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Master's Thesis

# Aspects of the Velar Nasal Consonant in English

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Aspects of the Velar Nasal Consonant in  
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This thesis has been examined and approved.

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## I . Introduction

Phonetic languages are the languages that the spelling and the pronunciation of the language are closely related. For example, it is easy to look at a written word and know almost immediately how to pronounce it in Korean, but things are different in English. In terms of that, English is hardly considered as a phonetic language. English has many inherent uncertainties in that its spelling and pronunciation are not corresponding each other.

Consider the words in (1) below:

- (1) a. bang, ring, sing
- b. anger, linger, finger
- c. banger, ringer, singer

As shown above, words in (1a) have a silent /g/ whereas the /g/ in (1b) are all realized as voiced velar stop. The relationship between spelling and pronunciation in English is anomalous. Incredibly, words in (1c), which have only one letter difference from (1b) (eg. *anger* and *banger*), are pronounced either /ŋg/ or /ŋ/.

Researchers examine to find rules under this asymmetrical relation between English spelling and its pronunciation so that those who speak English as a second language can pronounce an unknown word by means of the rules.

Note, however, that there exist perplexing problems. A typical and mysterious case among them is related to the existence of the velar nasal consonant /ŋ/ - /ŋ/ is one of handful consonant symbols, along with /θ, ð,

ʃ, ʒ/, which can appear in the list of English segments, but never as an English written alphabet. Its phonological behavior is different that of other nasal consonants, /m/ and /n/.

The purpose of this thesis is to explore the real identification of /ŋ/ by analysing the specific distributions of /ŋ/. Moreover, exceptions to Chomsky and Halle(1968)'s /g/-Deletion Rule cannot explained will be discussed. Criticizing the rule-based approach in Sound Pattern of English(SPE), this thesis is an attempt to explain issues of the [ŋg]-[ŋ] alternation in English based on the constraint-based approach.

The organization of this thesis is as follows. In Part II, two major theories about the velar nasal consonant's identity will be briefly reviewed. The Nasal Assimilation Rule and /g/-Deletion Rule in Chomsky and Halle(1968)'s model will be mentioned together. In Part III, the major questions posed in this study will be addressed by using counter examples. Part IV will go further with the two proposals considered in this thesis: one proposal is that /ŋ/ is not a phoneme, and the other is that SPE's rule-based approach cannot apply alternation between /ŋg/ and /ŋ/. Instead of it, it is the Optimality Theory(OT) that will be introduced to have better access to the /ŋg/ and /ŋ/ alternation. Finally, in the last part, there will be a conclusion of this thesis.



## II. Review of previous studies

In this part, scholars' views on the identity of /ŋ/ will be briefly examined. It is generally agreed that there are two major theories on the status of /ŋ/: an allophone as a derived form and a phoneme as one of the segments in the International Phonetic Alphabet(IPA)<sup>1)</sup>. The former is supported by Chomsky and Halle(1968) and Borowsky(1986), whereas the latter by Moore(1969) and Kahn(1976).

### 2.1 /ŋ/ as a derived form

#### 2.1.1 Chomsky and Halle(1968)'s /ŋ/

The real identity of /ŋ/ is vary from scholars to scholars. In the SPE, Chomsky and Halle(1968) claims that /ŋ/ is originally derived from /ng/ and then /g/ drops after [ŋ] sometimes:

"/g/ drops after nasals in word-final position but remains in word-medial position, so that we have [sɪŋ] but [mɪŋɡl] (from underlying /siNɡ/, /miNɡl/, respectively, /N/ being the archi-segment 'nasal consonant'."

(Chomsky and Halle 1968: 85)

The reason assuming the archi-segment /N/ in the phonological

---

1) IPA is the general convention which is particularly adapted to the English language.

representation is that the point of articulation for the nasal is determined by its following consonant (Chomsky and Halle 1968: 116). That is to say, an underlying nasal consonant usually assimilates to an immediately following obstruent consonant. Thus, phonetically, the /n/ in words like *finger* ['fɪŋgə], *hunger* ['hʌŋgə], *ink* [ɪŋk] and *bank* [bæŋk] have the same features with the following stops. Chomsky and Halle(1968) concludes this phenomenon with the rule of nasal assimilation.

(2) Nasal Assimilation Rule:

$$[+nasal] \rightarrow \left[ \begin{array}{l} \alpha \text{ anterior} \\ \beta \text{ coronal} \end{array} \right] / \text{---} \left[ \begin{array}{l} - \text{syll} \\ \alpha \text{ anterior} \\ \beta \text{ coronal} \end{array} \right]$$

According to their argument, the processes that derive /ŋ/ from /ng/ can be formulated as follows (Chomsky and Halle, 1968: 85, 369).

(3) Nasal Assimilation Rule:

$$/n/ \rightarrow /ŋ/ / \text{---} \{k, g\}$$

/g/-Deletion Rule (ordered after nasal assimilation):

$$/g/ \rightarrow \emptyset / /ŋ/ \text{---} \#$$

Based on these processes, "the underlying form of the word, *clung*, for example, is /klʌŋg/, and this form finally become [klʌŋ] by the Nasal Assimilation Rule(3) and dropping the final [g] after the nasal" (Chomsky and Halle 1968: 209). It is worth noting that Chomsky and Halle(1968) claims that /g/ is deleted in a boundary position. In SPE, "boundary" is defined as below;

"The boundary # is automatically inserted at the beginning and end of every string dominated by a major category, that is, by one of the lexical categories noun, verb, adjective, or by a category such as sentence, noun phrase, verb phrase, which dominates a lexical category. "

(Chomsky and Halle 1968: 366)

Based on this universal convention, the placement of the # boundary to word *singing* can be governed as below:

(4) [v # [v # sing # ]v ing # ]v

(Chomsky and Halle 1968: 367)

The # boundary internal to /sing # ing/ causes the deletion of the word-medial /g/ and indicates, that this word is finally pronounced ['sɪŋɪŋ] but not ['sɪŋgɪŋg].

According to the regulation of the SPE, words following the /g/-deletion after nasal assimilation can be divided into two classes: One is monomorphemic /g/-deletion words, and the other is dimorphemic /g/-deletion words. These two kinds of word classes can be illustrated as seen in (5) below.

(5) a. Typical monomorphemic words with /g/-deletion:

king	['kɪŋ]	bang	['bæŋ]	long	['lɔŋ]
ring	['rɪŋ]	rang	['ræŋ]	young	['jʌŋ]
sing	['sɪŋ]	sang	['sæŋ]	strong	['strɔŋ]
wing	['wɪŋ]	vang	['væŋ]	wrong	['rɔŋ]

b. Typical bimorphemic words with /g/-deletion:

bringer [brɪŋər]	banger [ˈbæŋər]	longish [ˈlɒŋɪʃ]
ringer [ˈrɪŋər]	ganger [ˈgæŋər]	youngish [ˈjʌŋɪʃ]
singer [ˈsɪŋər]	hanger [ˈhæŋər]	strongish [ˈstrɒŋɪʃ]
winger [ˈwɪŋər]	sanger [ˈsæŋər]	wrongish [ˈrɒŋɪʃ]

Compared to the words in (5b), there is no morpheme boundary word-internally for words in (6), thus the /g/-deletion cannot be applied to these words.

(6) Typical monomorphemic words without /g/-deletion:

anger [ˈæŋgər]
finger [ˈfɪŋgər]
hunger [ˈhʌŋgər]
linger [ˈlɪŋgər]
monger [ˈmʌŋgər]

Unfortunately, this deletion rule has weakness because words in (7) will challenge the approach given above.

(7) a. longer [ˈlɒŋgər]	b. longest [ˈlɒŋgɪst]
younger [ˈjʌŋgər]	youngest [ˈjʌŋgɪst]
stronger [ˈstrɒŋgər]	strongest [ˈstrɒŋgɪst]
wronger [ˈrɒŋgər]	wrongest [ˈrɒŋgɪst]

As shown above, words like *longer* [ˈlɒŋgər], *longest* [ˈlɒŋgɪst], *stronger* [ˈstrɒŋgər], *strongest* [ˈstrɒŋgɪst], *younger* [ˈjʌŋgər] and *youngest* [ˈjʌŋgɪst] have the /ŋg/ clusters in their morpheme boundary position but /g/-Deletion Rule never applies to these words. It seems that the comparative and superlative forms of adjectives are not subject to the rule

of deleting /g/ after nasal in a morpheme boundary position.

To solve this problem, Chomsky and Halle(1968: 370) suggest to formulate a specific rule which can eliminate #, thereby making the deleting rule /g/ inapplicable to these cases.

Obviously, the words which violate the /g/-deletion regulation have a comparative suffix *-er* or a superlative suffix *-est*. But notice that /g/ drops before *-ing*, *-er*(agentive), *-ed*, *-ly*. Hence the /g/-Deletion Rule should be revised as: /g/ will not be deleted if it followed by a comparative suffix *-er* or a superlative suffix *-est*. However, this view is no more than only referring to the difference of suffix classes, but the internal structure caused by suffixation is not accounted for.

On the other hand, the SPE claims that the elimination of # in these exceptional forms could be carried out in various ways and one possibility is that the rule deleting constituent structure in adjectives must be restricted to monosyllabic adjectives. However, this assertion also brings up another problem. Such that it is paradoxical with the words in (5b), which are repeated here in (8):

- (8) longish [lɔŋɪʃ]  
youngish [jʌŋɪʃ]  
strongish [strɔŋɪʃ]  
wrongish [rɔŋɪʃ]

Obviously, words in (8) are bisyllabic adjectives, but they succeed in the /g/-deletion process. Since this proposal is not feasibly, Chomsky and Halle(1968) insist these problems are not insurmountable. They inspire the scholars to devise more additional rules to account for the exceptions. Therefore, many scholars attempt to find a thorough explanation to distinguish the complex variation between /ŋg/ and /ŋ/. In order to explain

all the exceptions, more and more rules have been proposed. However, the exceptions always exist. It is doubtful if formulating everlasting additional rules is the best way.

### 2.1.2 Borowsky(1986)'s /ŋ/

Another study by Borowsky(1986) suggests that /ŋ/ is not an independent phoneme but a result derived by an assimilation from a consonant consisting of a nasal archiphoneme /N/<sup>2)</sup>.

Here, the nasal archiphoneme /N/, which is equivalent to the archi-segment that mentioned above, is the concept used to represent all nasal sounds when they are not contrastive to each other.

Since this archinasal /N/ only specifies the nasality without any specification of place, the process of Borowsky's opinions can be illustrated as in (9), and the archinasal /N/ receives all the place features from the following obstruent.

(9)

$$N \rightarrow \begin{bmatrix} -\text{ant} \\ -\text{cor} \\ +\text{son} \end{bmatrix} / \text{ \_\_\_\_ } \begin{bmatrix} -\text{ant} \\ -\text{cor} \\ -\text{son} \end{bmatrix}$$

Regard to the /g/-deletion phenomenon, Borowsky(1986) suggests that /g/ deletion is a syllable conditioned rule. /g/ is syllabified and deleted when it

---

2) Nasal archiphoneme, or archinasal, referring to a nasal which only specified for nasality but unspecified for place features.

is tautosyllabic with a preceding nasal, as illustrated in (10).

(10) /g/-deletion:

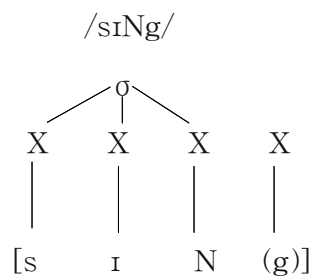
$$/g/ \rightarrow \emptyset / N \text{ \_\_\_ } \sigma]$$

(Borowsky 1986: 72)

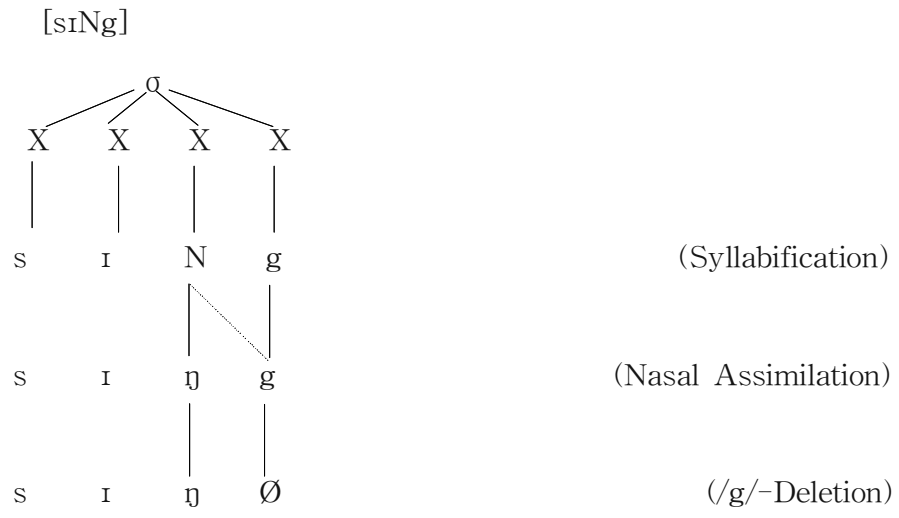
Borowsky(1986) views the English syllable rhyme as consisting of three positions in maximum. In her theory, /g/ retains when it is syllabified at level 1 but deleted when not (Borowsky 1986: 238). Moreover, the rule of Nasal Assimilation may not be applied until level 2 if the trigger obstruent is final since NA requires the obstruent to be metrically associated. Thus in the word final environment, neither syllabification of the obstruent nor assimilation of the nasal, may take place at level 1. At level 2 the consonant stops being extrametrical and may be syllabified and then Nasal Assimilation may take place (Borowsky 1986: 239).

Based on Borowsky's insistence, the derivations of word *sing*, for example, can be illustrated as follows:

(11) Level 1:



Level 2:



As illustrated above, at level 1 the final obstruent /g/ is extrametrical and thus, it is not syllabified. At level 2, /g/ is no longer extrametrical so that the nasal assimilation and /g/ deletion can be applied sequentially.

Further, Borowsky(1986) claims that level 2 is cyclic. The NA and /g/-deletion occur in the first cycle, whereas the suffixation occur in the second cycle. Thus, word like *singer* can be analysed as in (12);

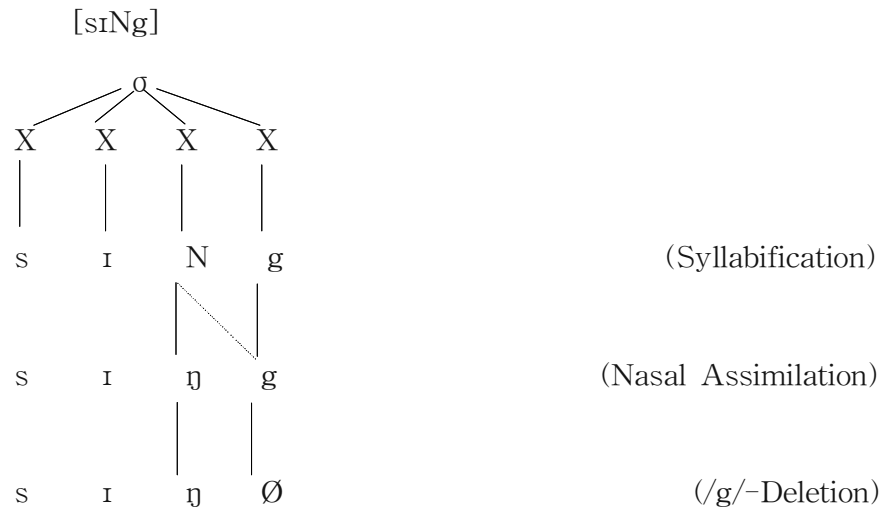
(12) Level 1:



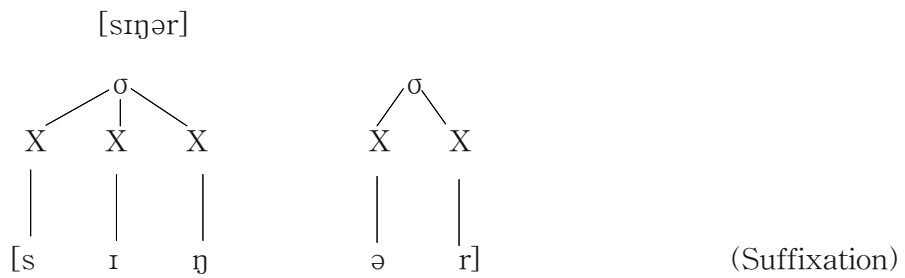
Level 2:

Cycle 1:





Cycle 2:



However, Borowsky's opinions cannot explain the violation of the /g/-deletion for words in (7). Words like *longer*, *younger*, and *stronger*, which also have the underlying /ng/ in a morpheme boundary, will be inconsistent with her insists.

## 2.2 /ŋ/ as a phoneme

Opinions on velar nasal consonant's real identity vary from scholars to scholars. The SPE's proposal seems plausible, but the objections always

exist. This part will examine the theories on the status of /ŋ/ supported by Moore(1969) and Kahn(1976). They insist that /ŋ/ is a phoneme as one of the segments in IPA.

### 2.2.1 Moore(1969)'s /ŋ/

Moore(1969) suggests that there are three nasal consonants in English, labelled as /m/, /n/, and /ŋ/ (as in *thing*). He says, in the articulation of nasal consonants, however, the velum is in the position it occupies in ordinary breathing, and the mouth passage is stopped by the lips or tongue, the closure being made for /m/, /n/, and /ŋg/, precisely as for /b/, /d/, and /g/ (Moore 1969: 3).

Moore(1969) also claims that English has these three nasal phonemes since /m/, /n/ and /ŋ/ are found as contrastive units to distinguish words.

Consider the following words in (13) below.

(13)

ran [ræn]	rin [rɪn]	run [rʌn]	sin [sɪn]	slin [slɪn]
ram [ræm]	rim [rɪm]	rum [rʌm]	sim [sɪm]	slim [slɪm]
rang [ræŋ]	ring [rɪŋ]	rung [rʌŋ]	sing [sɪŋ]	sling [slɪŋ]

As shown above, the data in (13) supports that /ŋ/ as an independent phoneme since the words listed in the column are minimal pairs each other.

Based on Moore's argument, the classification of English consonant phonemes by the IPA can be illustrated in (14). It can be seen that /ŋ/ is

considered as one of the English nasal consonant phonemes by IPA.

(14) (Moore 1969: 17)

	Labial	Labio- dental	Inter- dental	Alveolar	Alveolo- Palatal	Velar
Stops	p b			t d		k g
Fricatives		f v	θ ð	s z	ʃ ʒ	
Affricates					tʃ dʒ	
Nasals	m			n		ŋ

Similarly, many other scholars also acquiesce in the convention that the velar nasal /ŋ/ is a phoneme when they count the number of English phonemes. For instance, Giegerich(1992) lists the basic inventory of consonant phonemes in English as shown in (15) below. Same with Moore's approach, the velar nasal /ŋ/ is regarded as an independent phoneme in this list.

(15) English consonant phonemes: basic inventory(Giegerich 1992: 34).

/p/	pie	Pooh	leap	rip	ripe	
/t/	tie	two		writ	write	mitten
/k/	kye	coo	leak	rick		
/b/	buy	boo		rib		
/d/	die	do	lead	rid	ride	
/g/	guy	goo	league	rig		
/tʃ/		chew	leech	rich		Mitchum
/dʒ/		jew		ridge		pigeon
/m/	my	moue		rim	rhyme	
/n/	nigh	gnu	lean		Rhine	

/ŋ/				<b>ring</b>	
/f/	fie		leaf	riff	rife
/θ/	thigh		Leith		
/s/	sigh	sue	lease		rice
/ʃ/	shy	shoe	leash		
/v/	vie		leave		
/ð/	thy				writhe
/z/		zoo			rise mizzen
/ʒ/					vision
/l/	lie	loo			rile
/r/	rye	rue	leer		
/w/	Wye	woo			
/j/		you			
/h/	high	who			

---

### 2.2.2 Kahn(1976)'s /ŋ/

Another important study which suggests the necessity to regard /ŋ/ as an independent phoneme is presented by Kahn(1976). Kahn dissented from Chomsky and Halle(1968)'s SPE.

At first, Kahn(1976) tries to expand the rule because there are additional exceptions which are not recognized in SPE. He finds [ŋ] in words like *angma*, *angstrom*, *anxiety*, *tungsten*, and *Yngve* not followed by either [g] or #. Thus, Kahn expands the domain of /g/-Deletion as below;

(16) (Kahn 1976: 84)

/ŋg/ → [ŋ] / [ŋ] \_\_\_\_ [C, #]

However, Kahn(1976) soon finds the cases that cannot be explained by rule (16): /ŋ/ is not always tied up with /g/ and it may occur independently between two vowels. Hence he reconsiders the identity of /ŋ/ and suggests it should be regarded as an independent phoneme when and /ŋ/ and /g/ are no longer tautosyllabic. He states:

"... The rule analysis, which derives all [ŋ] from /ng/ in \_\_\_\_[C, #], has no way of accounting for phonetic [VŋV] in those cases in which it is not possible to motivate # between /ŋ/ and the following vowel. As it stands, the constraint analysis, which allows syllable final /ŋ/ (*hang* would be from [hæŋ], for example), predicts that morpheme-internal [VŋV] should be possible. As is well known, there do exist occurrences of this sequence, as in *hangar* [hæŋər]."

(Kahn 1976: 127)

"...if words like *hangar* are not deviant from the point of view of English phonology, then even a rule analysis of the deviance of tautosyllabic [ŋg] must allow underlying /ŋ/. But if /ŋ/ is a phoneme, there is no barrier to its use in the lexical representation of a word like *hang* and in the vast majority of words with phonetic [ŋ]."

(Kahn 1976: 128)

As Kahn suggests, the velar nasal /ŋ/ should be treated as an independent phoneme if the /ŋg/ clusters are heterosyllabic.

### III. Problems

The different views from previous studies has been reviewed. On the one hand, Chomsky and Halle(1968) elaborate the Nasal Assimilation Rule and the /g/-Deletion Rule to explain /ŋ/ is derived from /Ng/ or /Nk/ clusters. Similarly, Borowsky(1986) argues /ŋ/ as a derived form. On the other hand, Moore(1969) and Kahn(1976) states /ŋ/ is not a derived but an independent phoneme. The identification of this velar nasal consonant is different by scholars.

Still, the real identification of /ŋ/ is not clear. If /ŋ/ is an independent phoneme as Moore(1969) and Kahn(1976) suggest, there are some cases that cannot be fully explained by them studies. This part will show two typical problems found in the examination of /ŋ/'s identification: One is whether /ŋ/ is an independent phoneme or not; the other is whether there is a rule apply to all the cases of the alternations between /ŋg/ and /ŋ/.

#### 3.1 Is /ŋ/ a phoneme?

##### 3.1.1 The definition of phoneme

English words change their sounds and spellings as time goes by. Some of today's phonemes are the remnants of earlier, others cannot be found in the history. The most typical example is the velar nasal /ŋ/. Different from

the other nasal phonemes, /ŋ/ is not registered as a phoneme in Old English and Middle English, whereas /m/ and /n/ are independent phonemes consistently from the Old English period to nowadays English. Besides, /ŋ/ has peculiar behaviors which differ from /m/ and /n/.

Before moving to explore the peculiar behaviors of the velar nasal /ŋ/, it is worth looking closely at what it means to be a phoneme.

"Phonemes are contrastive units that are used to distinguish words, and thus represent differences in meaning. If a sound difference gives rise to a meaning difference in at least one pair of words in a language then this sound difference is phonemic in that language."

(Giegerich 1992: 32)

In other words, phonemes are always defined by their distinctive features that allow minimal pairs in a language. For example, /k/ and /g/ are treated as phonemes in English because they allow the exist of minimal pairs like *back* [bæk] and *bag* [bæg]. Based on this, /ŋ/ may be regarded as a different phoneme from /n/ since there are some minimal pairs like *sin* [sɪn] vs. *sing* [sɪŋ], and *ran* [ræn] vs. *rang* [ræŋ].

But, even there is no phonetic velar following /ŋ/ in words like *sing* [sɪŋ], *king* [kɪŋ], and *ring* [rɪŋ], in each of which the word is spelled with a following "g". One possibility is to say that words like *sing* have a silent /g/ at the end, and this silent /g/ gets deleted when it occurs at the end of a word (Roach, 2000: 68). On the other hand, if /ŋ/ is an independent phoneme, it should be similar to other phonemes that under specify one or more allophones (just as /n/, for instance, underlies unreleased allophone [n]). Unfortunately, /ŋ/ has no allophone as opposed to other phonemes.. Thus, /ŋ/ is hard to be regarded as an independent phoneme.

### 3.1.2 Allophonic alternations

Consider the /n/ in the word *tenth*. Is this /n/ independent from the following dental fricative consonant? Obviously, that is not. The surface form of the /n/ in *tenth* is a dentalized [n̪]. Gimson(1980) assumed the unreleased [n̠] and dentalized [n̪] alternation in *ten/tenth* is an allophonic alternation.<sup>3)</sup>

If this is the case, then the alternation between unreleased [n̠] and velarized [n̠ˠ] should also be regarded as an allophonic alternation. Consider the following two pairs of words in (17) below;

- (17) a. ten [tɛn]  
tenth [tɛn̪θ]
- b. ban [bæn]  
bank [bæn̠k]

As discussed above, the [n̪] in *tenth* is derived to from its underlying form by application of the dentalization rule. The dentalized [n̪] is never regarded as an independent phoneme. In the same manner, the surface velarized form [n̠ˠ] which is derived from the underlying /n/ in *bank*, is not likely to be assumed as an independent phoneme either.

Another pair of words is more persuasive than (17).

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3) Allophonic alternations refer to the alternation between the two allophones of the same phoneme.



- (18) pan      cake      vs.      pancake  
       [pæn]    [keɪk]                [pæn<sup>v</sup> keɪk]

When *pan* and *cake* are pronounced carefully as independent words, they are [pæn keɪk]. On the other hand, for the compound word *pancake*, speakers often anticipate the place of articulation of the [k] to the previous [n]. Thus, it can be heard as [pæn<sup>v</sup> keɪk] in which [n<sup>v</sup>](or labelled the [ŋ] is velarized). If the dentalized [n̪] is not an independent phoneme, how can the velarized nasal become an independent phoneme /ŋ/? It is difficult to regard an assimilative form as an independent phoneme.

Compare the allophonic dentalized [n̪] to the velarized [ŋ] in phrases as words below:

- (19) Assimilated forms(phrases): allophonic dentalized [n̪] and velarized [ŋ]

Phrases	Assimilated Forms	Allophonic Results
on <sup>←</sup> the top	[aŋ ðə tɒp]	dentalized [n̪]
in <sup>←</sup> the box	[ɪŋ ðə bɒks]	dentalized [n̪]
in <sup>←</sup> camera	[ɪŋ kæməɾə]	velarized [ŋ]
in <sup>←</sup> contact with	[ɪŋ kəntækt wɪθ]	velarized [ŋ]
in <sup>←</sup> Cologne	[ɪŋ kələʊŋ]	velarized [ŋ]
in <sup>←</sup> group	[ɪŋ grʊp]	velarized [ŋ]

(20) Assimilated forms(words): allophonic dentalized [ŋ] and velarized [ŋ]

Words	Assimilated Forms	Allophonic Results
dozenth ↖	[dʌzəŋθ]	dentalized [ŋ]
eleventh ↖	[ɪlevəŋθ]	dentalized [ŋ]
enthuse ↖	[ɪŋθuz]	dentalized [ŋ]
fifteenth ↖	[fɪftɪŋθ]	dentalized [ŋ]
month ↖	[mʌŋθ]	dentalized [ŋ]
millionth ↖	[mɪljəŋθ]	dentalized [ŋ]
ninth ↖	[naɪŋθ]	dentalized [ŋ]
anger ↖	[æŋ gər]	velarized [ŋ]
finger ↖	[fɪŋ gər]	velarized [ŋ]
longer ↖	[lɒŋgər]	velarized [ŋ]
stronger ↖	[strɒŋgər]	velarized [ŋ]
blank ↖	[blæŋk]	velarized [ŋ]
crank ↖	[kræŋk]	velarized [ŋ]
pink ↖	[pɪŋk]	velarized [ŋ]
sank ↖	[sæŋk]	velarized [ŋ]

As shown above, there is no doubt that velarized nasals are produced in

the same phonological process as dentalized nasals, resulting in the allophonic alternation.

However, scholars like Moore(1969) and Kahn(1976) insist velarized nasal consonant differ from dentalized nasals. Thus, based on their views, velarized nasal consonant should be an independent phoneme, labelled as /ŋ/. The data in (20) suggests that these scholars' approaches seem to be failed in persuasiveness and proof.

### 3.2 Issues of the alternation between /ŋg/ and /ŋ/

As mentioned before, Chomsky and Halle(1968) propose two rules to account for /ŋg/ and /ŋ/ alternations.

(21) Nasal Assimilation Rule:

/n/ → [ŋ] / \_\_\_\_\_ {k, g}

/g/-Deletion Rule:

/g/ → Ø / [ŋ] \_\_\_\_\_ #, C

Unfortunately, sometimes these rules do not work feasible. Based on their rules, words like *younger* and *stronger* are expected to pronounced as \*[jʌŋɚ] and \*[strɔŋɚ], with the deletion of /g/ as *young* [jʌŋ] and *strong* [strɔŋ]. However, the onstruent /g/ is not deleted in these words. Chomsky and Halle insist these problems are not insurmountable. As a solution, they inspire the scholars to devise more additional rules to account for the exceptional situations. However, the exceptions always exist. Is there a rule apply to all the cases of /ŋg/ and /ŋ/ alternations?

### 3.2.1 The diachronic alternation between /ŋg/ and /ŋ/

This part will show the diachronic change in the /ŋg/ and /ŋ/ alternation. It was not until the early Modern English period that the /g/-deletion was always available to apply the /ŋg/ clusters. The /g/-deletion is not found in Old English or in Middle English.

#### 3.2.1.1 The Old English Period (449-1100)

"The consonant segments in Old English are *b, c, d, f, g, h, l, m, n, p, r, s, t, þ* or *ð, w, x, and z*" (Algeo. J & Butcher. C. A. 1976: 94). Obviously, /ŋ/ is not an independent phoneme in Old English. Besides, in Old English, the alternation between /ŋg/ and /ŋ/ does not exist.

That is to say, "in the combination *ng* (as in *bringan* 'to bring' and *hring* 'ring'), the letter *g* indicated the same [g] sound - that of Modern English *linger* as contrasted with *dinger*. Consequently, [ŋ] was not a phoneme in Old English, but merely an allophone of /n/. There were no contrastive pairs like *sin-sing* and *thin-thing*, nor were there to be any until the Modern English loss of [g] in what had previously been a consonant sequence [ŋg]" (Algeo. J & Butcher. C. A. 1976: 95).

Here are a few examples of Old English [ŋg] easily found in *Beowulf*<sup>4)</sup> *Genesis*<sup>5)</sup>, and *Prodigal Son (Luke 15)*<sup>6)</sup>, with a translation of each line

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4) *Beowulf*, translated by William Ellery Leonard(1923).

5) The lines of *Genesis* are excerpted from *The Origins and Development of the English Language*(Algeo J. & Butcher C. A. 1976: 117)

6) *Prodigal Son (Luke 15)*, edited by Walter W. Skeat(1871).

and its probable pronunciation representation.

(22) *Beowulf*, 3, 2794–2795, 3180.

a. hū ða æþelingas ellen fremedon! (Beowulf, 3)

[hu: θa: æθelɪŋgas æ:l:en fræmɛdɔn]

How the princes courage accomplished!

b. Ic ðāra frætwa Frēan ealles ðanc, (Beowulf, 2794)

[ɪtʃ θa:ra frætwa fræ:n æ:l:ɛs θaŋk]

For these treasures, Lord, all thanks

c. Wuldur-cyninge. (Beowulf, 2795)

[wuldur kynɪŋgɛ]

to the King of Glory.

d. cwædon þæt hē wære wyrudcyninga. (Beowulf, 3180)

[kwædɔn ðæt hi wære wiruld kynɪŋgɑ]

they said that he had been of world-kings.

(23) *Genesis*, 1.1, 2.1.

a. On angynne gesēop God heofonan and eorðan. (Genesis, 1.1)

[an aŋgynɛ gɛsia:p gad heafonan ænd earðan]

In (the) beginning created God heavens and earth.

b. Heofonans and eðore and eall heora frætewung. (Genesis, 2.1)

[heafonan ænd earðan ænd æ:l:ɛ heara frætewʊŋg]

Heavens and earth and all their ornaments.

(24) *Prodigal Son*(*Luke 15*), 13, 17, 20–22.

- a. ealle his þing gegaderode se gingra sunu (Luke, 13)  
 [æ:l:ɛ hɪs θɪŋg gɛgɑdɛrɔdɛ ðɛ ɡɪŋgrɑ sunu]  
 all his things gathered the younger son
- b. ēalā hū fela yrðlinga on mīnes fæder hūse (Luke, 17)  
 [æ:l:a hu: fɛla yrðlɪŋg on mɪnɛs fædɛr hu:sɛ]  
 alas how many farm workers in my father's house
- c. āstyred and ongēan hine (Luke, 20)  
 [ɑ:styred ænd oŋgæn hine]  
 stirred and toward him
- d. Ic syngode on heofon. (Luke, 21)  
 [a:k syŋgɔdɛ on hɛafon]  
 I sinned against heaven.
- e. Bringað hræðe. (Luke, 22)  
 [brɪŋgɑð hræðɛ]  
 Bring quickly.

Chomsky and Halle(1968) proposes two rules to account for surface [ŋ] – the Nasal Assimilation Rule and the /g/-Deletion Rule. However, as shown above, the underlying /ng/ cluster in Old English only refers to the Nasal Assimilation Rule. That is to say, in Old English, the underlying /ng/ derived to the surface [ŋg], but it is never changes into a surface form [ŋ]. The [ŋ] is merely an allophone of /n/ in Old English.

### 3.2.1.2 The Middle English Period (1100-1500)

Middle English is a period with great literary achievements. One of the representative authors of this period in the history of English is Geoffrey Chaucer. Following are some examples taken from the prologue to Chaucer's *Canterbury Tales*<sup>7)</sup>. The phonetic transcription and the translation follows the selections. All of these samples contain at least a /ng/ cluster. Note that the /g/-deletion does not happen in the pronunciation of /ng/ cluster.

#### (25) *Canterbury Tales*

- a. A **yong** Squyer (*Canterbury Tales*, 79)  
[a ju**ng** skwi:'e:r]  
A young Squire.
- b. Of his stature he was of evene **leng**the, (*Canterbury Tales*, 83)  
[of his sta:'tiu:r he: was of ε:ven le**ng**θe]  
In his stature he was of middle height.
- c. And wonderly deliver, and greet of streng**th**e. (*Canterbury Tales*, 84)  
[and wunderli de'livr, and gre:t of ste**ng**θe]  
And wonderfully active and great of strength.
- d. **Sing**ing he was, or floy**ti**ng, al the day; (*Canterbury Tales*, 91)  
[si**ng**i**ng** he: was, or floi**ti**ng, al θe dai]  
He was singing, and fluting, all the day.

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7) *Canterbury Tales*, edited with introduction and notes by Sanki Ichikawa(1926).

- e. He sleep namore than dooth a nightingale. (*Canterbury Tales*, 98)  
 [he: sle:p na'mɔ:r θan do:θ a nictiŋ'gɑ:lɛ]  
 He slept no more than does a nightingale.
- f. That of hir smyling was ful simple and coy; (*Canterbury Tales*, 119)  
 [θat of hir smi:liŋg was ful simpl and koi]  
 Her smiling was full of simple and coy.
- g. Ful wel she song the seivice divyne, (*Canterbury Tales*, 122)  
 [ful we:l fe: sɔ:ŋg θe servi:se di:vi:ne]  
 Full well she sang the divine service.
- h. Ne wette hir fingres in hir sauce depe. (*Canterbury Tales*, 129)  
 [ne wet hir fiŋgres in his sause de:pe]  
 nor wetted her fingers deep in her sauce.
- i. That in hir coppe was no ferthing sene. (*Canterbury Tales*, 134)  
 [θat in hir kuppe was nɔ: ferðiŋg se:ne]  
 that in her cup there was seen not a bit of grease.
- j. And ther-on heng a broche of gold ful shene, (*Canterbury Tales*, 160)  
 [and θɛ:ron he:ŋg a brɔ:tʃ of go:ld ful ʃe:ne]  
 And thereon hung a brooch of gold full bright.
- k. Ginglen in a whisting wind as clere, (*Canterbury Tales*, 170)  
 [dʒiŋglen in a hwistliŋg wi:nd as kle:re]  
 jingle in a whistling wind as clear.



- l. This ilke monk leet olde **thinges** pace,                   (*Canterbury Tales*, 175)  
     [θis ilke muŋk le:t ɔ:lde θiŋges pa:se]  
     This is to say, a monk out of his cloister.
- m. Of priking and of hunting for the hare,               (*Canterbury Tales*, 191)  
     [or prikiŋg and of huntiŋg for θe ha:re]  
     In tracking and in hunting for the hare.
- n. Ther-to he strong was as a champioun.               (*Canterbury Tales*, 239)  
     [θer'to: he strɔŋg was as a tʃampi'u:n]  
     Moreover he was strong as a champion.

As shown in the data above, the alternation between /ŋg/ and /ŋ/ does not happen even in Middle English. Similar to Old English, the underlying /ng/ in this period only refers to Chomsky and Halle(1968)'s Nasal Assimilation Rule. The /g/-Deletion Rule will not be executed after /ng/ derived to [ŋg]. Moreover, the [ŋ] is an allophone of /n/ rather than an independent phoneme in Middle English.

### 3.2.1.3 The Modern English Period (1500-present)

According to the literary records, the origin of the /g/-deletion in /ng/ cluster is traced back to the times of Early Modern English.

"Many spellings and rhymes in our older literature testify to the orthodoxy of what is popularly called 'dropping the g'..... For instance, Swift wrote

the couplets:

'See then what mortals place their **bliss in!** /

Next morn betimes the bride was **missing'** (*Phyllis*)

and the delicate:

'His jordan [*chamber poy*] stood in manner **fitting** /

Between his legs, to spew or **spit in**" (*Cassinus and Peter*)'."

(Algeo. J & Butcher. C. A. 1976: 164)

According to the passage from Shakespeare's *As you like it*, as seen in (26), the phonetic transcription<sup>8)</sup> indicates that the /g/-deletion was probably current in the late sixteenth and early seventeenth centuries.

(26) *As you like it*

a. Mewling and punking in the nurse's arms.

[mjʊ: lɪn ən pju:kŋ ɪn ðə nɜ:rsɪz armz]

b. Then the whining schoolboy, with his satchel

[ðen ðə hwɪnɪŋ sku:bɔɪ wɪð (h)ɪz sætʃəl]

c. And shining morning face, creeping like snail

[ən ʃəɪnɪŋ mɔ:rnɪŋ fe:s kri:pɪŋ ləɪk sneɪl]

d. Sighing like furnace, with a woeful ballad

[saɪɪŋ ləɪk fɜ:məs wɪð ə wo:ful bæləd]

f. Seeking the bubble reputation

[si:kɪŋ ðə bʌbl rɛpətɛ:ʃɪən]

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8) These phonetic transcriptions noted for the same selection by Bronstein A. J. (1960: 289).

As the data shown above, it was not until the Early Modern English period that the /g/-deletion was always apply to the /ng/ segments. It is worth noting that even the /g/-deletion applied to the /ng/ cluster in Early Modern English, but the Nasal Assimilation was not apply to /ng/ cluster in this period.

Further evidence for the /g/-deletion is from Late Modern English work by Alexander Pope.<sup>9)</sup>

(27) *Epistle to Robert Harley*

a. Such were the notes thy once-loved poet **sung**

[sʌtʃ wə(r) ðə no:ts ðʌɪ wʌns lʌvd pɔɪt sʌŋ]

b. Till Death untimely stopped his tuneful **tongue**.

[tɪl dɛθ ʌntʌɪmlɪ stɔpt hɪz tjʊnfl tʌŋ]

As fas as that the /g/-deletion is devided into two periods: Early Modern English(1500-1700) and Late Modern English(1700-present). In Early Modern English, as well illustrated in Shakespeare's *As you like it*, the /g/-deletion occurred with no its previous application of nasal assimilation. In Late Modern English, however, the /g/-deletion came up with the nasal assimilation.

The diachronic change in /ŋg/ and /ŋ/ can be illustrated as in table 3.2 below.

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9) This quotation of Alexander Pope, *Epistle to Robert Harley*, is from Bronstein A. J. (1960: 290)

Table 3.2 The diachronic change in /ŋg/ and /ŋ/

Old-Middle English (490-1500)	Early Modern English (1500-1700)	Late Modern English (1700-present)
Nasal Assimilation	* Nasal Assimilation	Nasal Assimilation
/g/-Deletion	/g/-Deletion	/g/-Deletion
/ŋg/ → [ŋg]	/ŋg/ → [n]	/ŋg/ → [ŋ]

### 3.2.2 The synchronic alternation between /ŋg/ and /ŋ/

In current English, /ŋ/ is commonly spelled with the two consecutive letters, n and g. The /ŋg/ clusters were pronounced /ŋ/ or /ŋg/, depending on different phonological. As seen so far, scholars attempt to offer a thorough rule system to account for the alternation between /ŋg/ and /ŋ/. However, the exceptions which cannot be solved by the given rules appear constantly. Theoretically, if the /ŋg/ cluster comes in the final of a monomorphemic words, it is always pronounced /ŋ/; if the /ŋg/ cluster comes in the boundary position of bimorphemic words, it should be pronounced /ŋ/; if the /ŋg/ cluster occurs in the medial of monomorphemic words, it has to be pronounced /ŋg/. Besides, some words are pronounced either /ŋ/ or /ŋg/.

Regarding the pronunciation of the /ŋg/ sequence, the words of /ŋg/ clusters can be classified into three groups:

(28) a. /ng/ only pronounced /ŋ/:

(monomorphemic words contain boundary /ng/)

bang [bæŋ]  
hang [hæŋ]  
rang [ræŋ]  
lung [lʌŋ]  
ding [dɪŋ]  
king [kɪŋ]  
ring [rɪŋ]  
ting [tɪŋ]  
bring [brɪŋ]  
cling [klɪŋ]  
sling [slɪŋ]  
spring [sprɪŋ]

(bimorphemic words containing boundary /ng/)

cangue [kæŋ]  
harangue [hə'ræŋ]  
meringue [mə'ræŋ]  
tongue [tʌŋ]  
Bingham [bɪŋəm]  
Binghamton ['bɪŋəmtən]  
Washington ['wɑʃɪŋtən]  
Springfield ['sprɪŋfild]

(inflectional endings added to words above):

lungs [lʌŋz]  
kings [kɪŋz]

rings [riŋz]  
 tings [tiŋz]  
 springs [sprɪŋz]  
 cangues [kæŋz]  
 harangues [hə'ræŋz]  
 meringues [mə'ræŋz]  
 tongues [tʌŋz]  
 sitting ['sɪtɪŋ]  
 coming ['kʌmɪŋ]  
 going ['gʊʊɪŋ]  
 picking ['pɪkɪŋ]  
 ganger ['gæŋə]  
 ringer ['rɪŋər]

**b. /ŋg/ only pronounced /ŋg/:**

(monomorphemic words containing medial /ŋg/):

angora [æŋ'gɔ:rə]  
 dinger ['dɪŋgər]  
 hunger ['hʌŋgər]  
 languet ['læŋgwet]  
 linguini ['lɪŋgwɪni]  
 mingle ['mɪŋgəl]  
 merengue [mə'reŋge]  
 pangolin ['pæŋgəlɪn]  
 unguent ['ʌŋgwənt]  
 sangria [sæŋ'griə]  
 tingle ['tɪŋgəl]

(bimorphemic words with the comparative and superlative inflections):

stronger [strɔŋgəɹ]

strongest [strɔŋgɪst]

younger [jʌŋgəɹ]

youngest [jʌŋgɪst]

(bimorphemic words with the added *al*, *ate*, *ation*)

diphthongal [dɪp'θɔŋgɪ]

monophthongal ['mɔnəfθɔŋgɪ]

elongate [ɪ'lɔŋgeɪt]

ingate ['ɪŋgeɪt]

elongation [ɪlɔŋ'geɪʃn]

prolongation [ˌprɔʊlɔŋ'geɪʃn]

(other bimorphemic words)

banging ['bæŋgɪŋ]

Congress ['kɔŋgrəs]

ingress ['ɪŋgrəs]

farthingale ['fɑɹðɪŋgəl]

nightingale ['naɪtɪŋgəl]

Hungary ['hʌŋgəɪ]

hungarian ['hʌŋgəɪrɪən]

mongoose ['mɔŋgʊs]

Mongolian [mɔŋ'gɔʊlɪən]

rangoon [ræn'gʊn]

c. /ng/ pronounced /ŋ/ or /ŋg/:

bringing	[brɪŋɪŋ]	[brɪŋŋɪŋgɪŋ] <sup>10)</sup>
clangor	[klæŋə]	[klæŋgə]
England	['ɪŋlənd] <sup>11)</sup>	['ɪŋglənd]
English	['ɪŋlɪʃ]	['ɪŋglɪʃ]
finger	['fɪŋə] <sup>12)</sup>	['fɪŋgə]
hangar	['hæŋə]	['hæŋgə]
langue	[lɑŋ]	[lɑŋg]
languages	[lɑŋz]	[lɑŋgz]
long	[lɔŋə]	[lɔŋgə]
longer	[lɔŋ]	[lɔŋgə]
sanger	['sæŋə]	['sæŋgə]
sing	['sɪŋ]	['sɪŋg]
singer	['sɪŋə]	['sɪŋgə]
winger	['wɪŋə]	['wɪŋgə]

The data above reveals that the variation of /ŋg/ and /ŋ/ are distributed synchronically. Some words which contain a /ng/ cluster have two alternative pronunciations(/ŋg/ or /ŋ/). It is difficult to make a concrete conclusion that where the /g/-deletion applied.

10) See Browstein(1960: 110). "Central European language speakers tend to pronounce all

/ŋ/ words with [ŋg] or [ŋk]: *singer* as [sɪŋgə], *bringing* as [brɪŋŋɪŋgɪŋ]."

11) See Browstein(1960: 78). "/g/' is commonly lost in *English* and *England* by some educated and many less cultivated speakers."

12) See Browstein(1960: 109).



## IV. Proposal: /ŋ/ is not a phoneme

As discussed in the previous chapter, different people have different views towards the controversy about velar nasal consonant. There is no clear-cut answer yet. This thesis will insist that velar nasal /ŋ/ is not a phoneme. In the ensuing discussion, the constraints and dubious status of /ŋ/ will be illustrated in detail to show that /ŋ/ is different from other nasal phonemes in its phonological behaviors, thus it is hard to be regarded as a phoneme.

### 4.1 The spelling constraints on /ŋ/

To account for the properties which make /ŋ/ differ from the other nasal sounds, unique constraints on /ŋ/ will be discussed below.

As mentioned before, the particular problem with the velar nasal /ŋ/ is the fact that it has a rather strangely restricted distribution compared to the other nasal sounds /m/ and /n/. The most obvious difference between them is phonotactic constraints on /ŋ/. /ŋ/ is not a written alphabet in English. It is always spelled with /n/ in conjunction with /k/ or /g/ in the underlying form. That is to say, /ŋ/ never occurs independently like /m/ and /n/. Both /m/ and /n/ do not need to be bundled up with another segment. They can be placed freely and independently in words initially, medially, and finally, as independent phonemes.

(29)

a. word-initial position

nap        [næp]                map        [mæp]

noodle    ['nu:dl]                mental    ['mentl]

b. word medial position

sinner    ['sɪnər]                summer    ['sʌmər]

winner    ['wɪnər]                women     ['wɪmɪn]

c. word-final position

pin        [pɪn]                    ham        [hæm]

run        [rʌn]                    ram        [ræm]

#### 4.2 The syllabic constraints on /ŋ/

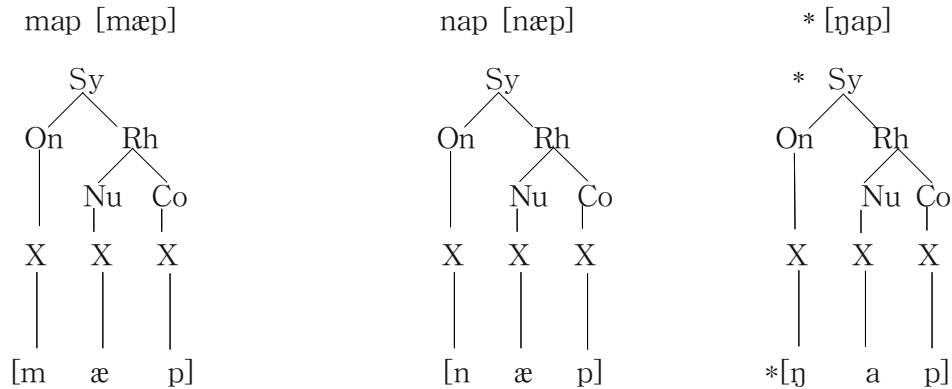
Another important evidence which can prove the velar nasal /ŋ/ is not a phoneme but rather derived from a sequence consisting of /Ng/ or /Nk/, is the complex constraints on /ŋ/ inside a syllable. The constraints on /ŋ/ inside a syllable can be analyzed as below: First, /ŋ/ cannot occur in syllable onset position. Second, /ŋ/ cannot follow the fricative s in a two-X syllable onset position as /m/ and /n/ do. Third, /ŋ/ cannot occur in a syllable nucleus position whereas /m/ and /n/ can. Fourth, /ŋ/ can not occur in a syllable coda position if it is preceded by a long vowel.

#### 4.2.1 Restriction on syllable onset position

As stated before, the velar nasal /ŋ/ has posed analytical problems at various points of the phonemics and phonotactics of English. A case in point is, unlike other nasal phonemes /n/ and /m/, that it cannot occur in syllable onsets.

Note that this standpoint can be exemplified in (30) below.

(30) Syllable structure of [mæp], [næp], and \*[ŋæp]:



In English, syllables starting with /m/ or /n/ are very common, but syllables starting with /ŋ/ do not exist. This constraint on the velar nasals' occurrence is also common in Korean.

According to Chung(2001), Korean prefers a syllable with an onset to an onsetless syllable in a C<sub>1</sub>V<sub>1</sub>C<sub>2</sub>V<sub>2</sub>C<sub>3</sub> string. However, when C<sub>2</sub> is the velar nasal, it is not syllabified as an onset of the second syllable, but is syllabified as a coda of the preceding syllable (Chung 2001: 179). Words in (31) show the onsetless syllable with a preceding /ŋ/ in Korean.

(31) 강아지 (puppy)  
/kaŋaci/ -> [kaŋ.a.ci] \* [ka.ŋa.ci]

농업 (agriculture)  
/noŋŋp/ -> [noŋ.ŋp] \* [no.ŋŋp]

방어 (defence)  
/paŋŋ/ -> [paŋ.ŋ] \* [pa.ŋŋ]

방울 (bell)  
/paŋul/ -> [paŋ.ul] \* [pa.ŋul]

As in the case with /m/ and /n/ in English, note also that in Korean they are likely to be syllabified as the onset. Compare them to words in (32).

(32) 논의 (debate)  
/noni/ -> [no.ni] \* [non.i]

잠옷 (sleepwear)  
/camos/ -> [ca.mot] \* [cam.ot]

The key to the impossible word-initial existence is in the scale of sonority in table 4.2. That is to say, there is no reason to prevent /ŋ/ from occurring in syllable onset if it is an independent phoneme. If /ŋ/ is really an independent nasal phoneme, it is expected to constitute the upward sonority slope required for the syllable-initial consonant clusters. In contrast, if /ŋ/ is no longer a phoneme but rather derived from the sequence /Ng/ or /Nk/, then the reason why /ŋ/ cannot occur in the onset of syllable can be explained.

Table 4.2 Sonority scale (Giegerich, H. J: 1992: 152)

Oral stops		Fricatives		Nasals	Liquids	Semi-vowels	Vowels	
Voiceless	Voiced	Voiceless	Voiced	m	l	j	High	Low
p	b	f	v				n	r
t	d	θ	ð	ŋ			u	o
k	g	s	z				...	...

sonority

This sonority scale can be labelled in a simplified sonority hierarchy, as illustrated in (33) below, which is due to Hogg & McCully(1987: 33).

(33) Hogg & McCully(1987: 33)'s sonority scale:

- Low vowels ⑩
- Mid vowels ⑨
- High vowels ⑧
- Flaps ⑦
- Laterals ⑥
- Nasals ⑤
- Voiced fricatives ④
- Voiceless fricatives ③
- Voiced stops ②
- Voiceless stops ①

If /ŋ/ cannot occur independently, the conventional spellings of \*[ŋap] should be illustrated as \*/Ngap/ or \*/Nkap/. However, /g/ or /k/ is less sonorous than the nasal consonant. That is to say, if /g/ or /k/ follows /N/ in the onset position, then /N/ will fail to conform to the sonority

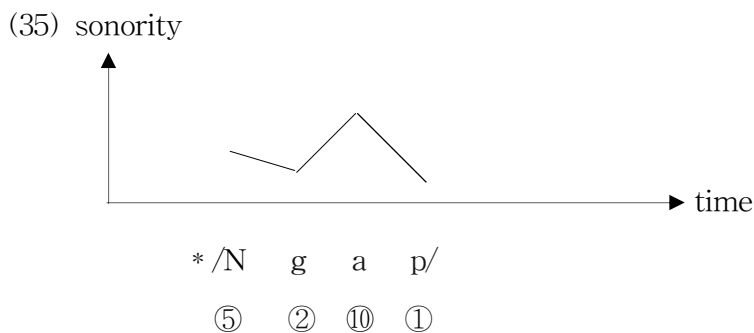
sequencing generalization<sup>13)</sup>, as suggested by Selkirk(1984: 116).

(34) SSG

Sonority Sequencing Generalization (Selkirk, 1984)

In any syllable, there is a segment constituting a sonority peak that is preceded and/or followed by a sequence of segments with progressively decreasing sonority values.

In a rather impressionistic graphic representation, the sonority profile of \* /Ngap/ is illustrated in (35) below.



Obviously, \* /Ngap/ constitutes an additional sonority peak that violates the sonority-based definition of the syllable - A single consonant will always be less sonorous than the peak following it, and if there are two onset consonants, then the first must be less sonorous than the second (which in turn will be less sonorous than the peak). Whatever, English only allows /s/ that can violate the sonority generalization of the onset, such as *stoke* [stɔ:k]. Nasal-plus-stop sequences are impossible in syllable onsets in English. According to the fact that /ŋ/ is restricted to syllable onset position, /ŋ/ can be inferred as a result derived from the

13) Sonority Sequencing Generalization(SSG), is a phonotactic principle that aims to outline the structure of a syllable in terms of sonority.

nasal-plus-stop sequence.

Given this, the reason why /ŋ/ cannot occur in a syllable onset seems to be obvious however. Note, that this constraint is controversial. Consider the words in (36).

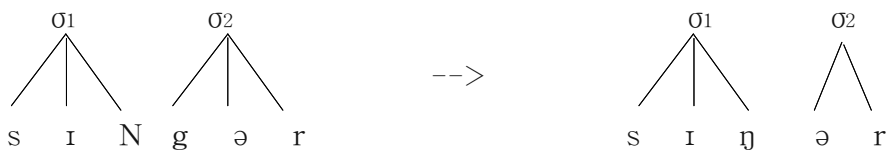
- (36) hangar ['hæŋər]  
 singer ['sɪŋər]

Generally, these words structures can be illustrated as in (36).

- (37) hangar ['hæŋər]



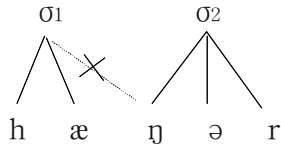
- singer ['sɪŋər]



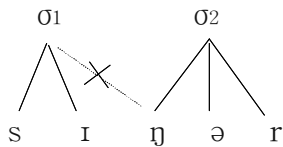
It is interesting to note that /ŋ/ may be supposed to be able to occur in a syllable onset position in these words. That is to say, in order to avoid an onsetless syllable over a syllable boundary, /ŋ/ is expected to fulfill the position of the following onset as in (38). This claim is not without foundation. The Principle of Maximal Onsets(PMO) suggests onsets are

maximized.

(38) hangar [ˈhæŋər]

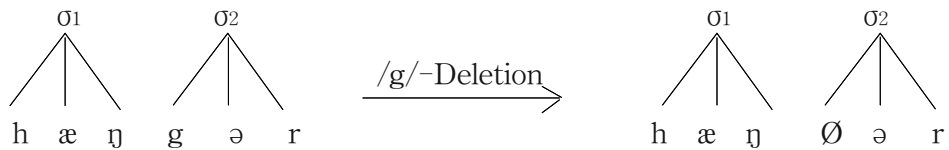


singer [ˈsɪŋər]

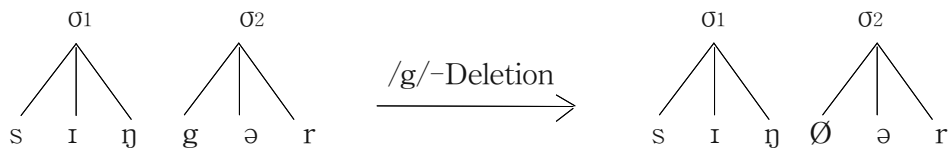


However, granted the /g/ in /ŋg/ cluster is deleted, it does not mean the onset of the second syllable is deleted together. This is to say, the onset is phonetically null after the /g/-deletion, but psychologically it is accounted to be fulfilled with a zero phoneme, /Ø/. This processes can be illustrated as below (39).

(39) hangar [ˈhæŋər]



singer [ˈsɪŋər]





Here is an interesting quote from McCully(2009). McCully(2009) first suggests the concept of zero phoneme and uses the minimal-pair tests to prove the existence of /Ø/. He says, "if the segment /Ø/ is a 'zero phoneme' then it should contrast with other phonemes that occur in the same position as a minimal pair" (McCully 2009: 86). This opinion can be supported by examples below (40).

- (40) add [Øæd] vs. bad [bæd]  
 eat [Øit] vs. meat [mit]  
 eye [Øaɪ] vs. lie [laɪ]  
 owe [Øoʊ] vs. bow [boʊ]

One of the supporting evidences for this proposal is that /Ø/ underlies one or more allophones like other independent phoneme. McCully assumes that the phoneme /Ø/ underlies an allophone that is the glottal stop. (McCully 2009: 86)

Having discussed about the zero phoneme, then it can be more confident to suggest that /ŋ/ has a constraint to appear in a syllable onset, this makes /ŋ/ differ from /m/ and /n/.

#### 4.2.2 Restriction on a two-X syllable onset position

Onsets in English provide an illustration of phonotactic patterning. As seen above, nasal-plus-stop sequences are forbidden to occur in English syllable onsets since the nasal is more sonorous than the following stop sounds, and this will violate Selkirk's SSG. However, English has syllabification rules in addition to the sonority theory. That is, uniquely,

fricative-plus-nasal sequences are permissible in syllable onsets in English. For instance, as in (41a), words of a fricative-plus-nasal or a fricative-plus-liquid sequence are common in English.

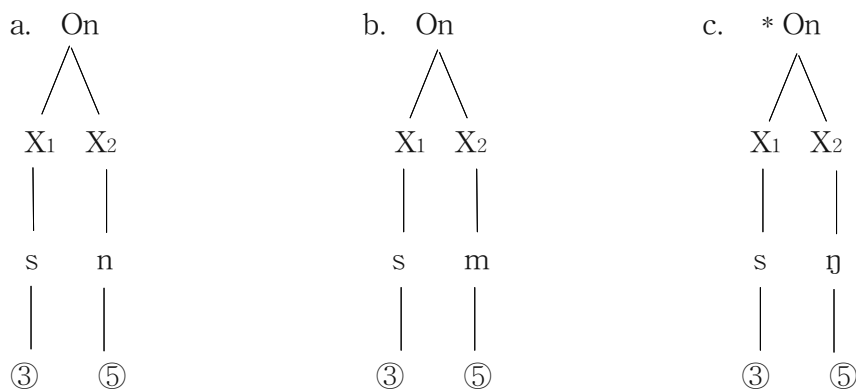
Here comes the question: if /snek/ and /smoʊk/ are permissible in English then why is \*/sɲek/ or \*/sɲoʊk/ not?

- |      |    |       |         |    |   |         |
|------|----|-------|---------|----|---|---------|
| (41) | a. | snake | [snek]  | b. | * | [sɲake] |
|      |    | smoke | [smoʊk] |    | * | [sɲoʊk] |
|      |    | slow  | [sləʊ]  |    | * | [sɲəʊ]  |
|      |    | swim  | [swɪm]  |    | * | [sɲɪm]  |

As shown above, /s/ occurs before by a list of sonorant consonants in these cases. It is worth noting, however, that the exceptions in (41b) once again involve the velar nasal /ŋ/. If /ŋ/ is an independent nasal phoneme, it takes the same sonority hierarchy with /m/ and /n/.

Comparing the onset clusters of /sn/, /sm/ and \*/sɲ/ illustrated below. It is hard to explain why the onset clusters like /sn/ and /sm/ are well formed but \*/sɲ/ is not.

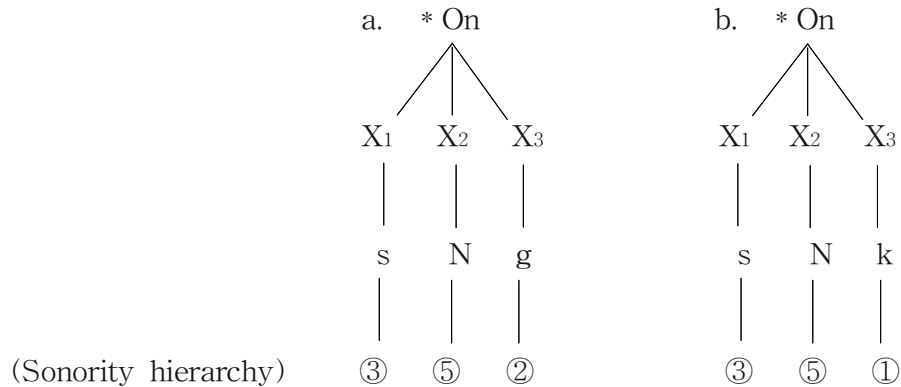
(42) Onset clusters: /sn/, /sm/ vs. \*/sɲ/



(Sonority hierarchy)

However, if /ŋ/ is derived from a segmental sequence composed of either /Ng/ or /Nk/, it seems to be possible to account for such apparent exceptions since \*/sŋ/ cluster can be understood as (43):

(43)



The onset structures in (43) indicate that if /ŋ/ is derived from /Ng/ or /Nk/ clusters, then \*/sŋ/ is no longer a two-X syllable onset but a three-X syllable onset. Scholars find there are limitations in a three-X syllable onsets. Ashby and Maidment(2005) say, for three-consonant syllable onsets, the first consonant is always /s/, the second consonant is generally one of /p, t, k/, and the third consonant is one of approximants, /r, l, w, j/. This gives combinations such as /str-/ as in *string*, /spl-/ as in *splash*, /skw-/ as in *squash*, /stj-/ and as in *stupid*. (Ashby and Maidment 2005: 147).

According to this regulation, /g/ and /k/ are not approximant so that they cannot occur in the X<sub>3</sub> syllable onset position. Therefore, \*/sNg/ or \*/sNk/ onset sequences are forbidden in English. In retrospect, \*/sŋ/ is also a forbidden onset sequence which differ from /sm/ or /sn/. Thus, /ŋ/ is more like a result derived from /Ng/ or /Nk/ rather than being an independent phoneme.

#### 4.2.3 Restriction on syllable nucleus

There is another gap in the distribution of /ŋ/ which can be explained if the velar nasal is taken to be derived from a nasal followed by a velar obstruent (Borowsky 1986: 73).

Giegerich(1992) says, "nucleus must contain only one X-slot; Nuclear X-slot of an unstressed syllable may be filled by non-vocalic segments /n, m, l/, and in rhotic accents, by /r/" (Giegerich 1992: 166). Similarly, McCully(2009) also assumes that "/m/ and /n/ can function as syllabic peaks(or nucleus) in certain environments (*but**ton***, *ch**asm***, where the boldened part of the word is a syllable in its own right)" (McCully 2009: 38). What's more, linguists suggest /m/ and /n/ are syllabic nasals. On the contrary, the velar nasal /ŋ/ is avoided to be mentioned. Consider the words in (44).

(44) a. [dm]

boredom	['bɔrdm]	dukedom	['dukdm]
earldom	['ɜldm]	freedom	['frɪdm]
kingdom	['kɪŋdm]	tardom	['stɑrdm]

[zm]

abysm	[ə'bɪzɪzm]	bossism	[bɒ'sɪzɪzm]
chasm	['kæzɪzm]	civism	['sɪvɪzɪzm]
egoism	['egəʊɪzɪzm]	fantasm	['fæntæzɪzm]
globalism	['glɔʊbəlɪzɪzm]	humanism	['hju:mənɪzɪzm]

**[ðm]**

algorithm [ˈælgə,rɪðm]      rhythm [ˈrɪðm]

b. **[tn]**

aten	[ˈatn]	automaton	[ɔˈtəmətn]
bitten	[ˈbɪtn]	badminton	[ˈbæd,mɪntn]
fatten	[ˈfættn]	fronton	[ˈfrʌntn]
kitten	[ˈkɪtn]	kiloton	[ˈkɪlə,tɪn]
mitten	[ˈmɪtn]	mutton	[ˈmʌtn]
sitten	[ˈsɪtn]	sexton	[ˈseksɪtn]
written	[ˈrɪtn]	wanton	[ˈwɒntn]

**[dn]**

hidden	[ˈhɪdn]	hodden	[ˈhʊdn]
loden	[ˈloʊdn]	olden	[ˈoʊldn]
widen	[ˈwaɪdn]	wooden	[ˈwʊdn]
sadden	[ˈsædn]	sudden	[ˈsʌdn]

**[dʒn]**

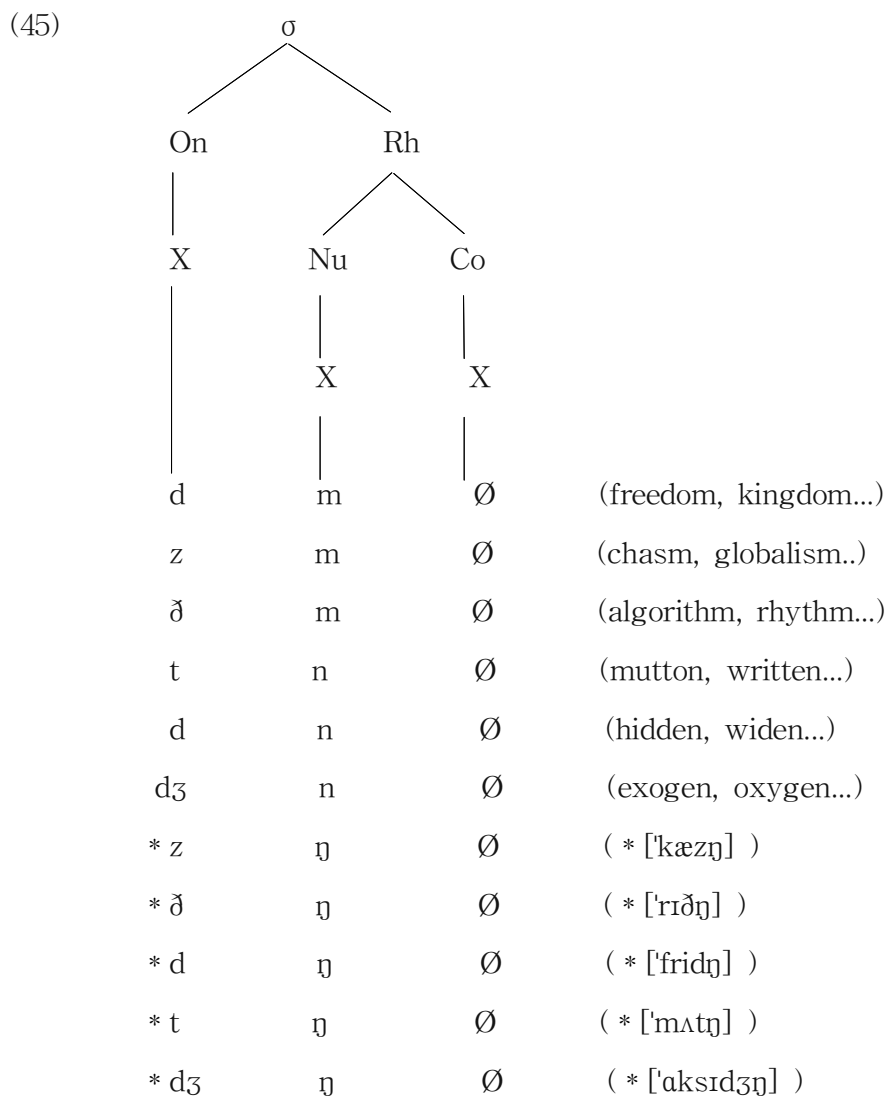
cryogen	[ˈkraɪədʒn]	exogen	[ˈeksədʒn]
mitogen	[ˈmaɪədʒn]	mutagen	[ˈmjutədʒn]
indigen	[ˈɪndədʒn]	oxygen	[ˈɒksɪdʒn]

c.

- \* [ˈfrɪdɪŋ]
- \* [ˈkæzɪŋ]
- \* [ˈrɪðɪŋ]
- \* [ˈmʌtɪŋ]
- \* [ˈɒksɪdʒɪŋ]

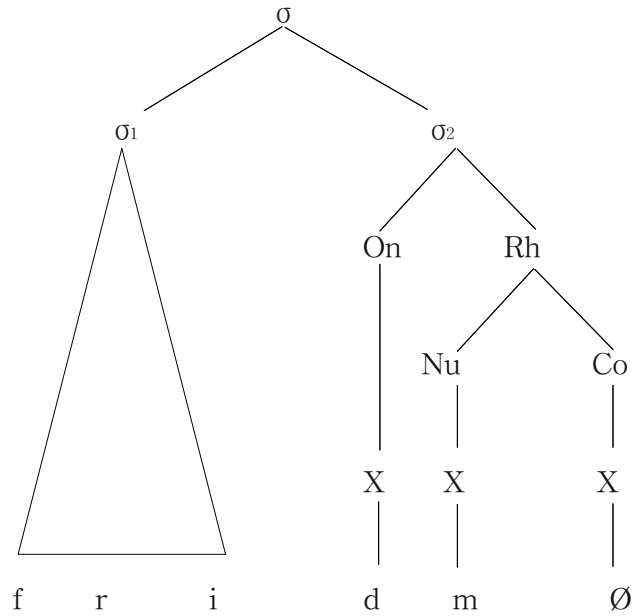
Words in (44a) suggest that nasals phoneme /m/ are common to be found in a syllable nucleus and words in (44b) show that nasal phoneme /n/ can occur in the syllable nucleus. However, as shown in (44c), same as nasals, /ŋ/ is an exception which can not occur in a syllable nucleus.

It is worth noting that the syllable which can have a syllabic nasal in nucleus is an unstressed syllable with an empty coda position. That is to say, when /m/ or /n/ are in a syllable nucleus position, there is no other consonant following them. Thus, the structure of the unstressed syllable which involves the syllabic nasal can be constructed as below:

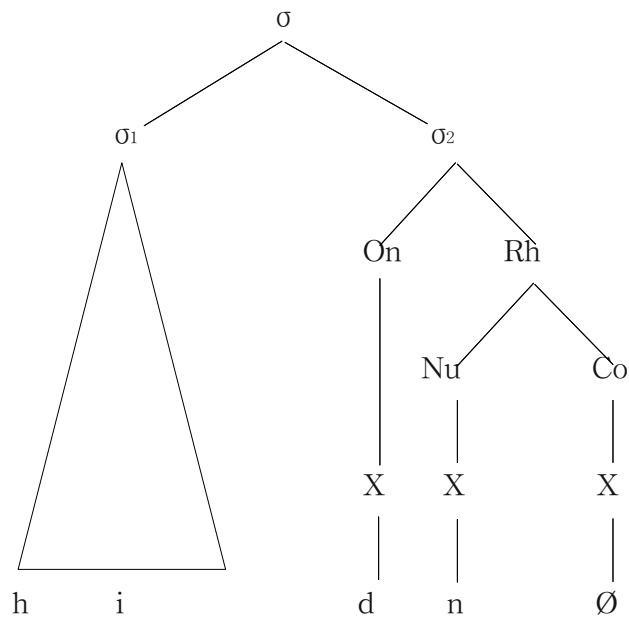


According to this regulation, the syllabic structure of words like *freedom* and *hidden* can be modified like (46), but there is no word of \* [fridŋ] or \* [hidŋ]:

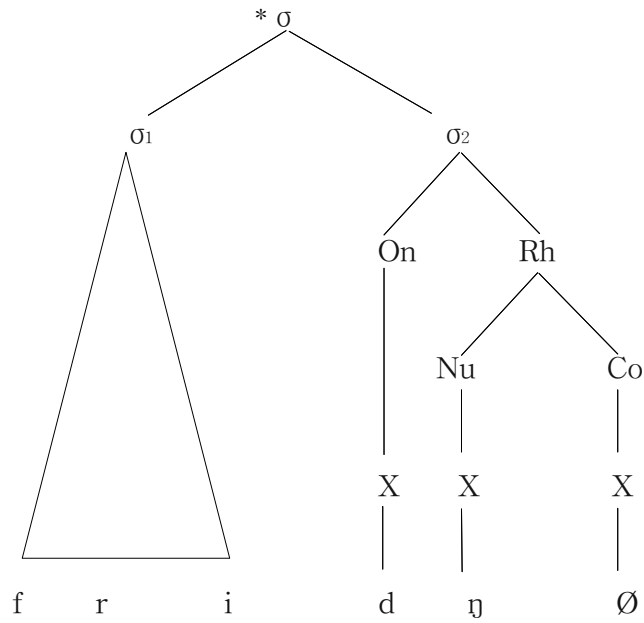
(46) *freedom* ['fridm]



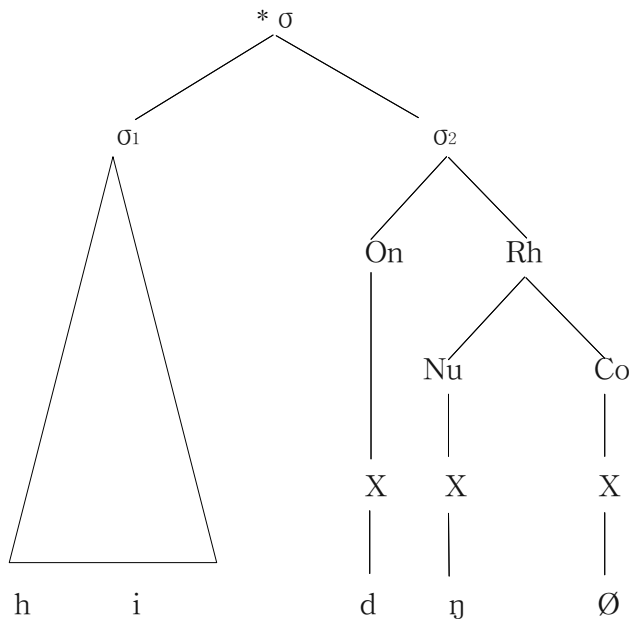
*hidden* [ˈhɪdn]



\* [fridŋ]



\* [hidŋ]



Regard to the permissibility of a syllabic nasal, Chomsky and Halle(1968) claim that it follows the syllabic rule:



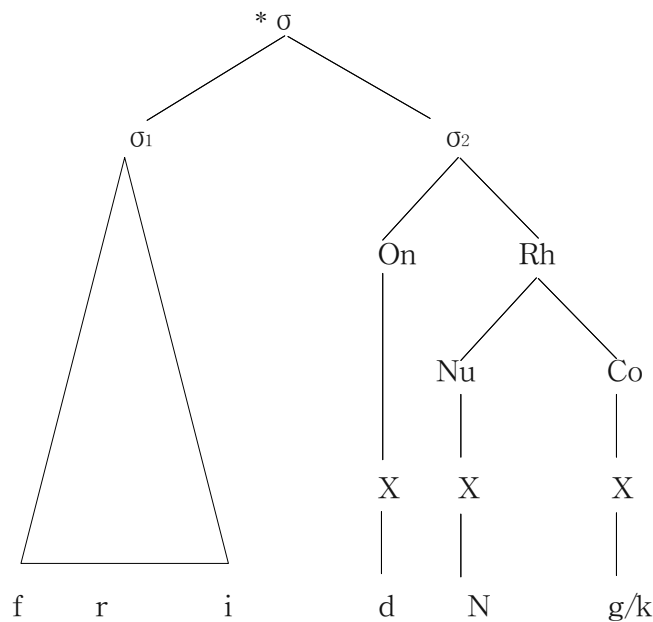
(47) (Chomsky and Halle 1968: 85)

sonorants become syllabic / C\_\_\_\_\_#

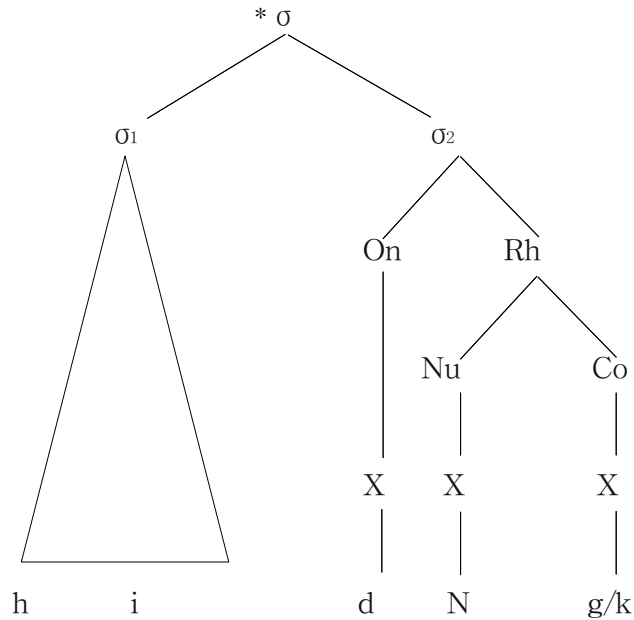
According to the regulation of the SPE, "the feature 'sonorant' distinguishes vowels, liquids, glides, and nasals from nonnasal(obstruent) consonants. What's more, a syllabic sonorant consonant will ultimately have the neutral vowel [ə] inserted before it" (Chomsky and Halle 1968: 85).

However, as shown above, /ŋ/, the nasal sonorant blocked to be present in a syllable nucleus. If [fridm] and [hidn] are permissible then why is \* [fridŋ] or \* [hidŋ] not? This phenomenon can be explained only if /ŋ/ is not an independent phoneme but a derivative from /Ng/ or /Nk/ cluster. Comparing the following structures in (48).

(48) \* [fridŋg] / \* [fridŋk]



\* [hidŋg] / \*[hidŋk]



As we know, nucleus X-slot of an unstressed syllable can be filled by the non-vocalic segments only when no other following consonants come after this non-vocalic segment. That is to say, the syllabic nasal only appear in a non-coda rhyme. If /ŋ/ is derived from /Ng/ or /Nk/ cluster, then the coda is no longer an empty position. For such a reason, /ŋ/ cannot be considered as a syllabic sonorant.

#### 4.2.4 Restriction on syllable coda

Up to now, several evidence to prove the velar nasal /ŋ/ is not a phoneme but derived from a given sequence have been posted. There is another general rule which can also support this proposal. This rule states that /ŋ/

only occurs after lax vowels(short vowels).

Consider the words in (49).

(49)

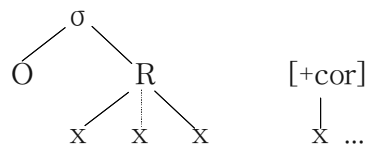
sin	[sɪn]	seen	[si:n]	sign	[saɪn]
sim	[sɪm]	seem	[si:m]	lame	[leɪm]
song	[sɔŋ]	long	[lɔŋ]	*	[saʊŋ]

The data show that *song*, *bring* are well formed but \*/saʊŋ/, \*/brɪŋ/ are not. The fact that /ŋ/ does not occur after long vowels makes it behave like a non-coronal consonant cluster again.

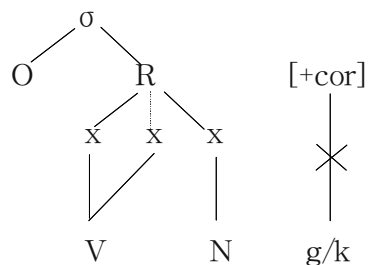
For this case, Borowsky(1986) argue that this is due to the "overload" of a rhyme. Borowsky(1986) views the English syllable rhyme as consisting of three positions in maximum. She illustrates the largest type of rhyme in a final syllable in English as in (50a), and she also shows how the segments would be derived if /ŋ/ follows a long vowel as in (50b):

(50) (Borowsky 1986: 74)

a.



b.



According to Borowsky's assumption, if /ŋ/ occurs only as the derived result of /Ńg/ or /Ńk/ sequence, this sequence can not occur in the syllable rhyme together if its previous vowel is a long vowel. In other words, as Borowsky says, "/ŋ/ occurs only as the derived result of a sequence, and, given the above structure, the syllabification of any segment, other than a coronal, in a rhyme which has three slots already filled, is disallowed" (Borowsky 1986: 74).

However, there are some problems in Borowsky's assumption since words like *sixths* [sɪksθs] have more than three slots in the final syllable rhyme. The reasons that /ŋ/ cannot occur after long vowels still have to be worked out.

Up to now, the peculiar behaviour of velar nasal /ŋ/ has been examined. It can be confirmed that velar nasal /ŋ/ plays a special role unlike the other nasals. This thesis will continue to examine the Optimality Theory(OT) of /ŋ/ and /ŋg/ alternation.

## V. Analysis: Constraints on /ŋg/ and /ŋ/ alternations

As mentioned before, Chomsky and Halle(1968) propose two rules, the Nasal Assimilation Rule and the /g/-Deletion Rule, to account for the alternations between /ŋg/ and /ŋ/. However, the exceptional situations which can not covered by the these rules keep showing up. Words like *hangar*, which is expected to pronounced [hæŋər], can pronounced as [hæŋər] or [hæŋgər]. It is impertinent to state that people who spells out *hangar* as [hæŋgər] is wrong or people who spells out *hangar* as [hæŋər] is right.

Except for the inexplicable exceptions, there also lies some problems in Chomsky and Halle(1968)'s proposals: first, there is no mention of the rational reasons of the /g/-deletion in the SPE(1968). The motivation of the /g/-Deletion Rule is opaque. Second, one or more rules may apply as the additional remarks of special cases, but there is no apparent limit as to how many rules may apply. The exceptions which cannot be solved by the given rules appear constantly, thus the additional rules are bottomless and meaningless. Therefore, the abstract rule-based approach given by Chomsky and Halle(1968) is not the best way of expressing the alternations of /ŋg/ and /ŋ/. The ensuing discussion will challenge Chomsky and Halle(1968)'s view by examining a non-derivational approach, the Optimality Theory(OT).

## 5.1 Optimality Theory

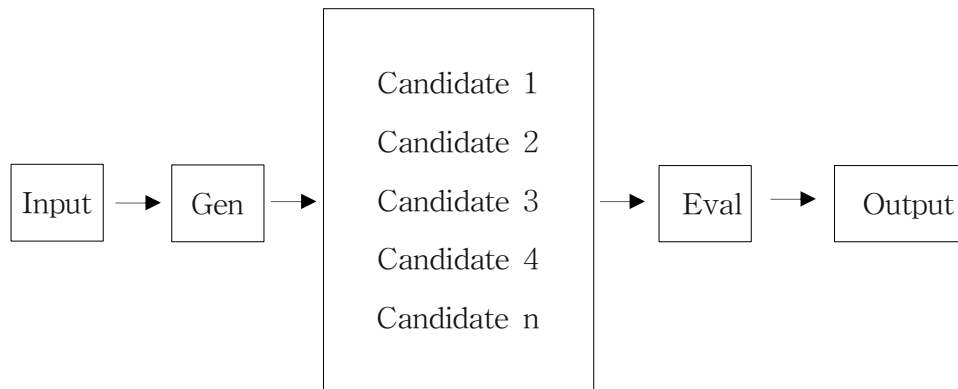
In recent years non-derivational approaches to phonology have been developed to relate abstract, underlying phonological structure to the form that actually surfaces without using rules and derivations. One of the attractions of this kind of approach is that it could counter some of the problems associated with derivational phonology if for no other reason than there will be no rules or derivations. Although not the only non-derivational model of phonology, the most successful theory, measured in terms of the greatest number of phonologists working within that framework, is Optimality Theory(OT) (Davenport, M. & Hannahs, S. J. 1998: 198).

Different from Chomsky and Halle's rule-based approach, Optimality Theory(OT) is a constraint-based approach. That is to say, instead of rules, OT is a model proposing that the underlying forms derive to the surface forms through the evaluation of some conflicting constraints. An example of such a constraint is \*CODA/[ŋ-g]. This constraint states that [ŋ] and [g] is prohibit occurring together in a morpheme boundary.

In an OT-style analysis, the underlying form can manipulated in random ways by "Generator". The "Candidates" are the outputs which resulted from the manipulation of underlying form. All of these candidates will be tested by the "Evaluator", and one of them which conforms to the set of constraints will finally selected as the optimal output.

The process of OT can be represented as below.

(51) Diagram of Optimality Theory<sup>14)</sup>



5.2 OT for the diachronic variation in /ŋg/ and /ŋ/ alternations

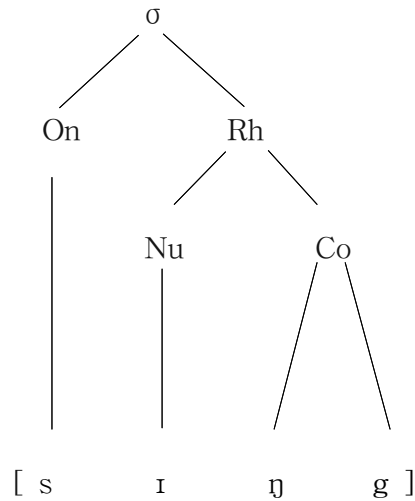
Consider the historical variation of /ŋg/ and /ŋ/ alternations. /g/-deletion does not apply in Old English and Middle English. It comes up until the Early Modern English period. These diachronic changes cannot be explained by Chomsky and Halle(1968)'s rule-based approach. It is not accurate to state Old English and Middle English are wrong or Modern English is right. Obviously, the reason for such change is the different ranking of constraints between the old days and the present.

Consider the word *sing* in Old English and Middle English, which surfaces as [sɪŋg] in the output. The syllable structure of this word can be illustrated as below.

---

14) This diagram is cited from *Introducing Phonetics and Phonology* (Davenport, M. & Hannahs, S. J. 1998: 199).

(52) Syllable structure of word *sing* in Old English and Middle English



As seen above, the number of the underlying segments is the same as the number of the surface segments. That is to say, there does not happen a segment-deletion. One possible assumption is that there is a constraint which states the segment-deletion cannot happen in Old English and Middle English. A shorthand version of such a constraint might be \*SEGMENT-DEL. Moreover, the underlying nasal segment /n/ finally assimilated to the adjacent stop and derived to [ŋ]. The articulation place of [ŋ] is same with [g]. The demand for nasal assimilation can be stated by a AGREEPLACE(nasal) constraint – a nasal segment should not be followed by a stop which differ in its place of articulation. These two constraints must outrank IDENT-IO(pronunciation), a constraint which requires the input segments to match their pronunciations with the output segments's pronunciations. The OT constraints discussed above can be presented as follows.

(53) OT constraints on /ŋg/ and /ŋ/ alternations



- a. \*SEGMENT-DEL: the number of segments is consistent from input to output, there is no segment-deletion.
- b. AGREEPLACE(nasal): a nasal segment should not be followed by a stop which differ in its place of articulation.
- c. IDENT-IO(pronunciation): the input segments should match their pronunciations with the output segments' pronunciations.
- d. \*CODA/[ŋ-g]: [ŋ] and [g] is prohibit occurring together in a syllable coda.

These four constraints are potentially in conflict. For Old English and Middle English, these constraints can be ranked in a hierarchy of decreasing importance from left to right. As shown below, the \*SEGMENT-DEL and AGREEPLACE(nasal) are highly ranked than IDENT-IO(pronunciation) and \*CODA/[ŋ-g].

(54) \*SEGMENT-DEL, AGREEPLACE(nasal) >> IDENT-IO(pronunciation),  
\*CODA/[ŋ-g]

Underneath is a tableau for word *sing* in Old English and Middle English. The "\*" in the relevant cell of tableau means ordinary violation whereas the asterisk "\*" refers to the fatal violation. The most harmonic candidate is indicated with a pointing finger (☞) (Davenport, M. & Hannahs, S. J. 1998: 200). Shading in a cell indicates that that cell is irrelevant to any further evaluation of the candidates (Davenport, M. & Hannahs, S. J. 1998: 201).

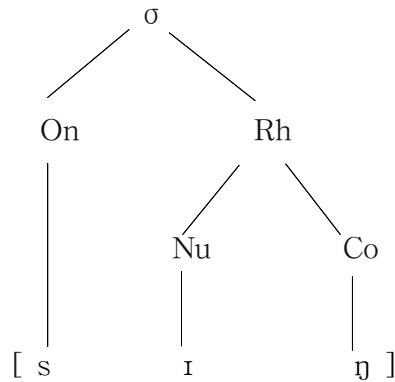
(55) OT tableau for *sing* in Old English and Middle English

/sing/	* SEGMENT- DEL	AGREEPLACE (nasal)	IDENT-IO (pronunciation)	* CODA/[ŋ-g]
☞ [sɪŋg]			*	*
[sɪŋg]		* !		
[sɪŋ]	* !		*	
[sɪn]	* !	*	*	
[sɪg]	* !	*	*	

In tableau (55), there are five candidates generated by *Gen* from the input /sing/. These candidates are evaluated by four constraints. Despite the fact that the candidate [sɪŋg] is more faithful to the input /sing/, [sɪŋg] is selected as the optimal output. This is because AGREEPLACE(nasal) is more important than IDENT-IO(pronunciation). Therefore, even the output [sɪŋg] violates the constraints of IDENT-IO(pronunciation) and \* CODA/[ŋ-g], [sɪŋg] is still the optimal output.

On the contrary, the word *sing* in Modern English has a syllable structure as in (56).

(56) Syllable structure of word *sing* in Modern English



In order to get the candidate [sɪŋ] as the output form, the constraints on word *sing* in Modern English should be re-ranked as below.

(57) AGREEPLACE(nasal), \*CODA/[ɪŋ-g] >> IDENT-IO(pronunciation),  
\*SEGMENT-DEL

Thus, the tableau for Modern English *sing* can be illustrated as in (58).

(58) OT tableau for *sing* in Modern English

/sing/	AGREEPLACE (nasal)	*CODA/[ɪŋ-g]	IDENT-IO (pronunciation)	*SEGMENT- DEL
☞ [sɪŋ]			*	*
[sɪŋg]		*!	*	
[sɪŋg]	*!			
[sɪn]	*!		*	*
[sɪg]	*!		*	*

Again, even the output [sɪŋg] is more faithful to the input /sɪŋg/, it violates the fatal constraint AGREE<sub>PLACE</sub>(nasal), thus it cannot win the other candidates. The winner in Old English and Middle English, [sɪŋg], is no longer the optimal candidate since it violates another fatal constraint \*CODA/[ŋ-g].

### 5.3 OT for words with /ŋg/ clusters in Modern English

In retrospect, regarding the pronunciation of the /ŋg/ sequence, the words which include /ŋg/ clusters in present English can be classified into three groups: one is that /ŋg/ only pronounced as /ŋ/; one is that /ŋg/ only pronounced as /ŋg/; the other is that /ŋg/ pronounced as /ŋ/ or /ŋg/. The irregular variation between /ŋg/ and /ŋ/ cannot be illustrated by the rules given from Chomsky and Halle(1968). The ensuing discussion will attempt to illustrate these three parts of words with Optimality Theory.

First, the /ŋg/ cluster in words like *ring* [rɪŋ], *ringer* [rɪŋər], as mentioned in (28a), only pronounced as [ŋ]. For these kind of words, the constraints can be ranking as:

- (59) AGREE<sub>PLACE</sub>(nasal), \*CODA/[ŋ-g] >> IDENT-IO(pronunciation),  
\*SEGMENT-DEL

Therefore, the OT for word *ring* would like this.

(60) OT tableau for *ring*

/ring/	AGREEPLACE (nasal)	* CODA/[ŋ-g]	IDENT-IO (pronunciation)	* SEGMENT- DEL
☞ [rɪŋ]			*	*
[rɪŋg]		* !		
[rɪŋg]	* !			
[rɪn]	* !			
[rɪg]	* !			

Although the candidate [rɪŋg] is more faithful to the input /ring/, [rɪŋ] is selected as the optimal candidate since [rɪŋg] violates the most important constraints but [rɪŋ] only violates some less-important constraints.

On the other hand, as mentioned in (28b), /ng/ in words like *hunger* [hʌŋgər], *stronger* [strɒŋgər] only pronounced as [ŋg]. For such a case, the constraints should be ranked as below.

- (61) \* SEGMENT-DEL, AGREEPLACE(nasal) >> IDENT-IO(pronunciation),  
\* CODA/[ŋ-g]

Since the constraint of \* SEGMENT-DEL and AGREEPLACE(nasal) become more important than IDENT-IO(pronunciation) and \* CODA/[ŋ-g], the tableau for word *hunger* can be illustrated as follows.

(62) OT tableau for *hunger*

/hunger/	* SEGMENT- DEL	AGREEPLACE (nasal)	IDENT-IO (pronunciation)	* CODA/[ŋ-g]
☞ [hʌŋgər]			*	*
[hʌŋgər]		* !		
[hʌŋər]	* !			
[hʌnər]	* !	* !		
[hʌgər]	* !	* !		

As seen in (62), in contrast with the winner [hʌŋgər], the candidate [hʌŋgər] violates the important constraint of AGREEPLACE(nasal); [hʌŋər] violates another important constraint of \* SEGMENT-DEL; [hʌnər] and [hʌgər] violate both the \* SEGMENT-DEL and AGREEPLACE(nasal). Thus they fail to be chosen as the optimal candidate.

Another kind of words with /ng/ clusters, as mentioned in (28c), can be derived from the underlying /ng/ to [ŋg] or [ŋ]. The typical examples of this kind of words are *long* [lɔŋg]/[lɔŋ] and *singer* [sɪŋgər]/[sɪŋər]. For these words, the constraints can be ranked as below.

- (63) AGREEPLACE(nasal) >> \* CODA/[ŋ-g], IDENT-IO(pronunciation),  
\* SEGMENT-DEL

Therefore, the tableau for *long* would like this.

(64) OT tableau for *long*

/long/	AGREEPLACE (nasal)	* CODA/[ŋ-g]	IDENT-IO (pronunciation)	* SEGMENT- DEL
☞ [lɔŋ]			*	*
☞ [lɔŋg]		*	*	
[lɔŋg]	* !			
[lɔn]	* !			
[lɔg]	* !			

As illustrated above, words like *long* can have two optimal candidates, [lɔŋ] and [lɔŋg]. This is because these two candidates comply with the constraint of AGREEPLACE(nasal) and this constraint is more highly ranked than other constraints.

In sum, since the rule-based approach proposed by Chomsky and Halle(1968) cannot apply to /ŋg/ and /ŋ/ alternations, the constraint-based approach of OT is more appropriate to account for the variational behavior between /ŋg/ and /ŋ/. OT relies on a set of constraints, and the ranking of constraints follow the situational ethics.

## VI. Conclusion

This thesis is aimed to investigate the identity of the velar nasal /ŋ/ because it contains distinctive characteristics and behaves differently from the other nasal consonants. This velar nasal consonant's peculiar behaviors can be concluded in six points: First, /ŋ/ is not as independent as /m/ or /n/. It always tied up with /k/ or /g/; Second, /ŋ/ never occur in a syllable onset position. Third, /ŋ/ cannot follow the fricative /s/ in a two-X syllable onset position as /m/ and /n/ do. Forth, /ŋ/ cannot occur in syllable nucleus position, but /m/ and /n/ can. Fifth, /ŋ/ cannot occur in syllable coda position if it is preceded by a long vowel. Finally, there is a complex variation between /ŋ/ and /ŋg/.

According to the special status of /ŋ/, researchers began to explore whether /ŋ/ is a phoneme or not. Chomsky and Halle(1968), Borowsky(1986), Moore(1969) and Kahn(1976) have controverted about this topic. However, views on this velar nasal sound vary from person to person. All of these views can be divided into two representative parts: /ŋ/ is derived by the assimilation from another nasal sound; /ŋ/ is an independent phoneme.

By the examination of /ŋ/'s identification, we find a contradictory analysis between /ŋ/ and an allophone of phoneme /n/. Gimson(1980) assumed that the unreleased [n] and dentalized [n̪] alternation in *ten/tenth* is an allophonic alternation. If this is the case, then the alternation between unreleased [n] and velarized [ŋ] should also be regarded as an allophonic alternation. The dentalized [n̪] is never regarded as an independent phoneme. In the same manner, the surface velarized form [ŋ], which is



derived from the underlying /n/ as in *bank*, cannot be considered as an independent phoneme.

Thus, the velar nasal /ŋ/ is not a phoneme in this thesis. To prove this proposal, this thesis provides a systematical analysis on the underlying and surface spelling constraints on /ŋ/ and the syllabic constraints on /ŋ/.

Besides, Chomsky and Halle(1968) proposes two rules to account for the alternation between /ŋg/ and /ŋ/. Unfortunately, the given rules cannot account for all the cases with /ŋg/ clusters. Since the rules given in SPE cannot illustrate all the cases, Chomsky and Halle(1968) proposes to formulate specific additional rules which can make the rule deleting /g/ inapplicable in exceptional cases. However, there still lie some problems: First, the motivation of /g/-Deletion Rule is opaque. Second, there is no apparent limit as to how many additional rules may apply.

In order to account for the unsolved problems left by Chomsky and Halle(1968), this thesis has adopted the idea of Optimality Theory. Different from Chomsky and Halle's rule-based approach, Optimality Theory(OT) is a constraint-based approach. That is to say, instead of rules, OT is a model proposing that the underlying forms derive to the surface forms through the evaluation of some conflicting constraints. An example of such a constraint is \*CODA/[ŋ-g]. This constraint states that [ŋ] and [g] is prohibit occurring together in a morpheme boundary. Variational behavior between /ŋg/ and /ŋ/ is analyzed by ranking of constraints in this thesis.

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## 초록

# 영어의 연구개 비음 연구

## 이목자

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이 논문은 영어의 연구개 비음 /ŋ/를 다룬다. 다른 비음과는 달리 이 /ŋ/는 음절초 (onset)에서 나타나지 못하는 영어의 사실상 유일한 분절음일 뿐만 아니라 그 밖의 음절후부 (coda) 와 음절핵 (nucleus)에서 성절자음의 자격문제 등에서도 제약을 받고 있다는 점에서 독특하다. 이 /ŋ/의 본질에 관한 연구는 크게 Chomsky (1968)의 규칙중심 접근방법과 Kahn (1976)의 음절구조 중심의 접근방법 두 가지로 이루어져 왔다. 전자의 경우는 규칙적용의 보편적 원리라는 관점에서 결핍이 있고 후자의 경우는 전자의 약점을 많이 보완해 주고는 있으나, 역시 /ŋg/와 /ŋ/의 다양한 변이형태의 공존 문제를 설명하기에는 부족하다.

이 두 변이형의 공존문제는 규칙적용과 음절구조만으로 설명할 수 없음을 단적으로 나타내주고 있다. 먼저 영어사적 관점으로 볼 때 고대영어 (449-1100),

중세영어 (1100-1500), 현대영어 (1500- 현재) 에 이르면서 동일한 단어 속의 이 발음이 변동되어 왔음을 본다. 고대영어와 중세영어를 걸치는 긴 세월동안 /ŋg/로 실현되던 것이 초기현대영어 시기, 특히 셰익스피어 시대에 이르러서는 오늘날과 같은 /ŋ/ 의 형태로 고정되어 간다.

다른 한편으로는 오늘날의 공시적 관점에서 보더라도 영국영어와 미국영어에서 서로 다르게 실현되며, 똑같은 어휘임에도 지역에 따라 다르고 심지어 개인에 따라 다른 것을 발견하게 된다. 예를 들어 “hangar” 나 “singer” 의 경우 단어의 어형성 (word formation) 조건과 상관없이 두 가지 변이형으로 실현되고 있음을 본다.

따라서 이 논문에서는 이와 같은 성격의 이 연구개비음의 문제는 최근 최적성이론 (Optimality Theory)의 방법인 제약조건의 서열화로써 접근하는 방식으로 설명하고자 하는 시도를 하였다. 예를 들어 고대·중세 영어의 지배적 발음 이었던 /sɪŋg/와 초기현대영어 시기부터 등장되고 있는 /sɪŋ/의 변동을 설명하기 위한 제약조건으로서 \*SEGMENT-DEL, AGREEPLACE(nasal), IDENT-IO(pronunciation), \*CODA/[ŋ-g] 등의 제약이 제시되고 있다. 여기서 고대영어/중세영어까지는 \*SEGMENT-DEL, AGREEPLACE(nasal) >> IDENT-IO(pronunciation), \*CODA/[ŋ-g] 로 적용이 되어 /sɪŋg/가 최적의 산출로 된 것인 반면에, 초기현대영어 시기부터는 그 제약들의 우선순서가 AGREEPLACE(nasal), \*CODA/[ŋ-g] >> IDENT-IO(pronunciation), \*SEGMENT-DEL 로 적용됨으로 인해 그 최적의 산출로 /sɪŋ/이 되는 것으로 본다. 마찬가지로 이와 같은 제약의 등급을 이용해서 연구개비음의 변이형을 공시적 관점에서 적용할 수 있음을 보이고 있다.