

# On Internal Syllable Structure of Korean\*

## -with reference to external evidence-

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### 1. Introduction

This paper is primarily concerned with arguments justifying the internal structure of phonological representations of nonlinear phonology with special respect to Syllable Structure using 'external evidence'.

First, I will discuss the internal structure of syllables in Korean. Under the view that syllables are a well-defined unit in phonology, I will argue that syllables are internally organized on a hierarchical basis to give explanatory adequacy as well as descriptive adequacy in phonology. If syllable structure is hierarchical, the next question is whether it is universal for the nucleus and coda to be grouped together. In order to answer this question, I will address various theoretical arguments concerning internal syllable structure. I will also explore some of linguistic and psycholinguistic implications of the internal syllable structure of Korean experimentally, and provide external evidence which sheds light on the nature of syllable structure, such as blending, language games, and speech errors found in Korean.

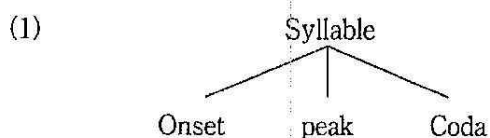
### 2. Internal Syllable Structure

In this section, special focus will be given to the internal structure of syllables; how

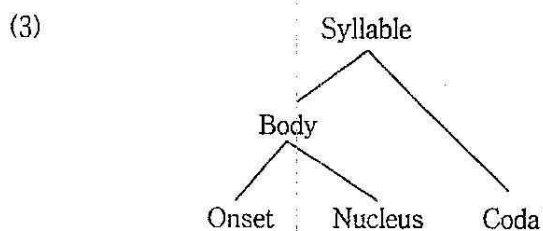
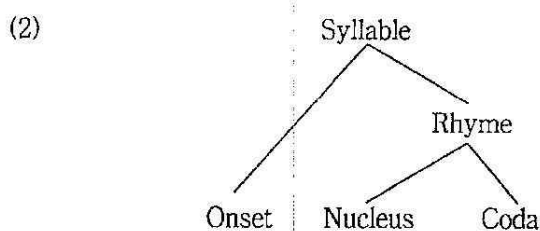
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are syllables organized internally? Various suggestions have been made for incorporation of syllable structure into phonological theory, and the problem as to how syllables are internally organized has received considerable attention in recent phonological theory. As far as the internal structure of syllables is concerned, there are two different alternatives. One is flat structure in which the constituents such as an onset, a peak and a coda, are immediately dominated by the syllable node, which is referred to as flat structure, as illustrated in (1):



Kahn (1976), Davis (1985), and Clements and Keyser (1983) among others claim that there is no intermediate constituent between the syllable level and the terminal constituents such as an onset, a peak and a coda. The other is hierarchical structure, in which that two constituents, either a nucleus plus a coda or an onset plus a nucleus, form a unit under the syllable node, as illustrated in (2) and (3), respectively:



MacKay (1972), Selkirk (1978, 1982), McCarthy (1979), Halle and Vergnaud (1978, 1980), Fudge (1968, 1987), Treiman (1983, 1985, 1986, 1988) among others argue for the

rhyme. In particular, MacKay (1972), Vergnaud (1978), and Fudge (1987) consider the rhyme to be universal. Another view of the hierarchical structure of syllables, called body structure, as illustrated in (3), has been suggested by McCarthy (1976), Bach and Wheeler (1981), Vennemann (1984) and Ahn (1987), all of whom assume, without giving any decisive evidence, that the structure given in (3) may be just one of possible hierarchical structures.

In the flat structure of syllables illustrated in (1) there is no significantly different relationships between a nucleus and an onset as well as between a nucleus and a coda. On the other hand, in the hierarchical structure of syllables given in (2) a nucleus is more closely related to a coda than to an onset, while in (3) a nucleus is more closely related to an onset than to a coda. Those in favor of the structure (1), therefore, argue that since there are many possible interactions among constituents other than those between a nucleus and a coda, the flat structure of syllables is the only possibility to allow those interactions. However, the conclusion drawn from those who argue for the structure (2) or (3) is based on the claim that there is overwhelmingly systematic evidence, although it is true that there is a very small number of exceptions, in supporting rhyme or body as a phonological unit. In what follows, I will assume that syllables are internally organized on a hierarchical basis to give explanatory adequacy as well as descriptive adequacy in terms of linguistic and psycholinguistic points of view since the flat structure fails to capture linguistically significant generalization. In the following section, more emphasis will be given to the structure of (3) by providing some external evidence from Korean.

### 3. Body-Coda Division: Evidenced from Korean

In the preceding section we have assumed that the hierarchical structure of syllables makes possible to capture linguistically significant generalization. If syllable structure is hierarchical, then the next question is whether it is universal for the nucleus and coda to be grouped together, as MacKay (1972), Halle and Vergnaud (1978) and Fudge (1987) claim. In what follows, I will argue that in Korean an onset and a nucleus should form a constituent, called body, as repeatedly illustrated in (3)

above.

First of all, two experiments, blends and insertion, will be carried out to provide psychological reality of subsyllabic constituents in Korean. As Ohala (1986:10)<sup>1</sup> explicitly points out, the observation made during experiments make possible to 'eliminate all anticipated potential distortions that might render their evidential value ambiguous.' Following these experiments, I will provide external evidence that sheds light on the nature of syllable structure, such as language games, abbreviation phenomena, poetic device and speech errors found in Korean. Let us briefly consider why these can be used as relevant evidence that bears on the nature of syllable structure. First, one of the most common mechanism used in language games is affixing. If a language-specific sequence of segments are infixed in a language, it is reasonable to consider that the infixed word is inserted between subsyllabic constituents. Secondly, MacKay (1972) claims that when abbreviations (shortening) take place within a syllable, they rarely break up the natural units in syllable. Thirdly, repetitions of a specially specified part within syllable in folk songs or poems show apparent evidence that bears on subsyllabic constituency. Finally, speech errors are provided for a very important source of external evidence for the reality of phonological constituents since a segment of a sequence of segments involved in speech errors comprises a single constituent (see Fromkin 1973; David 1985; Shattuck-Hufnagel 1982; Stemberger 1983).

### 3.1. Blends

I carried out an experiment, blending, on Korean syllable structure to determine whether the internal structure proposed by Fudge (1987) is universal, or different in different languages. Blending is an experiment by which subjects presented two words create a new word by taking part of each word. In order to support the fact that internal evidence in favor of the distinction between an onset and a rhyme in English

<sup>1</sup> Ohala (1986) gives experiments the highest rating 9.5 of reliability on a scale of 10 since they provide evidence for the highest quality. For the rest of external evidence, he rates the evidence from surface patterns at 1.0, sound change at 2.0, poetry at 4.0, speech errors 7.0 and word games at 8.0, respectively.

comes primarily from co-occurrence restrictions, Treiman (1983, 1986) presents several experiments, hypothesizing that the subsyllabic constituents such as an onset and a rhyme should be easily blended than nonsyllabic constituents. For example, in Treiman (1983), subjects were told to blend the pairs of CCVCC nonsense syllables into one new syllable by taking parts of each syllable. The results were consistent with the hypothesis that subjects preferred to blend the first two CC of the first syllable into the VCC sequence of the second syllable. A similar experiment to that of Treiman (1983, 1986) was carried out with the hypothesis that if Koreans prefer a body and coda division (Body/Coda division), then they tend to blend an onset and a nucleus of the first syllable into a coda of the second syllable.

### Experiment 1

#### Procedure

Three pairs of CVC syllable were presented to subjects, who were told they would hear a pair of nonsense word three times on each trial. Their task was to create one new word by taking part of each word. The new word should be ordered in a way that the part taken from the first word was to be followed by the part taken from the second word. If the subject blended the first two phonemes of the first word with the third phoneme of the second word, it was represented CV/C, called CV/C Blending. On the other hand, if the subject blended the first phoneme of the first word with the last two phonemes of the second word, it was represented C/VC, called C/VC Blending. Our null hypothesis maintained that subjects would prefer CV/C Blending and C/VC Blending with equal frequency.

Each subject was tested individually with oral presentation with the experimenter. If subjects' responses did not match the possible responses given in Table 1, the experimenter repeated the instruction until the subject gave one of the possible responses. No practice was given before experiment.

### Stimuli

The stimuli for this experiment were a 3 pairs of CVC syllables. All their possible responses were nonsense words in order not to create a bias towards favoring the real words in their responses. Table 1 shows the stimuli and their corresponding responses.

Table 1: Stimuli and possible responses

Stimuli	Responses	
	CV/C	C/VC
/kal/, /həm/	/kam/	/kəm/
/tok/, /nup/	/top/	/tup/
/sin/, /ciŋ/	/siŋ/	/siŋ/

In the stimuli given in Table 1, each phoneme in a CVC syllable was selected based on the frequency at each position in order to minimize the tendency towards selecting relatively frequent phonemes. That is, in Korean, /k, h, t, n, s, c/, /a, ə, o, u, i, i/, /n, l, ŋ, m, k, p/ are the most frequent 6 phonemes in the onset, nucleus, and coda, respectively. In addition, there are two different types of orthographic letters in Korean; one is letters containing a horizontal vowel, in which a vowel is located under an onset consonant, while the other is those containing a vertical vowel, in which a vowel is positioned to the right of an onset consonant. In order to minimize the possible tendency in favor of one of each mode, three vowels out of six (/a, ə, i/) are selected among horizontal vowels and rest of them (/o, u, i/) are selected among vertical vowels.

### Subjects

The subjects chosen in this experiment were native Korean speakers. To avoid the possible influence of age, schooling and sex differences, 10 male and 10 female graduate students attending at the University of Minnesota, from 25 to 33 years of age, were selected.

## Results

The number of subjects, based on their responses to stimuli, is shown in Table 2.

Table 2: Number of subjects based on their responses

Responses		No. of subjects
CV/C	C/VC	
3	0	11
2	1	5
1	2	4
0	3	0

Table 2 shows that 11 subjects out of 20 blended the first two phonemes of the first word with the third phoneme of the second word (CV/C Blending), and they never blended the first phoneme of the first word with the last two phonemes of the second word (C/VC Blending). 5 subjects out of 20 showed CV/C Blending two times, and C/VC Blending once. 4 subjects out of 20 showed CV/C Blending once, and C/VC Blending two times. It should be noted that no subject responded with only C/VC Blending. The responses in favor of CV/C Blending outnumbered C/VC Blending about four to one. The Wilcoxon signed-ranks test was also carried out, claiming that the null hypothesis must be rejected and the results of Table 2 was significant ( $W=20$ , the critical value of  $W$  for  $n=20$  at a 5 percent level is 52). Therefore, it might be safe to conclude that Korean indicates a clear preference of body as a unit.

## Discussion

Similar experiments were carried out by Treiman (1983, 1986) to provide strong linguistic and psycholinguistic evidence for the internal syllable structure of English which was composed of an onset and a rhyme. The stimuli were 30 pairs of CVC syllables, falling into 5 conditions according to their initial consonants and the subjects were 20. Table 3 shows the mean number of C/VC Blending, CV/C Blending and other responses<sup>2</sup> in each condition.

<sup>2</sup> The 'other' responses observed in the experiment were mostly blends of the first two phonemes of the first word with the first phoneme of the second word due to the subjects'

Table 3: Mean no. of C/VC, CV/C and other responses

Condition	Responses		
	C/VC	CV/C	Other
stop	4.25	1.45	.30
fricative	4.55	1.20	.25
nasal	4.80	1.25	.00
liquid	4.65	1.15	.20
glide	4.95	1.05	.00

Unlike the similar experiment held in Korean, the results in Table 3 show that C/VC Blending outnumbered CV/C Blending about four to one. Another similar experiment undertaken by MacKay (1972) was concerned with the question as to whether breaks more often preceded than followed the vowel within a syllable by analyzing 46 synonymic intrusion, by which he meant the resulting word shell from an involuntary combination of shout and yell. The results of the experiment are as follows:

Table 4: Within syllable breaks: preceding vs. following the vowel

	Breaks before the vowel	Breaks after the vowel
No. of occurrence (%)	70	30

According to the results in Table 4, 70% of the remaining breaks within syllables immediately preceded the vowel, whereas 30% immediately followed it. Consequently, from the results in Table 2, it is apparent that the responses in favor of CV/C Blending outnumbered C/VC Blending in Korean, indicating a clear preference of Body/Coda division. On the other hand, the results in Table 3 and 4 apparently show that Onset/Rhyme division is clearly preferred in English.

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misunderstanding of the experiment. Unlike the experiment in Korean, the subjects' 'other' responses were not corrected in this experiment.



### 3.2. Language Games (Insertion)

Language games, sometimes called word games, ludling, secret languages, speech disguise or language play, include any creative use of languages beyond the mere communicative purpose of ordinary language use (see Farb 1973; Kirshenblatt-Gimblett 1976 and Nilsen and Nilsen 1977 for general discussion). According to Laycock (1972), there are four different types of language games: expansion (or, affixation), contraction (or, deletion), substitution and rearrangement.

These games are coded by a linguistic rule with which people in a given society share, either consciously or unconsciously. Therefore, language games have been widely used to support linguistic units as being psychological real, proving or revealing the ways in which the linguistic units can be manipulated in a variety of contexts (Sierzer 1991). According to Treiman (1986), MacKay (1972), and Fudge (1987), for example, language games that treat onsets and rhymes as units should be preferred to games that break up onsets and rhymes. It is not uneasy to find these language games in favor of Onset/Rhyme division in English. One of the most popular language games in English is the so-called Pig Latin game, according to which the initial consonant moves to the final position, creating a new syllable with a vowel *ay*. The word, *Pig*, for example, is coded as *Ig Pay*. Likewise the so-called Cockney rhyming slang (Fudge 1987) and *ap*-insertion game (Burling 1970 and Fudge 1987) imply Onset/Rhyme division since in the Cockney rhyming slang game, the initial consonant is replaced with new consonant, and in the *ap*-insertion language game, *ap* is inserted immediately before the vowel of each syllable. However, Laycock (1972) reports another language game for English, which implies, as opposed to the games above, Body/Coda division; the sequence of *g* and a vowel reduplicated from the immediately preceding vowel is inserted after each vowel<sup>3</sup>. For example, the phrase 'Shall we go away' is realized as 'Shagall wege gogo agawaygay'. Based on these language games in English, Davis (1985:180) concludes:

<sup>3</sup> However, the so-called *gV* language game is very uncommon so that not only are most native English speakers unfamiliar with the game, but they also make lots of mistakes when asked to do the game.

From the above examples it seems that language games provide contradictory evidence for hierarchical syllable structure. The language game evidence, though, can be better understood not as providing evidence for the rhyme or the body, but rather, as providing evidence for each of onset, nucleus, and coda.

Davis' conclusion may be true but fails to capture linguistically significant generalization that if a language-specific sequence of segments are infixes in a language, it is reasonable to consider that the infixes tend to be inserted between sub-syllabic constituents. Consider what Fudge (1987:375) argues:

Once again, the important fact is not the existence of game (even when they both occur within the same language), but the balance between them over the totality of languages: if games in which Peak+Coda behave as a unit are markedly more numerous than those in which Onset+Peak belong together (and, such does appear to be the case), then the reality of the Rhyme receives further support.

What follows is concerned with the language games found in Korean, arguing for Body/Coda division. Among above four types of mechanisms usually employed in language games, Korean language games make use of expansion and substitution to the best of my knowledge. As for expansion, some interesting language games in Korean are provided by Gim (1987). First, in the so-called 'nosa-language game', *nosa* is inserted after the vowel of phrase initial CVC syllable words so as to break up existing syllables in the following manner (citing Ahn1988).

- (4)     $c^h\text{əl-su-nin o-nil hak-kyo-e an-kan-ta.}$   
        $\rightarrow c^h\text{ənsal-su-nin onosa-nil hanosak-kyo-e anosan-kan-ta.}$   
       'Chulsu does not go to school today.'

As (4) illustrates, *nosa* is inserted between the first two phonemes (CV) and the last phoneme (C) in syllables like *chəl* and *hak*. *nosa* is also inserted after a vowel as in *o* and after a vowel and before a consonant as in *an*, indicating that there must be a break between a vowel and following consonant in Korean. Another popular language game in Korean is the 'pV-insertion game', in which /p/ and an echoed vowel from the preceding syllable are inserted immediately after a vowel. Let us repeat the sentence given in (4) for the sake of convenience.

- (5) c<sup>h</sup>əl-su-nin o-nil hak-kyo-e an-kan-ta.  
 -> c<sup>h</sup>əɾəl -supu-nipin opo-nipil hapak-kyopyo-epe apən-kapən-tapa.

Korean language games also make use of substitution, in which [N] substitutes for the syllable-final consonant. If there is no syllable-final consonant, it remains unchanged as follows:

- (6) c<sup>h</sup>əl-su-nin o-nil hak-kyo-e an-kan-ta.  
 -> chəɾl-su-niŋ o-niŋ haŋ-kyo-e aŋ-kaŋ-ta.

Based on the language games given in (4) and (5), Ahn (1988) claims that games in which an onset and a nucleus behave as a single constituent lend support to Body/Coda division as the basic internal division in Korean. However, this claim seems to be a little flawed since the inserted words such as *nosa* and *pV* begin with a consonant. In other words, the words with a initial consonant are never allowed to be inserted after the first consonant (onset) due to the fact that the resulting consonant cluster in onset position is the violation of Korean phonotactics. Thus it seems to be possible to argue that the language games in (4) and (5) might show a bias toward inserting the words, *nosa* and *pV*, after a vowel, which is the only place not to violate Korean phonotactics.

The purpose of the following experiment is thus to see if the preference for the Body/Coda division still holds for the insertion of words beginning and ending with a vowel. The stimuli for this study were three CVC syllable words and the inserted word was *isi*

## Experiment 2

### Procedure

The subjects were told that they would hear one CVC syllable word on each trial, and that their task was to create one new nonword by inserting *isi* either after the first consonant (onset) or before the second consonant (coda). If the subject inserted *isi* after the first consonant, it was represented CV/C. On the other hand, if the subject inserted *isi* before the second consonant, it was represented C/VC.

Each subject was tested individually with the experimenter. If subjects' responses did not match the possible responses given in Table 5, the experimenter repeated the instruction until the subject gave one of the possible responses. Our null hypothesis maintained that subjects would insert *isi* either after the first consonant or before the second consonant with equal frequency.

### Stimuli

The stimuli for this experiment were three CVC syllable words. All their possible responses were nonsense words. Table 5 shows the stimuli and their corresponding responses.

Table 5: Stimuli and possible responses

Stimuli	Responses	
	CV/C	C/VC
sap	saisip	sisiap
ton	toisin	tision
mul	mujsil	mijsul

### Subjects

The 10 subjects used in this experiment were identical to those selected in Experiment 1.

Results and Discussion

The number of subjects, based on their responses to stimuli, is shown in Table 6.

Table 6: Number of subjects based on their responses

Responses		No. of subjects	
CV/C		C/VC	
3	0	14	
2	1	5	
1	2	1	
0	3	0	

Table 6 shows that 14 subjects out of 20 inserted *isi* before the second consonant (CV/C), and they never inserted *isi* before the first consonant (C/VC). 5 subjects out of 20 showed *isi* insertion before the second consonant two times, and after the first consonant once. Only 1 subject out of 20 more often inserted *isi* after the first consonant twice; no subject inserted *isi* exclusively after the first consonant. The Wilcoxon signed-ranks test was also carried out to prove the significance of the results of Table 2 ( $W=3.5$ , the critical value of  $W$  for  $n=20$  at a 5 percent level is 52), thus the null hypothesis must be rejected.

From the results in Table 6, which are exactly analogous to those drawn from the Korean language games and Experiment 1, it is apparent that the responses in favor of *isi* insertion before a coda outnumbered those after an onset, indicating a clear preference for body as a unit in Korean.

### 3.3. Speech Errors

Speech errors in English, often involving the exchange of segment(s), have been exhaustively discussed to provide the psychological reality of phonological rules, phonemes and distinctive features (Fromkin 1971) and that of subsyllabic constituents (MacKay 1972; Stemberger 1983; Fudge 1987; Kubozono 1989). Ohala (1986:9) explicitly argues for the use of speech errors as evidence for the psychological reality:

Speech errors do have the overriding advantage that they are completely natural and spontaneous and presumably give insight into the psychological structures and processes actually used by native speakers in the generation of speech.

For example, Stemberger (1983) provides the evidence for the existence of ambisyllabic consonants in English, arguing that consonants interact with each other. Kubozono (1987) also makes use of speech errors as evidence for the reality of mora in Japanese, arguing that long syllables (bimoraic) tend to be replaced by either long syllables or two adjacent short syllables (two mono-moraic), but it is very rare that long syllables are replaced by a short syllable. It is therefore assumed that the segment(s) involved in speech errors form subsyllabic constituents.

Based on this assumption, Fudge(1987) reanalyzes Fromkin (1973) to see if there is any strong tendency toward favoring certain types of subsyllabic constituents. Following is slightly modified and simplified Table from Fudge (1987:372) for better understanding:

Table 7: Errors in Fromkin (1973)

Switch point	No. of occurrences(%)
CV/C	24 (13%)
C/V(C)	109(60%)
Ambiguous	50 (27%)

Table 7 shows that errors made on the nucleus and coda boundary outnumber those on the onset and nucleus boundary, which may be taken as the evidence in favor of Onset/Rhyme division in English.

Unfortunately, the data as to Korean speech errors available are extremely limited since little attention has been paid to Korean speech errors. Thus a small experiment was carried out with non-words to whether or not the Onset/Rhyme division still holds for Korean speech errors.

In the experiment, a nonsense word was presented to identical subjects to those

employed in Experiment 1 and 2, who were told they would look at a nonsense word written with Korean alphabets on a plain paper. Their task was to pronounce the word simultaneously as soon as they saw the nonsense word and as fast as they can. The stimulus for this experiment was /kamcinkam/. In a casual situation, the word should be pronounced as [kamciNkam] since Coronals assimilate to the following velars in Korean. But 15 subjects out of 20 made a mistake, pronouncing the word as [kamcimkam] where a coronal /n/ assimilates to [m] by the influence of the /m/s located in the coda positions of the preceding and following syllables. Subsequently, a similar experiment was undertaken to see whether we can get the same result on the onset position. The stimulus of the subsequent experiment was /maknicmak/ where the only difference between the stimuli of each experiment is the ordering of consonants; the onset and coda of the first syllable of the first experiment become the coda and onset of the first syllable of the second experiment, respectively, and so on. Interestingly enough, no subject pronounced the nonsense word as [makmicmak]. From these two experiments, it seems to be reasonable to assume that a coda is phonologically relevant, thus being a subsyllabic unit.

This assumption may be further reinforced by the following data collected in such an artificial context that sounds are accidentally confused:

- (7) a. /mal-mæn-mal-mal-t'uk/  
 --> [mal-mæl-mal-mal-t'uk]  
 'a pole to which a horse was kept tied'
- b. /cuŋ-aŋ-chəŋ-chəŋ-chəŋ-sal/  
 --> [cuŋ-aŋ-chəŋ-chəŋ-chəŋ-saŋ]  
 --> [cuŋ-aŋ-chəŋ-chəŋ-chal-sal]  
 --> \*[cuŋ-aŋ-chəŋ-chəl-chəŋ-chal]  
 'an iron blind of the Capital Hall'
- c. /kan-caŋ-kəŋ-caŋ-kəŋ-caŋ-caŋ/  
 --> [kaŋ-caŋ-kəŋ-caŋ-kəŋ-caŋ-caŋ]  
 --> \*[kaŋ-caŋ-coŋ-caŋ-kəŋ-caŋ-caŋ]  
 --> \*[kaŋ-caŋ-kəŋ-caŋ-coŋ-caŋ-caŋ]  
 'a boss of a soy sauce company'

These examples also reveal the same generalization as that drawn from the above experiments since in every error in (7), laterals and/or coronals in the coda positions of a syllable assimilate to nasals and/or velars in the coda position of neighboring syllables. The evidence from Korean speech errors contrasts with the evidence from English in the sense that speech error data in Korean provide no substantial evidence for the existence of an onset or a rhyme but a coda as a syllable unit.

#### 4. Conclusion

In this paper I have argued that contrary to Fudge's (1987) argument that the rhyme structure is universal, there is no universal syllable structure; syllable structure should be parameterized, so that it can have either rhyme structure or body structure in different languages. In order to prove my arguments, some of the linguistic and psycholinguistic implications of the internal syllable structure of Korean have been explored by providing experiments and external evidence. First, I carried out two experiments, blending and isi-insertion, and compared the results from my experiments and those from previous experiments on the internal structure of English Syllables (MacKay 1972; Treiman 1983, 1986), concluding that Onset/Rhyme division is clearly preferred in English, whereas Body/Coda division in Korean. Since two experiments and external evidence given above revealed a great deal of systematic results in favor of Body/Coda division, it would be reasonable to conclude that the internal structure of Korean syllable is different from that of English, arguing against Fudge's claim that Onset/Rhyme division is universal. Instead the onset and nucleus should form a constituent, body, in Korean.

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