning by both raters. This suggested that 67% of the responses were likely to conform to the purported meaning of *cl-* phonaestheme. The probabilities of these responses rated as being related to the key meanings by both raters for the entire lists are illustrated in Figure 6-2 below.

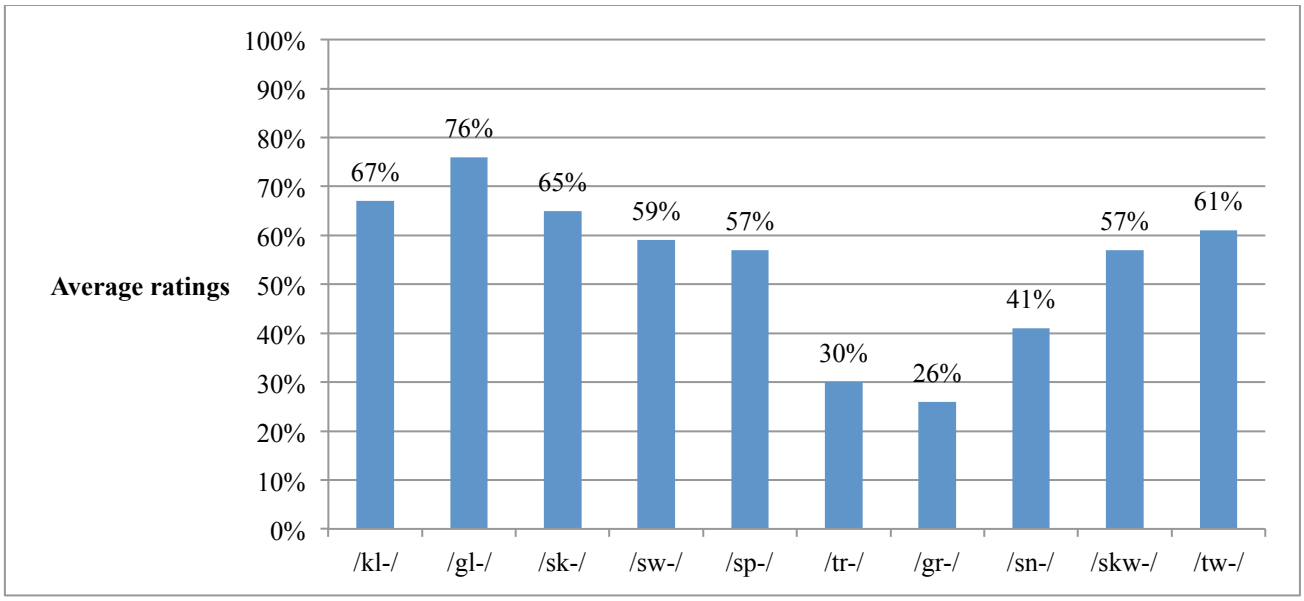


Figure 6-2. The probabilities of the responses of the first group of English-speaking subjects that were rated as being related to the key meanings of the phonaesthemes of interest

Figure 6-2 clearly shows that there were variations in the listeners' sensitivities to the semantic aspects of the phonaesthemes. The English-speaking listeners seemed to recognise the phonosemantic relationship of some phonaesthemes, such as *gl-* (76%), more clearly than that of *tr-* (30%) or *gr-* (26%). This variability is, however, not exclusive to the selected phonaesthemes. Previous research had also revealed that phonaesthemes in general contain probabilistic attributes. For example, in Markel and Hamp (1960), their native English subjects rated that *gl-, fl-,* and *sm-* contained stronger connotations than *sp-* and *st-*. Hutchins (1998) also supported the variability among phonaesthemes by showing that her native English subjects' ratings as to the semantic relatedness of the 46 word-initial and word-final phonaesthemes to their purported meanings varied from 1.90 for *–[V]nk* (e.g., *clank, thunk, yank*) to 5.04 for *-olt* (e.g., *bolt, jolt, volt*) on a 7-point Likert scale.

6.2.2.2 Multiple-choice task result

For the multiple-choice task, the mean proportion that the participants chose the target definition and non-target definitions for each list of nonsense phonaesthemic words is shown in Table 6-5. The rows and columns indicate the involved phonaesthemes and their purported meanings, respectively. The shaded cells indicate the proportions that the participants correctly chose the target definition for the phonaestheme of interest.

Table 6-5. English-speaking participants' guessing performance in the multiple-choice task

	cl-	*gl-*	*sk-*	*sw-*	*sp-*	*tr-*	*gr-*	*sn-*	*sq-*	*tw-*
cl-	33%***	11%	13%	4%	9%	4%	2%	2%	9%	13%
gl-	4%	61%***	7%	0%	7%	2%	4%	7%	9%	0%
sk-	13%	4%	17% (n.s.)	13%	9%	24%**	0%	4%	4%	11%
sw-	2%	2%	7%	39%***	4%	2%	2%	13%	20%*	9%
sp-	17%	4%	4%	4%	22%**	2%	2%	17%	22%**	4%
tr-	2%	4%	20%*	9%	9%	24%**	4%	2%	4%	22%**
gr-	9%	0%	0%	4%	9%	9%	48%***	7%	2%	13%
sn-	0%	4%	4%	7%	4%	2%	9%	59%***	7%	4%
sq-	13%	2%	9%	9%	4%	2%	4%	2%	43%***	11%
tw-	20%*	7%	13%	4%	13%	7%	0%	4%	7%	26%**

* $p < .05$, ** $p < .01$, *** $p < .001$

The percentage of correct and incorrect answers in each list was compared to the chance probability of being correct (1/10), using a one-tailed binomial test. As a result, it was shown that for *sk-*, the definition for *tr-* 'a path, or to walk in a line; or to locomote by foot; or to step forcefully' was incorrectly chosen as an appropriate answer at a statistically significant level. An above-chance level of incorrect answers also appeared for *sw-, sp-, tr-, tw-*. In detail, in *sw-* and *tw-*, although the participants chose their target definitions at a significant level, the level of incorrectly choosing the definitions for *sq-* and *cl-*, respectively, for the two lists also reached significance (however the significance level was still higher for their choices of the correct answers). For *sp-*, the participants' responses were ambiguous, because they chose both the correct answer and one of the incorrect answers (definition of *sq-*) at the same significance level. For *tr-*, two incorrect definitions (definitions for *sk-* and *tw-*) were chosen in addition to the target definition at a statistically significant level. The best agreement on the purported form-meaning mapping was seen for *cl-, gl-,*

gr-, sn-, and *sq-*, where no definitions other than the target ones were chosen at an above-chance level.

Returning to the results in the free-choice task, some researchers (Bergen, 2004; Hinton, Nichols, & Ohala, 1994) have argued that the psychological reality of phonaesthemes is a consequence of their statistical prevalence in the lexicon. In a similar vein, Parault and Schwanenflugel (2006) raised the possible effect of "sound association", based on the fact that many of the definitions of word-initial English phonaesthemes generated by their native English-speaking subjects contained the same phonological patterns of the phonaesthemes of interest. They also raised a possible effect of mediated priming – that the nonsense phonaesthemic words (e.g., *scriek* with *scr-* 'grating impact or sound') may have primed the existing word that contained the phonological pattern of the sound symbol (e.g., *scream*) and this in turn may have primed the word in the subject's final answer (e.g., *cry*). The mediated priming effect is difficult to verify, however there appears to be some indirect evidence for the sound association effect in the current experiment. For example, some of the correctly generated definitions for *cl-* in Table 6-3 contained words starting with *cl-* (e.g., "things *clumped* together" – subject 022; "a short glimpse of something being *clamped* in mid-air – subject 027; "an orange *clam clapping* its shell together making a *clapping* sound" – subject 032). The percentage of correct responses for the *cl-* list drops from 67% to 52% when correct answers that contain words starting with *cl-* are excluded. The possible influence of sound association was also observed in one of the wrongly generated definitions (e.g., "clay" – subject 008). Table 6-6 below shows the percentages of the subjects' responses that contained the phonological form of each phonaestheme. The columns and rows indicate the involved phonaesthemes and their phonological forms, respectively. The shaded cells indicate the proportions of responses that contained the phonological form of the target phonaestheme.

Table 6-6. The percentages of the subjects' responses that contained the phonological form of the target phonaestheme

	cl-	*gl-*	*sk-*	*sw-*	*sp-*	*tr-*	*gr-*	*sn-*	*sq-*	*tw-*
cl-	20%	15%	0%	0%	2%	9%	0%	0%	0%	0%
gl-	4%	46%	0%	0%	0%	0%	0%	0%	0%	0%
sk-	0%	2%	50%	7%	0%	0%	0%	0%	0%	4%
sw-	0%	2%	0%	43%	0%	0%	0%	0%	0%	4%
sp-	4%	4%	4%	4%	39%	4%	0%	0%	2%	4%
tr-	7%	4%	4%	7%	2%	26%	9%	2%	9%	13%
gr-	9%	2%	9%	9%	4%	7%	35%	9%	7%	2%
sn-	0%	4%	7%	0%	0%	9%	0%	43%	2%	2%

sq-	2%	0%	2%	2%	0%	0%	0%	0%	33%	0%
tw-	0%	0%	0%	0%	0%	2%	0%	0%	0%	20%

In Table 6-6, it is easily noticeable that the participants' responses contained the phonological pattern of the target phonaestheme to a greater degree than those of non-target phonaesthemes (e.g., for *cl-* phonaestheme, 20% of the responses contained words starting with *cl-* and 4 % with *gl-* and 9% with *gr-*, and so on.). This result increases uncertainty as to whether the psychological reality of the phonaesthemes is mainly due to sound association or to natural motivation. The following section clarifies the underlying reason for the observed psychological reality of the phonaesthemes, through examining non-English speakers' perceptions of the phonaesthemes.

6.3 Experiment 2B: Korean-speaking listeners' perceptions of English phonaesthemes

6.3.1 Method

6.3.1.1 Participants

A total of 31 students from Kunsan National University in Korea, who had not participated in any of the experiments in the previous chapters, served as Korean-speaking participants on a voluntary basis. According to the language-background questionnaire that they completed prior to the experiment, there were three Korean speakers who were fluent in English. For a strict measurement of Korean speakers' interpretation of the phonaesthemes, the responses of those three participants, who self-rated themselves as fluent English speakers, were discarded.[51] This reduced the actual number of to 28.

The exclusion of fluent English speakers of Korean, however, does not entirely ensure that participants were unable to make inferences from an existing knowledge of English, since all of the Korean-speaking participants were university students in Korea who had been exposed to English as a second language for at least nine years. For future research, participants who are less well educated and thus have little exposure to English are needed to overcome this limitation.

6.3.1.2 Stimuli

The audio stimuli for this experiment were the same as those used in free- and multiple-choice tasks in §6.2. The participants were told that the stimulus words were from a non-existing language. The

[51] The three Korean speakers of fluent English did not show a notably improved correct guessing performance in the experiments, however.

English semantic glosses of the ten phonaesthemic words used in multiple-choice task were translated word by word into Korean by the author, a native Korean speaker.

6.3.1.3 Procedure and design

The procedure and design are the same as in §6.2. The instructions for the free- and multiple-choice tasks were translated into Korean by the author, a native Korean speaker.

6.3.2 Results

6.3.2.1 Free-choice task result

The participants wrote the description for each list of the nonsense phonaesthemic words in Korean in the free-choice task and the author translated them into English, as exemplified in Table 6-7 below (see full lists of Korean responses and their English translations in Appendix I).

Table 6-7. Korean-speaking listeners' invented descriptions for a group of nonsense words starting with *cl-*

Subject ID	Descriptions for a group of nonsense words starting with *cl-*
001	‘ㅍ’ 발음과 ‘ㅋ’ 발음 같이 센 발음인데 영어 'queen' , 'king' 같이 좀 고급스러운 단어라고 생각됐다. ‘Strong pronunciation, such as pronunciations of /p^h/ and /k^h/. Something elegant such as “queen” and “king”’
002	뭔가 불만을 표시하는 것 같다. 딴지를 거는 것 같기도 하다. 무언가를 붙잡아 놓으려고 꽉 잡는 느낌. ‘Expression of complaint or picking on a word somebody says. Or grasping action to hold something tightly’
003	박수치다. 환호하다. ‘To clap one's hand. To cheer’
004	강렬한 느낌을준다 ‘Something intense’
005	톡톡 튀어오르는 느낌. ‘Something pops with a popping sound’
006	시계초침이 똑딱이는 이미지. 가볍게 튕겼다 잠시 내려가는 느낌. ‘A watch with a second hand is tick-tocking. Downward movement followed by a light bounce’
007	격투기를 하는 모습 ‘Somebody is doing martial arts’
008	점점 딱딱해져 가는 길을 밟는 느낌 ‘Stepping on road which is getting harder’
009	박수소리 ‘Clapping sound’

010	깨끗하게 청소해야 할거같다. 등산하는 모습도 떠오르고 'Cleaning. Climbing the mountain'
011	호두를 까는 느낌 'Cracking a walnut'
012	우렁찬. 박살. 'Loud. Ssmash'
013	구두를 신고 딱딱한 계단을 걸어올라가는 느낌 'Walking up the hard stairs on shoes'
014	딱딱한 느낌 'Something hard'
015	완벽하게 딱딱 맞아듣는 상황 'A situation when everything dovetails perfectly'
016	나무토막끼리 부딪치는 느낌 'Pieces of wood hit against each other'
017	끝이 안보이는느낌 'There's no end in sight'
018	깨끗하고, 깔끔히 정돈된 이미지. 'Clean, neat, and tidy'
019	악센트를 주는 것 같다. 차갑게 말하는 것 같다. 화가 난 것 같다. 'Accenting words. They sound angry and cold'
020	마주치는 소리 'A sound when things hit against each other'
021	모서리처럼 뾰족하고 날카로운 느낌 'Something pointy and sharp like an edge'
022	가벼운 물건이 통통 튀는 느낌 'Something light is popping with sound'
023	분명한느낌 'Clear without confusion'
024	일할때 도구같은거의 느낌 'A working tool'
025	부정적인 단어 같은 느낌 'Negative words'
026	산, 깨끗함 'Mountain, clean'
027	뭘 떨어트리는 이미지가 생각난다 'Dropping something'
028	튀어오르는 느낌 'Bounce'

Similar to the English-speaking participants' responses in §6.2, the Korean-speaking participants' responses contained several ambiguities in their interpretation, due to the semantic freedom given in the free-choice task. For example, in Table 6-7, although certain responses seemed clearly to match the purported meaning of *cl-*, (e.g., "pieces of wood hit against each other" – subject 016; "a sound when things hit against each other" – subject 020), the majority did not seem to match the key

meaning as clearly. The description created by subject 015, "a situation when everything dovetails perfectly" seemed related to the given meaning only by a metaphorical extension – that it is associated with the intermeshing state of the two things. Subject 008's description "stepping on road which is getting harder" and subject 013's "walking the hard stairs on shoes" appear to conform with the key meaning only when using the most imaginative interpretation (e.g., walking on a hard surface involves a percussion between the shoes and the surface). In order to reduce this ambiguity in their interpretation, the Korean participants' responses were evaluated in comparison with the purported meanings of the phonaesthemes by collecting judgements from four naïve native Korean speakers, similar to the case in §6.2. Two native Korean speakers judged the subjects' responses for the first five phonaesthemes – *cl-, gl-, sk-, sw-,* and *sp-* – and the other two judged the remaining five phonaesthemes – *tr-, gr-, sn-, sq-,* and *tw-*. Then, Cohen's Kappa coefficient of Korean inter-rater agreement was measured. As a result, it was shown that the level of inter-rater agreement was not high, except for *sk-*, confirming the expected ambiguities of assessing the relatedness of the responses (see Table 6-8).

Table 6-8. Cohen's Kappa coefficient of inter-rater agreement for Korean results

Phonaesthemes	Kappa	Phonaesthemes	Kappa
kl-	0.337	*tr-*	0.286
gl-	0.315	*gr-*	0.360
sk-	0.786	*sn-*	0.364
sw-	0.019	*skw-*	0.034
sp-	0.117	*tw-*	0.125

Note: A value of above 0.5 for Kappa indicates significant agreement.

Despite this low inter-rater agreement, the naïve raters' judgements of similarity were successful in providing the percentages of the cases where both raters identified a response as being related to the key meaning. The probabilities of these responses rated as being related to the key meanings by both raters for the entire lists are illustrated in Figure 6-3 below.

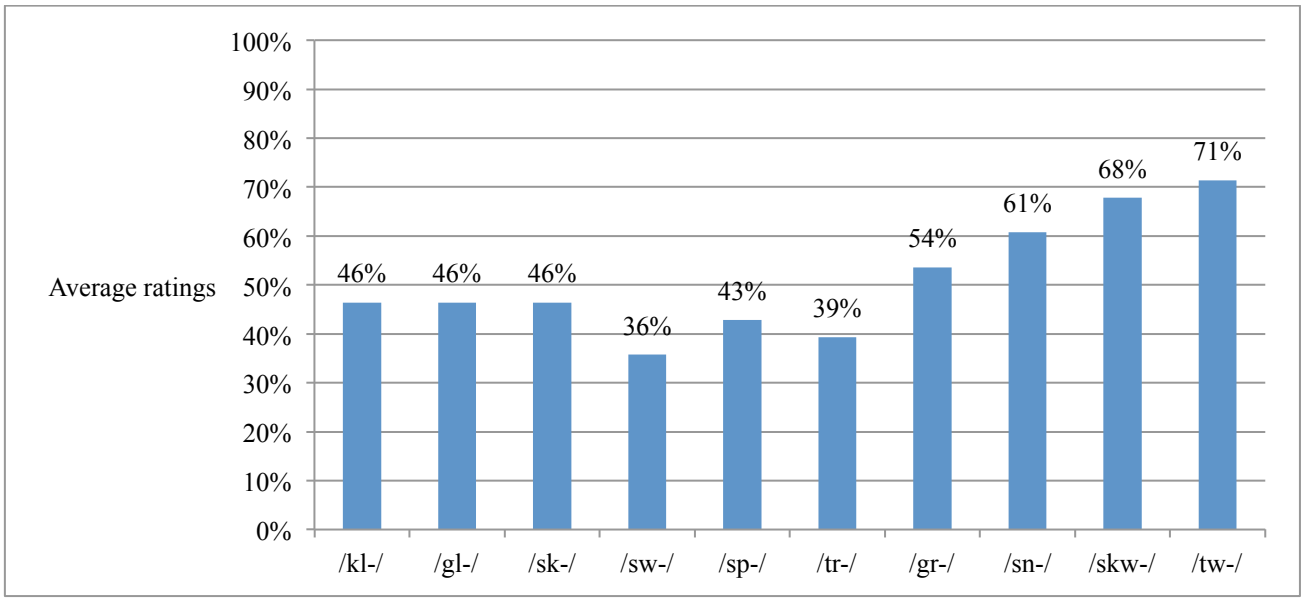


Figure 6-3. The probabilities of the responses of the first group of Korean participants that were rated as being related to the key meanings of the phonaesthemes of interest

Figure 6-3 shows that the Korean-speaking listeners' correct guessing rates varied across the phonaesthemes. For example, they guessed the purported meaning of *tw-* (71%) better than they did for *sw-* (36%) or *tr-* (39%). Rhodes (1994) claimed that there may be a possible difference in the natural iconicity level between onomatopoeic and non-onomatopoeic phonaesthemes. For example, onomatopoeic *cl-* (which is suggestive of its proposed noise-related meaning) should have a greater natural component than non-onomatopoeic *sw-* (whose sound has nothing suggestive of 'swinging movement') (Marchand, 1969, p. 398). However, this possible dichotomy between onomatopoeic and non-onomatopoeic phonaesthemes did not seem to be present in the current free-choice task. For example, *tw-* which seems to contain no suggestive character of 'twisted' was more correctly defined than *gr-* which seems to have "sound-imitative origin" (Marchand, 1969, p. 412) – see the detailed comparison of English and Korean-speaking listeners' meaning-guessing performances in the free-choice task in §6.4 to determine any possible differences in the natural motivation among the different phonaesthemes.

6.3.2.2 Multiple-choice task result

For the multiple-choice task, the mean proportion that the Korean participants chose the target definition and non-target definitions for each list of nonsense phonaesthemic words is shown in Table 6-9. The rows and columns indicate the involved phonaesthemes and their purported meanings, respectively. The shaded cells indicate the proportions that the participants correctly chose the target definition for the phonaestheme of interest.

Table 6-9. Korean-speaking participants' guessing performance in the multiple-choice task

	cl-	*gl-*	*sk-*	*sw-*	*sp-*	*tr-*	*gr-*	*sn-*	*sq-*	*tw-*	*Un-answered*
cl-	24%*	10%	17%	0%	3%	10%	14%	3%	0%	14%	0%
gl-	0%	24%*	10%	7%	0%	7%	7%	10%	17%	10%	3%
sk-	0%	17%	34%***	0%	14%	14%	7%	7%	0%	3%	0%
sw-	3%	3%	7%	21%	21%	0%	3%	14%	24%*	0%	0%
sp-	14%	17%	21%	3%	7%	7%	14%	3%	10%	0%	0%
tr-	21%	7%	7%	3%	3%	17%	10%	3%	10%	14%	0%
gr-	0%	10%	0%	14%	17%	10%	7%	14%	17%	7%	0%
sn-	14%	3%	17%	14%	7%	7%	7%	14%	3%	7%	3%
sq-	3%	3%	7%	7%	28%**	7%	21%	14%	0%	7%	0%
tw-	28%**	7%	3%	3%	0%	7%	3%	3%	10%	31%**	0%

* $p < .05$, ** $p < .01$, *** $p < .001$

The percentage of correct and incorrect answers in each list was compared to the chance probability of being correct (1/10) using a one-tailed binomial test. As a result, it was revealed that the correct definitions were chosen at a significant level only for *cl-, gl-, sk-,* and *tw-* (for *tw-*, however, the participants chose the correct also one of the incorrect answers (definition for *cl-*) at the same significance level). For *sw-*, the definition for *sq-* was chosen as an appropriate answer at an above-chance level. For the remaining phonaesthemes, none of the provided definitions was chosen as an appropriate answer at an above-chance level.

Given the separate results from the free-choice and the multiple-choice tasks in both language groups, the following sections, §§6.4-6.5, compare in detail the guessing performances of the Korean and English-speaking participants in each task. These comparisons will serve to empirically examine whether the varied psychological statuses of the individual phonaesthemes (observed in §6.2) possess any strong natural motivation and thus contradict the hypothesis that English phonaesthemes hold opaque iconicity.

6.4 Comparison of English and Korean-speaking participants' guessing performance in the free-choice tasks

Prior to comparing the percentage of correct answers from the two language groups in the free-choice task, it is important to establish a baseline for measuring the correctness of the free-choice responses. This baseline is needed to show, for each phonaestheme, how many free-choice

meanings are "correct" just by chance in each language group. Only once we have that measure can we judge what the implications are of the comparison between the English and Korean speakers. Without any baselines, the statistical significance of the free-choice results in §§6.2 and 6.3 would arguably be impossible to interpret meaningfully, in which case an objective comparison between the performances of the English and Korean speakers would not be achieved.

For the process of establishing a baseline, I took two random selections of the English-speaking participants' free-choice answers from each phonaestheme except the target phonaestheme. I then asked the four English-speaking raters, who had judged the correctness of the English participants' invented responses in §6.2, to judge the random selections against the purported meaning of the target phonaestheme using the same methodology; two English-speaking raters judged the randomly chosen responses for the first five phonaesthemes – *kl-, gl-, sk-, sw-,* and *sp-* – and the other two judged the remaining five phonaesthemes – *tr-, gr-, sn-, skw-,* and *tw-*. The purported meaning of the target phonaestheme was broken down to a small number of yes-no questions (e.g., for *cl-*, 'involve two things coming together', 'involve two things separating', 'involve a noise'). The raters' instructions were as follows:

> You are asked to read each description on the list carefully, and answer yes or no based on your judgment of whether each description is related to each small part of the key description.
>
> 'Y' if you think a description is related to the given part of the key description
>
> or
>
> 'N' if you think a description is not related to the given part of the key description
>
> Do not think too much as I am interested in your initial impression of the descriptions.

The raters read each randomly chosen response on the list carefully, and answered 'yes' or 'no' based on their judgement of whether each response was related to each small part of the purported meaning of the phonaestheme. Their 'yes/no' answers to each mini-question were changed to two categorical variables (i.e., 0 = no, 1 = yes) and merged into one (i.e., 0 = if there was no 'yes' in the mini-questions, 1 = if there was at least one 'yes' in the mini-questions). In detail, for each rater, if there was at least one 'yes' (i.e., 1) in the mini-questions, it was considered that the randomly chosen response conformed to the key meaning of the phonaestheme and thus, a total score of 1 was

given. From this, the percentages of the cases where both raters identified a response as being related to the key meaning were produced and used as English baselines. The same process applied with the Korean raters for the establishment of a Korean baseline for each phonaestheme.

Figure 6-4 below shows the English-speaking listeners' mean percentages of correct answers for each phonaestheme in the free-choice task in §6.2 and the correlated English baseline.

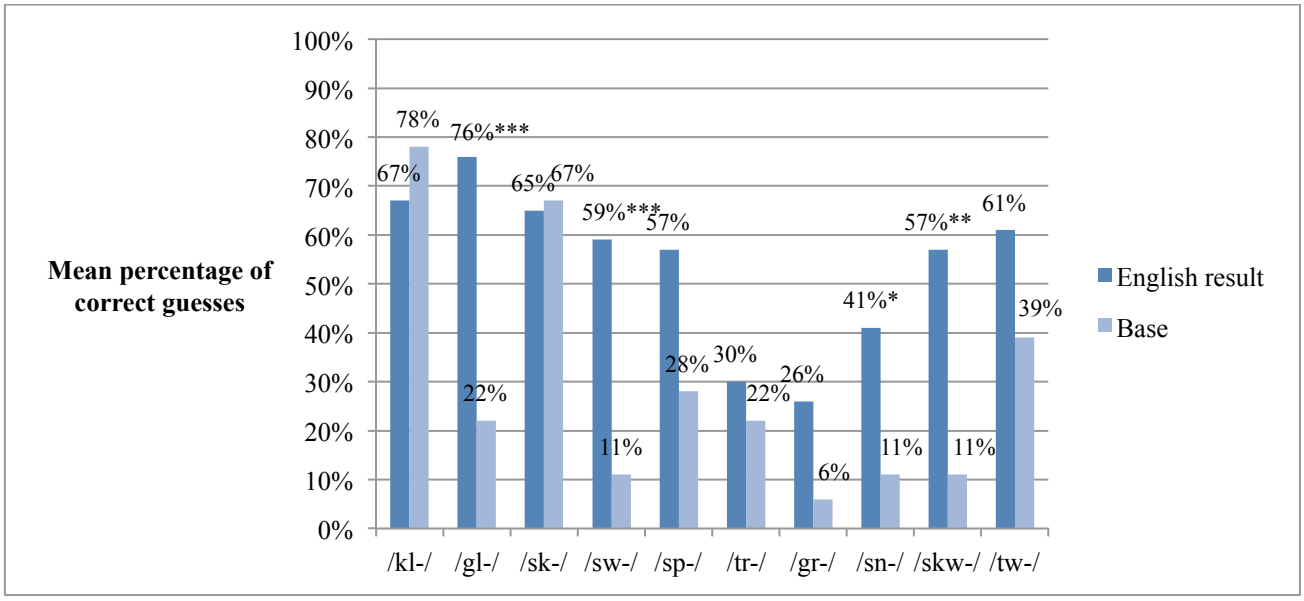


Figure 6-4. The significance of the correct guessing rates of English-speaking listeners in the free-choice task

Separately conducted Fisher's exact tests, which compared the English-speaking listeners' perceptual result with a baseline for each phonaestheme, revealed that only *gl-* ($p < 0.001$), *sw-* ($p = 0.001$), *sn-* ($p < 0.05$), and *sq-* ($p < 0.01$) were correctly guessed at an above-chance level.

In line with this, Figure 6-5 shows Korean participants' mean percentages of correct guesses for each phonaestheme in the free-choice task in §6.3 and the correlated baseline.

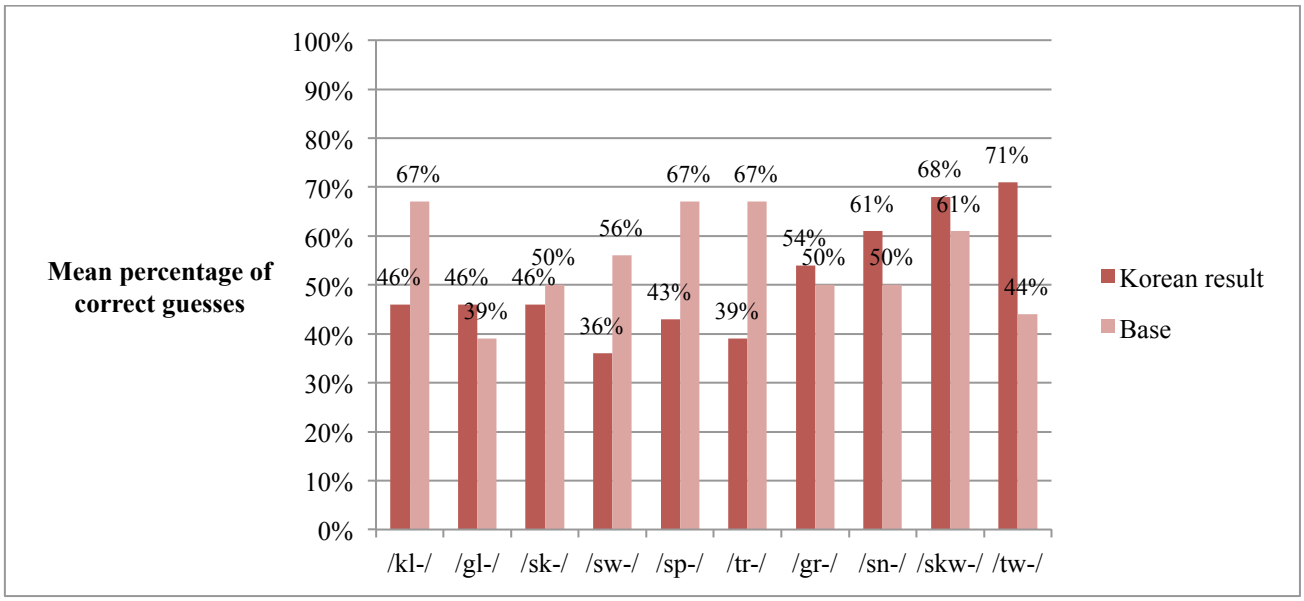


Figure 6-5. The significance of the correct guessing rates of Korean-speaking listeners in the free-choice task

Fisher's exact tests revealed that none of the phonaesthemes were correctly guessed at an above-chance level (*cl*-, p = 0.232; *gl*-, p = 0.763; *sk*-, p = 1; *sw*-, p = 0.231; *sp*-, p = 0.141; *tr*-, p = 0.130; *gr*-, p = 1; *sn*-, p = 0.550; *sq*-, p = 0.754; *tw*-, p = 0.121).

The comparison of the significance levels of the English and Korean-speaking participants' correct-guessing rates for each phonaestheme in the free-choice tasks can lead to four possible scenarios, as shown in Table 6-10: (1) both English- and Korean-speaking listeners' correct guessing rates were above chance; (2) only the English-speaking listeners' correct guessing rate was above chance; (3) only the Korean-speaking listeners' correct guessing rate was above chance; and (4) both English- and Korean-speaking listeners' correct guessing rates were at (or below) chance level.

Table 6-10. Four possible categories

	English result	Korean result
(1) naturally motivated	High	High
(2) conventionalised	High	Low
(3) highly conventionalised with natural motivation	Low	High
(4) highly conventionalised with no natural motivation	Low	Low

The logic of the scenarios is as follows. Since naturalness is linked to universality, the statistically significant level of correct answers for both subject groups indicates that a phonaestheme is psychologically real, mainly due to natural motivation (1). On the other hand, the case where only the English result is above-chance level indicates that the psychological reality of the phonaestheme is due to arbitrary convention in the existing English lexicon (2). The interpretation for the case where only the Korean result is above-chance level is complex; given that Korean speakers' correct guessing rate of the phonaestheme was significantly high, it can be interpreted that the phonaestheme contains natural motivation to a great degree. However, at the same time, for English speakers, the purported meaning of the phonaestheme, which is active in existing words, is not being observed in novel words. This suggests that, for English speakers, the phonaestheme is conventionalised in a highly arbitrary and lexicalised manner and this arbitrary sound-symbolic link blocks the natural sound-symbolic interpretation in novel words for English speakers (3). The remaining case (4) is the most arbitrary, under which the phonaestheme has neither psychological reality nor natural component.

Given this, the phonaesthemes examined in the cross-linguistic free-choice task can be situated in one of the hypothesised categories shown in Table 6-11 below.

Table 6-11. The phonaesthemes in the hypothesised categories

	English result	Korean result	Phonaestheme
(1) naturally motivated	High	High	None
(2) conventionalised	High	Low	*gl-, sw-, sn-, sq-*
(3) highly conventionalised with natural motivation	Low	High	None
(4) highly conventionalised with no natural motivation	Low	Low	*cl-, sk-, sp-, tr-, gr-, tw-*

The fact that the psychological status of *gl-, sw-, sn-,* and *sq-* was significantly strong in the mental lexicon of English-speaking listeners but not in that of Korean-speaking listeners suggests that their psychological reality is a reflection of conventionality existing in the English lexicon. The remaining phonaesthemes (i.e., *cl-, sk-, sp-, tr-, gr-,* and *tw-*), where not only the Korean-speaking listeners but also the English-speaking listeners were unable to guess the purported form-meaning mappings, suggest a more arbitrary case – they hold neither strong psychological reality nor natural motivation. Altogether, the fact that none of the purported meanings of the phonaesthemes occurring in the core members were correctly guessed by Korean-speaking listeners at a statistically

significant level largely supports the original hypothesis – that English phonaesthemes hold opaque iconicity.

6.5 Comparison of English-speaking and Korean-speaking participants' guessing performances in the multiple-choice tasks

In this section, I compare the results of the multiple-choice tasks (discussed in §§6.2-6.3), considering the chance probability of being correct (1/10) as a baseline for each phonaestheme at both language groups. Figure 6-6 below illustrates the English-speaking listeners' percentages of correct answers in the multiple-choice task and their level of significance.

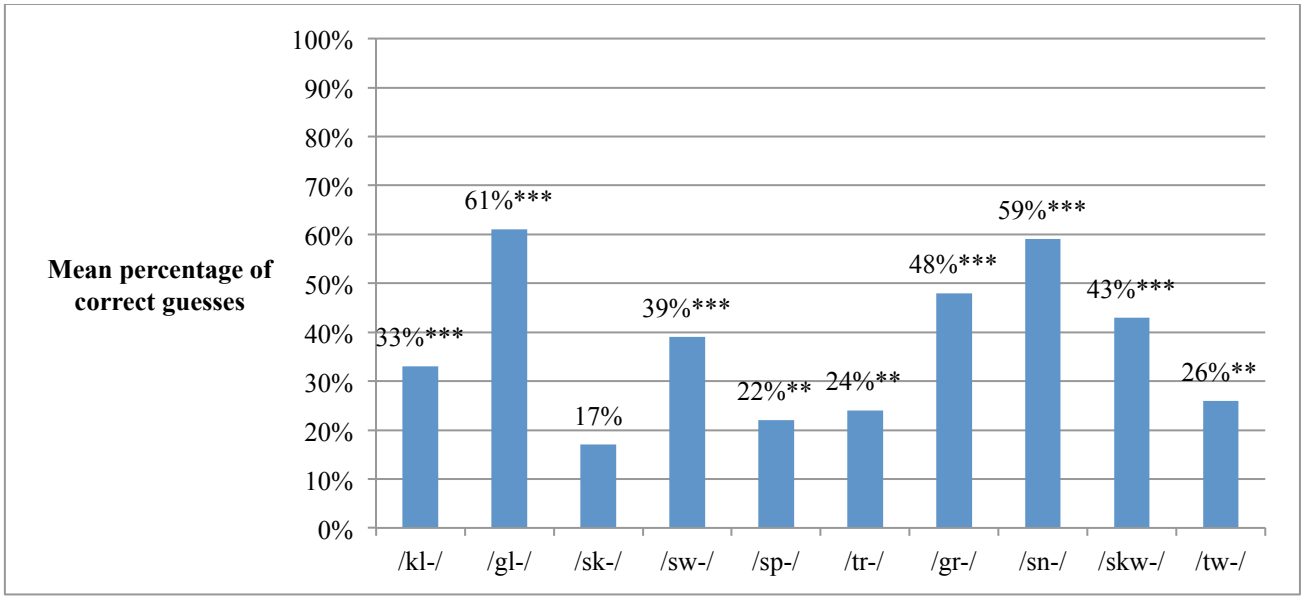


Figure 6-6. The significance of the correct guessing rates of English-speaking listeners in the multiple-choice task (see Table 6-5 for details)

A one-tailed binomial test, which compared the English-speaking participants' mean correct guessing rate for each phonaestheme with a baseline, revealed that all but *sk-* ($p = 0.084$) were correctly guessed at an above-chance level. This indicates that the majority of the stimuli fall into either category 1 or 2 (see Table 6-10).

Following this, Figure 6-7 shows the level of significance for the Korean-speaking participants' mean correct guessing rate for each phonaestheme in the multiple-choice task in §6.3.

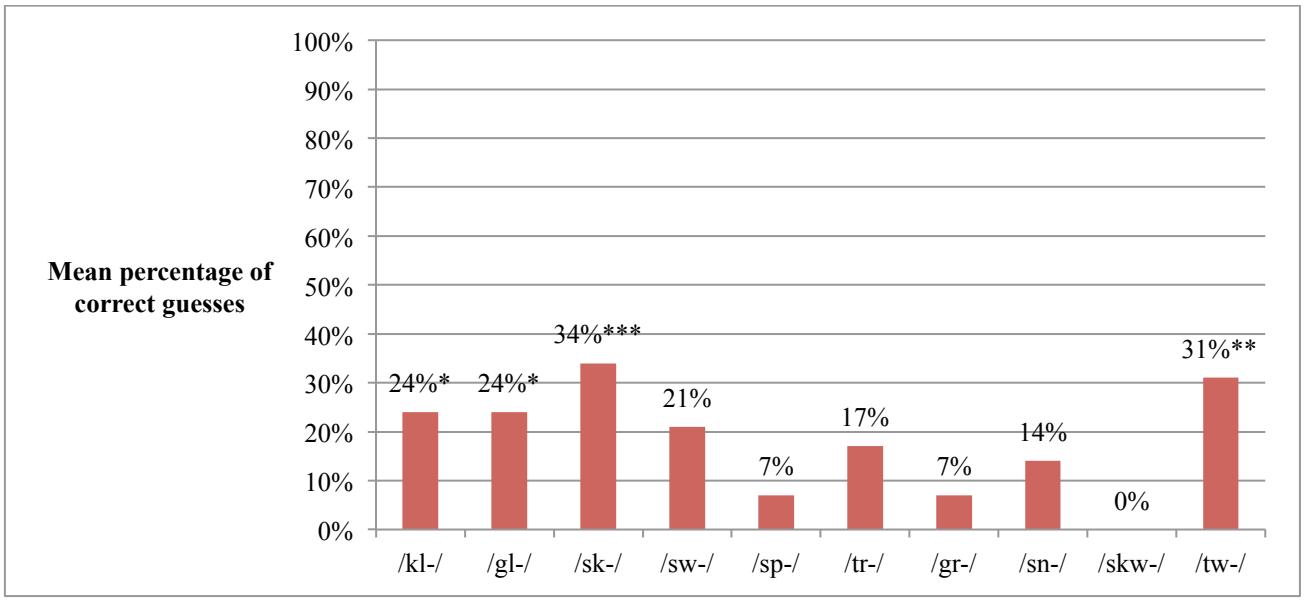


Figure 6-7. The significance of the correct guessing rates of Korean-speaking listeners in the free-choice task (see Table 6-9 for details)

One-tailed binomial tests revealed that only *cl-* (p = 0.018), *gl-* (p = 0.018), *sk-* (p = 0.000), and *tw-* (p = 0.001) were correctly guessed at a level above chance. This indicates that the majority of the stimuli (*sw-*, p = 0.055; *sp-*, p = 1; *tr-*, p = 0.194; *gr-*, p = 1; *sn-*, p = 0.521; *sq-*, p = 0.107) fall into either category 2 or 4 (see Table 6-10).

Combining the English and Korean results, each phonaestheme can be situated in one of the hypothesised categories, as in Table 6-12 below.

Table 6-12. The phonaesthemes in the hypothesised categories

	English result	Korean result	Phonaestheme
(1) naturally motivated	High	High	*cl-, gl-, tw-*
(2) conventionalised	High	Low	*sw-, sp-, tr-, gr-, sn-, skw-*
(3) highly conventionalised with natural motivation	Low	High	*sk-*
(4) highly conventionalised with no natural motivation	Low	Low	None

Unlike in the free-choice tasks, the participants in the multiple-choice tasks placed some phonaesthemes (i.e., *cl-, gl-,* and *tw-*) in category 1, suggesting that the psychological reality of certain phonaesthemes is mainly due to natural motivation. With respect to the remaining

phonaesthemes, the majority (i.e., *sw-, sp-, tr-, gr-, sn-, sq-*) fell into category 2, indicating that their psychological reality is a reflection of conventionality existing in the English lexicon. As for *sk-*, only the Korean-speaking listeners were able to guess the purported form-meaning mappings at a significant level. This suggests a complex scenario, in which *sk-* in existing words such as *skim, skid, skip, skate,* and *skimp* has a strong natural component, but is highly conventionalised as a lexical mapping in English, and so this does not extend to novel forms.

In sum, one can see that the location of each phonaestheme in the hypothesised categories can change depending on the testing methods. Unlike the free-choice tasks, the multiple-choice tasks, in which the participants' semantic judgements of the phonaesthemic words were restricted, provide certain evidence that some English phonaesthemes occurring in core members are results of natural motivation, and this partly contradicts the hypothesis that English phonaesthemes hold opaque iconicity.

The following section discusses the implications of the current conflicting findings between the free- and multiple-choice tasks, and draws a final conclusion about the opaque iconicity of English phonaesthemes.

6.6 Discussion and conclusion

For an initial comparison of the results between different testing methods, I measured the differences in the proportions of correct answer (0 = incorrect, 1 = correct) in the individual phonaesthemes between the free-choice task and the multiple-choice task, using McNemar's test (Pallant, 2011, p. 221). First, for the English-speaking listeners' data in §6.2, a significant difference between the two tests in the proportion of correct answers was found in *cl-* ($p < .001$***), *sk-* ($p < .001$***), *sp-* ($p = .001$**), and *tw-* ($p = .001$**). For all of the phonaesthemes that received significant *p* values, the proportion of correct answers was higher in the free-choice task than in the multiple-choice task. For example, the meaning of *cl-*, which was correctly guessed at an above-chance level (33%) in the multiple-choice task, was significantly better guessed in the free-choice task (67%). For the remaining phonaesthemes (*gl-*, $p = .143$; *sw-*, $p = .078$; *tr-*, $p = .607$; *gr-*, $p = .076$; *sn-*, $p = .115$; *sq-*, $p = .362$), the participants did not show any change in their meaning guessing performances in the two separate tasks. As for the Korean-speaking listeners' data in §6.3, it appeared that a significant difference was found at *sp-* ($p = .006$), *gr-* ($p < .001$), *sn-* ($p = .002$), *sq-* ($p < .001$), and *tw-* ($p = .019$) and, as in the case of the English-speaking listeners' data, the phonaesthemes that received significant *p* values from the McNemar's test had a higher proportion of correct answers in the free-choice task than in the multiple-choice task. For example, the meaning of *tw-*, which was correctly guessed at an above-chance level (31%) in the multiple-choice task, was significantly better guessed in the free-choice task (71%). For the remaining

phonaesthemes (*cl-*, p = .146; *gl-*, p = .109; *sk-*, p = .581; *sw-*, p = .344; *tr-*, p = .109), the participants did not show a significant difference in their meaning guessing performances between the two separate tasks.

In sum, both language groups had a higher proportion of correct answers in the free-choice tasks than in the multiple-choice task. For example, all other things being equal, the English-speaking participants had a higher proportion of correct answers for *sk-, sp-, tw-,* and *cl-*, and the Korean-speaking participants had a higher proportion of correct answers for *sp-, gr-, sn-, sq-, tw-* in the free-choice tasks. This suggests that the free-choice tasks served better to identify the meanings of the phonaesthemes than did the multiple-choice task.

However, when taking baselines into account for the free-choice tasks, the interpretation of the comparison is reversed; baselines for all phonaesthemes were higher in the free-choice tasks than in the multiple-choice tasks, where the chance probability of being correct was 10% without variation.[52] Due to the high baselines, the responses in the free-choice tasks, although they have a higher proportion of correct answers, are accorded a lower level of significance than those in the multiple-choice tasks. Consequently, this suggests that the multiple-choice tasks have more valid responses for recognising the attribution of the meanings of the phonaesthemes to their sounds. Indeed, the comparison of the meaning guessing performances between English-speaking and Korean-speaking participants in the free-choice tasks in §6.4 largely supports the CSH (that phonaesthemes are not based on natural motivation), by locating all of the stimulus phonaesthemes, which occur in the core exemplars, in either category 2 ("conventionalised") or category 4 ("highly conventionalised with no natural motivation"). On the other hand, the cross-linguistic comparison of the meaning guessing performances in the multiple-choice tasks located some phonaesthemes in category 1 ("naturally motivated"), partly contradicting the CSH and the prediction that the iconicity of typical English phonaesthemes is opaque. In detail, in the multiple-choice tasks, it appears that *cl-, gl-,* and *tw-* contain not only psychological reality but also strong natural motivation. This is in contrast to the results of the free-choice tasks, which located *gl-* in category 2, and *cl-* and *tw-* in category 4. For the remaining phonaesthemes, those which were located in category 2 (*sw-, sn-, sq-*) and category 4 (*sk-, sp-, tr-, gr-*) in the free-choice tasks appear in category 2 (*sw-, sp-, tr-, gr-, sn-, skw-*) and 3 (*sk-*) in the multiple-choice tasks.

[52] One hypothesis to explain the particularly high baselines in the free-choice tasks is that the definitions of the phonaesthemes were broad enough to cover a number of randomly chosen descriptive images. For example, the English baseline for *cl-* is 78% because many descriptive images could actually involve some degree of an action that is claimed to be exclusive to *cl-*, 'two things coming together or separating often producing a noise'; the definition of *cl-* can cover an image written down for *sk-* 'a fluffy squirrel-like animal skating over some ice' since the image incidentally involves 'two things (i.e., an animal and some ice) coming together'. It can also cover an image written down for *sp-*, 'regurgitation of various semi-digested things' in the sense that it incidentally involves 'two things separating often producing a noise'.

Why did the results of the multiple-choice tasks place the phonaesthemes in a less arbitrary category when compared to the free-choice tasks?[53] At this point, I would not wish to commit to any single answer. However, one may speculate that the identification of the meanings of phonaesthemes are "context sensitive" (Abelin, 1999, p. 52). In other words, the natural motivation of phonaesthemes is only recognised when the possible contexts are narrowed down, as in the multiple-choice task where subjects were presented with multiple meanings which contained the target meaning and different suggested meanings from which participants could choose the meaning with the best fit for the given phonaestheme. This suggests that the reported natural motivation of phonaesthemes exhibits translucent iconicity, and not transparent iconicity in which the arbitrariness of the linguistic sign is blocked entirely (see §7.2 for details). Further research is needed to ascertain the nature and extent of context-sensitive natural motivation of certain phonaesthemes. For example, one could examine the influence of semantic context on the interpretation of phonaesthemes through an additional free-choice task where each list of nonsense phonaesthemic words appeared in the context of other words related to the proposed meaning of a target phonaestheme. That is, a list of nonsense words beginning with *cl-* ('two things coming together or separating often producing a noise; the result of such an action') would be given to participants together with a word, such as *hear*, or sound-related words, thereby limiting the semantic field. A comparison of the results of the additional free-choice task and the current free-choice task would give a clear idea of the potential effect of semantic context on the universal interpretation of the given phonaesthemes.

In conclusion, in the free-choice tasks, none of the stimulus phonaesthemes were correctly guessed by the Korean-speaking listeners at a statistically significant level. This empirically shows that none of the selected phonaesthemes are naturally motivated, supporting Firth's (1930) idea that phonaesthemes are the results of "phonetic habit" of language users. For some phonaesthemes (*cl-, sk-, sp-, tr-, gr-,* and *tw-*), the recurrent form-meaning mappings appeared to be more arbitrary, since even English-speaking listeners did not recognise their purported meanings. This indicates that some of the phonaesthemes do not even hold a generalisable psychological reality, confirming their probabilistic attributes in line with previous studies (Markel and Hamp, 1960; Hutchins 1998; see also §6.2.2).

The results of the free-choice tasks largely support the hypothesis that English phonaesthemes hold opaque iconicity, by showing that arbitrariness prevails even over those phonaesthemes occurring in core exemplars. The findings of the multiple-choice tasks, on the other hand, revealed

[53] Under the account that the multiple-choice task results depend on the semantic closeness between the ten phonaesthemes, it can be interpreted that *cl-, gl-,* and *tw-* do not possess high iconic status but that their meanings are greatly different from those of the other phonaesthemes. In this case, the current question does not need to be addressed.

that some phonaesthemes occurring in core members (i.e., *cl-, gl-,* and *tw-*) could exhibit translucent iconicity, partly contradicting the hypothesis that English phonaesthemes support the CSH. In this chapter, there has been a discussion of the speculation that the universal interpretations of *cl-, gl-,* and *tw-* were observed only in the multiple-choice tasks because their natural iconicity is context dependent. Some directions for further investigation in this respect were proposed.

7 Conclusions

A growing number of recent studies are acknowledging the role of both arbitrariness and non-arbitrariness in language, deviating from the received view that language is fundamentally governed by arbitrariness (Dingemanse et al., 2015). A question, which could be raised, related to the recent trend is, "do sound-symbolic phenomena essentially violate the near-axiomatic expectation in modern linguistics, of arbitrariness in pairings of sounds to simple meaning?" In this study, this question was answered by examining the degree of natural motivation in the recurrent existence of less-than-arbitrary pairings in Korean and English from three different perspectives. First, through surveying the literature, the iconicity of meaning-bearing elements of Korean ideophones and English phonaesthemes were identified on a *conceptual* level. Second, by applying the methods of Canonical Typology, the ways that the two manifestations of sound symbolism could be calibrated and compared to other arbitrary morphological entities were assessed, from a *theoretical* perspective. Third, complementing the conceptual and theoretical investigations, psycholinguistic evidence of the natural iconicity in Korean ideophones and English phonaesthemic words was sought, from an *empirical* perspective.

The following section (§7.1) provides an overall summary of the conceptual, theoretical, and empirical findings of the role of natural motivation in Korean and English sound-symbolic words. Section 7.2 re-conceptualises the iconicity of Korean ideophones and English phonaesthemic words based on empirical findings. Section 7.3 suggests directions for future research and concludes.

7.1 Overall summary

Chapter 1 highlighted that both Korean ideophones and English phonaesthemic words have recurrent sound-meaning pairings within a word, namely meaning-bearing elements (MEI's) and phonaesthemes, respectively. The chapter explained the similarity between MEI's and phonaesthemes in terms of their contribution to the establishment of diagrammatic iconicity at the word level. Diagrammatic iconicity involves form-meaning correspondences, which are created by relating similar sets of forms with similar sets of meanings. For example, in Korean ideophonic pairs, *pipi/pɛpɛ* 'a state of bigger/smaller things being entwined' and *piŋkɨl/pɛŋkɨl* 'twirling of a bigger/smaller object', the relation between vocalic MEI's, high vowel /i/ and low vowel /ɛ/, is associated with the relation between largeness and smallness, respectively. English phonaesthemic words also exhibit a type of diagrammatic iconicity, known as relative iconicity, by relating a

shared component of forms to a shared meaning in multiple words. For example, in a set of English phonaesthemic words (*gleam, gloss, glow, glint*) the shared form *gl-* is related to the shared meaning 'vision and light'.

Despite this similarity, regarding the iconicity manifested at the sub-word level, I posited that there is a crucial difference between English phonaesthemes and Korean MEI's. Presuming that natural motivations in sound symbolism might reflect the effects of the perception, acoustics, and articulation of sound on meaning, the iconicity of English phonaesthemes seems to be relatively opaque compared to the MEI's of Korean ideophones; English phonaesthemes appear to possess less plausible articulatory/acoustic grounds than Korean MEI's. From this, I claimed that Korean MEI's exhibit translucent iconicity, while English phonaesthemes exhibit opaque iconicity, following Fordyce's (1988) classification of sub-lexical iconicity developed from observation of sign languages. Importantly, given that any linguistic signs undergo certain degrees of conventionalisation, the difference between translucent iconic and opaquely iconic signs is not that one is totally motivated and the other is totally arbitrary. Rather, the difference lies in whether or not the naturalness is blocked by arbitrary conventionalisation. This conceptual classification of iconicity in Korean MEI's and English phonaesthemes led to a prediction that the former would support the ESH and the latter would support the alternative, the CSH.

Chapter 2 reviewed previous experimental studies of the iconicity of language, covering not only the traditional explicit paradigms this thesis adopts, but also the recent advancements of implicit methods in sound-symbolic literature. It suggested that motivatedness operates in language, but that its operation is arguable within normal vocabulary. Thus, this chapter provided *prima facie* evidence of the overall hypothesis — that natural motivation could come into play only at subsets of the vocabulary where sound symbolism is claimed to exist.

Chapter 3 provided an elucidation of the dimensions along which the properties of several instantiations of sound symbolism can be calibrated and compared to other morphological entities using canonical typology. In canonical typology, one firstly sets up the canonical criteria of a phenomenon, for example, a canonical phonaestheme has one meaning, one form, it is composed of a contiguous string segments, and so forth. Criteria such as these — e.g., number of meanings, number of forms, (non)contiguity — define a theoretical space in which one can use an appropriate scale of each canonical criterion to locate real instances of the phenomenon. In this chapter, measured against seven canonical criteria for phonaesthemes, which had been formulated by surveying the literature, it was found that phonaesthemes were differentiated from other stem building morphology solely by their canonical accompaniment by non-recurrent residues. In contrast, MEI's were differentiated from other morphemes on several criteria; particularly, in the case of the underlying forms of MEI's, the most pertinent properties were MEI's frequent

occurrence among lexical stems, their one-to-many form-to-meaning correspondences, their canonical pairing with one form per meaning, and their accompaniment by residues that recur only in a paradigm. The relatively small number of clear differentiators of typical English phonaesthemes (i.e., non-paradigmatic type) versus classical morphemes suggested that typical English phonaesthemes sit closer to classic arbitrary morphemes than do MEI's. This theoretical characterisation of MEI's and English phonaesthemes within canonical typology is in accordance with the conceptual characterisation of their iconicity levels in Chapter 1, i.e., that phonaesthemes, which have opaque iconicity, exhibit a lower level of natural iconicity than MEI's.

Chapters 4 and 5 reported empirical investigations of the natural iconicity in vocalic and consonantal MEI's, respectively. These investigations used binary-choice meaning matching tasks where both native English and Korean speakers listened to the audio files of nonsense Korean ideophonic pairs and chose their meanings. In preparation for the larger experiments, the English speakers' discrimination of non-English Korean contrastive sounds was examined. One factor here was that if the English-speaking participants were not able to discriminate the sounds involved when they listened to the stimulus items, it would be impossible for them to correlate connotation oppositions with the corresponding sound oppositions in the meaning matching task. Taking into account the sound discrimination results, Chapter 4 showed that two different language groups (i.e., Korean and English) failed to match a correct meaning with a nonsense ideophonic pair that contrasted the sound-symbolic vowel quality, suggesting that vocalic MEI's are based on convention, in support of the CSH. Chapter 5, on the other hand, demonstrated that consonantal MEI's are based on natural motivation, supporting the ESH.

Chapter 6 reported empirical investigations of the natural iconicity in phonaesthemes. It examined two separate tasks, free-choice and multiple-choice tasks, where both native English and Korean speakers guessed the meanings of phonaesthemes in sets of aurally presented nonsense English phonaesthemic words. Since the membership of a phonaesthemic word family is fuzzy, a group of English speakers used their intuitions to delimit the English phonaesthemic word-sets. This preliminary experiment gathered empirical evidence for a strong sound-meaning association in the claimed phonaesthemes and helped to choose English stimuli for the larger experiment. Notably, in terms of the main experiments, there are methodological differences between Chapters 4-5 and Chapter 6, in that the former used a single binary-choice task and the latter used free- and multiple-choice tasks. These differences were appropriate because Korean ideophones show clear semantic contrasts accompanied with the consonant/vowel alternations (and thus a binary-choice task was sufficient to observe their perceptual decisions), while form-meaning correspondences in English phonaesthemes do not exhibit such semantic contrasts (and thus separate steps, which were different in their restriction to perceptual freedom, were required in order to detect participants' sensitivity to

the meanings of the phonaesthemes). The results differed depending on testing methods. In the free-choice task, universal interpretations of the phonaesthemes were not achieved, thus suggesting that the phonaesthemes are based on convention. In the multiple-choice task, some of the phonaesthemes (i.e., *cl-, gl-,* and *tw-*) were found to be naturally motivated, supporting the ESH. From this, it was speculated that the universal interpretations of *cl-, gl-,* and *tw-* were observed only in the multiple-choice tasks because their natural iconicity is recognised only when the possible contexts have been narrowed down.

To sum up the findings of Chapters 4-6, they showed that the translucent iconicity of MEI's gains its empirical support only in the consonantal MEI's. Contrary to the prediction made on a conceptual basis, the vocalic MEI's display opaque iconicity on empirical grounds. With respect to phonaesthemes, some of them exhibit translucent iconicity when the possible contexts have been narrowed down, as in the multiple-choice task.

In light of the empirical findings of this thesis, the following section re-conceptualises the iconicity manifested in Korean MEI's and English phonaesthemes.

7.2 Conceptualisation of cross-linguistic instances of sound symbolism

The conceptual discussion for the iconicity in Korean ideophones and English phonaesthemic words can be built on Peirce's three levels of signs (Nuckolls, 1999) – "icon", "index", and "symbol" – and Sonesson's (1997) further distinction of iconic signs.

In Peircean terms, an icon is a sign which displays a close resemblance to a referent (e.g., a portrait), and index refers to a sign which is, by contiguity, associated with a referent in the external world (e.g., smoke as an index of fire). A symbol, on the other hand, is a sign that arbitrarily matches with a certain idea by convention (e.g., $ for dollar). Since a symbol does not involve any apparent similarity between sign and referent, iconic and indexical signs have been considered as ideal instances of sound symbolism (Nuckolls, 1999).

Both Korean ideophones and English phonaesthemic words display recurrent sound-meaning mappings (i.e., MEI's and phonaesthemes) which do not appear in ordinary vocabulary. In this sense, they can be seen to consist of "iconic" signs. However, being iconic does not necessarily indicate that Korean MEIs and English phonaesthemes totally exclude indexical or symbolic (i.e., conventional) relations. Indeed, they often reveal mixed properties (from the different Peircean levels of signification above) since strict Peircean distinctions do not exist in the real world (Ahlner & Zlatev, 2010). In this regard, Sonesson further categorised iconic signs, in particular, into "primary iconicity" and "secondary iconicity". Primary iconicity involves a sign whose referent is recognised sufficiently by possible natural motivation underlying it. Secondary iconicity involves a sign which is established by convention, and any possible natural motivation plays a secondary role.

For a clear description for the difference between primary and secondary iconicity, Sonesson provided two drawings, shown in Figure 7-1.

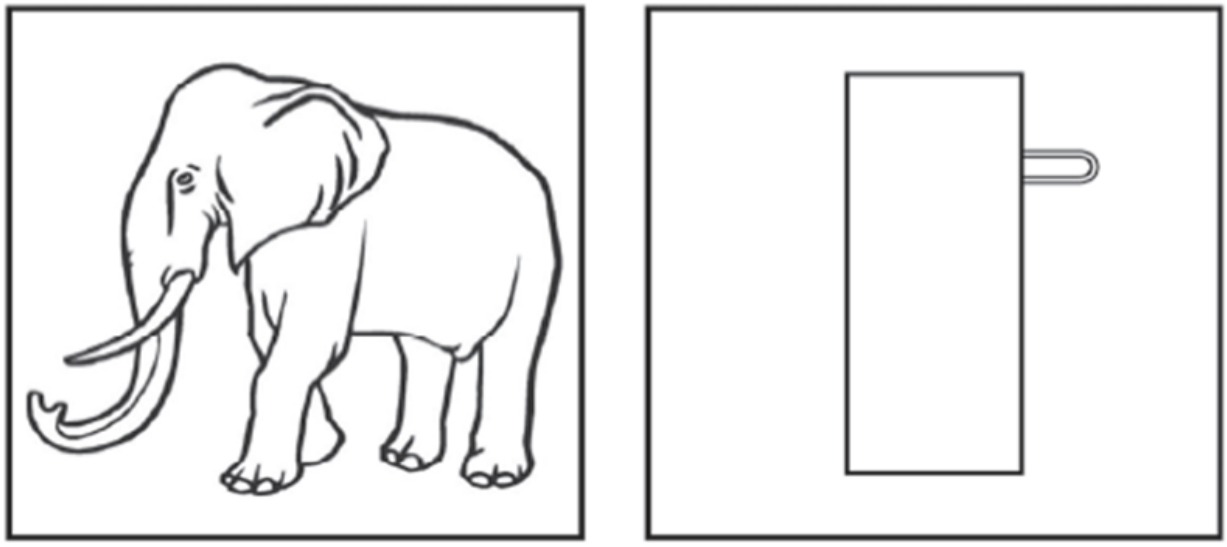


Figure 7-1. A picture of an elephant for an example of a primary iconic sign, and a droodle for an example of a secondary iconic sign (adapted from Ahlner & Zlatev, 2010, p. 316).

For the picture of an elephant, what is depicted is guessable from the drawing itself, because the drawing has a direct resemblance to the depicted object, an elephant. This is analogous to primary iconic sign. For a droodle, on the other hand, the interpreter can find some resemblance between the drawing and the depicted object only after he/she has been told what it depicts (e.g., it could be a depiction of a person playing a trombone in a wardrobe, or a paper clip placed under an envelope). This is analogous to secondary iconic sign, where the level of conventionalisation is high.

Primary iconicity is equivalent to Fordyce's term, "transparent iconicity", in which "the meaning of a linguistic sign can be determined from its form alone". In spoken language, this type of iconicity is rare, and perhaps, such iconicity may be found only in some few greatly imitative onomatopoeic words (Fordyce, 1988, p. 9). Indeed, none of the MEI's and phonaesthemes investigated in this thesis exhibit transparent iconicity. Instead, they show either translucent iconicity or opaque iconicity.

Translucent iconicity is distinct from primary iconicity (or transparent iconicity) in the sense that it requires possible contexts as well as forms before non-native speakers can guess the meaning of a sign in a language. An instance of translucent iconicity, which is a combination of primary and secondary iconicity, is found in consonantal MEI's in Chapter 5 (also see the application of a combination of primary and secondary iconicity to previous experimental studies of sound-shape symbolism in Ahlner & Zlatev, 2010). In the binary-choice task, the participants from two language

groups were firstly told that a given nonsense ideophonic pair (e.g., p'uŋ.kɬl ~ $p^huŋ.kɬl$) shared the same denotation but that only one member of the pair should match with the specific connotation provided in a question (e.g., Both words describe a motion of circling. Which word describes a STRONGER AND MORE VIOLENT motion of circling?). Given the 'knowledge' about the existence of a certain form-meaning mapping (i.e., secondary iconicity), the participants succeeded in matching correct form with the meaning by 'perceiving' natural motivation underlying the form (i.e., primary iconicity). Another instance of translucent iconicity is found in some of the phonaesthemes examined in Chapter 6. In the multiple-choice task, the Korean- and English-speaking participants were presented with the information that one of the given alternative meanings should match with the shared form in a list of nonsense phonaesthemic words. Given the knowledge of the existence of iconic signs, they showed correct matching performance for *cl-, gl-,* and *tw-* by discerning a possible natural ground between the forms and the associated meanings.

Opaque iconicity is equivalent to secondary iconicity. Opaquely or secondarily iconic signs are largely conventional, and the role of any possible natural motivation is secondary. Instances of opaque iconicity are found in vocalic MEI's and in the majority of the phonaesthemes in Chapters 4 and 6, respectively, where the participants failed to match their meanings even though they had been given knowledge of the existence of iconic signs in the questions in the binary- and multiple-choice tasks (the result of the free-choice task in Chapter 6, where no contexts were given, and where none of the phonaesthemes received correct meaning-guessing rates at a statistically significant level, demonstrated that the investigated phonaesthemes are not *primarily iconic*).

The types of iconicity that the investigated sound-symbolic entities display can be summarised as in Table 7-1 below.

Table 7-1. Types of iconicity

Fordyce's iconicity	Sonesson's iconicity	Examples
Transparent iconicity	Primary iconicity	Some onomatopoeia
Translucent iconicity	Primary iconicity + Secondary iconicity	Consonantal MEI's Phonaesthemes *cl-*, *gl-*, and *tw-*
Opaque iconicity	Secondary iconicity	Vocalic MEI's The majority of phonaesthemes

The summary of the types of iconicity (i.e., the levels of natural motivation) underlying each sound-symbolic unit suggests that there is a need to revisit the way that all of the sound-symbolic

categories discussed in Chapter 1 were grouped together as a more or less unitary phenomenon. Given that at least two sound-symbolic categories falling under the description of sound symbolism (Korean ideophones and English phonaesthemic words) display graded natural iconicity, they seem to be unified more in the character of 'family resemblances' (Wittgenstein, 2001 [1953]) than in existing as a coherent category. To explain the philosophical concept of family resemblance, which Wittgenstein created, I quote Wittgenstein (2001 [1953], section 66) cited in Ahmed (2010, p. 42) as below:

> Consider for example the proceedings that we call "games". I mean board-games, card-games, ball-games, Olympic Games, and so on. What is common to them all? – Don't say: "There must be something common, or they would not be called "games" – but look and see whether there is anything common to all. – for if you look at them you will not see something that is common to all, but similarities, relationships, and a whole series of them at that. To repeat: don't think, but look! – look for example at board-games, with their multifarious relationships. Now pass to card-games; here you find many correspondences with the first group, but many common features drop out, and others appear. When we pass next to ball-games much that is common is retained, but much is lost. – are they 'amusing'? Compare chess with noughts and crosses.

Using the example of games, Wittgenstein argues that when one expression (e.g., games) is applied to things (e.g., board-games, card-games, ball-games, etc.), it may not be because they bear something that is common to *all*, but maybe because they bear overlapping similarities.

Figure 7-2. The Smith Brothers (Armstrong, Gleitman, & Gleitman, 1983, p. 269)

Armstrong et al. (1983, p. 269) illustrated the notion of family resemblance by taking the example of the Smith Brothers, shown in Figure 7-2:

> All these Brothers have features in common – the eyeglasses, the light hair, the bushy moustache, and so forth. But not all Smith Brothers have the same Smith-features, and no one critical feature defines the family…we can distinguish among the Smith Brothers according to the number of Smith-family attributes each embodies. The Brother at 11 o'clock is a poor exemplar of Smithness for he has only a few of the attributes and thus will share attributes with the Jones family or the James family. But the Brother in the middle is a prototypical Smith for he has all or most of the Smith attributes.

The cross-linguistic instances of sound symbolism appear to form a family in a similar way. Korean ideophones and English phonaesthemic words are called sound-symbolic words, but they do not possess something that is common to *all*. That is, although there are overlapping similarities between them – sensory semantics and idiosyncratic formal behaviours – they are not exactly the same. For example, there are different details on the general recurrent properties of sound-symbolic words in particular languages and also different levels of natural iconicity. Among many overlapping similarities, according to the degree of natural motivation, one can clearly distinguish the members of the family of sound symbolism. Following the argument made in Chapter 3 (that the most canonical manifestation of sound symbolism is naturally motivated signs), ideophones

containing vocalic MEI's and the majority of phonaesthemic words are poor exemplars of sound symbolism, because they support the CSH and thus share attributes with arbitrary prosaic words to a great extent. Ideophones containing consonantal MEI's and phonaesthemic words which have *cl-, gl-,* and *tw-* phonaesthemes are good exemplars of sound symbolism since they support the ESH. Perhaps, the best exemplars of sound symbolism (c.f. the Brother in the middle in Figure 7-2) may be found in onomatopoeic words – empirical investigation of the natural motivation of onomatopoeia is beyond the scope of the current thesis, however.

7.3 Future research

I have thus far explored in-depth sound-symbolic phenomena in Korean and English, seeking psycholinguistic evidence through a series of cross-linguistic perception experiments. I have also contributed to the theoretical characterisation of sound-symbolic words using the methods of canonical typology. My findings so far have been significant, but also raise further issues that begin to define a coherent program of cross-linguistic research into the pervasiveness of motivatedness in natural languages.

7.3.1 CV-interactions in sound symbolism

In Chapters 4 and 5, I investigated the universality of Korean vocalic and consonantal MEI's separately to find empirical evidence for their natural iconicity levels. The experimental chapters on Korean sound symbolism successfully showed that vocalic and consonantal MEI's display opaque (secondary) iconicity and translucent iconicity, respectively. However, no consideration was given to the possible sound-symbolic relevance of feature combinations. Previously, Ahlner and Zlatev (2010) found a strong iconic effect of consonant-vowel (CV) interactions in their experiments on sound-shape symbolism. In detail, they asked Swedish speakers to match pairs of non-words, which were systematically different in terms of vowels (front vs. back vowels; e.g., *lili* vs. *lulu*), consonants (voiced sonorants vs. voiceless obstruents; e.g., *nini* vs. *kiki*), and combinations of these in incongruent ('hard' consonants and 'round' vowels vs. 'soft' consonants and 'sharp' vowels; e.g., *tutu* vs. *lili*) and congruent ('hard' consonant and 'sharp' vowel vs. 'soft' consonants and 'round' vowels; *titi* vs. *lulu*) conditions, with curvy and angular shapes. The results showed that a word pair that contrasted consonants and vowels each reached significant correct guessing levels, but that the correct matching rate was significantly decreased when words in a pair contained an incongruent combination of consonants and vowels. From this, they concluded that not only individual consonants and vowels, but also the consonant-vowel interactions are important for eliciting a sound-symbolic effect.

Likewise, D'Onofrio (2014) pointed to the sound-symbolic relevance of feature combinations. Using the logistic regression model, she measured the role of vowel backness, consonant voicing, and consonant place of articulation, individually and in combination, in native English speakers' perceptions of the sound-symbolic effect observed in sound-shape symbolism. As a result, it was found that vowel backness had a significant effect on the establishment of the well reported bouba-kiki phenomenon. As for the role of consonant voicing and consonant place, voicing itself appeared to not be a significant predictor of shape selection, but its interaction with certain consonant places of articulation elicited a desirable shape selection. From the finding that voiceless consonants, which were not significant predictors of shape selection, had a significant effect on the selection of angular shapes when they appeared at the places of alveolar and velar, D'Onofrio stressed the compositionality of sound symbolism and suggested that "…in order to fully understand how nonsense words are mapped to object qualities, it is necessary and fruitful to examine the ways that multiple phonetic features work in concert with one another to predict the selection of a round versus a spiky shape". In this regard, it would be interesting to investigate whether interactions of consonantal and vocalic MEI's reinforce sound-symbolic effects, by making comparisons with the current results in Chapters 4 and 5 where the perceptions of the sound-symbolic effects of C_1 and V_1 were seperately examined.

7.3.2 Lexical/statistical basis of sound symbolism

Another issue relates to lexical/statistical influences on sound-symbolic perception. In designing the experiments described in Chapter 6, I used nonce phonaesthemic words as stimulus items to examine any possible universal perceptions of English phonaesthemes. The nonce words were used in order to minimise the possibility that participants would make inferences from their existing knowledge of English. Nevertheless, I could not totally exclude such a possibility, since the nonce words were created from existing English phonaesthemic words (given the idea that completely "outlandish" words may not be conceived by the participants as words at all). This raises a question of whether the observed translucent iconicity of the *cl-, gl-,* and *tw-* phonaesthemes is based on participants' inferences from the existing English lexicon – the Korean-speaking participants were university students in Korea who had been extensively exposed to English as a second language.

Shinohara and Kawahara (2010) raised a similar issue in their perceptual experiment of size sound symbolism. For example, they observed that many of the existing lexical items of English which denote largeness contain a low vowel (e.g., the word, large) and that those which denote smallness contain a high vowel (words with a diminutive suffix *–y*). They questioned whether such "stochastic patterns in the lexicon" were a base of their English participants' sensitivity to the universal pattern of magnitude symbolism. Such questions deserve attention in future research. It

would be interesting to measure how many existing English phonaesthemic words with the phonaesthemes of interest were known by the Korean participants and in this way investigate the factor of lexical influences. One prediction is that the participants may have known more of the existing phonaesthemic words that start with *cl-, gl-,* and *tw-* compared to those words starting with the other remaining phonaesthemes, thus revealing an above chance level of correct guessing rates on their meanings only. This prediction invites future investigation.

To conclude, this thesis has provided empirical assessment for the possible existence (and different degrees) of iconicity in language and contributed to a balanced theoretical approach to one of the fundamental question of linguistics, namely the nature of association between sound and meaning. In the course of comprehensive testing of the ESH and its central claim that naturalness prevails over arbitrariness in sound-symbolic vocabularies, this thesis has shown that sound-symbolic phenomena have varying degrees of motivatedness of linguistic signs, and that some instances of sound symbolism are based on arbitrary convention, contrary to the central claim of the ESH. Although there is still a need for further investigations of the natural motivation of sound symbolism, this suggests that, to some extent, sound symbolism may not challenge the near-axiomatic expectation that pairings of sounds with simple meanings are arbitrary, and encourages us to adopt the role of iconicity in language with a caveat.

References

Abelin, Å. (1999). *Studies in sound symbolism*. Ph.D. dissertation, Göteborg University.

———. (2012). Relative frequency and semantic relations as organizing principles for the psychological reality of phonaesthemes. *Selected Articles from UK-CLS Meetings*, 1, 128-145.

Abramova, E., Fernández, R., & Sangati, F. (2013). Automatic labeling of phonesthemic senses. In M. Knauff, M. Pauen, N. Sebanz, & I. Wachsmuth (Eds.), *Proceedings of the 35th Annual Meeting of the Cognitive Society* , 1696-1701.

Ahlner, F., & Zlatev, J. (2010). Cross-modal iconicity: A cognitive semiotic approach to sound symbolism. *Sign Systems Studies,* 38(1/4), 298-348.

Ahmed, A. (2010). *Wittgenstein's Philosophical investigations: a reader's guide*. New York/London: Continuum.

Akita, K. (2009). *A grammar of sound-symbolic words in Japanese: Theoretical approaches to iconic and lexical properties of mimetics.* Ph. D. dissertation, Kobe University.

———., Imai, M., Saji, N., Kantartzis, K., & Kita, S. (2013). Mimetic vowel harmony. *Japanese/Korean Linguistics,* 20, 115-129.

Ameka, F. K. (2001). Ideophones and the nature of the adjective word class in Ewe. In F. Voeltz, & C. Kilian-Hatz (Eds.), *Ideophones* (pp. 25-48). Amsterdam: John Benjamins.

Anderson, S. R. (1992). *A-morphous morphology*. Cambridge: Cambridge University Press.

———. (forthcoming). The morpheme: Its Nature and Use. In M. Baerman (Ed.), *The Oxford Handbook of Inflection*. Oxford: Oxford University Press.

Armstrong, S. L., Gleitman, L. R., & Gleitman, H. (1983). What some concepts might not be. *Cognition,* 13(3), 263-308.

Aronoff, M. (1994). *Morphology by itself: Stems and inflectional classes*. Cambridge, MA: MIT press.

Asano, M., Imai, M., Kita, S., Kitajo, K., Okada, H., & Thierry, G. (2015). Sound symbolism scaffolds language development in preverbal infants. *Cortex,* 63, 196-205.

Baerman, M., Brown, D., & Corbett, G. G. (2005). *The syntax-morphology interface: A study of syncretism*. Cambridge: Cambridge University Press.

———., & Corbett, G. G. (2012). Stem alternations and multiple exponence. *Word Structure,* 5(1), 52-68.

Bauer, L. (1999). Is the morpheme dead? *Acta Linguistica Hafniensia,* 31(1), 7-25.

Beck, D. (2008). Ideophones, Adverbs, and Predicate Qualification in Upper Necaxa Totonac 1. *International Journal of American Linguistics,* 74(1), 1-46.

Beckman, J. N. (2013). *Positional faithfulness: an optimality theoretic treatment of phonological asymmetries*. New York: Routledge.

———., Jessen, M., & Ringen, C. (2013). Empirical evidence for laryngeal features: Aspirating vs. true voice languages. *Journal of Linguistics,* 49(2), 259-284.

Bentley, M., & Varon, E. J. (1933). An Accessory Study of "Phonetic Symbolism". *The American Journal of Psychology*, 45, 76-86.

Bergen, B. K. (2004). The psychological reality of phonaesthemes. *Language*, 80(2), 290-311.

Berlin, B. (1994). Evidence for pervasive synesthetic sound symbolism in ethnozoological nomenclature. In L. Hinton, J. Nichols, & J. Ohala, pp. 76-93.

———. (2006). The first congress of ethnozoological nomenclature. *Journal of the Royal Anthropological Institute,* 12, 23-44.

Bernard, J. R. L. (1967). Length and the identification of Australian English vowels. *Journal of the Australasian Universities Language and Literature Association*, 27(1), 37-58.

Blench, R. (2010). The sensory world: ideophones in Africa and elsewhere. In A. Storch (Ed.), *Perception of the Invisible: religion, historical semantics and the role of perceptive verbs* (pp. 275-296). Cologne: Köppe.

Bloomfield, L. (1933). *Language*. New York: Holt, Rinehard & Winson.

Bloomfield, M. W. (1953). Final root-forming morphemes. *American Speech*, 28, 158-164.

Blust. (1988). *Austronesian root theory: An essay on the limits of morphology*. Amsterdam: John Benjamins.

———. (2003). The phonestheme ŋ-in Austronesian languages. *Oceanic linguistics*, 42(1), 187-212.

———. (2011). The Problem of Doubleting in Austronesian Languages. *Oceanic linguistics,* 50(2), 399-457.

Bolinger, D. L. (1950). Rime, assonance, and morpheme analysis. *Word*, 6, 117-136.

Bond, O. (2012). A base for canonical negation. In Brown, Chumakina, & Corbett, pp. 20-47.

Brackbill, Y., & Little, K. B. (1957). Factors determining the guessing of meanings of foreign words. *The Journal of Abnormal and Social Psychology,* 54(3), 312-318.

Bremner, A. J., Caparos, S., Davidoff, J., de Fockert, J., Linnell, K. J., & Spence, C. (2013). "Bouba" and "Kiki" in Namibia? A remote culture make similar shape–sound matches, but different shape–taste matches to Westerners. *Cognition,* 126(2), 165-172.

Briggs, S. R., & Cheek, J. M. (1986). The role of factor analysis in the development and evaluation of personality scales. *Journal of personality,* 54(1), 106-148.

Browman, C. P. (1978). Tip of the tongue and slip of the ear: Implications for language processing. *UCLA Working Papers in Phonetics*, 42.

Brown, D., & Chumakina, M. (2012). What there might be and what there is: an introduction to Canonical Typology. In Brown, Chumakina, & Corbett, pp. 1-19.

———., Chumakina, M., & Corbett, G. G. (2012). *Canonical morphology and syntax.* Oxford: Oxford University Press.

———., Chumakina, M., Corbett, G., Popova, G., & Spencer, A. (2012). Defining 'periphrasis': key notions. *Morphology,* 22(2), 233-275.

Brown, R. W., Black, A. H., & Horowitz, A. E. (1955). Phonetic symbolism in natural languages. *The Journal of Abnormal and Social Psychology,* 50(3), 388-393.

———., & Nuttall, R. (1959). Method in phonetic symbolism experiments. *The Journal of Abnormal and Social Psychology,* 59(3), 441-445.

———., & McNeill, D. (1966). The "tip of the tongue" phenomenon. *Journal of Verbal Learning and Verbal Behavior, 5*(4), 325-337.

Bruner, J. S., & O'Dowd, D. (1958). A note on the informativeness of parts of words. *Language and speech,* 1(2), 98-101.

Brysbaert, M., & New, B. (2009). Moving beyond Kučera and Francis: A critical evaluation of current word frequency norms and the introduction of a new and improved word frequency measure for American English. *Behavior Research Methods,* 41(4), 977-990.

Bybee, J. L. (1985). *Morphology: A study of the relation between meaning and form*. Amsterdam: John Benjamins Publishing.

———. (1988). Morphology as lexical organization. In M. Hammond, & M. Noona (Eds.), *Theoretical morphology* (pp. 119-141). San Diego: Academic Press.

Carr, D. (1966). Homorganicity in Malay/Indonesian in expressives and quasi expressives. *Language*, 42(2), 370-377.

Casali, R. F. (2008). ATR harmony in African languages. *Language and Linguistics compass,* 2(3), 496-549.

Childs, G. T. (1988). *The phonology of Kisi ideophones*. Ph.D. dissertation, University of California, Berkeley.

———. (1994). African ideophones. In L. Hinton, J. Nichols, & J. Ohala, pp. 178-204.

Cho, M.-H. (1994). *Vowel harmony in Korean: A grounded phonology approach*. Ph.D. dissertation, Indiana University.

Cho, T., Jun, S. A., & Ladefoged, P. (2002). Acoustic and aerodynamic correlates of Korean stops and fricatives. *Journal of Phonetics, 30*(2), 193-193.

———. & Keating, P. A. (2001). Articulatory and acoustic studies on domain-initial strengthening in Korean. *Journal of Phonetics,* 29(2), 155-190.

Chomsky, N., & Halle, M. (1968). *The sound pattern of English*. New York: Harper & Row.

Ciccotosto, N. (1991). *Sound symbolism in natural languages.* Ph.D. dissertation, University of Florida.

Cole, R. A. (1973). Listening for mispronunciations: A measure of what we hear during speech. *Perception & Psychophysics,* 13(1), 153-156.

Collins, J. T. (1979). Expressives in Kedah Malay. *South-east Asian linguistic studies,* 4, 379-406.

Comrie, B. (2003). When agreement gets trigger-happy. *Transactions of the philological society,* 101(2), 313-337.

Corbett, G. G. (2003). Agreement: Canonical instances and the extent of the phenomenon. In D. Brown, G. Corbett, & C. Tiberius (Eds.), *Agreement: A typological persepective* (pp. 313-317). Oxford: Blackwell.

———. (2005). The canonical approach in typology. In Z. Frajzyngier, A. Hodges, & D. S. Rood (Eds.), *Linguistic diversity and language theories* (pp. 25-49). Amsterdam: John Benjamins.

———. (2006). *Agreement*. Cambridge: Cambridge University Press.

———. (2007). Canonical Typolgy, Suppletion, and Possible Words. *Language*, 83(8), 8-42.

———. (2010). Canonical derivational morphology. *Word Structure,* 3(2), 141-155.

Crisfield, A. G. (1983). *Sound symbolism and the expressive words of Lao*. Ph.D. dissertation, University of Hawai'i.

D'Onofrio, A. (2014). Phonetic Detail and Dimensionality in Sound-shape Correspondences: Refining the Bouba-Kiki Paradigm. *Language and speech*, 57(3), 367-393.

Dalgaard, P. (2008). *Introductory statistics with R*. New York: Springer.

Davis, S., & Lee, J. S. (1996). Korean partial reduplication reconsidered. *Lingua,* 99(2), 85-105.

DeLoache, J. S. (2004). Becoming symbol-minded. *Trends in Cognitive Sciences*, 8(2), 66-70.

———. (2005). Mindful of symbols. *Sceintific American*, 293(2), 60-65.

Dhoorre, C. S., & Tosco, M. (1998). 111 Somali ideophones. *Journal of African Cultural Studies,* 11(2), 125-156.

Diffloth. G. (1972). Notes on expressive meaning. *Papers from the Eighth Regional Meeting* (pp. 440-447). The Chicago Linguistic Society.

———. (1976). Expressives in Semai. *Oceanic Linguistics Special Publications*, 13, 249-264.

———. (1994). I: big, a: small. In L. Hinton, J. Nichols, & J. Ohala, 107-113.

Dingemanse, M. (2011). *The meaning and use of ideophones in Siwu*. Ph.D. dissertation. Raboud University.

———. (2012a). Advances in the Cross-Linguistic Study of Ideophones. *Language and Linguistics compass,* 6(10), 654-672.

———. (2012b). Expressiveness and system integration: On the typology of ideophones, with special reference to Siwu. *STUF - Language Typology and Universals*.

———, Blasi. D. E., Lupyan, G., Christiansen, M. H. & Monaghan, P. (2015). Arbitrariness, Iconicity, and Systematicity in Language, *Trends in Cognitive Sciences*, 19(10), 603-615.

Doke, C. M. (1935). *Bantu linguistic terminology*. London: Longmans, Green, and Co.

Fay, D., & Cutler, A. (1977). Malapropisms and the structure of the mental lexicon. *Linguistic Inquiry*, 8, 505-520.

Feist, J. (2013). "Sound symbolism" in English. *Journal of Pragmatics*, 45(1), 104-118.

Finley, S. (2006). Vowel harmony in Korean and morpheme correspondence. *Harvard Studies in Korean Linguistics,* 11, 131-144.

Finley, S. (2009). Morphemic harmony as featural correspondence. *Lingua,* 119(3), 478-501.

Firth, J. (1930). *Speech*. London: Ernest Benn.

Fischer-Jørgensen, E. (1968). Perceptual Dimensions of Vowels. *Zeitschrift fur Phonetik, Sprachwissenschaft und Kommunikationsforschung,* 21, 94-98.

Fordyce, J. F. (1988). *Studies in sound symbolism with special reference to English.* Ph.D. dissertation, University of California, Los Angeles.

Fromkin, V., Rodman, R., Hyams H, N., Collin, P., Amberber, M., & Cox, F. (2012). *An Introduction to Language.* South Melbourne, Vic: Cengage Learning Australia.

Garrigues, S. L. (1995). Mimetic parallels in Korean and Japanese. *Studies in Language,* 19(2), 359-398.

Gasser, M., Sethuraman, N., & Hockema, S. (2005). Iconicity in expressives: An empirical investigation. In S. Rice, & J. Neman (Eds.), *Experimental and empirical methods* (pp. 163-180). Stanford, CA: CSLI Publications.

Gebels, G. (1969). An investigation of phonetic symbolism in different cultures. *Journal of Verbal Learning and Verbal Behavior,* 8(2), 310-312.

Gregerson, K. (1976). Tongue-root and register in Mon-Khmer. *Oceanic Linguistics Special Publications*, 13, 323-369.

———. (1984). Pharynx symbolism and Rengao phonology. *Lingua,* 62(3), 209-238.

Haiman, J. (1980). The iconicity of grammar: isomorphism and motivation. *Language*, 56(3), 515-540.

Halle, M., & Stevens, K. (1969). On the Feature [Advanced Tongue Root]. *Quarterly Progress Report of the MIT Research Laboratory in Electronics, 94*, 209-215.

Hamano, S. (1998). *The Sound-Symbolic System of Japanese*. Stanford: CSLI.

Han, M. S., & Weitzman, R. S. (1970). Acoustic features of Korean/P, T, K/,/p, t, k/and/ph, th, kh/. *Phonetica,* 22(2), 112-128.

Healy, C. (2011). Pinky Extension as a Phonestheme in Mongolian Sign Language. *Sign Language Studies,* 11(4), 575-593.

Helgason, P., & Ringen, C. (2008). Voicing and aspiration in Swedish stops. *Journal of Phonetics,* 36(4), 607-628.

Henderson, E. (1952). The main features of Cambodian pronunciation. *Bulletin of the School of Oriental and African Studies,* 14(1), 149-174.

Hinton, L., Nichols, J., & Ohala, J. J. (1994). *Sound symbolism*. Cambridge: Cambridge University Press.

Hockett, C. F. (1958). *A Course in modern linguistics*. New York: Macmillan.

———. (1960). The origin of speech. *Scientific American*, 203, 89-96.

———. (1963). The problem of universals in language. In J. H. Greenberg (Ed.), *Universals of language* (pp. 1-22). Cambridge, Mass: MIT Press.

Horowitz, L. M., White, M. A., & Atwood, D. W. (1968). Word fragments as aids to recall: the organization of a word. *Journal of experimental Psychology, 76*, 219-226.

Householder, F. W. (1946). On the problem of sound and meaning, an English phonestheme. *Word,* 2, 83-84.

Hutchins, S. S. (1998). *The psychological reality, variability, and compositionality of English phonesthemes.* Ph.D. dissertation, Emory University.

Imai, M., Kita, S., Nagumo, M., & Okada, H. (2008). Sound symbolism facilitates early verb learning. *Cognition,* 109(1), 54-65.

Ingram, J. C., & Park, S.-G. (1997). Cross-language vowel perception and production by Japanese and Korean learners of English. *Journal of Phonetics,* 25(3), 343-370.

Itô, J., & Mester, A. (1996). Japanese Phonology. In J. Goldsmith (Ed.), *The Handbook of Phonological Theory* (pp. 817-838). Massachusetts: Blackwell Publishers.

———. (1999). The Phonological Lexicon. In N. Tsujimura (Ed.), *The Handbook of Japanese Linguistics* (pp. 62-100). Malden, MA/Oxford: Blackwell Publishers.

Ivanova, G. (2006). Sound-symbolic approach to Japanese mimetic words. *Toronto Working Papers in Linguistics,* 26, 103-114.

Jakobson, R., & Waugh, L. R. (1979). *The sound shape of language*. Brighton, Sussex: Harvester Press.

Jespersen, O. (1922). *Language: its nature, development and origin*. London: Allen & Unwin.

———. (1933). Symbolic value of the vowel i. in *Linguistica. Selected Papers in English, French and German* (pp. 283-303). Copenhagen: Levin & Munsksgaard.

Kantartzis, K., Imai, M., & Kita, S. (2011). Japanese sound-symbolism facilitates word learning in English-speaking children. *Cognitive Science,* 35(3), 575-586.

Kawahara, S., & Braver, A. (2014). Durational properties of emphatically lengthened consonants in Japanese. *Journal of the International Phonetic Association,* 44(3), 237-260.

———., Shinohara, K., & Uchimoto, Y. (2008). A positional effect in sound symbolism: An experimental study. *Proceedings of Japan Cognitive Linguistics Association*, 417-427.

Keuleers, E., & Brysbaert, M. (2010). Wuggy: A multilingual pseudoword generator. *Behavior Research Methods,* 42(3), 627-633.

Kim-Renaud, Y.-K. (1976). Semantic Features in Phonology: Evidence from Vowel Harmony in Korean. *Papers from the Regional Meetings, Chicago Linguistic Society,* 12, 397-412.

———. (1978). The syllable in Korean phonology. In C. W. Kim (Ed.), *Papers in Korean Linguistics: Proceedings of the Symposium on Korean Linguistics* (pp. 85-98). Columbia, South Carolina: Hornbeam Press.

Kim, K.-O. (1977). Sound symbolism in Korean. *Journal of Linguistics,* 13(1), 67-75.

Kim, Y. S. (1984). *Aspects of Korean morphology.* Ph.D. dissertation, University of Texas at Austin.

Kim, J. K. (2000). *Quantity-sensitivity and feature-sensitivity of vowels: a constraint-based approach to Korean vowel phonology*. Ph.D. dissertation, Indiana University.

Kim, H. (2005). The representation of the three-way laryngeal contrast in Korean consonants. In M. Oostendorp & J. Weijer (Eds.), *The internal organization of phonological segments* (pp. 263-293). Berlin: Mouton de Gruyter.

Kim, C.-W. (1965). On the autonomy of the tensity feature in stop classification (with special reference to Korean stops). *Word,* 21(3), 339-359.

Kita, S. (1997). Two-dimensional semantic analysis of Japanese mimetics. *Linguistic*s, 35, 379-415.

Klamer, M. (2001). Expressives and iconicity in the lexicon. *Typological Studies in Language,* 44, 165-182.

———. (2002). Semantically motivated lexical patterns: A study of Dutch and Kambera expressives. *Language*, 78(2), 258-286.

Köhler, W. (1947). *Gestalt psychology, an introduction to new concepts in modern psychology* (2nd ed.). NY: Liveright.

Köhler, W. (1929). *Gestalt psychology*. New York, NY: Liveright.

Kovic, V., Plunkett, K., & Westermann, G. (2010). The shape of words in the brain. *Cognition,* 114(1), 19-28.

Kunene, D. P. (1965). The ideophone in Southern Sortho. *Journal of African Languages*, 4, 19-39.

Kunihira, S. (1971). Effects of the expressive voice on phonetic symbolism. *Journal of Verbal Learning and Verbal Behavior,* 10(4), 427-429.

Kwon, N., & Round, E. R. (2015). Phonaesthemes in morphological theory. *Morphology*, 25(1), 1-27.

Ladefoged, P., & Maddieson, I. (1996). *The sounds of the world's languages*. Oxford: Blackwell.

Larsen, D., & Heinz, J. (2012). Neutral vowels in sound-symbolic vowel harmony in Korean. *Phonology,* 29(3), 433-464.

Lawler, J. (2006). The Data Fetishist's Guide to Rime Coherence. *Style,* 40(1/2), 158-178.

Lee, J. S. (1992). *Phonology and sound symbolism of Korean ideophonies*. Ph.D. dissertation, Indiana University.

Lee, Y. S. (1993). *Topics in the vowel phonology of Korean.* Ph.D. dissertation, Indiana University.

Lee, M. (2001). *Optionality and variation in optimality theory: focus on Korean phonology*, Ph.D. dissertation, Indiana University.

Leech, G., Rayson, P., & Wilson, A. (2001). *Word frequencies in written and spoken English: Based on the British National Corpus*. Harlow: Longman

Lindau, M. (1979). The feature expanded. *Journal of Phonetics,* 7(2), 163-176.

Locke, J. (1690/1975). *An Essay concerning Human Understanding*, ed. P. H. Nidditch. Oxford: Oxford University Press.

Maduka, O. N. (1988). Size and shape ideophones in Nembe: a phonosemantic analysis. *Studies in African linguistics,* 19(1), 93-113.

———. (1990). Pharynx Size in Nembe Sound Symbolism. *Afrikanistische Arbeitspapiere,* 24, 69-80.

———. (1992). A phonosemantic analysis of Nembe reduplicated sound ideophones. *Frankfurter afrikanistische Blätter*, 4, 71-81.

Magnus, M. (2000). *What's in a Word? Evidence for Phonosemantics*. Ph.D. dissertation, University of Trondheim.

Maltzman, I., Morrisett, L., & Brooks, L. O. (1956). An investigation of phonetic symbolism. *The Journal of Abnormal and Social Psychology,* 53(2), 249-251.

Marchand, H. (1969). *The categories and types of present-day English word-formation: A synchronic-diachronic approach*. München: Beck.

Markel, N. N., & Hamp, E. P. (1960). Connotative meanings of certain phoneme sequences. *Studies in linguistics,* 15(1), 47-61.

Marslen-Wilson, W. D. (1975). Sentence perception as an interactive parallel process. *Science,* 189, 226-228.

Martin, S. E. (1962). Phonetic symbolism in Korean. *American studies in Altaic linguistics,* 13, 177-189.

Martinet, A. (1960). *Éléments de linguistique générale*. Paris: Librairie Armand Colin.

Mathews, P. (1974). *Morphology: an introduction to the theory of word-structure*. Cambridge: Cambridge University Press.

Mattys, S., & Samuel, A. G. (2000). Implications of stress-pattern differences in spoken-word recognition. *Journal of Memory and Language,* 42(4), 571-596.

Maurer, D., Pathman, T., & Mondloch, C. J. (2006). The shape of boubas: Sound–shape correspondences in toddlers and adults. *Developmental science,* 9(3), 316-322.

McCarthy, J. J. (1983). Phonological Features and Morphological Structure. *Papers from the Parasessions, Chicago Linguistic Society*, 19, 135-161.

———. (1989). Linear order in phonological representation. *Linguistic Inquiry*, 20(1), 71-99.

McFarland, T. (2010). Ideophones and templatic morphology in Totonac: Páks páks tamakawán. Paper presented at *the Annual Meeting of the Linguistic Society of America*, Albuquerque, January 6, 2006.

McMurray, G. A. (1960). Meaning associated with the phonetic structure of unfamiliar foreign words. *Canadian Journal of Psychology/Revue canadienne de psychologie,* 14(3), 166-174.

Mester, R. A., & Itô, J. (1989). Feature predictability and underspecification: Palatal prosody in Japanese mimetics. *Language*, 65 (2), 258-293.

Meunier, F., & Segui, J. (1999). Morphological priming effect: The role of surface frequency. *Brain and Language,* 68(1), 54-60.

Mihas, E. I. (2012). Ideophones in Alto Perené (Arawak) from Eastern Peru. *Studies in Language,* 36(2), 300-344.

Miller, J. D. (1967). An acoustical study of Brou vowels. *Phonetica,* 17(3), 149-177.

Miller, R. G. (1966). *Simultaneous statistical inference*. New York: McGraw-Hill.

Mitchell, A. G., & Delbridge, A. (1965). *The pronunciation of English in Australia.* Sydney: Angus and Robertson.

Mok, W. E. (2001). *Chinese sound symbolism: A phonological perspective.* Ph.D. dissertation, University of Hawaii at Manoa.

Monaghan, P., Mattock, K., & Walker, P. (2012). The role of sound symbolism in language learning. *Journal of Experimental Psychology: Learning, Memory, and Cognition,* 38(5), 1152-1164.

Nam, P.-H. (1965). 15 seki kukŏ-ŭi ŭmsŏng sangcing yŏnku [A study of sound symbolism in 15th century Korean]. *kukŏ,* 13, 1-87.

Newman, S. S. (1933). Further experiments in phonetic symbolism. *The American Journal of Psychology,* 45(1), 53-75.

Newman, P. (1968). Ideophones from a syntactic point of view. *Journal of West African Languages*, 5, 107-117.

———. (2001). Are ideophones really as weird and extra-systematic as linguists make them out to be? In F. Voeltz, & C. Kilian-Hatz (Eds.), *Ideophones* (pp. 251-258). Amsterdam: John Benjamins.

Nooteboom, S. G. (1981). Lexical retrieval from fragments of spoken words: beginnings vs. endings. *Journal of Phonetics,* 9(4), 407-424.

Nuckolls, J. B. (1996). *Sounds like life: sound-symbolic grammar, performance, and cognition in Pastaza Quechua*. New York: Oxford University Press.

———. (1999). The case for sound symbolism. *Annual Review of Anthropology*, 28, 225-252.

Nygaard, L. C., Cook, A. E., & Namy, L. L. (2009). Sound to meaning correspondences facilitate word learning. *Cognition,* 112(1), 181-186.

Ohala, J. J. (1983). Cross-language use of pitch: an ethological view. *Phonetica,* 40(1), 1-18.

———. (1994). The frequency code underlies the sound-symbolic use ofvoice-pitch. In L. Hinton, J. Nichols, & J. Ohala, pp. 325-347.

———. (1997). Sound symbolism. Paper presented at *the Proceedings of the 4th Seoul International Conference on Linguistics*. Seoul.

Oswalt, R. L. (1994). Inanimate imitatives in English. In L. Hinton, J. Nichols, & J. Ohala, pp. 293-306.

Otis, K., & Sagi, E. (2008). Phonaesthemes: A corpus-based analysis. In B.C. Love, K. McRae, & V. M. Sloutsky (Eds.), *Proceedigns of the 30th Annual Meeting of the Cognitive Science Society* (pp. 65-70). Austin, TX: Cognitive Science Society.

Ozturk, O., Krehm, M., & Vouloumanos, A. (2013). Sound symbolism in infancy: evidence for sound–shape cross-modal correspondences in 4-month-olds. *Journal of experimental child psychology,* 114(2), 173-186.

Paget, R. (1929). *Human Speech*. New York, NY: Harcourt.

Pallant, J. (2011). *SPSS survival manual: a step by step guide to data analysis using SPSS*. Crows Nest, N.S.W: Allen & Unwin.

Parault, S. J. (2006). Sound symbolic word learning in written context. *Contemporary Educational Psychology,* 31(2), 228-252.

———., & Parkinson, M. (2008). Sound symbolic word learning in the middle grades. *Contemporary Educational Psychology,* 33(4), 647-671.

———., & Schwanenflugel, P. J. (2006). Sound-symbolism: a piece in the puzzle of word learning. *Journal of psycholinguistic research,* 35(4), 329-351.

Peirce, C. S. (1932). *Collected Writings, 2: Elements of Logic*. Cambridge, MA: Harvard University Press.

———. (1955). In J. Buchler (Ed.), *Philosophical writings of Peirce* (pp. 99-119). New York: Dover.

Peña, M., Mehler, J., & Nespor, M. (2011). The role of audiovisual processing in early conceptual development. *Psychological Science,* 22(11), 1419-1421.

Perkell, J. S. (1969). *Physiology of speech production: results and implications of a quantitative cineradiographic study*. Cambridge, Mass: MIT Press.

Perniss, P., Thompson, R., & Vigliocco, G. (2010). Iconicity as a general property of language: evidence from spoken and signed languages. *Frontiers in Psychology,* 1, 1-15.

Polinsky, M. (2003). Non-canonical agreement is canonical. *Transactions of the philological society,* 101(2), 279-312.

Ramachandran, V. S., & Hubbard, E. M. (2001). Synaesthesia--a window into perception, thought and language. *Journal of consciousness studies,* 8(12), 3-34.

Rhodes. (1994). Aural images. In L. Hinton, J. Nichols, & J. Ohala, pp. 276-292.

Rhodes, & Lawler, J. M. (1981). Athematic metaphors. *Chicago Linguistic Society*, 17, 318-342.

Riad, T. (2013). *The Phonology of Swedish.* Oxford: Oxford University Press.

Round, E. (2007). *A regular phonological analysis of six cases of exceptionality in Swedish*. ms, Yale University.

Rowlands, E. C. (1970). Ideophones in Yoruba. *African Language Studies,* 11, 289-297.

Samarin, W. J. (1965). Perspective on African ideophones. *African Studies,* 24(2), 117-121.

Sapir, E. (1929). A study in phonetic symbolism. *Journal of experimental psychology,* 12(3), 225-239.

Sussure, F. de. (1966/1916). *Course in General Linguistics*. New York: McGraw-Hill.

Schmidtke, D. S., Conrad, M., & Jacobs, A. M. (2014). Phonological iconicity. *Frontiers in Psychology,* 5:80, 1-6.

Shinohara, K., & Kawahara, S. (2010). A cross-linguistic study of sound symbolism: The images of size. In *Proceedings of the 36th Annual Meeting of the Berkeley Linguistics Society*, Berkeley, CA, 6-7 February 2010. Berkeley, CA: UC Berkeley.

Sien, N. C. (1997). *An autosegmental analysis of ideophones in Korean.* Ph.D. dissertation, University of Washington.

Silverstein, M. (1994). Relative motivation in denotational and indexical sound symbolism of Wasco-Wishram Chinookan. In L. Hinton, J. Nichols, & J. Ohala, pp. 40-60.

Simmons, J. P., Nelson, L. D., & Simonsohn, U. (2011). False-positive psychology undisclosed flexibility in data collection and analysis allows presenting anything as significant. *Psychological Science,* 22(11), 1359-1366.

Sohn, H.-m. (1999). *The Korean language*. New York: Cambridge University Press.

Sohn, H.-S. (1986). Toward an Integrated Theory of Morphophonology: Vowel Harmony in Korean in Illinois Studies in Korean Linguistics. *Studies in the Linguistic Sciences,* 16(2), 157-184.

Son, M., Kim, S., & Cho, T. (2012). Supralaryngeal articulatory signatures of three-way contrastive labial stops in Korean. *Journal of Phonetics,* 40(1), 92-108.

Sonesson, G. (1997). The ecological foundations of iconicity. In R, Irmengard, & C, Gerald (Eds.), Paper presented at *the Semiotics Around the World: Synthesis in Diversity. Proceedings of the Fifth International Congress of the IASS, Berkely* (pp. 739-742). Berlin & New York: Mouton de Gruyter.

Taft, M., & Forster, K. I. (1976). Lexical storage and retrieval of polymorphemic and polysyllabic words. *Journal of Verbal Learning and Verbal Behavior,* 15(6), 607-620.

Taylor, I. K., & Taylor, M. M. (1962). Phonetic symbolism in four unrelated languages. *Canadian Journal of Psychology/Revue canadienne de psychologie,* 16(4), 344-356.

———. (1965). Another look at phonetic symbolism. *Psychological bulletin,* 64(6), 413-427.

Tedlock, D. (1999). Ideophone. *Journal of Linguistic Anthropology,* 9(1-2), 118-120.

Thompson, P. D. (2013). *Phonetic symbolism for size, shape, and motion.* Ph.D. dissertation, University of Warwick.

———., & Estes, Z. (2011). Sound symbolic naming of novel objects is a graded function. *The Quarterly Journal of Experimental Psychology,* 64(12), 2392-2404.

Tufvesson, S. (2011). Analogy-making in the Semai sensory world. *The Senses and Society,* 6(1), 86-95.

Udoh, I. I. (2007). Fortition and reduplication in Leggbo ideophones. *Journal of African languages and linguistics,* 28(1), 57-70.

Uhlenbeck, M. E. (1996). About cran- and cranberry. In B. Nothodfer (Ed.), *Reconstruction, classification, description: In honor of isidore Dyen* (pp. 249-259). Hamburg: Abera.

Ultan, R. (1978). Size-sound symbolism. In J. H. Greenberg, C. A. Ferguson, & E. A. Moravcsik (Eds.), *Universals of human language: Vol. 2. Phonology* (pp. 525-568). Stanford, CA: Stanford University Press.

Voeltz, F. E., & Kilian-Hatz, C. (2001). *Ideophones*. Amsterdam/Philadelphia: John Benjamins.

Waugh, L. R. (1992). Presidential Address: Let's take the con out of iconicity. *The American Journal of Semiotics, 9*(1), 7-47.

Wayland, R. (1996). Lao expressives. *Mon-Khmer Studies*, 26, 217-232.

Wescott, R. W. (1980). *Sound and sense: Linguistic essays on phonosemic subjects*. Lake Bluff, IL : Jupiter Press.

Westbury, C. (2005). Implicit sound symbolism in lexical access: Evidence from an interference task. *Brain and Language,* 93(1), 10-19.

Wittgenstein, L. (2001/1953). *Philosophical Investigations*. *The German Text, with a Revised English Translations*, translated by G. E. M. Anscombe. Oxford: Blackwell Publishing.

Wood, E. J. (2007). *The semantic typology of pluractionality*. Ph.D. dissertation, Berkely: University of California.

Woodworth, N. L. (1991). Sound symbolism in proximal and distal forms. *Linguistics,* 29(2), 273-300.

Yang, B. (1992). An acoustical study of Korean monophthongs produced by male and female speakers. *The Journal of the Acoustical Society of America,* 91(4), 2280-2283.

———. (1999). Measurement and synthesis of the vocal tract of Korean monophthongs by MRI. Paper presented at *the XIVth Internat. Congress of Phonetic Sciences (ICPhS)*, 2005-2008.

Yoshida, H. (2012). A cross-linguistic study of sound symbolism in children's verb learning. Journal of Cognition and Development, 13(2), 232-265.

Appendices

Appendix A

Nonsense disharmonic Korean ideophone pairs

Vowel contrast	Nonsense pair	Question	Proposed answer
i ~ ɛ	mɛl.c'uk / mil.c'uk	Both words describe a sulky face. Which word describes a MORE sulky face?	2nd word
	hiŋ.kɨl / hɛŋ.kɨl	Both words describe the sound of twirling. Which word describes the twirling of a BIGGER object?	1st word
	nɛ.cuk / ni.cuk	Both words describe a jagged shape. Which word describes a MORE jagged shape?	2nd word
	hi.t'ul / hɛ.t'ul	Both words describe a crooked shape. Which word describes a MORE crooked shape?	1st word
	hɛn.tuŋ / hin.tuŋ	Both words describe a state of idling around. Which word describes HIGHER FREQUENCY of the state of idling around?	2nd word
	mi.kɨn / mɛ.kɨn	Both words describe a sound of gasping. Which word describes a HEAVIER gasping?	1st word
ɨ ~ a	ha.k'ɨm / hɨ.k'ɨm	Both words mean painful. Which word describes STRONGER pain?	2nd word
	nɨ.tɨs / na.tɨs	Both words mean moderate temperature. Which word describes HIGHER degree of temperature?	1st word
	na.ɾɨk / nɨ.ɾɨk	Both words describe a motion of sweeping. Which word describes a STRONGER sweeping?	2nd word
	hɨl.s'in / hal.s'in	Both words mean thin and tall. Which word describes the thinness of a TALLER thing?	1st word
	nan.tɨl / nɨn.tɨl	Both words describe a motion of swaying. Which word describes a HEAVIER swaying?	2nd word
	nɨ.tɨk / na.tɨk	Both words describe a full amount. Which word describes MORE fullness?	1st word

u ~ o	mo.ʇɨl / mu.ʇɨl	Both words describe the taste of dry and hard rice. Which word describes GREATER dryness and hardness?	2nd word
	mu.mul / mo.mul	Both words describe the motion of wriggling. Which word describes a BIGGER motion of wriggling?	1st word
	nom.sil / num.sil	Both words mean sluggish. Which word describes sluggishness with BIGGER motion?	2nd word
	hun.ʇɨk / hon.ʇɨk	Both words mean sticky. Which word describes GREATER stickiness?	1st word
	no.kɨl / nu.kɨl	Both words mean crumpled. Which word describes MORE crumpling?	2nd word
	huŋ.kɨl / hoŋ.kɨl	Both words mean round. Which word describes the roundness of a BIGGER object?	1st word
i ~ a	mal.kis / mil.kis	Both words describe durability. Which word describes GREATER durability?	2nd word
	hil.k'ɨn / hal.k'ɨn	Both words describe a motion of tightening. Which word describes a STRONGER tightening?	1st word
	na.k'ɨn / ni.k'ɨn	Both words describe a sound of snapping. Which word describes the snapping of a BIGGER object?	2nd word
	nil.kɨm / nal.kɨm	Both words describe a state of trickling. Which word describes a LARGER amount of liquid trickling?	1st word
	ha.kɨl / hi.kɨl	Both words describe a sound of sizzling. Which word describes a STRONGER sizzling?	2nd word
	miŋ.kɨs / maŋ.kɨs	Both words describe a manner of smiling. Which word describes a BROADER manner of smiling?	1st word

Appendix B

Nonsense harmonic Korean ideophone pairs

Vowel contrast	Nonsense pair	Question	Proposed answer
i ~ ɛ	nɛ.cak/ ni.cək	Both words describe the sound of scribbling. Which word describes a ROUGHER sound of scribbling?	2nd word
	ni.pi/nɛ.pɛ	Both words describe a state of being entwined. Which word describes a state of BIGGER things being entwined?	1st word
	mik.s'ik / mɛk.s'ɛk	Both words mean huffing and puffing. Which word describes ROUGHER huffing and puffing?	2nd word
	ni.k^{h}ɨm[6] / nɛ.k^{h}om	Both words mean sourish. Which word describes a STRONGER degree of sourness?	1st word
	mɛ.k'al/mi.k'əl	Both words describe the sound of chattering. Which word describes a LOUDER voice?	2nd word
	hiŋ.tiŋ/hɛŋ.t^{h}ɛŋ	Both words describe a state of being swollen. Which word describes MORE swelling?	1st word
ɨ ~ a	ha.ɾaŋ/hɨ.ɾəŋ	Both words mean brimming with liquid. Which word describes MORE liquid?	2nd word
	nɨlk.cək / nalk.cak[7]	Both words describe the motion of scrawling text. Which word describes a ROUGHER motion of scrawling?	1st word
	hal.tal/ hɨl.tɨl	Both words describe the motion of parching sesame-seeds by turning them upside down. Which word describes a ROUGHER motion of parching sesame-seeds?	2nd word
	hɨl.s'ək / hal.s'ak	Both words describe the state of an object, which is stuck to something, being easily removed. Which word describes the state of a HEAVIER object being pulled off easily?	1st word
	hɨm.səŋ / ham.saŋ	Both words mean loose and sparse. Which word describes a GREATER degree of looseness and	1st word

		sparseness?	
	hɨ.tək / ha.tak	Both words describe a motion of nodding. Which word describes a HEAVIER nodding?	1st word
u ~ o	moŋ.al / muŋ.əl	Both words describe the sound of muttering. Which word describes the muttering of a LOWER voice?	2nd word
	nuŋ.təŋ / noŋ.taŋ	Both words describe a plopping sound. Which word describes a plopping sound of a BIGGER AND HEAVIER object?	1st word
	nol.t'ak / nul.t'ək	Both words describe a sound of swallowing. Which word describes swallowing of a LARGER amount of food?	2nd word
	nuŋ.t^{h}uŋ / noŋ.t^{h}oŋ	Both words mean plump. Which word describes the plumpness of something TALLER?	1st word
	hok.c^{h}ok / huk.c^{h}uk	Both words mean damp. Which word describes MORE dampness?	2nd word
	nuŋ.tuŋ/ noŋ.toŋ	Both words describe a state of floating. Which word describes the floating of a BIGGER object?	1st word
i ~ a	mal.ɾok / mil.ɾuk	Both words describe a shape which is narrow at some point. Which word describes a TIGHTER narrowing?	2nd word
	nil.ɾəŋ / nal.ɾaŋ	Both words describe the sound of trembling water about to overflow. Which word describes a STRONGER sound?	1st word
	hal.cal / hil.cil	Both words describe the motion of dragging. Which word describes the dragging of a HEAVIER object?	2nd word
	nil.kəŋ / nal.kaŋ	Both words describe an action of chewing. Which word describes a ROUGHER chewing?	1st word
	ma.ɾaŋ / mi.ɾəŋ	Both words describe a state of drooping. Which word describes a drooping of a LONGER object?	2nd word
	niŋ.əl / naŋ.al[8]	Both words describe a sound of whimpering. Which word describes a LOWER voice?	1st word

Appendix C

Participant instructions for Experiments for the phonosemantic effect of vowel harmony in §4.3 and 1B in English translation

In this experiment, you will hear a pair of nonsense words for each question. Both words in each pair share the same basic meaning but they are slightly different in their associated emotion, feeling or force. For example:

Both 'hihi' and 'haha' have the basic meaning of “the sound of laughter”. One of the two words means “a BIGGER laughing voice”.

When you answer the questions on the screen, you will see both the basic meaning, and the more emotionally specific meaning of only one member of the pair. Your task is to choose either first word or second word as the one which has the specific meaning. So please tick against:

- ‘First word’ if you think the first word has the more emotionally specific meaning, or

- ‘Second word’ if you think the second word has the more emotionally specific meaning.

There are no ‘right’ or ‘wrong’ answers. So, use your own intuition freely. You can replay each sound file as often as you want, but make sure to tick on ‘first word’ or ‘second word’ before you move on to the next question.

Appendix D

Nonsense ideophone pairs that show Korean consonantal symbolism

Laryngeal contrasts	Nonsense ideophonic pairs	Questions
/p-p'/	pol.c'ok ~ p'ol.c'ok	Both words describe a motion of opening the mouth slightly and laughing without making a sound. Which word describes a MORE forceful motion of opening the mouth?
	pin.cil ~ p'in.cil	Both words mean greasily. Which word describes GREATER greasiness?
	pa.soŋ ~ p'a.soŋ	Both words describe softness and moisturelessness of the laundry. Which word describes GREATER degree of softness and moisturelessness?
	pi.kɨl ~ p'i.kɨl	Both words describe the sound of water boiling. Which word describes MORE rapid boiling?
	pi.tɨk ~ p'i.tɨk	Both words mean "persistently". Which word describes STRONGER persistence?
	po.cak ~ p'o.cak	Both words describe a crackling sound. Which word describes a STRONGER crackling?
/p-p^{h}/	pil.s'uk ~ p^{h}il.s'uk	Both words describe an abrupt change of shape. Which word describes a GREATER abruptness?
	pun.tuŋ ~ p^{h}un.tuŋ	Both words mean idly. Which word describes a GREATER degree of idleness?
	pi.tɨl ~ p^{h}i.tɨl	Both words describe a motion of shivering. Which word describes a STRONGER AND MORE VIOLENT motion of shivering?
	pun.tɨl ~ p^{h}un.tɨl	Both words mean idly. Which word describes a GREATER degree of idleness?

	pi.sɨl ~ p^{h}i.sɨl	Both words describe the drizzling of rain. Which word describes a STRONGER AND MORE VIOLENT drizzling?
	paŋpɛŋ ~ p^{h}aŋp^{h}ɛŋ	Both words describe a motion of circling round. Which word describes a STRONGER AND MORE VIOLENT motion of circling?
/p'-p^{h}/	p'il.ɾəŋ ~ p^{h}il.ɾəŋ	Both words mean hurriedly. Which word describes a STRONGER AND MORE VIOLENT manner of hurriedness?
	p'un.tɨl ~ p^{h}un.tɨl	Both words mean indolently. Which word describes a GREATER degree of indolence?
	p'un.tuŋ ~ p^{h}un.tuŋ	Both words describe one's state of being lazy. Which word describes a STRONGER AND MORE VIOLENT degree of being lazy?
	p'i.sək ~ p^{h}i.sək	Both words describe a rustling sound of leaves. Which word describes a STRONGER AND MORE VIOLENT rustling sound?
	p'un.c'ək ~ p^{h}un.c'ək	Both words describe a flash of light. Which word describes a STRONGER AND MORE VIOLENT flash?
	p'uŋ.kɨl ~ p^{h}uŋ.kɨl	Both words describe a motion of circling. Which word describes a STRONGER AND MORE VIOLENT motion of circling?
/t-t'/	tol.mak ~ t'ol.mak	Both words describe the state of a light object being lifted up and down. Which word describes a GREATER degree of being lifted up and down?
	tol.s'ak ~ t'ol.s'ak	Both words describe the motion of a light object rising and sinking. Which word describes a STRONGER motion of rising and sinking?
	tu.tɨm ~ t'u.tɨm	Both words describe a manner of stammering. Which describes STRONGER stammering?
	ti.k'ək ~ t'i.k'ək	Both words describe a state of working easily and unfalteringly. Which word describes a GREATER degree of working easily and

		unfalteringly?
	taŋ.kaŋ ~ t’aŋ.kaŋ	Both words describe the sound of clinking. Which word describes STRONGER clinking?
	ti.mun ~ t’i.mun	Both words mean sparsely. Which word describes a GREATER degree of sparseness?
/t-t^{h}/	tol.kaŋ ~ t^{h}ol.kaŋ	Both words describe a sound of clanging. Which word describes STRONGER AND MORE VIOLENT clanging?
	tol.ɾɛ ~ t^{h}ol.ɾɛ	Both words describe a motion of walking while swaying. Which word describes a STRONGER AND MORE VIOLENT motion of walking while swaying?
	tim.pəŋ ~ t^{h}im.pəŋ	Both words describe a plopping sound. Which word describes a STRONGER AND MORE VIOLENT plopping sound?
	top.sak ~ t^{h}op.sak	Both words describe a sound of snapping. Which word describes STRONGER AND MORE VIOLENT snapping?
	til.k^{h}ək ~ t^{h}il.k^{h}ək	Both words describe the mental state of being shocked. Which word describes a STRONGER AND MORE VIOLENT shock?
	taŋ.tɛŋ ~ t^{h}aŋ.t^{h}ɛŋ	Both words mean swollen. Which word describes STRONGER AND MORE VIOLENT swelling?
/t’-t^{h}/	t’iŋ.t’əŋ ~ t^{h}iŋ.t^{h}əŋ	Both words mean clang-clang. Which word describes a STRONGER AND MORE VIOLENT clang-clang?
	t’ol.kak ~ t^{h}ol.kak	Both words describe the sound of rattling. Which word describes STRONGER AND MORE VIOLENT rattling?
	t’aŋ.t’oŋ ~t^{h}aŋ.t^{h}oŋ	Both words mean chubby. Which word describes a GREATER degree of chubbiness?
	t’ol.ɾaŋ ~ t^{h}ol.ɾaŋ	Both words describe the sound of tinkling. Which word describes STRONGER AND MORE VIOLENT tinkling?
	t’i.təl ~ t^{h}i.təl	Both words describe a grumbling sound. Which word describes a

		STRONGER AND MORE VIOLENT grumbling?
	t'i.tək ~ t^hi.tək	Both words mean tap-tap. Which word describes a STRONGER AND MORE VIOLENT tap-tap?
/k-k'/	kon.toŋ ~ k'on.toŋ	Both words describe a motion of bundling things up neatly. Which word describes a MORE POWERFUL motion of bundling things up?
	kiŋ.tuŋ ~ k'iŋ.tuŋ	Both words describe a motion of jumping. Which word describes STRONGER jumping?
	kip.sil ~ k'ip.sil	Both words describe the motion of bending forward and backward. Which word describes a STRONGER motion of bending forward and backward?
	ko.tak ~ k'o.tak	Both words mean dry and stiff. Which word describes a GREATER degree of dryness and stiffness?
	ki.pus ~ k'i.pus	Both words describe a curved shape. Which word describes a STRONGER curve?
	kon.sil ~ k'on.sil	Both words describe a manner of flattering. Which word describes a STRONGER degree of flattering?
/k-k^h/	ki.ɾəŋ ~ k^hi.ɾəŋ	Both words describe a state of liquid full to the brim. Which word describes a STRONGER AND MORE VIOLENT state of being full to the brim?
/k'-k^h/	k'il.ɾəŋ ~ k^hil.ɾəŋ	Both words describe the sound of a splash inside a bottle. Which word describes STRONGER and MORE VIOLENT sound of splashing?
	k'il.k'ul ~ k^hil. k^hul	Both words describe a sound of bubbling. Which word describes STRONGER AND MORE VIOLENT bubbling?
	k'iŋ.k'uŋ ~k^hiŋ.k^huŋ	Both words mean thump. Which word describes a STRONGER thump?
	k'aŋ.k'ɛŋ~k^haŋ.k^hɛŋ	Both words mean yelp. Which word describes a STRONGER

	AND MORE VIOLENT yelp?
k’ul.k’il ~ k^{h}ul.k^{h}il	Both words describe the sound of giggling. Which word describes STRONGER giggling?
k’uŋ.k’iŋ ~k^{h}uŋ.k^{h}iŋ	Both words describe a sound of groaning. Which word describes a STRONGER groaning?

Appendix E

The selected example words for 20 candidate phonaesthemes

Candidate phonaesthemes	Key words	Selected example words
cl-	clang	**clank, clash, clap, clack, cling, click**, cluck, clamp, clip, clod, clog, clam, clinch, clutch, clasp, clump, clench, claw, clay, cloy
fl-	flow	float, flush, flee, flail, flop, flap, fleet, flit, flag, flex, fling, flare, flash, flip, flick, flat, flaunt, fluster, fleck, flirt, flinch, flake
gl-	gleam	**glow, glint, gloss, glare, glaze**, glee, glad, glimpse, glance, gloom, gloat, glum, glide, globe, glove
sk-	skim	**skid, skip, skate, skimp**, scud, scour, skirt, scope, skin, sketch, skew, scat, scoff, scare, skull
st-	stiff	stick, stump, stanch, steep, stall, stuff, stir, stamp, sting, stomp, stash
str-	straight	stripe, strip, stretch, streak, strait, string, strap, stream, stride, strive, strut, strum, strength, strain, stroll, strife, strange, strew, stress
sw-	swing	**swish, swoop, swipe, sweep, swirl, swat,** swoon, switch, swag, swap, swell, swill, swim
sp-	spit	**spat, spew, spurt,** spout, spurn
tr-	tread	**trudge, trot, tramp**, trip, troll, trap
bl-	blow	blast, blurt, blaze, bleat, blob
kr-	crook	creep, crack, crick, cramp, crutch, creak, crouch, cross, cringe, crane, croak, crimp, crag, crow, crash, crawl, crunch, crush, crib, crate, crump, crab, crumb
dr-	drag	drift, droop, drape, drawl, drown, dregs, drug, drain, droll, drench, drool, drip, dry, drum, dram
gr-	growl	**grunt, groan, gruff**, grim, grouse, grudge, grasp, grope, grab, grip, graft
sl-	slide	slip, slope, slant, slick, slink, sleek, slime, sleet, sludge,

		slosh, slop, slouch, slough, slash, slow, sling, slack, slam, slay, slit, sloth, slap, slog, slave, slang
sn-	snout	**sniff, snort, sneeze, snore, snuff, snarl,** sneer, snoop, snub, snob, snack, snap, sneak, snatch, snag, snip
wh-	whack	whip, whoosh, whoop, whisk, whizz, whirl, whine, wheeze, whit
squ-	squeeze	**squash, squirt, squirm, squelch**, squeal, squeak, squawk, squid, squall, squander
tw-	twist	**twirl, twine, tweak,** twitch, twang
wr-	writhe	wring, wrap, wrath, wry, wrench
scr-	screech	scream, scrape, scratch, scrawl, scrub, scrounge, screw

Appendix F

Subjects' instructions for Experiment 2A

This survey contains 10 lists of English words. Each list has a key word written above it. You are asked to read each word on the list carefully, and rate one by one how closely each word is related to the key word at the top with the following numbers below. You may refer back to the key word at any time.

Score	Rating
1	not related at all
2	less related
3	somewhat related
4	related
5	strongly related

Key words can have various alternative meanings. Rate a word by matching the most closely related meaning of the key word. Some words on the list can also have various possible meanings. For example, 'close' can mean shutting or completing (a verb) and nearness (an adjective). In this case, regardless of a part of speech, select and rate the most closely related meaning to the key word given. It is important that you use your own judgement and do not consult dictionaries. When you encounter a word that you do not know, please select 'Don't know' option. Participation in this experiment has no time limit so it is recommended to take a short break if you feel stressed by reading lists of many words all at once.

Appendix G

Subjects' instructions for free-choice task in experiment 2B

In this experiment, you will hear 10 lists of nonsense words: one list in each question. The nonsense words in a list all share one general meaning with each other. Your task is to hear a list of words and picture in your mind the related meaning of the words. And, describe the image that they bring to mind. So, for example, after you hear a list of nonsense words 'drice-droon-dral', you might describe your impression like:

'Something heavy is moving slowly'.

There are no 'right' or 'wrong' answers. So, use your own intuition freely. You may replay each sound file as often as you want but make sure to complete your definitions before you move on to the next question. Participation in this experiment has no time limit.

Appendix H

English-speaking participants' invented descriptions for the ten phonaesthemes

Subject ID	Descriptions for a group of nonsense words starting with *gl-*
001	A family of dwarves going on a quest for treasure.
002	An evil teenage boy thinking up some sort of mischievous sneaky plan
003	Shiny glass
004	Something shiny but liquid, like a drip of water in the sunlight
005	A duck gliding across water glistening with the sun's reflection.
006	Something fat trying to talk
007	Shining diamond or other stone
008	Glory
009	Cleanliness of glass
010	Sparking, glowing, pretty, glass, glitter.
011	Glass charms swinging in the wind at the beach
012	Something is shining in the sky and you are peacefully observing it until a cloud comes and blocks your view
013	Flying free above the clouds
014	Boasting, being rude
015	People cheering at a sports game
016	Someone who is unreasonable, rude and impatient
017	Something sneering and negative, sneaky, deceptive
018	A person moves closer to a large object
019	Something blobby and gross like a jellyfish or toad
020	Descriptors of emotional qualities
021	Something expansive and fresh, particularly the ocean
022	Something gliding
023	Something glowing
024	Something shinny shimmering in the sun
025	Claw
026	Glaring window
027	When the moon glistens on the glass windows
028	Anger

029	Describing a monster of some kind
030	Something gory or scary
031	A stone glittering in the sunlight
032	Shimmering silver chandelier glowing in the room
033	When clear wind makes you stop and stare
034	Glittering glass
035	Things made of glass
036	Something heavy and soft in motion
037	A reflective piece of glass
038	Light shining through a large glass window
039	A person looking at the sun
040	Sun shining through a clean glass wall
041	Describing something beautiful and amazing
042	A piece of glass glimmering on the beach
043	Something is glary
044	An object that glows
045	Glinda from Wicked, shiny objects or muscles related to the tongue.
046	A small object rolling across a surface

Subject ID	Descriptions for a group of nonsense words starting with *sk-*
001	A fluffy squirrel-like animal skating over some ice.
002	Someone scared running down a street at night trying to dodge obstacles
003	Pests, like geckos
004	A skateboard skidding on pavement leaving marks
005	Teenagers playing at a skate park on skateboards, bikes and rollerblades.
006	Reminds me of a skate park
007	Running and then suddenly halting
008	Skidding
009	A car accident
010	Skateboard, road, sports, fast
011	Children skipping in the streets
012	A magpie is approaching a scarecrow
013	Being afraid or angry

014	Getting out of a place
015	A child slipping in water
016	Rough surface to rollerblade on
017	Anti-social, not accepted, skidding to a halt
018	A person moves quickly and gracefully through obstacles
019	Desolate, concrete or ice
020	Descriptive words/adjectives - for movement
021	A messy line through a texture - like dirt or snow
022	Something dirty
023	Someone skate boarding
024	Something being dragged over a hard, scratchy bumpy surface
025	Scared-skid-sky
026	Skidding on slippery ground
027	A trashy young lady who exposes herself
028	Happiness
029	Skids, skating, and the sky
030	Actions
031	Children playing games in the street
032	A black skunk that is stinky
033	Hurting oneself after a winter sport activity involving snow
034	A skink/lizard slithering around
035	Something on rollers and moving fast
036	A small animal, like a rat
037	Mixing a pot
038	Somebody roller skating down a street
039	An animal scurrying
040	A skateboard being ridden along a road
041	Describing someone on some form of moving vehicle such as a skateboard or bike or car.
042	Someone skipping then falling/slipping over
043	Sit, sat, seat, seated
044	Something skidding along the ground
045	Scandinavian words for snow
046	A car skidding on gravel

Subject ID	Descriptions for a group of nonsense words starting with *sw-*
001	A sow taking her piglets for a walk in the bush.
002	An eagle flying in the sky trying to catch its prey
003	Manners of flying
004	Pigs and sea animals
005	A bird ascending slowly and softly and descending sharply and swiftly.
006	A fishing swimming in shallow water and its tail is splashing
007	Long ribbons or crate paper blowing in the wind
008	Something swooshing
009	A type of movement
010	Birds, swimming, water, movement.
011	An object moving gracefully and swiftly
012	An eel is swimming in the ocean
013	Activities being completed by a group
014	Types of bird flight
015	Trees swaying in the breeze
016	Acrobat doing tricks
017	Swift, elegant movement, the Nike swoosh
018	A thing is crawling around in different ways, slowly getting faster
019	Bubbles moving through liquid
020	Descriptive qualities to do with food
021	A bird flying, and its manoeuvres through the air
022	Something slimy
023	A bird
024	Something slippery
025	Swim, swam
026	Flying through the air (birds)
027	Swooning between mammals in the ocean
028	Sadness
029	Something slimy but elegant and graceful
030	A bird flying
031	Swimming in a river with elves
032	A magical spell like in Harry Potter, swirling in patterns in the wind

033	When birds flap the tip of their wings in water
034	Swimming gracefully through a pool
035	Something that swishes in the wind
036	Crashing waves and slimy goop
037	Broad, smooth gesturing
038	A bird swooping and soaring in the sky
039	A squire swimming
040	Birds flying really high, doing backflips etc.
041	Movements of a bird flying slowly and strategically
042	Unhurried swaying movement
043	Something is swimming
044	Something that is swooping past fast like a bird
045	Flying dragons swooping through the sky
046	A large object moving quickly through the air/water

Subject ID	Descriptions for a group of nonsense words starting with *sp-*
001	Regurgitation of various semi-digested things
002	The description of someone's vomit or someone vomiting
003	Garden tools
004	Phlegm, saliva, spit
005	A meal that is being prepared and is proving to be messy.
006	Water droplets falling into a bucket
007	Someone throwing something at someone
008	Splatter
009	Generic dogs names
010	Poke, digging, mud.
011	Weapons being fired
012	A volcano is spluttering ash everywhere
013	Forms of waste
014	Ways if getting something out of your mouth
015	Raindrops hitting a road
016	Bow and arrow and similar weapons
017	Spitting, disgusting, stupid, anti-social

018	A tall, thin thing is spitting
019	Toxic liquid or hot molten lava
020	Descriptive words/adjectives of a negative quality
021	Sharp but small metal objects
022	Things splattering everywhere
023	Someone spitting something out
024	Spitting saliva
025	Spade
026	Spitting
027	Crouched down on your bottom
028	Quiet
029	Someone spitting or vomiting.
030	Something dirty or smelly
031	Pigs in a pen on a farm
032	A slimy slug, someone spitting
033	When a spud potato doesn't taste good
034	Vomiting/ spewing on the ground
035	Something that flings something through the air
036	A medieval duel or joust
037	The noise of an old, broken-down car
038	Rowing a boat through a relentless sea storm
039	A dirty surface
040	Someone gagging and spitting in a sink, getting ready to throw up
041	A fighting scene describing the actions and movements
042	Someone spitting grotesquely
043	An act of spitting
044	Something that is moving fast like speeding
045	Biological words for different types of trees - particularly ‘spuice’ which is close to spruce.
046	A person being sick

Subject ID	Descriptions for a group of nonsense words starting with *tr-*
001	Upper class snobs sitting around drinking tea.

002	Someone stomping through a forest describing the noises they are making with their feet
003	Fish
004	Snooty people and prunes
005	A collection of high class Victorian women viciously discussing the lives of others.
006	Walking through heavy mud and the sound that your feet make as they come out of the mud
007	Trees
008	Trash
009	A risky intrusion
010	Pushed, fell, twist, step.
011	Tiptoeing carefully through the forest
012	Old Celtic / witch rituals
013	Someone being fooled by other people
014	Ways of walking
015	Cave people talking
016	Appropriate dinner table manners - sitting around a table with old fashioned decor
017	Sudden jerky or explosive movements, something shocking or inappropriate
018	A group of people harassing a person with malicious intent
019	Metal workers
020	Adjectives again -negative personal qualities
021	Sprouts of plants, small and green
022	Something getting all tangled
023	A snobby person
024	Different ways of walking; sneakily, thumpy, loudly/heavily, quietly,
025	true-trip
026	Someone tripping
027	Someone who is clumsy and trips on little things such as grass
028	Mellow
029	Something that has fallen over and is trapped.
030	Something trashy
031	Large old trees in a rainforest
032	A metal ladder
033	When a child hurts themselves after being rude to an adult
034	Tripping on the root of a tree

035	Something light, pointy and active
036	Undergrowth in a forest crunching beneath feet
037	An approaching creature with claws/hoofs
038	Raindrops falling on a large tin object
039	Someone being tricky
040	An intruder sneaking into a house
041	Falling down the stairs and hitting lots of things
042	A rude person tripping someone
043	An intruder
044	Something that intrudes your space and can trick you very well
045	<Unanswered>
046	A horse galloping

Subject ID	Descriptions for a group of nonsense words starting with *gr-*
001	Greasy food causing digestion problems
002	An old lady trying to feed children her awful tasting stew or soup
003	Beer
004	Bricks and gravel
005	The strides of an evil person taking no consideration of other pedestrians.
006	A car revving
007	Something slimy
008	Something growling
009	Different types of sound made
010	Brushed, smooth, silky
011	Something vile, perhaps an animal, slinking along
012	Black water is defying gravity and making its way up instead of running down
013	Something in excess
014	Something gross
015	A bear growling
016	Males would use these to keep up their physical appearance
017	Growling, the guy who played Ron in Harry Potter
018	Something increases in value
019	Furry animals making nests

020	Again descriptors for food
021	Something messy moving like it's in pain
022	Things grinding together
023	Someone trying to move something heavy
024	Harsh use of the teeth
025	Grind- groome-gross
026	Growing
027	Grotty, horse troughs with mould in it
028	Sadness
029	Green, gross and gruff
030	Facial expressions
031	A rocky path up a mountain
032	Stew with all different things in it, like a witch potion
033	Facial expressions that a person expresses when talking about Christmas in a negative manner
034	A big fluffy black poodle
035	Something boxy and immovable
036	A grumpy old man
037	<Unanswered>
038	Rusty gears or machinery trying to move
039	Different facial expressions
040	A big, black buffalo
041	Describing noises that a dog makes
042	Gremlin
043	Something is gross
044	An object that is dirty
045	Harry Potter, names of fictional characters in a JK Rowling novel
046	An animal growling in pain.

Subject ID	Descriptions for a group of nonsense words starting with *sn-*
001	A sleepy snail eating quite relentlessly.
002	A young boy with a cold and a snotty nose
003	Fruit

004	Aristocratic people in a large house
005	A shifty criminal up to no good.
006	A snake talking to another snake
007	Negative facial expressions
008	Snuff sniffling
009	Mannerisms
010	Slow, snail, sleepy, grumpy, old.
011	A small object moving slowly trying to be unnoticed
012	A snake is slithering through the field sneakily approaching an unsuspecting person in a field
013	People conspiring
014	An Up Yourself attitude
015	Someone with a cold
016	German food
017	A hissing snake, sneeriness, things coming from the nose
018	A creature jumps and hops through the wild
019	Someone with a bitter personality
020	Related to the body-qualities/parts
021	A sneer
022	Something slimy
023	A person making scoffing noises
024	Functions and bodily fluids of the nose; sneezing, snot, snoring
025	Snot
026	Ground, soil
027	An arrogant person who has no respect for other people - is someone people sneer at!
028	Peace
029	Something very sleepy
030	Something slippery and sneaky
031	A children's birthday party
032	Green, slimy, snake moving along the ground in the shape of a 'S'
033	The various emotions that snails feel
034	Sneering facial expression - at someone
035	Noses and the noises you make with noses and nose shaped things
036	Noses

037	A large bug crawling under something
038	A wild animal such as a wild hog furrowing for food.
039	A sick person with a runny nose
040	An angry snake
041	Movements of a distressed and angry person
042	Sneaky and untrustworthy people moving secretly
043	A snake is moving
044	Something that is sneaky
045	Dance moves from the 1950's, some sort of movement
046	A savage animal snarling/growling

Subject ID	Descriptions for a group of nonsense words starting with *sq-*
001	A farmer in wellingtons trudging through mud.
002	At the beach, the waves crashing on the shore and someone walking along the water's edge squishing the sand
003	Types of birds
004	Birds
005	A person walking through a muddy river bank in the summer towards a rowing boat.
006	Squishing jelly with your hands
007	Slithering animals
008	Squishing
009	Uncomfortable movements
010	Green, squishy, gross, slime.
011	Someone walking through the mud
012	Wizards reading spells
013	Avoiding something uncomfortable
014	Noises someone makes
015	Hungry baby bird
016	Stuck in a mud pond, struggling to get out
017	Wasting resources, vicious liquid moving through a small area, unhygienic
018	A cowardly person tries to escape something
019	Walking through muddy ground in the rain
020	Descriptors of food preparation processes

021	Something being crushed or stepped upon, small but messy - maybe like a slug
022	Something being squeezed
023	Moving water
024	Something or someone trying to get sneakily away from something
025	Wave-squirm-squeeze
026	Sloshing water
027	A squirmy person who can't sit still
028	Light
029	Something dirty and squishy
030	Something trying to get away - squirming and slippery
031	Walking in the mud while it's raining
032	Jelly being shot out of a water pistol
033	The mark a bird leaves after it bites you
034	Something squelchy like mud under foot
035	Something that is squeezed out of something that is gooey
036	Mud between toes
037	Mud!
038	Something struggling desperately to escape
039	The noises made walking through a muddy patch
040	Walking along flooded grass in thongs
041	Describing the sounds made when walking through thick mud
042	Squishing of water in gumboots
043	Something is being squeezed
044	Something that isn't smooth
045	Crushing something underfoot and my nephew Squish trying to crawl out of a bear hug.
046	A gooey substance being manipulated - squelching

Subject ID	Descriptions for a group of nonsense words starting with *tw-*
001	A girl dancing quickly with spinning tassels
002	A bird making strange noises in a tree
003	String
004	Sewing implements, spools of wool, thimbles, wire
005	A computer being rewired.

006	Plucking a wire with your fingers
007	Twisting wire
008	Twirling
009	Birds
010	Brown, old, rusty, ancient, old-fashioned.
011	An animal swinging through the trees
012	A campfire is being lit
013	Interwoven objects interacting
014	Materials and tools used to build
015	A monkey swinging in the jungle
016	A musical instrument that is highly complex
017	Something/one stupid, menial, annoying
018	A wire being plucked to make a sound
019	Something bound, growing (like vines), or wiry and rigid
020	Related to handicrafts/ knitting
021	Something being picked, like a guitar string or piece of wire
022	Twigs
023	Twins
024	Stringing something together
025	Wing-wire
026	Trees
027	Annoying, whiny girls
028	Waves
029	String or twining.
030	Unwrapping something
031	A very windy afternoon
032	Long skinny brown tree branch
033	The various languages of twitter
034	Thin branches of a tree, wispy branches in the wind
035	A wheel
036	A piece of elastic being moved in different fashions
037	A forest, types of trees
038	Metal buckling under heat
039	A twisted piece of string

040	Looking along a skinny vine covering a pole.
041	Movements of a ballerina
042	Delicate twine being woven
043	Something is becoming intertwined with another.
044	Something that winds itself around something else like a vine
045	Hearing ‘tweal’ makes me think of cooking and making brandy snaps.
046	Sounds made by an object making its way through some undergrowth.

Appendix I

Korean-speaking participants' invented descriptions for the ten phonaesthemes with the author's English translations (the use of Korean ideophones in the Korean participants' descriptions appear in parenthesis)

Subject ID	Descriptions for a group of nonsense words starting with *gl-*
001	□□ □□□□ '□' □□□ □□□□ □□□□□ □□□□□□□ □□□ □□ □ □□□.
	Puppies make a growling sound (kɨ.ɾɨŋ-kɨ.ɾɨŋ).
002	입술에 립글로스를 바르듯 유연하게 넘어가는 것 같은 느낌. 무언가 점성이 높은 물체를 만지는 것 같다.
	A smooth touch that you can feel when you apply lip gloss on your lip. Or touch of something that has high viscosity.
003	윤기가 나다. 반짝거리다.
	Gloss. Glitter.
004	지루하다
	Boring.
005	동그라미가 부드럽게 굴러가는 느낌.
	Something round is rolling smoothly.
006	가볍게 터지는 풍선껌같은 느낌.
	Bubble gum that bursts lightly.
007	간지러운 느낌
	Ticklish.
008	부드럽고 동그란 식물의 이미지.
	A soft and round plant.
009	빛나는 모습
	Shiny.
010	느끼하다. 버터를 잔뜩 입에 넣은듯..
	Greasy as if your mouth is full of butter.
011	초침이 돌아가는 소리
	A watch with a second hand is tick-tocking.
012	청초함. 맑음. 깨끗함. 청결함. 하늘.
	Neat. Clear. Clean. Sky.
013	해가 수면으로 마침내 완전히 모습을 드러낸 바로 그 순간을 본 느낌
	One sees the moment when the sun finally shows its full appearance on the horizon.
014	깨끗한 이미지
	Clean.
015	자랑스러워 하는 느낌
	Boastful.
016	물방울이 떨어져서 퍼지는 느낌
	A water drop drops and spreads out.
017	반복적이다
	Repetitive.

018	우아하고 번들거리는 느낌 Elegant and glitter.
019	다급하다. Urgent.
020	우울 Depressed.
021	둥근 꽃이나 원통, 구 들이 모여있는 느낌 Round flower, cylinder, or sphere gather together.
022	아름답고 우아한 느낌 Beautiful and elegant.
023	묽은 느낌(립글로스같은) Watery like a lip gloss.
024	꽃밭의 느낌 A flower garden.
025	청결한느낌 Clean.
026	끌리는느낌 To drag.
027	사랑스럽게 부르는거 같다 Call someone's name affectionately.
028	명확하고 푸르른느낌 Clear and green.

Subject ID	Descriptions for a group of nonsense words starting with *sk-*
001	□□ □□□ '□'□ □□□ □□ □□ □□□ □□□□□□ □□□ □□ □□. □□□ '□' □□□ '□' □□□ □□ □□ □□□□□□ □□ □□ □ □□□ □ □□□. /i/ reminds me of a funny face. And, because of /s/, /k/, they sound strong, not soft.
002	스케이트를 타며 쉭쉭 내려가는 것 같다. To go down on a skate by making (swɪk-swɪk) sound.
003	넘어가다.뛰어 넘어 미끄러지다. To cross. To slip after jumping.
004	동물들 이름같다 They are like animal names.
005	앞에 '스' 하는 발음 외에는 공통점이 뭔지 못 느끼겠다. No common connotation.
006	갑작스레 튀어오르는 느낌. 끌려가던 수레차같은 것이 언덕에서 튀어오르는 이미지. Something pops up suddenly. A dragged cart is bounding on a hill.
007	신 레몬을 먹는 느낌 Eating a sour lemon.
008	토끼가 돌다리를 뛰어가는 느낌 A rabbit is skipping on a stone bridge.
009	빙판에서 스케이트 날이 부딪히는 소리 Skate blades are hitting against each other on the ice.

010	상처??? 날카로운 느낌이랑 바람소리가 날이 서 있는 느낌이난다 피부위로 차가운 바람이 느껴질때 살이 베일거같은 느낌 A scar? Something sharp. The wind sounds have a sharp edge. One feels the cold wind on one's skin. To get a cut on one's flesh.
011	단단한 껍질을 까는 모습 To peel hard skin.
012	급한. 뒤죽박죽의. 지저분한. Urgent, messy, dirty.
013	기지개를 켜는 느낌 To stretch.
014	좋음을 나타낼때 쓰는 느낌 Niceness.
015	비웃으면서 깔보는 느낌 To look down by scoffing at someone.
016	딱딱한 물건을 긁다가 찍는 느낌. To spear after scratching a hard object.
017	평범하다 Ordinary.
018	느리게 움직이는 느낌 To move slowly.
019	날카롭다. 차갑다. Sharp. Cold.
020	미끄러짐 Sliding.
021	각진느낌, 산을 오르내리는 느낌 Angular. To climb up and down the mountain.
022	종이를 가위로 자를 때 나는 소리 The sound made when cutting paper with scissors.
023	상대에게서 무언가를 뺏는 느낌 To take something away from someone.
024	갑작스럽게 하는느낌 An abrupt action.
025	나무같은것을 깍는 듯한느낌 To cut wood.
026	먹는것이떠오른다 Food.
027	재잘거리는 느낌 To chatter.
028	의지를 표현하는 느낌 Expression of one's will.

Subject ID	Descriptions for a group of nonsense words starting with *sw-*
001	□□□□ □□□□ □□ □ □□□. Soft words.

002	빗자루 같은 걸로 바닥을 쓰는 느낌. 매운 걸 먹고 너무 매워서 침을 삼키며 씁씁거리는 것 같기도 하다. To sweep a floor with a broom. To make (s'ɨp-s'ɨp) noise after eating spicy food.
003	짜다. 쥐어짜다 To squeeze.
004	넓은 바다같은 느낌 Wide ocean.
005	얇은 입술 사이로 바람이 세는 소리. 스윙, 스완 같은 단어들이 떠오른다. Wind is leaking through thin lips. It reminds me of 'swing' and 'swan'.
006	먼지많은 곳을 쓸어 내리는 것같은 느낌. To sweep a dusty place.
007	가글하는 느낌 To gargle one's mouth.
008	작은 동물이 음식을 먹는 이미지 A small animal is eating food.
009	수면상태에서의 숨소리 Sound of breathing when one is sleeping.
010	백조 !!! 가 생각난다 블랙스완먹는 것도 떠오르는군 젤리같은거 Swan. Black swan. Jelly.
011	외계에서 온 우주선으로 끌려가는 신비로운 느낌 An arcane feeling when one is being taken to a UFO.
012	뒤바뀐. 섞인. Upside down. Mixed.
013	물 속에서 붕어가 뻐끔거리는 느낌 A carp in the water keeps opening and closing its mouth (p'ə.k'ɨm).
014	가벼움을 나타낼때 쓰는 느낌 Something light.
015	줄같은 물체로 휘감는 느낌 To convolve with a rope.
016	좁은 틈으로 바람이 새어나오는 느낌 Wind is leaking though a narrow crack.
017	차가운느낌 Cold.
018	부드럽고 미끄러운 Soft and slippery.
019	물속에 있는 것 같다. 입술을 앞으로 내밀며 말하는 것 같다. I feel like I'm in the water. Someone is speaking through pouting lips.
020	거만 Arrogant.
021	무언가가 헤엄쳐 가면서 물살을 가르는 이미지 Something is swimming and cleaving through the water.
022	나무늘보가 아주 느리게 이동함 A sloth is moving very slowly.
023	흐릿하게 문지르는 느낌 To rub lightly.
024	수영하는 느낌 To swim.

025	샤워할떄 나는 소리같은 느낌 The sound of someone taking a shower.
026	날카롭고차가운느낌이나요 Sharp and cold.
027	물컹 거리는 느낌 To be very soft.
028	부드럽게 밀고 나가는 느낌 To make a push softly.

Subject ID	Descriptions for a group of nonsense words starting with *sp-*
001	□□□□□ '□' □□ □□□□ □□ □□ □□□ □□□ □□ □□□ □ □□ □□ □□ □□□ □□ □□□ □□□.
	/s/ gives me a negative feeling.
002	와인병에 있던 병마개가 빵-! 터지는 느낌. 무언가 꽉 막혀 있던 것이 뻥 뚫리는 느낌.
	A cork from the bottle is being drawn making (pʰaŋ)! sound. Blockage is being removed making a (p'əŋ) sound.
003	물방울을 떨어뜨리다.물방울이 떨어지다.
	Water drop is dropping. Water drop is being dropped.
004	재빠름
	Rapid.
005	한껏 부풀린 풍선을 갑자기 '펑'하고 터뜨리는 느낌.
	To pop an inflated balloon making a (pʰəŋ) sound.
006	가죽으로 때리는 것같은 느낌
	To beat something with leather.
007	화가 나고 짜증난 느낌
	Irritating.
008	적당히 두꺼운 책을 드는 느낌
	To hold a rather thick book.
009	물건을 미는 소리
	A sound when one pushes something.
010	장소나 점이 떠오른다 어떤 장소에 점찍어둔 지도가 떠올랐다
	A place or point. A map with a point on one place.
011	돌을 호수나 강물에 던질 때 물수제비로 튀는 느낌
	To skip stones on the lake or river.
012	일순간. 점.
	A moment. A point.
013	녹슨 문을 강한 힘으로 한번에 여는 느낌
	To open the rusty door forcefully at one go.
014	강렬한 느낌
	Intense.
015	무언가 갑작스레 펑 터지는 느낌
	Something is suddenly being popped making a (pʰəŋ) sound.
016	풍선껌을 불다가 터지는 느낌
	To blow a bubble and to pop it.

017	뭉클한느낌 Clotty.
018	예리하지만 부드러운 느낌. Sharp but soft.
019	느리다. 답답하다. 꼬여있다. 졸리다. Slow. Stuffy. Twisted. Sleepy.
020	경쟁 Competition.
021	비가와서 물방울들이 바닥에 떨어져 퍼지는 모습 Rain drops drop and spread on the ground after the rain.
022	어떠한 장소를 나타냄 Some place.
023	무언가를 펼치는 느낌 To spread something.
024	튕기는 느낌 To bounce.
025	번쩍이는 느낌 Lucent.
026	긁히는느낌 Be scratched.
027	모름 Don’t know.
028	규격화된 느낌 Standardised.

Subject ID	Descriptions for a group of nonsense words starting with *tr-*
001	□ '□' □□□ □□□□ '□' □□□ □□ □□ 'tree' □ □□□ □□ □□□ □□□□ □□ □□□ 'trap' □□ □□□ □ □□□ □□. /tʰ/ and /r/ reminded me of 'tree' at first but now 'trap'.
002	날카롭게 퉁퉁 튕겨내는 것같은 느낌이다. 캔이 발에 치여 찌그러지는 소리 같다. To bounce something sharply making a (tʰuŋ-tʰuŋ) sound. A sound when a can is being dented by feet.
003	던지다. 멀리까지 날리다. To throw. To throw something far away.
004	비열함 To be mean.
005	튤립 Tulip.
006	골판지와 같이 융기있는 두꺼운 종이글 긁어 내리는 느낌. To scrape down a corrugated cardboard.
007	기분이 안 좋아서 툴툴대는 느낌 To grumble (tʰul.tʰul).
008	가벼운 것이 위에서 아래로 누르는 느낌 Something light is pressing from upside to downside.
009	탄산음료 따는 소리

	To open a carbonated drink.
010	쓰레기나 스트레스???나쁜 단어만 생각난다 Trash or stress? Something negative.
011	침 튀기다 To froth at the mouth.
012	추적. 변화. Trace. Change.
013	굳게 악수하는 느낌 A firm handshake.
014	무엇을 설명하는 느낌 To explain something.
015	뭔가 설교하면서 내뱉는 느낌 To spit out words while preaching.
016	안주를 먹는 느낌 To eat a snack served with alcoholic beverage.
017	딱딱한 느낌 Hard.
018	높고, 푸르른 느낌. High and blue green.
019	천천히 말하며 입과 혀를 동그랗게 하며 말하는 것 같다. 호흡을 밖으로 하며 말하는 것 같다. To speak slowly while making lips and tongue round. To speak while exhaling.
020	진실됨 대접해줌 To treat somebody sincerely.
021	녹색, 또는 나무나 숲이 생각남 Green, tree or forest.
022	남을 속이려 거짓말함 To lie to deceive someone.
023	배배 꼬는 느낌 To twirl (pɛ.pɛ).
024	던지고 받는느낌 To throw and receive.
025	진실된 이야기를 할때 스는단어같은 느낌 To talk truthfully.
026	나무나 도구같은 물체가 떠오른다 A tree or tool.
027	긴장감 Tension.
028	부딪히는 느낌 To bump.

Subject ID	Descriptions for a group of nonsense words starting with *gr-*
001	□'□ '□' □□□ □□ □□ □□ □□□□. '□---' □□ □□□ □□□□ □□□ □ □□ □□□□ □□□. /k/ and /r/ gave me the impression of uniqueness. /k/ seems to express scraping down

something.

002 게으르고 매우 느린 느낌이다. 슬로우 모션을 효과를 준 영상의 느린 소리같기도 하다. 굵은 남자의 목소리 같기도 하다.
Lazy and very slow. A sound in a video clip that has a slow motion shot. A deep male voice.

003 주저앉다. 점점 작아지다.
To drop down. To get smaller.

004 칙칙함
To look dark and dull.

005 목을 긁어서 내는 소리. 알파벳 G 가 연상됨 .
A sound when one scrapes down one's throat. It reminds me of letter 'G'.

006 오래된 차가 시동걸리는 느낌.
An old car is being started.

007 낮에 나른하게 잠이 오는 느낌
To get sleepy and drowsy during the daytime.

008 물에 젖어 무거워진 솜의 느낌
A wet and heavy cotton.

009 거대한 느낌
Giant.

010 잡는게 생각난다 볼펜을 잡거나 사냥하는것또는 역겨운,,, 그런 단어가 /떠오른다
To grip a ball-point pen. To hunt. Disgusting.

011 느리게 나아가는 느낌
To go forward slowly.

012 뭉친. 얽힌.
To be agglomerated. To get tangled.

013 커피포트로 커피잔에 커피를 아주 적절한 선까지 따르고 딱 멈추는 느낌
To pour the perfectly right amount of coffee into a coffee cup with a coffee pot and stop perfectly.

014 무거운 느낌
Heavy.

015 무언가를 놓쳐서 굴러가는 느낌
Someone missed catching something; as a result, it is rolling over and over.

016 끈적끈적한 액체가 엉기는 느낌
A sticky (k'ɨn.cək-k'ɨn.cək) liquid is being clotted.

017 따뜻하다
Warm.

018 무겁고 딱딱한 느낌
Heavy and hard.

019 혀를 많이 굴리는 것 같다. 발음을 길게 늘이는 것 같다. 원이 생각 난다.
Sounds made by rolling the tongue a lot. Their pronunciation is lengthened. Circle.

020 공동적 뭉침
Joint cluster.

021 물결치는 느낌, 매끄러운 곡선
Waves rise. A smooth curve.

022 하늘에 먹구름이 잔뜩 낀 모습
Many dark clouds in the sky.

023	무언가를 꽉 쥐는 느낌 To grip something firmly.
024	무언가 천천히 진행하는 느낌 To proceed slowly.
025	사람몸이 유연한 느낌 A flexible body.
026	무언가를키우는느낌 To raise something.
027	재미있고 웃긴 느낌 Something funny and hilarious.
028	둥글게 말리는 느낌 Something is being rolled up in a round shape.

Subject ID	Descriptions for a group of nonsense words starting with *sn-*
001	□□□□ □□□□ □□□ □ □□□. □□□ □ □□ □. Something sharp, such as a sharp knife.
002	뱀이 여기저기를 기어다니는 것 같은 소리다. 얇고 부드러운 천이 살갗을 스르륵 스칠 때 나는 소리 같기도 하다. The sound when a snake is crawling around here and there. The sound (sɨ.ɾɨ.ɾɨk) when a thin and soft cloth is brushing against the skin.
003	미끄러운. 날카로운. 매끄러운. 날이 선. Slippery. Sharp. Smooth. Edged.
004	멋있고 밝은느낌 Cool and bright.
005	점점 느려지고, 길게 늘어지는 느낌. To get slower and lengthened.
006	뱀이 풀 위를 소리내 지나치는 것 같은 느낌. A snake is crawling around the meadow making a sound.
007	진지하게 자기 의견을 내세우는 느낌 To express one's opinion seriously.
008	얇고 긴 막대를 바닥에 끌고 있는 느낌 To drag a thin and long stick on the floor.
009	뱀이 지나가는 소리 The sound when a snake is crawling around.
010	스스스 ~ 계속 바람소리가 들린다그런데 뭔가 딱딱하지않고 부드러운 느낌이 난다 A (sɨ.sɨ.sɨ) sound when the wind blows. At the same time, something soft.
011	눈덮인 산에서 스키를 타는 느낌 To ski on the mountain topped with snow.
012	침체된. 꼬인. 엉킨. Depressed. Twisted. Tangled.
013	오이를 칼로 썰어내는 느낌 To cut a cucumber with a knife.
014	강한 느낌 Strong.
015	차갑고 날카로운 느낌 Cold and sharp.

016	라디오 주파수가 안잡히고 *지지직*거리는 느낌 One can't get any stations on the radio and the radio keeps making a (ci.ci.cik) sound.
017	지루하다 Boring.
018	자연스러운, 흐르는, 미끄러운 이미지. Natural. Flow. Slippery.
019	처음 발음에 악센트를 주는 것 같다. 바람 소리가 많이 나는 것 같다. 발음이 물흐르는듯한 느낌이다. Emphasis is on the word initial position. I can hear some windy noise. Pronunciation flows like the river.
020	차가움 Cold.
021	뱀이 사냥을 하기 위하여 혀를 **날름**거리는 이미지 A snake darts its tongue in and out (nal.ɾɨm) for hunting.
022	뱀이 풀숲사이를 지나가는 느낌 A snake is crawling around the grassland.
023	칼로 무언가를 베는 느낌 To cut something with a knife.
024	먼가 날카로운 느낌 Something sharp.
025	눈과 관연된 단어 같음 Snow.
026	날카롭고차가워요 Sharp and cold.
027	뱀이 *꾸물꾸물* 기어가는 느낌 A snake is crawling around (k'u.mul-k'u.mul).
028	모름 Don’t know.

Subject ID	Descriptions for a group of nonsense words starting with *sq-*
001	□□' □□ □□□ □□ □□ □□ □□ □□□□□□? □□□ □□□ □□□ □□ □ □□ □□□ □□□. /skw/ seems to be articulated with a mouth/throat full of phlegm. Something is being blocked.
002	물체를 손에 꽉 잡고 쭉 짜내는 것 같다. 손에 오렌지를 쥐고 즙을 쭈욱 짜내는 것 같은 느낌. To hold something firmly and squeeze (c'uk). To hold an orange and squeeze its juice (c'uuk).
003	생채기를 내다. 상처를 내다. 긁다. To make a scratch. To make a wound. To scratch.
004	지루하고 늘어지는니낌 Boring and slack.
005	'쿼' 발음이 잘 들린다. 스쿼트라는 단어가 떠오른다. 똑같이 발음하기 힘들 것 같다. I heard /kwə/. It reminds me of 'squat'. They are hard to pronounce.

006	신중히 바닥을 기어들어가는 느낌. Something/someone is crawling on the floor cautiously.
007	신 음식을 먹은 느낌 To eat sour food.
008	중후한 느낌의 거리를 바라보는 느낌 To see a view of a dignified city.
009	천둥소리 개울음소리 문열리는소리 문닫히는소리 과일을손으로짜는소리 Thunder sound. Dog barking sound. Sound of opening the door. Sound of closing the door. Sound of squeezing a fruit.
010	뭔가 발음하기 힘든 단어같은데;;; 딱딱하고 네모가 생각난다. They sound hard to pronounce. Something hard and rectangular.
011	스치다 To brush against.
012	두려움. 공포. Fear. Fright.
013	힘들게 방귀뀌는 느낌 To fart effortfully.
014	부드러운 물체를 표현할 때 쓰는 느낌 Soft object.
015	지루하고 늘어지는 느낌 Boring and slack.
016	표면이 거친 물체들이 마찰을 일으키는 느낌 Rough-faced objects produce friction.
017	식상하다 Be sick of.
018	날카롭고 예리한 Sharp and pointed.
019	꼬여있다. 지루하다. 느리다. 답답하다. Slow. Stuffy. Twisted. Sleepy.
020	층 Floor.
021	여러개의 사각형이 겹쳐있는 느낌사각형의 블록들을 쌓아놓은 느낌 Several rectangles are stacked. Rectangular blocks are stacked.
022	배배꼬인 꽈배기 (pɛ.pɛ) Twisted bread stick.
023	무언가를 쥐어짜는 느낌 To squeeze something.
024	쥐어 짜는 느낌 To squeeze something.
025	물건모양이 각진느낌 Something angular.
026	날카로운느낌 Sharp.
027	무서움, 두려움 Fear. Terrified.
028	부드럽게 받아 치는 느낌 To return a shot softly.

Subject ID	Descriptions for a group of nonsense words starting with *tw-*
001	□□□□ 'tw' □ □□ □□ □□ □ □ '□□□--' □□ □ □□ □□□ □ □□□ □□□□ □ □□□.
	/tw/ reminds me of a person who is trying to articulate /tɨ.wa.a/, so it is funny.
002	가볍게 톡톡 튀는 느낌. 침을... 뱉는 것 같기도 하다;;
	To bounce softly (tʰok.tʰok). Or to spit.
003	손가락으로 튕기다.
	To snap one's fingers.
004	공격적으로 들린다
	Sounds aggressive.
005	입술을 힘껏 오무려 앞으로 내미는 이미지가 떠오른다.
	Someone is pursing up their lips and protruding it with all strength.
006	풍선껌보단 물기있는, 일부러 입에서 침으로 방울 만들어 터트리는 것같은 느낌.
	Something more watery than bubble gum. Someone is intentionally making a bubble with saliva and pops it.
007	프라이팬을 가지고 요리를 하는 느낌
	To cook with a frying pan.
008	똑같은 두개의 물건을 번갈아 보는 이미지
	To look back and forth at the same two objects.
009	침 뱉는 소리
	A sound of spitting.
010	쌍둥이가 떠오르고??? 함께하는 걸 말하는거 같다.
	Twin. To do something together.
011	튀는 느낌, 튄다
	To bounce.
012	쌍(雙), 복수의. 2 배수의.
	Pair. Plural. Multiple.
013	바퀴의 곡선을 손끝으로 어루만지는 느낌
	To stroke the curve of a wheel with a fingertip.
014	꼬인 느낌
	To get twisted.
015	둘을 뜻하는 느낌
	Two.
016	딱딱한 물체와 부딪히는 느낌
	To be bumped into a hard object.
017	무미건조하다
	Dull and boring.
018	반짝반짝 빛이나는 이미자
	To twinkle (pan.c'ak-pan.c'ak).
019	혀를 앞으로 차는 것 같다. 티 발음에 신경을 쓰는 것 같다.
	To click one's tongue. To pay attention to the pronunciation of /t/.
020	두개 한쌍
	A pair.
021	DNA 처럼 여러개의 나선들이 꼬여있는 이미지
	Several spirals are twisted together as DNA.
022	기타 줄을 튕기는 모습
	To twang a guitar.

023	통통 튀는 느낌 Something bounces (t^hoŋ-t^hoŋ).
024	겹치는 느낌 To be overlapped.
025	문을 닫는 느낌 To close the door.
026	꼬이는느낌 To be twisted.
027	두개나 여러개가 있는거 같다 There are two things or several things.
028	차분하게 설득하는 느낌 To persuade somebody calmly.