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# Lexical Representation in Korean: Evidence from the Tip of the Tongue Phenomenon<sup>1</sup>

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## 1. Introduction

The ‘tip of the tongue (henceforth TOT) phenomenon’ is a natural occurrence in speech production planning. The TOT phenomenon refers to the situation in which speakers cannot recall the complete phonological form of an intended word although they are sure that the word is known. In this state, speakers often retrieve a partial phonological form or other information related to the target word while they are trying to recall it. The information that is produced during word search functions as a window to lexical representation and language processing. Most TOT studies have been done in English or German, and there are no published TOT studies based on Korean. The current study attempts to answer questions regarding lexical representation in Korean, using the TOT experimental paradigm. Below are the specific research questions of this study:

- (1) Research questions of the current paper
  - a. What phonological information is stored in lexical representations?
  - b. Do specific underlying phonological representations posited for Korean words have any cognitive validity?
  - c. Does the origin of words influence the structure of lexical representations in the mental lexicon? If yes, how does this affect the lexicon?
  - d. What is a proper model of lexical representation and retrieval for Korean?

In section 2, I give an overview of previous TOT studies with respect to current research questions. In section 3, I describe the TOT experiment designed for the current study. In section 4, I report the results in terms of aspects of the retrieved information. In section 5, I address the research questions listed in (1) above by elucidating the TOT data and relating them to models of lexical representation. Finally, in section 6, I provide a conclusion and make suggestions for future research.

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<sup>1</sup> I would like to express my gratitude to Dr. Jeri J. Jaeger for her insightful advice.

## 2. Review of Tip of the Tongue studies

Among studies on the TOT phenomenon, the earliest experiment, considered the prototype for future experiments, was performed by Brown and McNeill (1966). In their experiment, the Ss were presented with 49 definitions of low-frequency words and then asked to recall the target words. At that time, those who could not think of the words but felt sure that they knew them were requested to write down certain aspects of the target words or to list other words that struck them as similar. Ss retrieved phonological details such as the number of syllables, the initial or final letter of a given word, the syllabic stress, etc. Brown and McNeill concluded that the more easily retrieved properties of low-frequency words carry more information than other properties and are thus paid more attention in speech perception. They suggested a model of lexical representation and access; their “faint-entry” theory assumes that a lexical item is represented in a multiply indexed format in the mental lexicon.

Koriat and Lieblich (1975) found that Ss often correctly retrieved final letters of target words when they simply guessed information about target words, which was interpreted as signaling a “correlation between semantic and structural information in word-final positions.”

Jones and Langford (1987) argued that words being generated for production are first activated in the semantic component of the lexicon, with the activation then spreading to the phonological component, as mentioned in Morton’s modified logogen model (Morton 1979, Jones, 1985). The Transmission Deficit Model of TOTs<sup>2</sup> proposed by Burke et al. (1991) also distinguished the semantic system from the phonological system. They posited several nodes within each system; from top to bottom: propositional node, lexical nodes, syllable nodes, phonological nodes, and feature nodes.

## 3. Methodology

### 3.1. Subjects

A total of 20 native Korean speakers (10 males and 10 females) who had been recruited from University at Buffalo participated in the experiment. Their ages ranged from 23 to 40. All Subjects (henceforth Ss) had a high degree of education; 14 spoke the Seoul dialect of Korean, and 6 spoke the North Kyungsang dialect.

### 3.2. Materials

The materials consisted of definitions of 60 Korean words. They include 15 native Korean (henceforth NK) words, 25 Sino-Korean (henceforth SK) words<sup>3</sup> and 20 recent loan (henceforth RL) words. To increase the probability of the TOT state,

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<sup>2</sup> This model was developed from the Node Structure Theory suggested by MacKay (1987), which is an interactive activation model of language production and perception.

<sup>3</sup> SK words refer to words borrowed from Chinese several hundred years ago. Since they have been used for a very long time, they are not considered RL words.

the materials consisted of mid-frequency words<sup>4</sup>. They were all uninflected nouns including both monomorphemic and multimorphemic nouns. The number of syllables of the words ranged from 2 to 5.

### **3.3. Procedures**

The Ss were tested individually and the whole session was recorded. Each subject was presented with 60 definitions in a random order. As soon as they heard each definition, the Ss were directed to say the target word. If they felt that they did not know a word, they said so and skipped over the word. However, if they felt that they had gone into the TOT state, they were asked to both speak out loud and write down everything that occurred to them about the word; they were allowed at most three minutes to find the target word. After three minutes, I read out the target word, and then the Ss in the TOT state were asked to report whether it was the word they were searching for. If they reported it was not the word, they were asked whether they had been searching for a different word, or had simply guessed several aspects of the target word.

## **4. Results**

### **4.1. General results**

The responses of each S to each definition were classified into the six categories given in (2) below, which are based on the five categories defined by Kohn et al. (1987):

(2) Types of Ss' search state

- a. Don't know: S felt that s/he did not know the target word. This was verified when the word was read out by the experimenter.
- b. Guess: S did not search for any particular word, but provided some aspects that they guessed.
- c. Negative TOT: S was searching for an incorrect target word.
- d. Positive TOT: S was searching for the correct target word, but did not produce the target word.
- e. Final Success: S finally produced the target word within the allotted period of time after experiencing the TOT state.
- f. Immediate Success: Ss recalled the target word immediately after hearing the definition.

I counted how many Ss declared themselves to be in one of the four 'search states': guess, negative TOT, positive TOT, final success. The table in (3) below summarizes Ss' responses in terms of search state.

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<sup>4</sup> Because there are currently no documented references concerning frequency of Korean words, I had two Korean linguists screen the original word list consisting of 129 words and then judge word-frequency based on their language usage and linguistic knowledge. I only included words that they judged as mid-frequency words.

## (3) Distribution of search states of 20 subjects for 60 target words

	Guess	Negative TOT	Positive TOT	Final success	Total
No. of cases	15	55	234	92	396

In this study, I only included the responses that subjects produced when they were in positive TOT state or final success state to ensure that subjects were looking for correct target words. The raw data collected from my TOT experiments are categorized according to the common attributes of Ss' responses. The categories of responses are defined in (4) below.

## (4) Categories of responses according to their attributes

a. Number of syllables: Ss attempted to retrieve how many syllables the target words had.

e.g. When the target word /kol.mu/ 'thimble' induced the TOT state, seven Ss recalled that it was a disyllabic word.

b. Words of similar sound (henceforth SS word): Ss produced complete words during the search, which did not completely match the target word but were phonologically similar to the target words<sup>5</sup>. When they produced words, they said that the words were either right or fairly similar to target words in sounds. SS words could be either a real word or a non-existent word.

e.g. When the word /pok+c<sup>h</sup>ε<sup>6</sup> 'fee for having one's fortune told' induced the TOT state, three Ss recalled a real word /pok.cu/, which is phonologically related to the target word in that it has the same number of syllables and the first syllable is identical.

c. Phonological fragments: Ss attempted to retrieve part of a word: a single consonant (henceforth C), a single vowel (henceforth V), sub-syllabic unit, and syllable.

e.g. When the word /sin+mun+ko/ 'drum which people hit to complain of an injustice' induced the TOT state, two Ss recalled that it ended in /ko/.

d. Other phonological information: Ss attempted to retrieve phonological information other than specific C, V, sub-syllabic fragment, and syllable.

e.g. When the word /sa+li/ 'relic of the Buddha' induced the TOT state, a S said that there was no aspirated sound in the target word.

e. Non-SS word: Ss produced words, but these words were not phonologically similar to the target words. In some cases, Ss immediately mentioned that the words were incorrect and phonologically unrelated to the targets.

e.g. When the word /tε.nim/ 'traditional pant-leg ties' induced the TOT state, a S recalled a word /ko.rim/ 'breast-tie', which is semantically related in that both are the names of ties attached to Korean traditional dress.

<sup>5</sup> The criterion for SS word as opposed to non-SS word was that the retrieved words should match at least one syllable or two separate segments in target words.

<sup>6</sup> In this paper, I transcribe a palatal affricate as /c/ for typographic simplicity.

f. Other non-phonological information: Ss attempted to retrieve non-phonological information such as word origin class regarding target words.

e.g. When the word /ə+jonj/ ‘government use’ induced the TOT state, a S mentioned that the target word was a Sino-Korean word.

Reflecting the specific categorizations defined in (4) above, the table in (5) shows how many responses there were in each category regardless of the correctness of the responses. Note that in many cases, a single S provided more than one responses when s/he experienced the TOT state.

(5) Distribution of responses according to categories

	No. of responses	% of responses
a. Number of syllables	232	34%
b. SS word	155	23%
c. Phonological fragments	148	21%
d. Other phonological information	22	3%
e. Non-SS word	101	15%
f. Other non-phonological information	27	4%
Total	685	100%

As shown in (5), the distribution of the response categories is as follows: number of syllables>SS words>phonological fragments>non-SS word>others.

#### 4.2. Number of syllables

Responses involving the number of syllables are summarized in (6) below.

(6) Total responses involving the number of syllables

Actual numbers	Responses					Total	Correct	Mode	Mean	Difference <sup>7</sup>
	1	2	3	4	5					
2	1	<b>80</b> <sup>8</sup>	18	1	0	100	80%	2	2.19	+0.19
3	0	6	<b>60</b>	8	2	76	79%	3	3.08	+0.08
4	0	2	15	<b>29</b>	6	52	56%	4	3.75	-0.25
5	0	0	2	1	<b>1</b>	4	25%	3	3.75	-1.25
Total	1	<b>88</b>	95	39	9	232	73%			

The table in (6) above shows that as the number of syllables in target words increases, accuracy of responses drops. In order to compare recall of the number of syllables for NK, SK and RL words, I separated the figures into three groups according to word origin. In NK words, the number of syllables was correctly retrieved 63% of the time; in SK words, 85% of the time; in RL words, 63% of

<sup>7</sup> ‘Difference’ means difference between means and actual number of syllables.

<sup>8</sup> The numbers in boldface in the table are the number of correct responses.

the time. To see if there is an association between word origin class and tendency of correctness in responses, a two-way chi square test was performed. The statistical result tells us that there is an association between them ( $\chi^2(2)=14.897$ ,  $p<.001$ ). Specifically, the number of syllables is more accurately retrieved in SK words than in NK or RL words.

#### 4.3. Phonological units involved in fragment

I examined what kinds of units were involved in fragments that subjects retrieved during the TOT state. The table in (7) presents the results of the analysis.

(7) Types of phonological units regardless of location

		Single C	Single V	Body	Syllable	Total
Total	Attempt	10 (6%)	6 (3%)	7 (4%)	159 (87%)	182 (100%)
	Correct	10 (7%)	6 (4%)	7 (5%)	120 (84%)	143 (100%)

As seen in (7) above, the phonological units retrieved were Syllable>Single C>Body (CV-)>Single V. Interestingly, the unit of rhyme (-VC) was not involved.

#### 4.4. SS word

I have investigated the extent to which the number of syllables in SS words matched the number of syllables in target words in comparison with the case of non-SS words. The table in (8) presents the result.

(8) Match in the number of syllables in SS words and non-SS words

	Same number	Different number	Total
SS words	117 (75%)	38 (25%)	155 (100%)
Non-SS words	56 (56%)	44 (44%)	100 (100%)

The differences between same number of syllables and different number of syllables are significantly associated with the category of SS words and non-SS words ( $\chi^2(1)=10.577$ ,  $p<.001$ ).

The table in (9) shows the number of complete matches of whole syllables in the same location in target words and SS words.

(9) Syllable match in SS words

	Initial syllable	Medial syllable	Final syllable	Total
NK	8 (25%)	5 (16%)	19 (59%)	32 (100%)
SK	18 (21%)	15 (17%)	53 (62%)	86 (100%)
RL	25 (33%)	36 (48%)	14 (19%)	75 (100%)
Total	51 (26%)	56 (29%)	86 (45%)	193 (100%)

The figures in (9) above can only be interpreted with reference to the possible number of matches. In order to calculate this figure, I counted the number of

initial, medial, and final syllables in target words. The count of possible matches is given in (10) below, by word origin.

(10) Possible numbers of syllable matches, by syllable location and by word origin

	Initial syllable	Medial syllable	Final syllable	Total
NK	15 (39.5%)	8 (21%)	15 (39.5%)	38 (100%)
SK	25 (37.5%)	17 (25%)	25 (37.5%)	67 (100%)
RL	20 (28.5%)	30 (43%)	20 (28.5%)	70 (100%)
Total	60 (34.5%)	55 (31%)	60 (34.5%)	175 (100%)

Looking first at NK words, it can be seen that the final syllables were recalled more often than would be expected by frequency of occurrence (59% match vs. 29.5% occurrence). Similar figures were found for SK words, with an even more pronounced effect of final-syllable recollection (62% match vs. 37.5% occurrence). A different pattern was found for the RL words. Initial syllables rather than final syllables matched more often than would be predicated by the frequency figures (initial=33% match vs. 28.5% occurrence).

#### 4.5. Phonological fragments

I have examined the responses where Ss in the TOT state produced parts of words. The table in (11) below summarizes the cases in which an entire syllable in the response matched a syllable in the target word.

(11) Syllable match regardless of correctness of locations in SK and RL words<sup>9</sup>

	Initial	Medial	Final	Total
SK	12 (29%)	6 (15%)	23 (56%)	41 (100%)
RL	12 (63%)	7 (37%)	0 (0%)	19 (100%)

With SK words, final syllables were much more frequently retrieved correctly. Conversely, initial syllable match was most predominant in RL words. This finding in SK and RL words corresponds to the result displayed in (9) in that the final syllable is more correctly retrieved in SK words and the initial syllable is more correctly retrieved in RL words.

#### 4.6. Other

There were other types of responses involving other phonological information illustrated in (4d), non-SS words in (4e), and other non-phonological information in (4f). However, they did not fall into any particular patterns, so will not be further discussed in this paper.

<sup>9</sup> Note that as there were only 5 cases of syllable match in total in NK words, NK words are not considered here.

## 5. Discussion

### 5.1. Lexical representation in Korean

This section addresses the first research question in (1) by examining Ss' responses regarding phonological information. As presented in section 4, responses that Ss provided while in the TOT state included the number of syllables, SS words, phonological fragments, phonological information such as categorical or positional information of segments, non-SS words, and other non-phonological information. Based on these results, I will discuss how robustly these various linguistic properties are represented in the phonological form of the mental lexicon.

#### 5.1.1. Syllables

This section concerns recollection of the number of syllables. From prior studies, it is known that, in English, the number of syllables is one piece of phonological information that is usually easily retrieved in the TOT state. The current study shows that this is also true for Korean. As presented in (5), one third of the total responses were concerned with the number of syllables in the target word. Not only did Ss frequently try to recall the number of syllables, but they also recalled this figure quite accurately. Furthermore, the argument that the number of syllables is robustly represented in the lexical entries is also supported by the fact that SS words (75%) had the same number of syllables as target words more often than non-SS words (56%).

Strictly speaking, however, the number of syllables was correctly retrieved 85% of the time in SK words, while it was correctly retrieved 63% of the time in NK and RL words, respectively. This result suggests that syllables of SK words are more robustly represented in the mental lexicon than those of NK and RL words. In other words, it appears that SK words are clearly represented syllable by syllable in the mental lexicon, allowing speakers to easily count the number of syllables in their minds even when they cannot recall the complete phonological form. The most likely explanation for this involves the morphological structure of SK words; each syllable exactly corresponds to an individual morpheme in SK words. For example, the disyllabic word /p<sup>h</sup>uŋ+kjəŋ/ 'wind-bell' consists of two morphemes; the first syllable corresponds to a morpheme /p<sup>h</sup>uŋ/ 'wind' and the second syllable corresponds to a morpheme /kjəŋ/ 'hand-bell.' Based on the fact that each syllable matches an individual morpheme in SK words, it can alternatively be said that SK words are represented morpheme by morpheme in the lexicon and speakers count the number of morphemes in their minds rather than the number of syllables. However, since Ss quite accurately recalled the number of syllables of NK and RL words as well as SK words, I would argue that syllables of words are represented in the lexicon regardless of word origin classes. In addition to that, I argue that the unique word structure of SK words contributes to frequent and correct retrieval of the number of syllables.

Another piece of evidence for the representation of syllables comes from analyzing phonological units involving fragments. The most frequent unit involving fragments that were correctly retrieved was syllable (84%). Hence, one could argue that Ss were more likely to access a node for an entire syllable than individual segments, or body, or rhyme.

Finally, evidence for syllables is found in the deletion of syllables in retrieved words. Ss often retrieved partial phonological forms while leaving out some segments. When phonological units were deleted, these units tended to be a syllable in the word's underlying form. For instance, a S produced [k<sup>h</sup>e.si.c<sup>h</sup>i] in search of word /k<sup>h</sup>e.si.t<sup>h</sup>ə.ne.c<sup>h</sup>i/ 'castanets', but dropped the third and fourth syllables.

I have shown that the syllable is a predominant unit in phonological representations in the Korean mental lexicon and so phonemes are grouped by syllables at some level in the phonological representations. In addition, words are hierarchically organized according to syllable level and individual segment level. This conforms to one of the arguments proposed by Fay and Cutler (1977) to some extent. Fay and Cutler argued from malapropism data that "the major partitioning of the dictionary seems to be by number of syllables.... (p. 516)"

### **5.1.2. Syllable structure**

In order to investigate syllable structure consistency, SS words of the same number of syllables were analyzed. Target words and SS words in underlying forms if available were compared by syllables from left to right. The calculation system was as follows: common syllabic slots that were occupied in both target and SS word were counted and then divided by the number of all possible syllabic slots. The syllable structure consistency between SS words and target words were 83.4%, while the consistency between non-SS words and target words were 69.9%. This difference was significant ( $\chi^2(1)=4.7, p<.03$ ). These figures argue that at least the syllable structure slots of 'onset', 'glide,' 'nucleus' and 'coda' are represented in phonological representations.

### **5.1.3. Segments**

Ss frequently attempted to recall individual segments of target words and also often produced SS words where some of segments are identical with those of targets. There is no doubt that individual segments are stored in phonological representations.

### **5.1.4. Prosody**

There were no responses involving prosodic information of targets in Korean, as opposed to English where people often recalled the location of primary stress of target words or produced words that had the primary stress on the same syllable as the target word. This suggests that in Korean prosodic information is either not represented in the lexicon or at least not strongly represented in the lexicon.

## 5.2. Cognitive validity of underlying form posited for Korean words

Concerning the second research question about the cognitive validity of the underlying forms, one could argue that the underlying forms are too abstract and that speakers actually store forms more similar to the surface forms. To resolve this controversy, I have analyzed the SS words and the phonological fragments only when there was a difference between the posited underlying forms of the target words and the surface forms of the responses to examine cognitive validity of underlying forms. Compare the targets with the responses in (12-14).

(12) Phonological process involving the target: Tensification

a. target /nak+kwan/ [nak.k'wan]<sup>10</sup> 'painter's sign and seal'

b. fragment [kwan]

(13) Phonological process involving the target: Place assimilation

a. target /in+kam/ [iŋ.gam] 'registered seal impression'

b. SS word [kwa.nin] ~ /kwan.in/<sup>11</sup> 'official seal'

(14) Phonological process involving the target: Palatalization

a. target /sin+mun+ko/ [sim.muŋ.go] 'drum which people hit to complain of an injustice'

b. SS word [səŋ.muŋ.go] nonce word

Responses in (12-14) above showed that underlying forms posited for target words correspond to the Ss' phonological representations, i.e., the underlying forms have cognitive validity.

## 5.3. Effects of word origin on syllable retrieval

In this section, I discuss how the word origin affects syllable retrieval, which is the third research question. As seen in (11), the final syllable was most correctly retrieved in SK words, while the initial syllable was more correctly retrieved in RL words. For example, when the target word /c<sup>h</sup>ən+toŋ+səl/ 'Geocentricism (universe+movement+theory)' induced the TOT state, Ss often recalled the final syllable /səl/ 'theory' only. This is best explained by the fact that final syllables in most SK multimorphemic nouns represent the superordinate component of the words. Therefore, it is argued that a syllable representing superordinate component of a word may be robustly represented in the mental lexicon, which suggests that there is more than one way to arrange phonological specification in the phonological representation as opposed to the left-to-right listing hypothesis argued by Fay and Cutler (1977)<sup>12</sup>.

<sup>10</sup> The apostrophe as in [nak.k'wan] traditionally represents a tense sound in Korean.

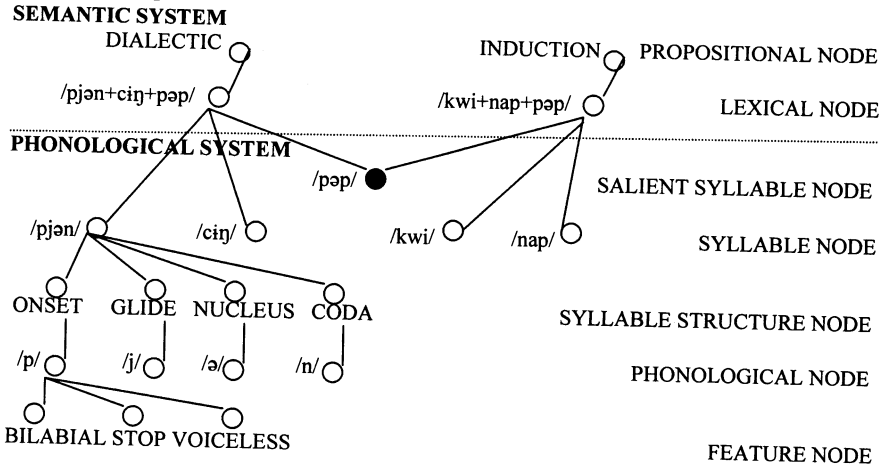
<sup>11</sup> The syllabification of the SS word /kwan.in/ is based on how Ss wrote down the word in Korean.

<sup>12</sup> Fay and Cutler (1977) hypothesized that in the mental dictionary, "words are arranged by phonemic structure, in a left-to-right manner" and "the words that begin with the same phoneme are listed together, those that have the same second phoneme form a subcategory of that class, and so on."

**5.4. Model of lexical representation and retrieval in Korean**

Based on the findings of the TOT experiment in Korean, I propose a model of lexical representation and retrieval for Korean which was developed from the Transmission Deficit Model proposed by Burke et al. (1991) and Rastle and Burke (1996). As an example, the figure in (15) below illustrates the lexical representation of a SK word.

(15) Hypothetical lexical representation of the multi-morphemic SK word /pjən+ciŋ+pəp/ 'dialectic'<sup>13</sup>



It should be noted that the final syllable is connected to a syllable node, illustrated with black color, which I call the 'salient syllable node.' This syllable is readily retrieved because of the meaning structure discussed in section 5.3. Furthermore, unlike Rastle and Burke's model for English, there is no information about stress available under syllable nodes. Also, Rastle and Burke grouped VC together forming a 'vowel group' at the level of phonological nodes, whereas I do not since there is no obvious reason to believe that the rhyme has special status in the Korean mental lexicon.

**6. Conclusion**

The current study attempted to resolve several issues regarding lexical representation in Korean by using the TOT method. This experiment confirmed that some phonological aspects such as the number of syllables are easily retrieved. However, it was argued that prosodic information is not strongly represented in the Korean lexicon. The data proved that underlying forms posited for target words have cognitive validity. I have also shown that phonological representations may partly differ according to word origin due to different

<sup>13</sup> /pjən/ stands for 'identification'; /ciŋ/ for 'evidence'; /pəp/ for logic.

meaning structure. Finally, I proposed a model of lexical representation and retrieval for Korean on the basis of the findings.

For future research, it would be interesting to collect naturalistic TOT data and examine any significant difference between experimental data and naturalistic data. It would also be useful to test the TOT phenomenon cross-linguistically in order to determine the universality and specificity of lexical representation.

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