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The non-arbitrary aspect of language: The iconicity of onomatopoeic words in Thai[2]

Abstract

The present study aims to investigate the relationship between phonetic forms and meaning components of onomatopoeic words in Thai. Data were elicited from two Thai monolingual dictionaries – representing formal documents – and 40 Japanese-to-Thai translated comic books – as representatives of informal documents. In addition, a sound-to-word transcription experiment with 100 Thai university students was done in order to test the findings from the written documents from the perspective of language users. It was found that there is – to some extent – the association between some particular class of initial consonants and some particular meaning components in Thai onomatopoeic words is predictable. In addition, from the perspective of language users, it was found that the saliency of sound components of some particular natural sounds – loudness, clearness, and the order of occurrence of sounds – is an important factor for the formation of onomatopoeic words.

1. Introduction

1.1 Symbols vs. Icons

Language is a symbolic system used for communicative purposes. Accordingly, it consists of two main components: forms and meanings (Ogden & Richards 1923; de Saussure 1959). In relation to the relationship between forms and meanings, it is known that majorities of linguistic forms in human language are convention of people in particular communities.

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Each particular form does not explicitly show its relationship to the meaning or referent. In other words, the word such as ‘tree’ or its phonetic form [t^hri] has nothing in relation to the meaning [TREE] or the referent  in particular. Otherwise, different languages should use the same form to refer to the meaning [TREE] (but it is ‘ต้นไม้’ [tôn$\acute{m}$aj] in Thai and [k^hi] in Japanese).

However, there is some small group of words in languages which does not follow such arbitrary property of language. The relationship between forms and meanings of this group of words can be, to some extent, explained. They are known as ‘icon’. The term ‘icon’ is usually used in contrast with the term ‘symbol’ to describe linguistic forms which have explicit/transparent motivation to their meanings or referents (Chang 1993). An ‘icon’ is a non-arbitrary intentional sign – which means that the sign/form contains an intrinsic resemblance to its referent. Examples of icon which are phonetically motivated by natural sounds in English are birds’ names like ‘kookaburra’ and ‘cuckoo’.

1.2 Degree of motivation in icons

It should be noted that the studies of ‘icon’ in languages are less in number comparing to those of ‘symbol’. This is because ‘icon’ is thought as exception in which relationship between forms and meanings can be explicitly observed. However, comprehensive studies about this group of words suggested that the relationship between forms and meanings can be classified into four different types according to the degree of motivation (Hinton, Nichols & Ohala 1994): Corporeal, Imitative, Synesthetic, and Conventional as adapted by Rungrojsuwan (2007a) in Figure 1.

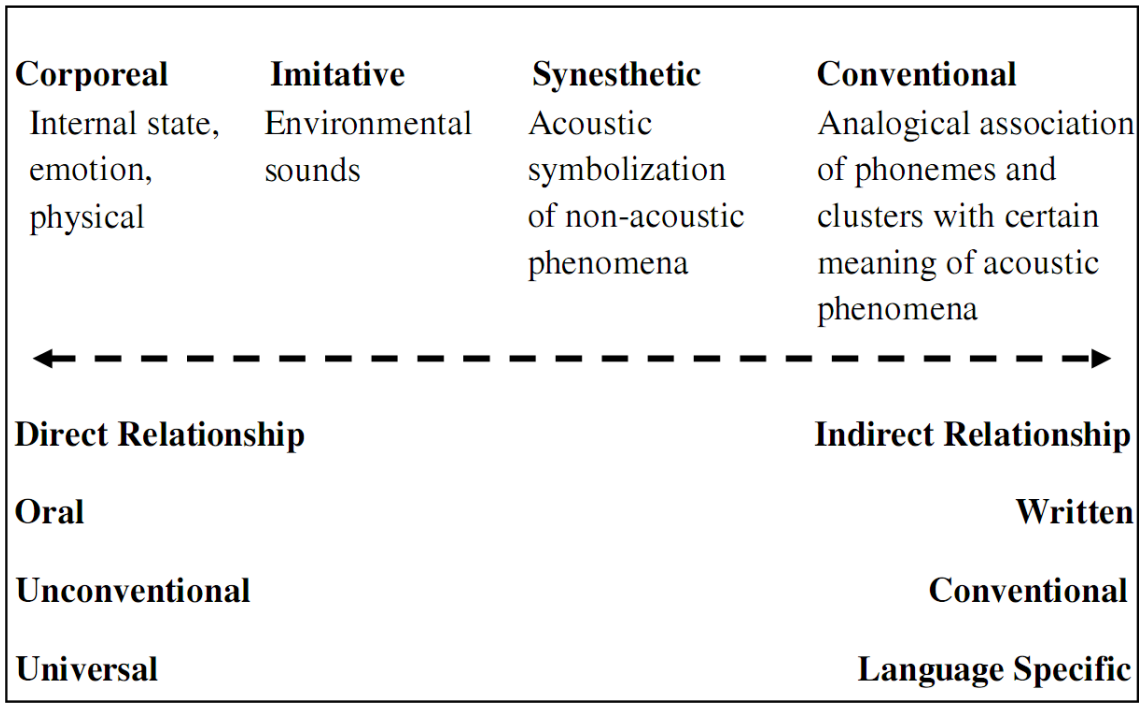

Figure 1. Four types of relationship between forms and meanings in language (Rungrojsuwan 2007a adapted from Hinton et al. 1994)

It should be noted that Hinton et al. (1994) refers to this particular phenomenon as 'sound symbolism'. From Figure 1, it can be seen that on the one hand, types of sound symbolism on the left side of the figure illustrate higher degree of universality, unconventional, oral (used in spoken language) because they show direct relationship between forms and meanings/referents. Examples of Corporeal and Imitative Sound Symbolism are 'cough' 'snore', 'hiccup', and 'meow'. On the other hand, Synesthetic and Conventional Sound Symbolism are more indirect in terms of transparency of relationship between forms and meanings/referents. Words in these groups are used in written language which means that they are highly conventional and can be varied from language to language. L. Thongkum (1979), from her study of 'Synesthetic Sound Symbolism', found that the use of back vowels in reduplications of Northeastern Thai Dialect usually indicates a large size or a higher degree of intensity while the use of non-back vowels, on the contrary, demonstrates a small size or a lower degree of intensity.

1.3 Universality of onomatopoeic words

Onomatopoeia is a group of words used to designate sounds in nature. This means that the meaning or referent of an onomatopoeic word is usually the sound of a particular thing or the sound of action of a particular thing in reality (Rungrojsuwan 2007b). Comparing to Figure 1, onomatopoeic words are distributed in both 'Corporeal' and 'Imitative' sound symbolism (Rungrojsuwan 2007a). Although they are less in number, from universal perspective, similarities of lexicon in various languages can be observed as shown in the examples of onomatopoeic words referring to [DOG'S BARK].

Language	**Phonetic Forms**
English	/baw waw/
German	/wau wau/
Spanish	/gua gua/
Italian	/bau bau/
Thai	/hôŋ hôŋ/
Japanese	/waŋ waŋ/

In relation to linguistic forms, it is reported from many studies that onomatopoeic words tend to be formed by reduplication process as shown in Table 1.

Table 1. Examples of reduplicative onomatopoeic words in different languages

Languages	**Phonetic Forms**	**Meanings**	**Sources**
Japanese	/pa-ta-pa-ta/	[HITTING A FLAT SURFACE WITH A LARGE FLAT OBJECT SUCH AS A FAN]	Hamano (1994)
Guarani	/po-ro-ro/	[POPCORN SPARKED]	Langdon (1994)
Nez Perce	/łox̣-lóx/	[WALKING THROUGH DRY GRASS LEAVES]	Aoki (1994)
Lahu	/qɑ́y-qɑ́y/	[PUPPY'S BARK]	Matisoff (1994)
African	/fu-fúlfúl-fúl/	[RUSHING OF AIR]	Childs (1994)
English	/dɪŋ-dɔŋ/	[BELL RANG]	Hinton et al. (1994)
Thai	/kâap-kâap/ /pɛ̀ pɛ̀/	[DUCK'S QUACK] [APPLAUSING]	Rungrojsuwan (2007b)

Moreover, it was found in some languages that consonant sounds used in forming onomatopoeic words are rarely used in some particular languages in common (as shown in Table 2).

Table 2. Examples of some unusual segments used in the formation

Languages	Unusual segments	Onomatopoeic words	Sources
Huastec	The sounds /tx/, /tx'/, and /j/ are rarely occurred in Huastec lexicon.	Many words with /tx/, /tx'/, and /j/ in the initial position	Kaufnan (1994)
Nez Perce	There is no /ƛ/ in Nez Perce.	/ƛép/	Aoki (1994)
Modern Greek	The sounds /ts/ and /dz/ are rarely found in Modern Greek.	/tsitsirízo/, /tsiyarízo/, /tsuruflízo/	Joseph (1994)
Lahu	There are very less number of reduplicatives in Lahu.	/pôʔ-pôʔ/, /qáw-qáw/	Matisoff (1994)

From Table 2, it is claimed that these unusual sounds do not receive any effect from language change because onomatopoeic words are small in number (Hinton et al. 1994). Accordingly, the remained unusual sounds are good resources of information for the study of comparative linguistics.

In relation to meaning, as described earlier, the meanings of onomatopoeic words are various sounds in reality. From the examination of Thai onomatopoeic words, Rungrojsuwan (2007b) claimed that semantic domains of onomatopoeic words include [HUMAN], [ANIMAL], [THING], and [NATURE].

1.4 The relationship between forms and meanings of onomatopoeic words

According to the above literature, it can be said that onomatopoeia is a good example of linguistic phenomenon which shows direct relationship between phonetic forms and meanings – sounds in nature. However, it is

still questioned that in addition to the meanings or the referents which are sounds in nature, is it possible to find other kind of relationship such as the use of some particular linguistic forms in relation to some particular concepts? A rough observation by Hinton et al. (1994) suggested that 'Imitative Sound Symbolism' tends to have, to some extent, some association between consonants and some particular meaning components as shown.

Phonetic classes	**Semantic fields**
Stops	[ABRUPT SOUNDS]
Fricatives	[QUICK AUDIBLE MOTION OF AN OBJECT THROUGH AIR]
Nasals	[RINGING AND REVERBERATING SOUNDS]
Continuants	[CONTINUING SOUNDS]

As a part of 'Imitative Sound Symbolism', the possession of this kind of association in onomatopoeic words is still unclear. In relation to Thai language, onomatopoeic words were examined as a part of reduplicative words (Sompong 1967; Liamprawat 1983; Udomanisuwat 1983; You 1983; Phuangpin 1991). Although some study tried to describe the characteristics of onomatopoeic words (Rungrojsuwan 2007b), the association between forms and meanings has not yet been focused. From universal perspective and as a continuation of study in this topic, the relationship between phonetic forms and some meaning components of Thai onomatopoeic words is focused in this study.

It should be noted that in Thai, in addition to spoken language, onomatopoeic words are lexicalized and added into Thai dictionary. This means that forms and meanings of these words are formally formed. However, it is the fact that not all onomatopoeic words used in spoken language are included in Thai dictionary. As a consequence, only the investigation of this type of words in the dictionary might not reflect the accurate picture about the characteristics of onomatopoeia. According to this, authentic usage of onomatopoeic words, which reflect the relationship

between forms and referents, elicited from other informal documents and from native speakers should be taken into account in order to confirm and to make the examination well-rounded. However, it should be noted that in terms of usage, including authentic use of non-dictionary forms of onomatopoeia, the term 'referent' is more appropriate because the meanings of some particular onomatopoeic words in the terms of concept might not yet been institutionalized (as being found in the dictionary).

2. Objectives

The objectives of this study are:

2.1 To investigate the relationship between forms, namely initial consonants, and meanings of onomatopoeic words in formal written documents (dictionaries) and the relationship between forms and referents of onomatopoeic words in informal written documents (comic books)

2.2 To test findings from 2.1 by examining the formation of onomatopoeic words by Thai natives

3. Methods

Data for this study are onomatopoeic words from three different sources representing formal written documents, informal written documents, and actual usage by native speakers of Thai.

3.1 Formal written documents

In relation to formal written documents, data were retrieved from two Thai dictionaries: *Royal Institute Dictionary*, 1999 edition and *Thai dictionary*, Matichon edition. Onomatopoeic words were selected from definitions of words which refer to the words as sounds (sound of …). It should be noted that definitions of onomatopoeic words in dictionaries can be taken as conventionalized 'meanings' which are formally accepted and defined by national institutions, the Royal Institute. Accordingly, the study in this part considers the relationship between forms and meanings.

3.2 Informal written documents

For informal written documents, 40 Japanese-to-Thai translated comic books with various themes – food, detective, love story, and fighting – were selected as representative. The reasons for using Japanese-to-Thai translated comic books are 1) in addition to spoken language and dictionaries, comic books are the only source in which onomatopoeic words can be significantly found, and 2) Japanese-to-Thai translated comic books have been distributed in Thailand for decades and are very popular among Thai youngsters. Moreover, they are richer in terms of number of onomatopoeic words comparing to Thai original comic books which have been published for about 10 years ago. It should be noted that in comic books meanings of onomatopoeic words are not given. Pictures of settings and cartoon characters are the only source of information which helps understand the meaning of the particular words. Accordingly, the study in this part considers the relationship between forms and referents.

The analysis for data from two types of written documents was focused on the relationship between initial consonants of onomatopoeic words and meaning components extracted from their meanings/referents. By doing this, initial consonants of words were classified into five groups, according to the manners of articulation and the number of consonants in prevocalic position: stops, fricatives, nasals, continuants, and clusters. Then, meanings and referents of each particular word containing each particular type of initial consonant were grouped and generalized as meaning components in order to provide the description in terms of relationship between forms and meanings/referents.

3.3 Usage of native speakers

Data representing the usage of onomatopoeic words by Thai natives were elicited from a set of experiment. The experiment was designed in order to test findings from the two types of written documents. The procedure of the experiment is as follows.

1) Findings about the relationship between forms – types of initial consonants – and meanings/referents of onomatopoeic words from written documents (sections 3.1 and 3.2) were used as basis for the experimental design. Five words for each type of

initial consonants with their corresponding meanings and referents were selected. It should be noted that for some class of initial consonants, those of fricatives and continuants, only two words were selected because the meanings/referents are sounds which are problematic (many words beginning with fricatives and continuants are almost imperceptible due to very low degree of loudness such as /wɛ̂ːp/ means [lightened sound] and /sùap/ means [sound of protruding one's hand into the pocket]).

2) Each meaning/referent was reproduced as a real sound and was recorded.

3) Preparing for data collection, total of 25 sounds were randomly mixed.

4) One hundred Mae Fah Luang University freshmen from four different geographical regions – north, northeast, south, and central – were recruited as participants.

5) The participants were asked to listen to the 25 sounds and write down the sounds they heard using Thai alphabets.

For analysis, according to the findings from the written documents, the written forms of those 25 sounds were already known prior to the experiment. This means that certain types of initial consonants are expected beforehand. After having collected data from the experiment, the collected data were compared to the expected ones. Twenty five sounds with their expected types of initial consonants are shown in Table 3

Table 3. List of sounds for experiment and their expected initial consonants

NO.	Sounds	Expected initial consonants	NO.	Sounds	Expected initial consonants
1	[GLASS BING]	Stops	14	[FAN BLOW]	Continuants
2	[WIND BLOW]	Continuants	15	[SQUEEZING DRIED LEAVES]	Clusters
3	[RUBBING HANDS]	Fricatives	16	[DOORBELL JANGLE]	Nasals
4	[SNORING]	Clusters	17	[PAPER FLIP]	Clusters
5	[CLOSING DOOR]	Stops	18	[GASPING THROUGH ONE' S MOUTH]	Fricatives
6	[DOORBELL JANGLE]	Nasals	19	[LIPS RAPPLE]	Clusters
7	[TAP WATER FLOW]	Fricatives	20	[BELL CHIME]	Nasals
8	[DROPPING BOOK]	Stops	21	[SNIFFING]	Fricatives
9	[GARGLING]	Clusters	22	[WIND BLOW]	Continuants
10	[FAN BLOW]	Continuants	23	[PUNCHING SOMEONE]	Stops
11	[FINGER SNAP]	Stops	24	[FAN BLOW]	Continuants
12	[RAINING]	Fricatives	25	[BELL CHIME]	Nasals
13	[BELL CHIME]	Nasals			

4. Results

4.1 Onomatopoeic words in the formal and informal written documents

From the qualitative examination of onomatopoeic words in the formal and the informal documents, some empirical evidence of words which shows relationship between initial consonants and some particular meaning components was found. Findings can be divided into five sub-sections (a)-e)) according to phonetic characteristics of word-initial consonants: Stops, Fricatives, Nasals, Continuants, and Clusters as follows.

a) Stop consonants

Phonetically, in pronouncing a stop consonant, the air stream is blocked by two articulators and then is released abruptly through the oral cavity. Accordingly, the meaning components related to such phonetic characteristic should be [ATTACK], [TOUCH], [BLOCK], [EXPLODE], and [BREAK]. From the two sources of data, it was found that onomatopoeic words which employ stop consonants in the initial position contain the expected meaning components as shown in the following examples.

Formal document		**Informal document**	
Form	**Meaning (Sounds of)**	**Form**	**Referent (Sounds of)**
/**c**á**c**á**k**/	[RAINING HEAVILY]	/**k**ɔ́**k**/	[KNOCKING DOOR]
/**t**ɔ̌**m**/	[SOMETHING FALLS INTO THE WATER]	/**t**ù**p**/	[SOMETHING FALLS ONTO THE GROUND]
/**p**â**p**/	[PUNCHING]	/**p**a**ŋ**/	[SHOOTING GUN], [EXPLODING]
/**ʔ**ì**k**/	[PUNCHING ONE'S BACK]	/**ʔ**ɛ́ɛ**t**/	[OPENING DOOR]

b) Fricative consonants

When a fricative consonant is pronounced, the air stream is forced through a narrow space shaped by two articulators. Consequently, a fricative

consonant is produced with audible turbulence or friction. Accordingly, the meaning components related to such phonetic characteristic should be [INTERVENE], [HISS], [FRICTION], and [PASS THROUGH WITH SOME DEGREE OF ATTEMPT]. From the two sources of data, it was found that onomatopoeic words which employ fricative consonants in the initial position contain the expected meaning components as shown in the following examples.

Formal document		Informal document	
Form	**Meaning (Sounds of)**	**Form**	**Referent (Sounds of)**
/**f**ɪ́t/	[SNEEZING]	/**f**ûu/	[EXHALING WITH RELEASED]
/**h**ɪj/	[BREATHING HEAVILY]	/**s**âa/	[WAVE BREAK]
/**s**ú̱ut/	[SIPPING HOT WATER]	/**h**ɛ̂k **h**ɛ̂k/	[BREATHING WITH TIRED]
/**h**ɛ̂ɛ/	[DOG ROAR]	/**h**ɪ́ɪ/	[EXHALING WITH RELEASED]

c) Nasal consonants

In pronouncing a nasal consonant, the soft palate is lowered. This allows the air to pass through the nasal cavity which has wider space than the oral cavity. Consequently, the sound produced through the nasal cavity sounds softer and weaker. Accordingly, the meaning components related to such phonetic characteristic should be [SOFT], [ECHOING], and [UNCLEAR]. From the written documents, it was found that onomatopoeic words with nasal consonants at the initial position contain the expected semantic components as shown in the following examples.

Formal document		Informal document	
Form	**Meaning (Sounds of)**	**Form**	**Referent (Sounds of)**
/**ŋ**ɨm **ŋ**am/	[MURMURING]	/**ŋ**ɑ̂m **ŋ**ɑ̂m/	[CHEWING RICE]
/**ŋ**ɑ̀aŋ/	[BELL CHIME]	/**m**íŋ **m**íŋ/	[INSECTS' CRY
/**m**ù**j**/	[HITING GONG]	/**m**ɑ̂p/	[HUGGING]
/**n**íŋ **n**ɔ̀ŋ/	[DOORBELL JANGLE]	/**m**ɑ̀p/	[TOUCHING SOMETHING]

d) Continuant consonants

Phonetically, when pronouncing a continuant consonant, the air stream continuously passes through the oral cavity without being blocked by the two articulators. Moreover, the space between two articulators when the consonant is pronounced is wider than that of the fricative consonant. Accordingly, the meaning components related to such phonetic characteristic should be [CONTINUE], [LINK], and [FLOW]. From the data, it was found that onomatopoeic words with continuants at the initial position contain the expected meaning components as shown in the following examples.

Formal document		Informal document	
Form	**Meaning (Sounds of)**	**Form**	**Referent (Sounds of)**
/**w**ɨ̂ɨt/	[WIND BLOW]	/**w**ɨ̂ɨt/	[MOVING QUICKLY]
/**w**ɑ́ak/	[CRYING LOUDLY LIKE CHILDREN]	/**w**ûup/	[THROWING SOMETHING AWAY]
/**j**ee **j**ee/	[CHILDREN CRY]	/**w**íi/	[WHISTLING]

e) Consonant clusters

Thai consonant clusters are combinations of two consonants from two phonetic classes: stop and continuant. Accordingly, meaning components of onomatopoeic words with consonant clusters at the initial position should be the combination of meaning between the two phonetic classes, that is [REPETITION OF ACTION] – [STOP] and then [CONTINUE]. From the written documents, it was found that onomatopoeic words

beginning with consonant clusters contain the expected meaning component as shown in the following examples.

Formal document		Informal document	
Form	**Meaning (Sounds of)**	**Form**	**Referent (Sounds of)**
/**kr**ùap/	[CHEWING HARD OR CRISPY FOOD]	/**khr**ɨɨn/	[THUNDERING]
/**khl**ɨɨn/	[THUNDERING]	/**phl**éŋ/	[BREAKING GLASS]
/**khl**ɑ̂k	[BOILING RICE]	/**pr**ía/	[BREAKING STONE]
khlɑ̂k/			
/**kr**ɔ́p/	[BREAKING FINGER]		

4.2 The formation of onomatopoeic words from perception of native Thais

It was found in section 4.1 that there are some relationship between phonetic characteristics of initial consonants and some particular meaning components. In this section, some onomatopoeic words – from section 4.1 – with five groups of initial consonants were selected and used to test language users in order to evaluate such relationship from users' perspective which are more dynamic – the production of onomatopoeic words from language users can be varied individually according to the capability in perception – than the conventionalized formed in written documents. Sounds which are referred to by the selected words – sounds which are referents of the selected words – were reproduced and recorded. They were listened to and transcribed by 100 Thai participants who are freshmen of Mae Fah Luang University. The same groups of initial consonants as in the written documents were expected in the participants' transcription in order to confirm the relationship between forms and referents. Results are described according to each expected group of initial consonant as follows.

a) Stop consonants

From the experiment, it was found that more than 65 % of participants used stop consonants as the initial consonants to form words for sounds which contain the meaning components [ATTACK], [TOUCH], [BLOCK], [EXPLODE], and [BREAK] in which stop-initial consonants are expected – Sound 1, 5, 8, 11, and 23 – as shown in Table 4.

Table 4. Participants' selection of initial consonants for sounds containing meaning components [ATTACK], [TOUCH], [BLOCK], [EXPLODE], and [BREAK] (Stop consonants were expected)

Sounds tested		Initial consonants used by participants (N = 100 participants/100 %)					
		Stops		Fricatives	Nasals	Continuants	Clusters
		Unasp	Asp				
1	[GLASS BING]	95	1	-	-	-	4
5	[CLOSING DOOR]	68	1	2	-	-	29
8	[DROPPING BOOK]	88	7	-	-	-	5
11	[FINGER SNAP]	73	1	-	-	1	25
23	[PUNCHING SOMEONE]	94	-	-	-	-	6

From Table 4, although some clusters are selected by some participants, it can be said that the results follow prior expectation because Thai consonant clusters contain stop consonants in the first position.

Considering in details, it was found that stop consonants used for sounds in this group are mostly unaspirated stop consonant as in the following examples.

Sounds		Transcribed words
5	[CLOSING THE DOOR]	/**p**ɨ́k/ /**k**ɛ́k/ /**p**àk/
8	[DROPPING A BOOK]	/**t**ɨk/ /**kh**ɨ́k/
23	[PUNCHING SOMEONE	/**c**ɨ́t/ /**c**ɨk/ /**t**ɨk/

b) Fricative consonants

Table 5 demonstrates the initial consonants used by 100 participants in transcribing sounds which contain fricative-consonant-expected meaning components.

Table 5. Participants' selection of initial consonants for sounds containing meaning components [INTERVENE], [HISS], [FRICTION], and [PASS THROUGH WITH SOME DEGREE OF ATTEMPT] (Fricative consonants were expected)

Sounds tested		Initial consonants used by participants (N = 100 participants/100 %)					
		Stops		Fricatives	Nasals	Continuants	Clusters
		Unasp	Asp				
3	[RUBBING HANDS]	5	43	48	-	1	3
7	[TAP WATER FLOW]	-	10	82	-	-	8
12	[RAIN]	8	12	69	1	1	9
18	[GASPING THROUGH ONE'S MOUTH]	4	63	32	1	-	-
21	[SNIFFING]	-	6	90	1	1	2

From Table 5, it can be seen that the range of number of participants who chose fricative consonants for Sound 3, 7, 12, 18, and 21 – which contain the meaning components [INTERVENE], [HISS], [FRICTION], and [PASS THROUGH WITH SOME DEGREE OF ATTEMPT] – is quite high (ranges from 32–90). This means that some selected sounds can be easily perceived as having fricative-related characteristics integrated, while some do not. However, considering in details, it was found that the stop consonants used for the transcription of Sound 3 and 18 are mostly aspirated stop consonants as shown in the following examples.

	Sounds	Transcribed words
3	[RUBBING HANDS]	/**ch̀ɨk ch̀ɨk**/ /**sii**/ /**śit śit śit**/
7	[TAP WATER FLOW]	/**sɨɨ**/ /**sɨ̂ɨk**/ /**sɨ̂ɨt**/
12	[RAINING]	/**sâa**/ /**sûuw**/ /**sî**i/
18	[GASPING THROUGH ONE'S MOUTH]	/**chûu**/ /**chûuw**/ /**ch́ɨt**/

Although fricative and aspirated stop consonants are distinctively different in terms of manner of articulation (two articulators move toward each other, leaving a very narrow space for the air to pass for the case of fricatives vs. two articulators touch each other, blocking the air in the oral cavity for the case of stops), from perception aspect, it can be said that fricative consonants and aspirated stop consonants share the same characteristic of possessing audible air – representing by the phonetic alphabet /h/ as in /ph/, /th/, /ch/, and /kh/. In other words, when these two types of consonants are produced, listeners could hear the air passing through the oral cavity clearer than other types of sounds – such as unaspirated stops and nasals. Accordingly, the selection of aspirated stop consonants for fricative-consonant-expected sounds can be possible.

c) Nasal consonants

It was surprisingly found that in transcribing sounds which contain nasal-consonant-expected meaning components, less than five percent of participants used nasal consonants for word-initial position as shown in Table 6.

Table 6. Participants' selection of initial consonants for sounds containing meaning components [SOFT], [ECHOING], and [UNCLEAR] (Nasal consonants were expected)

Sounds tested		Initial consonants used by participants (N = 100 participants/100 %)					
		Stops		Fricatives	Nasals	Continuants	Clusters
		Unasp	Asp				
6	[DOORBELL JANGLE]	52	-	1	1	25	21
13	[BELL CHIME]	85	-	-	1	-	14
16	[DOORBELL JANGLE]	55	-	1	5	16	23
20	[BELL CHIME]	82	1	-	3	-	14
25	[BELL CHIME]	81	-	1	1	1	16

From Table 6 it can be seen that after perceiving Sound 6, 13, 16, 20, and 25, most participants chose stop consonants as word-initial consonant. Results from the experiment seem to be completely different from those of written documents which obviously showed the relationship between nasal consonants – as initial consonants – and the meaning components [SOFT], [ECHOING], and [UNCLEAR] (See section 4.1 c)).

It should be noted that sounds in this set include sounds of [DOORBELL JANGLE] and [BELL CHIME]. Results indicate that the participants heard some obstructed sounds – which are meaning components of stop consonants. In other words, the sound component which contains the semantic component [ATTACK] – which is the component for stop consonants – is also included within sounds in this set and, with some reasons, it can be perceived easier than another sound component which contains the semantic component [ECHOING] – which is the meaning component of nasal consonants. As a consequence, stop consonants are significantly used as the initial consonants.

In order to explain this, the actual event of [DOORBEEL JANGLE] and [BELL CHIME] might firstly be considered. An example of the occurrence of the sound [BELL CHIME] is shown in Figure 2.

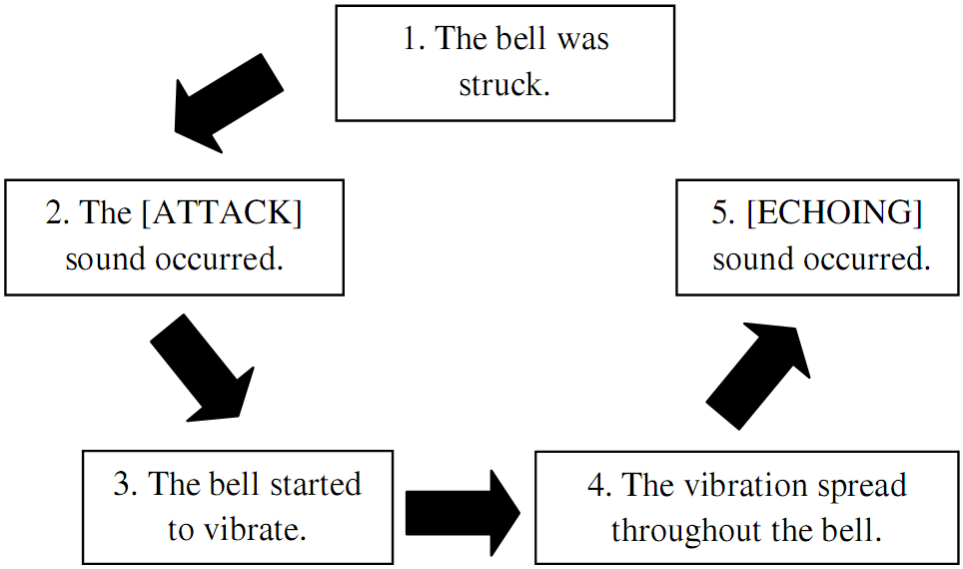

Figure 2. The occurrence of the sound [BELL CHIME]

From Figure 2, it can be observed that [ATTACK] sound occurs before [ECHOING] sound. This means that [ATTACK] sound will be heard before [ECHOING] sound and might be recognized and recalled very well and so easily that the participants chose to transform this sound into word-initial consonant – using stop consonants. In other words, the [ATTACK] sound contains higher degree of saliency than the [ECHOING] sound.

Although nasal sounds were not used as the initial consonants, it does not mean that the participants could not hear the [ECHOING] sound. Considering in details, it was found that the [ECHOING] sound is reflected in the participants' use of final consonants as shown in the following examples.

Sounds		**Transcribed words**
6	[DOORBELL JANGLE]	/kríŋ/ /kíiŋ/ /tíŋ/
13	[BELL CHIME]	/tîŋ/ /tɨ́ŋ/ /kɛ̂ŋ/

d) Continuant consonants

After perceiving Sound 2, 10, 14, 22, and 24 which are continuant-consonant-expected sounds, the participants transcribed these sounds using continuants as initial consonants less than 20 % as shown in Table 7.

Table 7. Participants' selection of initial consonants for sounds containing meaning components [CONTINUE], [LINK], and [FLOW] (Continuant consonants were expected)

Sounds tested		Initial consonants used by participants (N = 100 participants/100 %)					
		Stops		Fricatives	Nasals	Continuants	Clusters
		Unasp	Asp				
2	[WIND BLOW]	4	15	62	-	9	10
10	[FAN BLOW]	37	18	35	-	1	8
14	[FAN BLOW]	31	23	31	-	5	10
22	[WIND BLOW]	-	18	55	-	17	10
24	[FAN BLOW]	42	16	24	-	4	14

From Table 7, it can be seen that aspirated stop and fricative consonants are significantly used as initial consonant of the participants' onomatopoeic words. Examples of transcriptions are as follows.

Sounds	Transcribed words
2 [BLOWING]	/**f**ûuw/ /**h**úu/ /**h**uuh/
10 [FAN BLOW]	/**ph**ɪ̀ɪt/ /**h**ɪ̌ɪɪ/ /**f**ɪ́ɪ/

Considering in details, it was found that the sounds used for this set of experiment not only contain the meaning components [CONTINUE] and [FLOW], but also consist of [HISS] and are all audible. In terms of perception, as explained in section 4.2 b), the audible air is more significant than continuation and flowing properties. Accordingly, the selection of aspirated stops and fricatives for the transcription of continuant-consonant-expected sounds is outnumbered.

e) Consonant clusters

From the examination of transcriptions of consonant-cluster-expected sounds, it was found that most of initial consonants used for sounds in this group are consonant clusters as expected as shown in Table 8.

Table 8. Participants' selection of initial consonants for sounds containing meaning components [REPETITION OF ACTION] (Consonant clusters are expected)

Sounds tested		**Initial consonants used by participants (N = 100 participants/100 %)**					
		Stops		**Fricatives**	**Nasals**	**Continuants**	**Clusters**
		Unasp	**Asp**				
4	[SNORING]	2	14	-	1	-	83
9	[GARGLING]	1	9	1	-	1	88
15	[SQUEEZING DRIED LEAVES]	8	8	35	-	1	48
17	[PAPER FLIP]	29	3	5	-	1	62
19	[LIPS RAPPLE]	14	1	-	-	-	85

From Table 8, it can also be seen that some transcriptions contain stop consonants as initial consonants. This is possible because every Thai consonant cluster is composed of a stop consonant as the first element – such as [khr], [khl], and [pr] as shown in the following examples.

Sounds		**Transcribed words**
4	[SNORING]	/**kh**ɔ́ɔk/ /**khl**ɔ̂ɔk/ /**khr**ɔ́ɔk/
15	[SQUEEZING DRIED LEAVES]	/**kr**ɛɛ́p/ /**pr**ɛ́**ʔ**ɛ̀/ /**k**ɔ́ɔp/
17	[PAPER FLIP]	/**pr**ɔ̀ɔt/ /**pr**ɛ̀ɛkkkkk/ /**p**úut/

However, it can be observed that the use of continuant consonants which are another component of Thai consonant clusters was rarely found in the participants' transcriptions. This might be implied that stop consonants contain higher degree of saliency than continuant consonants. Accordingly,

the participants would perceive obstructed sounds clearer than continuing sounds and resulted in the selection of stop consonants as word-initial consonants.

5. Conclusion and Discussions

5.1 Conclusion

In addition to the direct relationship between phonetic forms and meanings of onomatopoeic words, another aspect of relationship between forms and meanings – that is the association between word-initial consonants and meaning components of onomatopoeic words – was investigated.

Data from formal and informal documents demonstrated some agreement on the association between initial consonants and meaning components (extracted from 'meanings' established in two Thai dictionaries and from 'referents' interpreted from pictures in 40 comic books) in five pairs as shown in Table 9.

Table 9. Pairs of association between initial consonants and meaning components

Initial Consonants	**Meaning Components**
Stops	[ATTACK], [TOUCH], [BLOCK], [EXPLODE], and [BREAK]
Fricatives	[INTERVENE], [HISS], [FRICTION], and [PASS THROUGH WITH SOME DEGREE OF ATTEMPT]
Nasals	[SOFT], [ECHOING], and [UNCLEAR]
Continuants	[CONTINUE], [LINK], and [FLOW]
Clusters	[REPETITION OF ACTION]

In addition to the written data, an experiment was conducted in order to test the existence of the relationship from language users' point of view. In the experiment, some natural sounds (from the findings of formal and informal documents) were selected, listened to, and transcribed by 100 Thai students. The sounds contain five groups of meaning components and the participants' use of initial consonants was expected prior to the experiment (according to the prior findings in Table 9).

Results confirmed the findings from written documents in the groups of stop consonants, fricative consonants, and consonant clusters. Moreover, it was found that the similarity in perception – that is some audible sound can be heard – of some phonetic classes – i.e. aspirated stops and fricatives – is an important factor affecting the selection of word-initial consonants of the language users.

It was also found that the saliency of sound components within a particular natural sound plays an important role in the formation of onomatopoeic words by language users as described in section 4.2 c) and d) in the case of transcribing nasal-consonant-expected and continuant-consonant-expected sounds.

5.2 Discussions

a) Natural sound and its sound components

From this study, it was found that a particular sound in nature can be composed of more than one sound component. Each sound component has different degree of significance or saliency in perception. The sound component with high degree of saliency – e.g. louder, clear, occur before other sound components, etc. – would be easier to perceive, recognize, and memorize than that with low degree of saliency. As a result, the more significant sound usually tends to be symbolized using alphabets or characters which contain similar phonetic characteristics. The evidence was found in the case of [BELL CHIME] sound as shown.

Source	**Phonetic Form**	**Remarks**
Written document	/moŋ/	convention
Transcribing from sound heard	/t̂iŋ/	influenced by perception

*1. /t/ sound at the moment when the bell was struck, sound/meaning component = [ATTACK]

2. /ŋ/ sound at the moment when the bell vibrates and the echo occurred, sound/meaning component = [ECHO]

In addition, it was claimed that aspirated stop and fricative consonants have similar phonetic characteristics in terms of perception – which are audible and continuous flowing of air from the oral cavity. Accordingly, this makes the formation of onomatopoeic words flexible among these three sound categories (see section 4.2 b) and d)).

b) The saliency sound class

According to the fact that a particular natural sound composed of many sound components and the most significant sound component tends to be selected and symbolized by language users, it was found from the experiment that stops consonants are the group of consonants which was widely used for the formation, in the initial position, of Thai onomatopoeic words. This implies that sound/meaning components of stop consonants – i.e. [ATTACK], [TOUCH], [EXPLODE], etc. – have the highest degree of saliency among the sound/meaning components of Thai consonants. By saliency, it includes the order of occurrence, clearness, and loudness.

However, it does not mean that the less salient sound will be abandoned. Examples of word formation using stop and nasal consonants in section 4.2 c) indicate the possibility of using the more salient consonant for the word-initial position and the less salient one for the word-final position.

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