

Weight-sensitive Tone Patterns in Loan Words of South Kyungsang Korean*

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1. Introduction

The purpose of this paper is to provide an explicit formal account for the loan-word tone patterns of South Kyungsang Korean (SK), a dialect spoken in the south-eastern part of Korea. SK is a pitch accent language. The location of the pitch accent H tone is lexically determined.

However, this paper will show that, unlike native words, SK loan words are subject to the H tone assignment which is predictable from the combination of various factors including syllable weight involved. Such various factors determining the H tone location will be formalized into phonological constraints, under the framework of Optimality Theory (Prince and Smolensky 1993, McCarthy and Prince 1993, 1995, 1999). We will show that these constraints interact to produce the attested tone patterns of SK loan words.

For the database of the present study, we have collected 2265 words and classified them by the number of component syllables and the syllable weight. We also discuss previous research on the North Kyungsang (NK) native and loan-word tone patterns since NK shows similar tone patterns.

This paper is organized as follows. In section 2, we will discuss the previous research on the tone patterns of SK native words. In section 3, we will provide the SK loan words data to analyze the tone patterns and discuss the previous research on NK native and loan words to refer to SK loan

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word tone analysis. In section 4, we will discuss the SK loan word data and provide a formal account. In section 5, we will summarize our claims.

2. The tone patterns of SK native words

In this section we will discuss the tone patterns of SK native words. In SK words, H tone is assigned on one syllable or a sequence of two syllables in a word. The location of the H tone pitch accent is lexically determined. The data of this section is from Kim (1994, 1998).

The SK native tone patterns are summarized in (1). H, M and L stand for High, Mid and Low tones respectively. As you can see in (1), positing H, M and L tones for the tone inventory, Kim classified di-syllabic words into four different patterns, tri-syllabic words into five different patterns and quadri-syllabic words into five different patterns. The patterns in the parentheses in quadri-syllabic words are derived nouns or compounds.

(1)

di-syllabic	tri-syllabic	quadri-syllabic
kurim MM(HH)'cloud'	ɔɾɛpɪ HHM 'elder brother'	adʒumənɪ MHHM 'aunt'
ɐrim HM 'ice'	maɲadʒɪ MHM 'foal'	halapədʒɪ HHMM 'grand father'
kəɾɪ LM 'street'	pukɾurum MHH 'shyness'	(kɪtɪtɪkɪ MHMM 'waiting')
taɾɪ MH 'bridge'	adʒɪmɛ HMM 'aunt'	(kɪpɾəhaki HMMM 'pleasing')
	ʃɪmparam LMM 'errand'	(namutarɪ MHHH 'wood bridge')

Huh (1954), Moon (1974), Lee (1994) also argue for the presence of the Mid tone. According to them mal (horse, H), mal (a unit of measurement, M), and mal (language, L) can be distinguished when they are followed by the subject case marker -ɪ (M):

- (2) a. mal ɪ b. mal ɪ c. mal ɪ
 H M M M L M
 (horse) (unit) (language)

Choi (1998) is, however, suspicious of the existence of the M tone because SK native speakers can distinguish between mal (horse, H) and mal (language, L), and on the other hand mal (unit, M) and mal (language, L) but they can not between mal (horse, H) and mal (unit, M). He, therefore,

claims that both mal (horse, H) and mal (unit, M) include the High tone and the SK toneme inventory consists of H and L tones only.

Chung (1980) also claims against the three-way contrast (H, M, L) in SK native words adopted by Kim (1994, 1998). Chung claims that the peak F0 value of the di-syllabic words with H on a sequence of syllables is lower than that of words with H on a single syllable. He argues that even though we can recognize the three different steps of pitch-H, M, L phonetically, it is not necessary to have three tonemes in the inventory.

In the tone analysis of SK loan words, we do not posit Mid tone. To justify Mid tone as a phonological tone, we would need evidence which indicates H-M-L are contrastive. For instance three-way contrast of HL-HM-HH or LL-LM-LH could justify the existence of Mid tone.

However, the previous research which hypothesize Mid tone shows only HM-HH two-way contrast. No di-syllabic words are claimed to show the HL pattern. Tri-syllabic words show HHM, HMM and MHH. These words can be analyzed under a theory assuming the two-way tonal contrast.

Then, the patterns in (1) can be reanalyzed as follow:

(3)

di-syllabic		tri-syllabic		quadri-syllabic	
3 tone analysis	2 tone analysis	3 tone	2 tone	3 tone	2 tone
MM(HH)	HH	HHM	HHL	MHHM	LHHL
HM	HL	MHM	LHL	HHMM	HHLL
LM	LH	HMM	HLL	(MHMM)	(LHLL)
MH		MHH	LHH	(HMMM)	(HLLL)
		LMM		(MHHH)	(LHHH)

In this paper we thus assume that H and L tones form the SK toneme inventory. We apply the two-way contrast, also, in SK loan words tone analysis so that we are able to compare the SK native and loan words tone patterns.

3. Tone patterns of SK loan words

In this section, we will classify 2265 loan words by the weight and number of component syllables for the discussion of the tone patterns of SK loan words. In 3.2 we will discuss the previous research on NK native and loan word tone patterns which shows similar tone patterns to SK.

3.1 Data

The data is collected through the interview with four SK native speakers. All of them were born in Masan city in South Kyungsang province and still live there.

The data is divided into three groups depending on how many syllables a word consist of: di-syllabic, tri-syllabic and quadri-syllabic words.

3.1.1 Di-syllabic words

Di-syllabic words can be further divided into four subgroups, depending on the combination of heavy and light syllables: Light-Heavy, Heavy-Light, Heavy-Heavy and Light-Light. Let us first consider words consisting of Light-Heavy syllables. 189 of 207 words have H tone on the second syllable. 18 words have H tone on the first light syllable.

(4) Light-Heavy

Tone pattern	LH	HL
example	ka. f ɪp (gossip)	mu. d ʒɪk (music)
Total 207	189(91%)	18(9%)

In sum, most words with Light-Heavy syllable combination include the H pitch accent on the final heavy syllable.

Second, in the case of words with Heavy-Light syllables, 146 words without exception have H tone on the first syllable.

(5) Heavy-Light

Tone patterns	HL
example	kɔ̌l.pi (golf)
Total 146	146 (100%)

Third, let us consider words consisting of Heavy–Heavy syllable. 123 of 153 words have H tone on both syllables.

(6) Heavy–Heavy

Tone patterns	HH	LH	HL
example	mɛn.ʃɛn (mention)	pɪl.lɛk (black)	hɛn.səm (handsom)
Total 153	123 (80%)	25 (16%)	5 (4%)

Of 30 remaining words, 25 show LH tone pattern. Of these 25 words, 23 words have the first syllable closed with a geminate [l]. Moreover no words with a geminate lateral show HH tone pattern that is, H is assigned on both syllables. Therefore it seems that the first syllable of these words does not behave as a heavy syllable in the H tone assignment. This phenomenon can be seen in tri-syllabic words as well. NK also shows this exceptional pattern involving a geminate [l] (Kenstowicz & Sohn 1998). We will discuss this in 3.1.2.

Of 25 LH tone pattern words, the remaining two words do not have any regularity. The other five words of 30 remaining words have HL tone pattern like hɛn. səm (handsome).

Let us finally consider words consisting of two light syllables. All 238 words have H tone on the first syllable.

(7) Light–Light

Tone pattern	HL
example	ka.sɪ (gas)
Total 238	238 (100%)

Even though both syllables are light in di-syllabic words, a H tone is assigned on the first syllable. This means every SK di-syllabic loan word must have at least one H tone and if there is no heavy syllable in a word, the penultimate syllable has the H.

As shown in (8) every heavy syllable has a High tone. This indicates that syllable weight plays a crucial role in the pitch accent assignment for di-syllabic loan words.

(8)

Syllable composition	Main tone pattern	Percentage for all data (%)
Light-Heavy	LH	189/207 (91%)
Heavy-Light	HL	146/146 (100%)
Heavy-Heavy	HH	123/153 (80%)
Light-Light	HL	238/238 (100%)
Total		696/744 (93%)

3.1.2 Tri-syllabic words

Tri-syllabic loan words can be further divided into following eight different subgroups depending on the combination of heavy and light syllables:

- (i) Light-Light-Light
- (ii) Heavy-Light-Light
- (iii) Heavy-Heavy-Light
- (iv) Heavy-Light-Heavy
- (v) Heavy-Heavy-Heavy
- (vi) Light-Heavy-Heavy
- (vii) Light-Light-Heavy
- (viii) Light-Heavy-Light.

Let us first consider words consisting of Light-Light-Light syllables. Of 403 words 370 have a H tone on the penultimate syllable.

(9) Light-Light-Light

Tone patterns	LHL	HLL	
example	ka.ɪ.tɪ (guide)	kɛ.sɪ.tɪ (guest)	wɪ.sɪ.kɪ (whisky)
Total 403	370 (91.8%)	26 (6.45%)	7 (1.74 %)

33 words show HLL tone pattern. Of these, 26 words have /-st/ and /-ft/ consonant cluster in correspondent English words like gɛ.sɪ.tɪ (guest) and gɪ.ft.tɪ (gift).

This phenomenon is also found in NK English loan words. If the corresponding original English words have /-st/ or /-ft/ consonant cluster, they become /-sɪtɪ/ and /-pɪtɪ/ because of the Korean syllable structure constraint that prohibits complex onsets and codas. Kenstowicz & Sohn (1998) claims the resulting epenthetic vowels cannot have a pitch accent.

The remaining 7 words (e.g. wɪ.sɪ.kɪ (whisky, HLL), kɛ.pɪ.ʈʂɪ (cabbage, HLL) and pɪ.nɪ.ʃɪ (finish, HLL)) have H tone on the first syllable.

Second, let us consider words consisting of Heavy-Light-Light syllables. Among 117 words, 71 words have H tone on the first two syllables.

(10) Heavy-Light-Light

Tone patterns	HHL	LHL		HLL
example	ɭɐ.p.sɔ.dɪ (rhapsody)	kɛ.l.ə.lɪ (gallery)	mɛk.ʃɪ.kɔ (Mexico)	tɛk.sɪ.tɪ (text)
Total 117	71 (60.7%)	42 (38.5%)	3 (2.56%)	1 (0.85%)

Out of 46 words which do not show this pattern, 45 words show LHL tone pattern. In these 45 words, 42 words have a geminate lateral (e.g. sɪl.lɪ.pə (sleeper, LHL), gɛl.lə.lɪ (gallery, LHL) and pɪl.lɪ.sɪ (blues, LHL)).

As shown in 3.1.1, H is not realized on the first syllable of the words with geminate [l] as gɛl.ləp (gallop, LH). All this indicates that a syllable closed with a geminate lateral patterns with a light syllable.

Three words of 45 exceptional words which show LHL tone pattern, i.e. mɛk.ʃɪ.kɔ (Mexico, LHL), ɔk.ta.pɪ (octave, LHL), and al.ta.ɪ (Altai LHL) have H tone on the second syllable alone although the first syllable is heavy. They seem to show the default penultimate H tone pattern.

The last word tɛk.sɪ.tɪ (text) of 46 exceptional words is the word with /-st/ or /-ft/ consonant cluster in a correspondent English word. As mentioned in (9) H tone is not realized on the syllables which have /-st/ or /-ft/ consonant cluster in the source language.

Third, let us consider words consisting of Heavy-Heavy-Light syllable. Among 41 words, 23 words have H tone on the first two syllables.

(11) Heavy-Heavy-Light

Tone patterns	HHL	LHL	
example	ak.sɛn.ti (accent)	sɪl.lɪn.tə (cylinder)	ɪn.dɛk.sɪ (index)
Total 41	23 (56.1%)	16 (39%)	2 (4.88%)

18 words which do not follow this pattern show LHL tone pattern. Of the 18 remaining words, 16 have geminate [l] as sɪl.lɪn.tə (cylinder, LHL), pɪl.lɛŋ.kɪ (blank, LHL) and tɛl.lɪn.dʒə (dellinger, LHL).

As mentioned before, we observed that syllables which have geminate lateral behave as light syllables. The first syllable of the words like sɪl.lɪn.tə (cylinder, LHL) is, therefore, seemed to function as light syllable. Therefore H tone is on the second Heavy syllable as expected.

The last 2 exceptional words are ɪn.dɛk.sɪ (index, LHL) and pɪn.lan.ti (Finland, LHL). The first syllables of the words are heavy so H tone is expected to be realized on the first two syllables. However these words have H tone only on the second syllable. These two words seem to follow the default tone (penultimate H tone) pattern of SK loan words as mentioned before.

Fourth, let us consider words consisting of Heavy-Light-Heavy syllable. Among 47 words, 20 words have H tone on the first and the second syllable.

(12) Heavy-Light-Heavy

Tone patterns	HHL	LHH		LHL
example	sɪn.ti.rɔm (syndrome)	pɛl.lɪ.kan (pelican)	al.pa.pɛt (alphabet)	kak.tɛ.ɪl (cocktail)
Total 47	20 (42.6%)	18 (38.3%)	4 (8.51%)	5 (10.64%)

The H tone is expected to be realized in the heavy syllable. This type of words, therefore, has two possible positions for the H tone assignment: the first and the last syllable. In most case the first syllable has H. This suggests that the first syllable has the priority for the realization of H tone.

22 words of 27 exceptional words show LHH tone pattern. 18 of these 22 words have geminate [l] as sɔl.lɔ.mɔn (Solomon, LHH) and pɛl.lɪ.kan (pelican, LHH). The first syllable of the words like sɔl.lɔ.mɔn (Solomon) seems as a heavy syllable but as mentioned before the first syllable which has geminate [l] behaves as a light syllable. Only the final syllable of the words as sɔl.lɔ.mɔn (Solomon) is, therefore, heavy and H tone is realized on the final heavy syllable and the penultimate syllable.

The last 4 words of 22 exception words which have LHH pattern do not show any particular generalization. The other 5 words, except these 22 LHH tone pattern words, have LHL pattern. They seem to follow the default tone pattern of SK loan words.

Fifth, let us consider words consisting of Heavy-Heavy-Heavy syllable. Among 18 words, 13 have H tone on the first two syllables.

(13) Heavy-Heavy-Heavy

Tone patterns	HHL	LHH		LHL
example	ɔ̌.ɾɛ̌n.t̪il.mɛ̌n (gentleman)	k̪il.lɛ̌n.ɔ̌ʒɪ̌ŋ (cleansing)	al.kaː.riː (alkali)	ɔ̌l.lɪ̌m.pɪ̌k (olympic)
Total 18	13 (72.2%)	3 (16.7%)	1 (5.6%)	1 (5.6%)

5 exceptional words do not follow the HHL tone pattern and out of which 4 show LHH tone pattern. 3 words of these 4 LHH tone words have geminate [l] as k̪il.lɛ̌n.ɔ̌ʒɪ̌ŋ (cleansing, LHH), p̪il lan.nɛ̌l (flannel, LHH) and p̪il.lɛ̌t.pɔ̌m (platform, LHH). As mentioned before the first syllables that have geminate [l] do not seem to function as heavy syllable. The last two syllable of words like k̪il.lɛ̌n.ɔ̌ʒɪ̌ŋ (cleansing) are, therefore, heavy syllables and H tone is realized on the final and the penultimate syllable. The one remaining word of 4 LHH words does not have any particular regularity.

The last word ɔ̌l.lɪ̌m.pɪ̌k (olympic, LHL), unlike 4 LHH words of 5 exception words, seems to follow the default tone pattern of SK loan words.

Sixth, let us consider words consisting of Light-Heavy-Light syllable. Among 111 words, 108 have H tone only on the penultimate syllable.

(14) Light-Heavy-Light

Tone patterns	LHL	HLL
example	ɔ̌.ɾɛ̌n.ɔ̌ʒɪ̌ (orange)	sɛ̌.kən.t̪i (second)
Total 111	108 (97.3%)	3 (2.7%)

3 words as sɛ̌.kən.t̪i (second, HLL), kɛ̌.pil.lə̌ (Kepler, HLL), and h̪ǐ.t̪il.lə̌ (Hitler, HLL) do not follow the LHL tone pattern.

Seventh, let us consider words consisting of Light-Heavy-Heavy syllable. Among 63 words, 61 have H tone in the final and the penultimate syllable.

(15) Light-Heavy-Heavy

Tone patterns	LHH	LHL
example	paɾɪə̌t (pilot)	ɭ.kɪ̌n.ɭɪ (rock'n-roll)
Total 63	61 (96.8%)	2 (3.17%)

Two words as ɭ.kɪ̌n.ɭɪ (rock'n-roll, LHL) and pa.kɪ̌n.sɪ̌n (Parkinson, LHL) do not follow the LHH tone pattern. These 2 words seem to follow the default tone pattern of SK loan words.

Finally, let us consider words consisting of Light-Light-Heavy syllable. Among 217 words, 197 have H tone in the final and the penultimate syllable.

(16) Light-Light-Heavy

Tone patterns	LHH	LHL	HLL
example	ɭ.mu.ɔ̌ʒɪ̌n (limousine)	sɪ.kɛ̌.ɪ̌l (scale)	ɪ̌.pɪ̌.nɪ̌ŋ (evening)
Total 217	197 (90.8%)	17 (7.8%)	3 (1.4%)

Seventeen words, such as ɔ̌.ɪ̌.ɔ̌n (Orion, LHL), sɪ.kɛ̌.ɪ̌l (scale, LHL) and kɪ̌.la.ɔ̌n (crown, LHL) of 20 exceptional words follow the default tone pattern of SK loan words and last 3 words as tɪ̌.ɔ̌ʒɪ̌.tal (digital, HLL), wɛ̌.sɪ̌.tɪ̌ (west, HLL) and ɪ̌.pɪ̌.nɪ̌ŋ (evening, HLL) have H tone on the first syllable.

The tone patterns discussed thus far are summarized in (17).

(17)

Syllable composition	Main tone pattern	Percentage (%)
$\sigma_L\sigma_L\sigma_L$	LHL	370/403 (91.8%)
$\sigma_H\sigma_L\sigma_L$	HHL	71/117 (60.7%)
$\sigma_H\sigma_H\sigma_L$	HHL	23/41 (56.1%)
$\sigma_H\sigma_L\sigma_H$	HHL	20/47 (42.6%)
$\sigma_H\sigma_H\sigma_H$	HHL	13/18 (72.2%)
$\sigma_L\sigma_H\sigma_L$	LHL	108/111 (97.3%)
$\sigma_L\sigma_H\sigma_H$	LHH	61/63 (96.8%)
$\sigma_L\sigma_L\sigma_H$	LHH	197/217 (90.8%)

If we consider a syllable closed with a geminate lateral as a light syllable, the number of words showing a main tone pattern for each syllable combination will increase as shown below:

(18)

Syllable composition	Main tone patterns	Percentage (%)
$\sigma_L\sigma_L\sigma_L$	LHL	412/446 (92.4%)
$\sigma_H\sigma_L\sigma_L$	HHL	71/75 (94.7%)
$\sigma_H\sigma_H\sigma_L$	HHL	23/25 (92%)
$\sigma_H\sigma_L\sigma_H$	HHL	20/26 (76.9%)
$\sigma_H\sigma_H\sigma_H$	HHL	13/14 (92.8%)
$\sigma_L\sigma_H\sigma_L$	LHL	124/126 (98.4%)
$\sigma_L\sigma_H\sigma_H$	LHH	33/36 (91.7%)
$\sigma_L\sigma_L\sigma_H$	LHH	246/269 (91.4%)
Total		942/1017 (92.6%)

In (18), the words which have a geminate [l] have been reclassified according to the observation that the syllables with geminate [l]s do not function as heavy. As a result, the ratio of the main tone pattern of each syllable consisting of tri-syllabic words in (18) is absolutely higher than in (17).

As can be seen above, the H tone is realized on the heavy syllable in tri-syllabic words as in di-syllabic words but in a more complicated way.

3.1.3. Quadri-syllabic words

We summarize the tone patterns of SK quadri-syllabic loan words in (19). The percentage is rounded off to the nearest number from Hundredth digit.

(19) The tone realization of SK quadri-syllable loan words

Tone patterns	LHHL	LHHH	HHHL	LHLL		HHLL	HLLL
example	sɪ.na.rɪ.ɔ̌ (scenario)	pa.ɪ.ɔ̌.lɪn (violin)	sɛn.di.wɪ.tʃɪ (sandwich)	wɛ.ɪ.sɪ.ti (waste)	pɪl.lɛ.ɪ.ə (player)	pa.sɪ.sɪ.ti (fascist)	pɪ.rɪ.ə.ti (period)
Total 502	369 (73%)	75 (15%)	45 (9%)	7 (1.4%)	3 (0.6%)	2 (0.4%)	1 (0.2%)

The main tone patterns of quadri-syllabic words are LHHL (73% of words, e.g. sɪ.na.rɪ.ɔ̌ ‘scenario’), LHHH (15% of words, e.g. pa.ɪ.ɔ̌.lɪn ‘violin’) and HHHL (9% of words, e.g. sɛn.di.wɪ.tʃɪ ‘sandwich’) shown in the above tableau. The tone patterns of 1% range or less are except for consideration. In particular, 7 words of 10 LHLL tone pattern words and 2 HHLL tone pattern words in 1% range or less have /-st/ and /-ft/ consonant cluster in the corresponding original English words and H tone is not realized on those syllables. In quadri-syllabic words H tone does not seem to be realized on the syllable which have /-st/ or /-ft/ consonant cluster in the corresponding original English words as tri-syllabic words.

We can expect from the tone patterns of example quadri-syllabic words that syllable weight plays a crucial role in the H tone realization. First, H tone is imposed on the second and the third syllable when all the syllables are light as sɪ.na.rɪ.ɔ̌ (Scenario, LHHL). Second, H tone is imposed on the last, second and third syllable from the last when the final syllable is heavy as pa.ɪ.ɔ̌.lɪn (Violin, LHHH). Finally H tone is imposed on the first, second and third syllable when the first syllable is heavy as sɛn.di.wɪ.tʃɪ (Sandwich, HHHL).

The three main tone patterns of quadri-syllabic words according to the syllable weight constitution are provided in (20). The items from (a) to (n) show all the possible syllable constitutions of quadri-syllabic words. The numbers in parentheses means the words which have geminate [l]. The percentage has been calculated on all words including the words with geminate [l].

(20)

Tone patterns	LHHL		LHHH		HHHL	
Syllable composition	No.	Percentage (%)	No.	Percentage (%)	No.	Percentage (%)
a. $\sigma_L\sigma_L\sigma_L\sigma_L$	214	95% (214/225)			1	0.4% (1/225)
b. $\sigma_L\sigma_H\sigma_L\sigma_L$	22	96% (22/23)			1	4.3% (1/23)
c. $\sigma_L\sigma_L\sigma_H\sigma_L$	29	94% (29/31)			1	3.2% (1/31)
d. $\sigma_L\sigma_H\sigma_H\sigma_L$	7	100% (7/7)				
e. $\sigma_L\sigma_L\sigma_L\sigma_H$	19	32% (19/59)	40	67% (40/59)		
f. $\sigma_L\sigma_L\sigma_H\sigma_H$	2	18% (2/11)	9	81% (9/11)		
g. $\sigma_L\sigma_H\sigma_L\sigma_H$	3	30% (3/10)	7	70% (7/10)		
h. $\sigma_L\sigma_H\sigma_H\sigma_H$	2	33% (2/6)	4	67% (4/6)		
i. $\sigma_H\sigma_L\sigma_L\sigma_L$	52(36)	64.2% (52/81)			27	33.3% (27/81)
j. $\sigma_H\sigma_H\sigma_L\sigma_L$	8(7)	72.7% (8/11)			3	27.3% (3/11)
k. $\sigma_H\sigma_L\sigma_L\sigma_H$	2(1)	10% (2/20)	13(13)	65% (13/20)	5	25% (5/20)
l. $\sigma_H\sigma_L\sigma_H\sigma_L$	9(8)	64.3% (9/14)			5	35.7% (5/14)
m. $\sigma_H\sigma_H\sigma_H\sigma_L$					2	100% (2/2)
n. $\sigma_H\sigma_H\sigma_L\sigma_H$			2(2)	100% (2/2)		

In (21) the syllables which have geminate [l] are reclassified as light syllables.

(21)

Tone patterns	LHHL		LHHH		HHHL	
Syllable composition	No.	Percentage (%)	No.	Percentage (%)	No.	Percentage (%)
a. $\sigma_L\sigma_L\sigma_L\sigma_L$	250	95.8% (250/261)			1	0.3% (1/261)
b. $\sigma_L\sigma_H\sigma_L\sigma_L$	29	96.7% (29/30)			1	3.3% (1/30)
c. $\sigma_L\sigma_L\sigma_H\sigma_L$	37	94.9% (37/39)			1	2.6% (1/39)
d. $\sigma_L\sigma_H\sigma_H\sigma_L$	7	100% (7/7)				
e. $\sigma_L\sigma_L\sigma_L\sigma_H$	20	27.4% (20/73)	53	72.6% (53/73)		
f. $\sigma_L\sigma_L\sigma_H\sigma_H$	2	18% (2/11)	9	81% (9/11)		
g. $\sigma_L\sigma_H\sigma_L\sigma_H$	3	25% (3/12)	9	75% (9/12)		
h. $\sigma_L\sigma_H\sigma_H\sigma_H$	2	33% (2/6)	4	67% (4/6)		
i. $\sigma_H\sigma_L\sigma_L\sigma_L$	16	35.5% (16/45)			27	60% (27/45)
j. $\sigma_H\sigma_H\sigma_L\sigma_L$	1	25% (1/4)			3	75% (3/4)
k. $\sigma_H\sigma_L\sigma_L\sigma_H$	1	16.7% (1/6)			5	83.3% (5/6)
l. $\sigma_H\sigma_L\sigma_H\sigma_L$	1	16.7% (1/6)			5	83.3% (5/6)
m. $\sigma_H\sigma_H\sigma_H\sigma_L$					2	100% (2/2)
n. $\sigma_H\sigma_H\sigma_L\sigma_H$						

The syllable constitution of three main tone patterns of quadri-syllabic words are as follows.

First, 95.8% of words with four light syllables (21a), 96.7% of words with the second syllable heavy (21b), 94.9% of words with the third syllable heavy (21c), and 100% of words with the second and third syllable heavy (21d) show LHHL tone pattern.

Second, 72.6% of words when the final syllable is heavy (21e), 81% of words when the last and penultimate syllables are heavy (21f), 75% of words when the last and antipenultimate syllables are heavy (21g), and 67% of words when the last, penultimate and antipenultimate syllables are heavy (21h) show LHHH tone pattern.

Finally 60% of words when the first syllable is heavy (21i), 75% of words when the first and second syllables are heavy (21j), 83.3% of words when the first and last syllables are heavy (21k), 83.3% of words when the first and third syllables are heavy (21l) and 100% of words when the first, second and third syllables are heavy (21m) show HHHL tone pattern.

From the three main tone patterns shown above, we can conclude that syllable weight plays also a crucial role in tone assignment of quadri-syllabic words even though many quadri-syllabic words compared to di- and tri-syllabic words follow the default form (LHHL).

The tone patterns of SK Korean loan words are summarized below.

(22) Di-syllabic words

- a. H tone is imposed on heavy syllable.
- b. If two syllables are all light, H tone is imposed on the penultimate syllable (HL).
- c. Geminate [l] functions as weightless unit.

(23) Tri-syllabic words

- a. If the first syllable is heavy, H tone is imposed on the first two syllables (HHL).
- b. If the last syllable is heavy, H tone is imposed on the last and penultimate syllable (LHH).
- c. H tone is imposed on the penultimate syllable in the other cases (LHL).
- d. Geminate [l] functions as weightless unit.
- e. H tone is not imposed on the syllables which have /-st/ or /-ft/ consonant cluster in corresponding original English words.

(24) Quadri-syllabic words

- a. If the first syllable is heavy, H tone is imposed on the first three syllables (HHHL).
- b. If the last syllable is heavy, H tone is imposed on the last, penultimate and anti-penultimate syllable (LHHH).
- c. H tone is imposed on the second and third syllable in the other cases (LHHL).
- d. Geminate [l] functions as weightless unit.
- e. H tone is not imposed on the syllables which have /-st/ or /-ft/ consonant cluster in corresponding original English words.

From the description (22)-(24), we can generalize the SK loan word tone patterns.

(25) SK Loan words tone patterns

- a. If the first syllable is heavy, H goes on the first syllable.
- b. Other wise, H goes on the second syllable. In other words, the H tone goes on the head syllable of an initial iambic foot.
- c. The H tone spreads rightward.
- d. Final mora is extrametrical.
- e. The foot structure is iambic.

Generally, tone patterns of SK native words are not predictable, the tone patterns of each word is supposed to be specified lexically. For example, the tone of patterns of the following three native

words which have no difference in the number of syllable and syllable weight are different as follows: ku. rɪm (crowd, HH), kɪ. rɪm (oil, HL), and kə. rɪm (fertilizer, LH).

In contrast the tone patterns of SK loan words are to large extent predictable when compared to SK native words. In particular, H tone is imposed on the heavy syllable.

The comparison of SK loan word and SK native word tone patterns is as below.

(26)

di-syllabic		tri-syllabic		quadri-syllabic	
native	loan word	native	loan word	native	loan word
HL	HL	HHL	HHL	LHHL	LHHL
LH	LH	LHL	LHL	HHLL	HHLL
HH	HH	LHH	LHH	(LHLL)	LHLL
		HLL	HLL	(HLLL)	HLLL
				(LHHH)	LHHH
					HHHL

In (26), except one tone pattern shown in quadri-syllabic words (HHHL), the tone inventory of loan words is the same as that of SK native words. The tone patterns of di- and tri-syllabic loan words are all in the tone inventory of di- and tri-syllabic native words and vice versa.

In this section I have suggested that tone patterns of SK loan words rely on the component syllable weight and number. In the next section, we discuss the loan word and native word tone patterns of North Kyungsang (NK) Korean, a dialect spoken in the south-eastern part of Korea, before I propose a formal analysis of SK loan word tone patterns.

3.2 NK Tone Patterns

3.2.1 NK native tone patterns

NK Korean is classified as a pitch accent language in which only a single syllable (or a sequence of two syllables) has a H tone. The SK loan words which are the object of the present study have not been discussed thoroughly nor has there been a huge collection of data so it might be instructive to refer to earlier research about NK native and English loan word tone patterns.

In this section, we, therefore, discuss NK data and researches centering around Kenstowicz & Sohn (1998) and Kim (1997), and compare NK tone patterns with SK tone patterns.

The tone inventory of SK and NK native words on the basis of the number of component syllables are summarized as below.

(27)

di-syllabic		tri-syllabic		quadri-syllabic	
SK	NK	SK	NK	SK	NK
HL	HL	HHL	HHL	LHHL	LLHL
LH	LH	HLL	HLL	HHLL	
HH	HH	LHL	LHL	(LHLL)	
		LHH	LLH	(HLLL)	
				(LHHH)	

First, NK native tone patterns of di-syllabic words are same as those of SK native di-syllabic words: HL, LH and HH. Secondly, NK native tone patterns of tri-syllabic words are HLL, LHL, LLH and HHL. Those tone patterns are the same as SK native tri-syllabic word tone patterns except that SK has LHH tone whereas NK has LLH tone pattern. Finally, one tone pattern (LLHL) is present in NK quadri-syllabic words, on the other hand, SK quadri-syllabic words have 5 different tone patterns including LHHL, HHLL tone.

From the loan word tone patterns of SK and NK Korean on the number of component syllables are shown in (27), we could suspect that the tone inventory of NK loan words is very similar to SK loan words.

NK loan word tone patterns discussed in Kim (1997) and Kenstowicz & Sohn (1998) are summarized as below:

(28) Kim (1997)

- If the final syllable is heavy (long vowel), H is imposed on the final syllable.
- Otherwise, H is imposed on the penultimate syllable (default tone pattern).

(29) Kenstowicz & Sohn (1998)

- If the first syllable of the output is heavy (long vowel and diphthong), H is realized on the first two syllables (doubled class).

- b. If the final syllable is heavy, H is realized only on the final syllable (final class).
- c. In the other cases, H is realized on the penultimate syllable (penultimate class).

Especially, NK loan word tone patterns which are listed in Kenstowicz & Sohn (1998) have common features with SK loan word tone patterns.

First, H tone goes to heavy syllables. Second, as shown in 3.1, geminate [l] does not function as a heavy unit in both NK and SK. Third, H tone is not imposed on the syllables which have /-st/ or /-ft/ consonant cluster in corresponding original English words.

In spite of the similarity of NK and SK, the analysis of NK loan word tone patterns in Kim (1997) shows a difference comparing to the analysis of SK loan word tone patterns. In Kim (1997) only long vowels belong to heavy syllable but coda consonants are not supposed to have a mora so they do not belong to heavy syllable in NK. For example, the tone pattern of **kɛ. ɪm** (game) in NK is HL. Because the coda consonant [m] of the final syllable does not have a mora, the final syllable is supposed to be a light syllable. In this case, there is no heavy syllable, so H tone is imposed on the penultimate syllable as default form.

In SK, however, the coda of the final syllable of **kɛ. ɪm** (game) has a mora, so the last syllable is supposed to be a heavy syllable. Therefore H tone is imposed on the final heavy syllable and the tone pattern of the word becomes LH.

From this fact we can see that H is assigned to a head of initial iambic foot in SK, however, in NK H is assigned to a final iambic foot. The real difference is that SK is left edge that is, H is imposed on the initial heavy or second syllable, however, NK is right edge that is, H is imposed on the final heavy or penultimate syllable.

Despite of the difference of NK and SK, there are lots of similarities between both dialects as shown above. Therefore it might be instructive to refer to the analysis of NK loan word tone patterns in Kim (1997) and Kenstowicz & Sohn (1998) for the SK loan word tone pattern analysis which will be provided in the next section.

4. Analysis

As shown in 3.1 even though the syllable weight plays a crucial role in SK tone assignment, the actual output is decided through the systematic interaction with other factors.

In this section, therefore, we provide a formal analysis of SK lone word tone patterns in the framework of Optimality Theory (Prince and Smolensky 1993, McCarthy and Prince 1993, 1995, 1999) in which all the phonological phenomena are analyzed as the result of the interaction of constraints. For the representation of the phonological form, we employ Autosegmental phonology model (Goldsmith 1976, 1990, Clements & Keyser 1983). Tonemes occupy the tone tier separated from segments, and the tonemes and their hosts are connected with association lines.

4.1 Di-syllabic words

In the SK di-syllabic loan word data shown in 3.1.1 we discovered a regularity that cannot be found in SK native words. The regularity that H tone is imposed on the heavy syllable is the most basic and central in the analysis of SK loan words. To provide an account for this regularity, we adopt the following constraint (Kim, 1997) which is based on Weight-to-Tone (e.g. Kager 1999, p.155):

(30) Weight-to-Tone: Heavy syllables have a High tone.

As a result of constraint (30), H tone is imposed on the heavy syllable in SK loan words in which one or two syllables are heavy.

Secondly, in the examples of (4)ti. ri:m (dream, LH), (5)kol. pi (golf), (7)ka. si (gas, HL), every SK di-syllabic loan word has a H tone. To explain this, we adopt the following constraint.

(31) One-H-Pw: A High tone is present in a prosodic word.

In this case, we hypothesize that the H tone can be doubly linked to neighboring syllables.

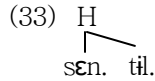
The analysis of the words in which both syllables are heavy is as below.

(32) Heavy-Heavy (sandal)

/sɛn.til/	One-H-Pw	W-t-T
a. L H		*!
b. H L		*!
c. H H		
d. L L	*	**!

In (32a), H tone is not imposed on the first heavy syllable, in (31b) H tone is not imposed on the final heavy syllable, so both candidates are ruled out by the violation of W-t-T constraint. In (31d) there is no H tone in a word so this is ruled out by the violation of One-H-Pw constraint. Therefore (32c) in which H tone is imposed on both heavy syllables becomes the optimal output.

The structure of (32c) is as below. A H is doubly linked to both syllable.



Third, the words in which the final syllable is light e.g. kɔl. pɪ (golf, HL) have a H tone on the penultimate syllable. To explain that a final light syllable does not have a H, we adopt the following constraint on the basis of Non-finality constraint (e.g. Kager 1999, p.151) in which stress is not imposed on the final syllable.

(34) Non-finality: Final mora is extrametrical.

First, we provide the analysis of words in which the first syllable is heavy and the final syllable is light in (35).

(35) Heavy-Light (golf)

/kɔl.pi/	One-H-Pw	W-t-T	Non finality
a. L H		*!	*
b. H L			
c. H H			*!
d. L L	*!	*	

In (35a), the H tone is not imposed on the first heavy syllable so it is ruled out because of a violation of W-t-T constraint. In (35c), H tone is imposed on the final light syllable so it is ruled out because of the violation of Non-finality constraint. In (35d), there is no H tone in the candidate word so it is ruled out because of the violation of One-H-Pw. The optimal output is, therefore, (35b) in which H tone is imposed only on the first heavy syllable.

Fourth, the words in which the first syllable is light and the second syllable is heavy e.g. tɪ.rɪm (dream, LH) have a H tone on the final syllable. One of the possible winning candidates, tɪ.rɪm

(dream, *HH) has H on both syllables and *ti.rɪm* (dream, LH) has High tone on the final syllable. However, optimal output does not have a H on the initial light syllable. To explain that the foot structure of SK loan words is Iambic, we adopt the following constraint.

(36) Foot Form: Iambic: High tone goes on the head syllable of an Iambic foot

(37) Light-Heavy (dream)

/ti.rɪm/	One-H-Pw	W-t-T	Iambic
a. L H			
b. H L		*!	
c. H H			*!
d. L L	*!	*	

In (37b), H tone is not imposed on the second, heavy syllable, so this candidate violates W-t-T constraint. In (37c), H tone is imposed on both syllables so this violates Foot Form: Iambic constraint. In (37d), there is no H tone on either syllables, so (37d) is eliminated by the violation of the One-H-Pw constraint. Therefore optimal output is (37a) in which H tone is imposed only on the final heavy syllable.

We could provide the analysis of the words in which the both syllables are light using the above constraints and their ranking. Here we can see that Non Finality outranks Iambic constraint. If not, the LH tone pattern will be the optimal output rather than the HL tone patterns.

(38) Light-Light (gas)

/ka.sɪ/	One-H-Pw	W-t-T	Non finality	Iambic
a. L H			*!	
b. H L				*
c. H H			*!	
d. L L	*!			

In (38a) and (38b), H tone is on the final light syllable so these candidates are ruled out by the violation of Non-finality constraint. In (38d), there is no H tone in the word so this is ruled out by the violation of One-H-Pw constraint. The optimal output is, therefore, (36c) in which H tone is imposed on the penultimate syllable when both syllables are light.

We have analyzed di-syllabic loan word tone patterns in the framework of OT. The relative constraint ranking of SK di-syllabic loan words is as below.

(39) Constraint ranking

One-H-PrWd, Weight-to-Tone, Non finality >> Foot Form: Iambic

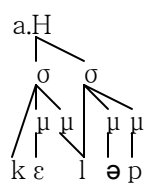
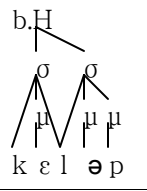
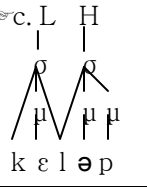
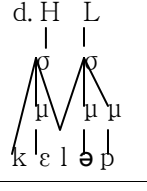
Now we will discuss geminate [l] mentioned in (6), which plays an important role in the SK loan word analysis.

In (6), the words like *kɛl.ləp* (gallop, LH), *pɪl.lɛk* (black, LH), *sɪl.lɪm* (slim, LH), *pɪl.lɛn* (plan, LH) have two heavy syllables. However, H tone is not imposed on both syllables. It is imposed only on the final syllable. The first syllable which has geminate [l], therefore, functions as light syllable as hypothesized before. To explain this, we adopt the following constraint.

(40) Geminate [l]: Moraic consonant must have independent feature (non-spread).

The ranking of this constraint is dominant. If not, the syllables which have a geminate [l] would be treated as heavy syllables and H tone would be imposed on the syllables with a geminate [l] as *kɛl.ləp* (gallop, *HH). This is illustrated in the following tableau.

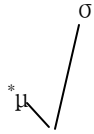
(41) gallop /kɛləp/

/kɛləp/ (gallop)		One-H-Pw	W-t-T	Non finality	Iambic
a. 	*!			*	*
b. 				*	*!
c. 				*	
d. 			*!		
e. 		*!	*		

In (41a), the geminate [l] has a mora so this candidate violates the geminate [l] constraint. In (41b), H tone is imposed on the both syllables so it violates the Iambic constraint. In (41d), H tone is not imposed on the second, heavy syllable so it is eliminated by W-t-T. Finally, in (41e), there is no H tone on either syllable so it violates the One-H-Pw constraint. Therefore the optimal output is (41c) in which H tone is imposed only on the final, heavy syllable.

As shown above, the final ranking of the relative constraints which explain the SK di-syllabic loan word tone patterns is as below.

(42) The final constraint ranking of SK di-syllabic loan words



One-H-PrWd, Weight-to-Tone, 1, Non finality >> Foot Form: Imbic

We have accounted for the SK di-syllabic loan word tone pattern. In the next section, we will provide the analysis of SK tri-syllabic loan word tone patterns.

4.2 Tri-syllabic words

The H tone assignment of SK tri-syllabic loan words is more complex than that of di-syllabic words. The tri-syllabic loan words tone patterns are summarized as below (compare (23)).

- (43) a. If the first syllable is heavy, H tone is imposed on the first syllable regardless of the syllable weight of the second and third syllable (e.g. *lɛp.sɔ.tɪ* (rhapsody, HHL)).
- b. Otherwise H tone is imposed on the second syllable (e.g. *la.tɪ.ɔ* (radio, LHL)).
- c. H tone spreads rightwards (e.g. *tɪ.rɒm.pɛt* (trumpet, LHH)).

To explain these patterns, let us discuss what constraints are needed. First, as shown in (13), even when all three syllables are heavy, H tone is not imposed on all heavy syllables in tri-syllabic words. This means the assignment of H tone on all syllables of a word is forbidden in tri-syllabic words. In NK native word tone patterns, H tone can also be imposed at most on a sequence of two syllables. This observation was previously made for NK in Narahara (1985), Kim (1998), Chung (1980), Chung (1991) and Kim (1997). To explain this, we propose a following constraint.

(44) *Monotone: Words of three or more syllable cannot be monotones.

*Monotone must be higher in ranking than W-t-T. If not, H tone is imposed on all the syllables of words in which three syllables are heavy (*dʒɛn.tɪl.mɛn* (gentleman, *HHH). Under this assumption, we can see that syllable weight in tri-syllabic words, as in di-syllabic words, plays a crucial role in tone assignment.

We provide the analysis of the words in which first two syllables are heavy and final syllable is light in (45).

(45) Heavy-Heavy-Light (accent)

/ak.sɛn.ti/	*Monotone	One-H-Pw	W-t-T
a. H L L			*!
b. L H L			*!
c. L L H			**!
d. H H L			
e. L H H			*!
f. H L H		*!	*
g. H H H	*!		

The candidate (45a), (45b), (45c) and (45e) violates the Weight-to-Tone constraint. The candidate (45f) violates One-H-Pw and the candidate (45g) violates the *Monotone constraint. Therefore, the optimal output becomes candidate (45d).

The analysis of the words in which three syllables are all heavy is as in (46).

(46) Heavy-Heavy-Heavy (gentleman)

/dʒɛn.təl.mɛn/	*Monotone	One-H-Pw	W-t-T	Iambic
a. H L L			**!	
b. L H L			**!	*
c. L L H			**!	*
d. H H L			*	
e. L H H			*	*!
f. H L H		*!	*	
g. H H H	*!			*

In (46a), (46b) and (46c), H tone is not imposed on two heavy syllables, so each of these candidates violate the Weight-to-Tone constraint twice. In (46e) H tone is not imposed on the first two, heavy syllables which are respectively the head syllable of iambic foot. Therefore it is ruled out by the violation of the Iambic constraint. In (46f), H tone is imposed on the first and the final syllables, so it violates the One-H-Pw constraint. In (46g), H tone is imposed on all three syllables so it violates

the *Monotone constraint. Therefore the optimal output can be (46d) in which H tone is imposed on the first and second syllable when all the syllables are heavy.

The words in which the first ayllable is heavy and the last two syllables are light (e.g. **lɛp.sɔ.tɪ** (rhapsody, HHL) have H tone not only on the first syllable but also on the second syllable. That means H tone spreads rightwards. To explain this, we adopt the following constraint.

(47) Align R: H is aligned with right edge of the prosodic word.

This is a gradient constraint. Violation of this constraint will amount to the position of H tone. HLL tone pattern which has H tone only on the first syllable incurs one more violation of Align R constraint than LHL tone pattern which has H tone on the second syllable (LLH > *LHL > **HLL).

We provide the analysis of the words in which only the first syllable is heavy and the words in which the first and final syllable are heavy using the above constraints and their ranking.

First, the analysis of the former case is provided in (48).

(48) Heavy-Light-Light (rhapsody)

/rɛp.sɔ.tɪ/	*Monotone	One-H-Pw	W-t-T	Non finality	Align R
a. H L L					**!
b. L H L			*!		*
c. L L H			*!	*	
 d. H H L					*
e. L H H			*!	*	
f. H L H		*!		*	
g. H H H	*!			*	

In (48a), H tone is realized on the first syllable so it violates the Align R constraint twice. In (48b), (48c) and (48e), H tone is not realized on the first, heavy syllable so these candidates violate the Weight-to-Tone constraint. In (48f), H tone is realized on the first and the last syllables at the same time so it violates the One-H-Pw constraint. Finally, in (46g), H tone is realized on all three syllables so it violates the *Monotone constraint. The optimal output is, therefore, (48d) in which H tone is imposed on the first two syllables when the first syllable is heavy.

Next, the analysis of the words in which the first and last syllables are heavy (e.g. *ʃam.pɛ̃.ɪ̃n* (champagne, HHL)) is provided in (49). In this case we could expect that H tone is imposed on the first and last syllable (e.g. *HLH) but actual tone pattern is HHL: H tone is imposed on the first two syllables. Therefore we could conclude that the One-H-Pw constraint outranks W-t-T. If not, the optimal output would be HLH tone pattern (e.g. *ʃam.pɛ̃.ɪ̃n* (champagne, *HLH) rather than HHL.

We could also conclude from this example that the Iambic constraint outranks the Align R constraint. If not, the tone pattern of the words in which the first and final syllables are heavy would be *ʃam.pɛ̃.ɪ̃n* (champagne, *LHH or *LLH) rather than HHL.

(49) Heavy-Light-Heavy (champagne)

/ʃam.pɛ̃.ɪ̃n/	*Monotone	One-H-Pw	W-t-T	Non finality	Iambic	Align R
a. H L L			*			**!
b. L H L			**!		*	
c. L L H			*		*!	
d. H H L			*			*
e. L H H			*		*!	
f. H L H		*!				
g. H H H	*!					

In (49a), H tone is imposed only on the first syllable so it violates the Align R constraint twice. In (49b), H tone is not imposed on the first and final heavy syllables so it violates the Weight-to-Tone constraint twice. In (49c) and (49e), H tone is not imposed on the head syllable of Iambic foot, which is the first, heavy syllable. Therefore these candidates violate the Iambic constraint. In (49f), H tone is imposed on the first and the final syllables so it violates the One-H-Pw constraint. Finally, in (49g), H tone is imposed on the all three syllables so it violates the *Monotone constraint. The optimal output is, therefore, (49d) in which H tone is imposed on the first two syllables when the first and final syllables are heavy.

Thirdly, we could provide the analysis of the words in which the first two syllables are light and the final syllable is heavy (e.g. *li.mu.dʒɪ̃n* (limousine, LHH)) Using the above constraints.

(50) Light-Light-Heavy (limousine)

/lɪ.mu.ʒɪn/	*Monotone	One-H-Pw	W-t-T	Non finality	Iambic	ALIGN R
a. H L L			*!		*	**
b. L H L			*!			*
c. L L H					*!	
d. H H L			*!		*	*
e. L H H						
f. H L H		*!			*	
g. H H H	*!				*	

In (50a), (50b) and (50d), H tone is not imposed on the final heavy syllable so they are ruled out by the violation of the Weight-to-Tone constraint. In (50c), H tone is not imposed on the head syllable of iambic foot, which is the second syllable so it violates The Iambic constraint. In (50f), H tone is imposed on the first and the last syllable so it violates the One-H-Pw constraint. Finally, in (50g), H tone is imposed on the all three syllables so it violates the *Monotone constraint. The optimal output is, therefore, (50e) in which H tone is imposed on the final and penultimate syllables when the final syllable is heavy.

Fourth, we could provide the analysis of the words in which the all three syllables are light (e.g. la.dɪ.ɔ (radio, LHL)) using the above constraints and their ranking.

(51) Light-Light-Light (radio)

/la.dɪ.ɔ/	*Monotone	One-H-Pw	W-t-T	Non finality	Iambic	Align R
a. H L L					*!	**
b. L H L						*
c. L L H				*!		
d. H H L					*!	*
e. L H H				*!		
f. H L H		*!		*	*	
g. H H H	*!			*	*	

In (51a), H tone is not imposed on the head syllable of the iambic foot, which is the second syllable. Therefore it violates the Iambic constraint. In (51c) and (51e), H tone is imposed on the final light

syllable so they violate the Non-finality constraint. In (51d), H tone is imposed not only on the second syllable but also on the first syllable. Therefore it violates the Iambic constraint. In (51f), H is imposed to the first and the final syllable so it violates the One-H-Pw constraint. Finally, in (51g), H tone is imposed on the all three syllables so it violates the *Monotone constraint. The optimal output is, therefore, (51b) in which H tone is imposed only on the penultimate syllable when the all three syllables are light.

Finally, let us note that the geminate [l] constraint which is applied in di-syllabic loan word analysis. It could also be used in the analysis of tri-syllabic loan words.

For the example words of this constraint application, only the words in which a geminate [l] comes in the first syllable as pīl.lū.sī (blues), sīl.lm.də (cylinder), and pēl.l.kan (pelican) are meaningful among other tri-syllabic words. The words in which the geminate [l] comes in the final and penultimate syllable as pa.l.lət (pilot) are not appropriate example words. Because in these words the final syllable is heavy so H tone is imposed on the penultimate syllable and spreads rightward regardless the geminate [l] is moraic or not. We, therefore, discuss only the words in which a geminate [l] comes in the first and second syllable.

First, in the case of words like pīl.lū.sī (blues), the first syllable which has a geminate [l] functions as light syllable. Therefore pīl.lū.sī (blues) considered as series of Light-Light-Light syllable and H tone is imposed on the penultimate syllable as in the words in which the all three syllables are light (e.g. pīl.lū.sī (blues, LHL)).

Secondly, in the case of words like sīl.lm.də (cylinder), the first syllable having a geminate [l] functions as light syllable. As the result H tone is imposed only on the second, heavy syllable as in the words in which only the second syllable is heavy (e.g. sīl.lm.də (cylinder, LHL)).

Finally, in the case of words as pēl.l.kan (pelican), the first syllable having a geminate [l] functions as light syllable. As the result, H tone is imposed on the final and penultimate syllable as in the words in which only the final syllable is heavy (e.g. pēl.l.kan (pelican, LHH)).

At first, the analysis of the words in which the first syllable has a geminate [l], the second syllable is heavy and the final syllable is light is provided in (52).

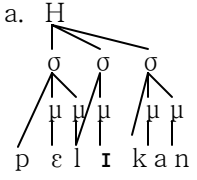
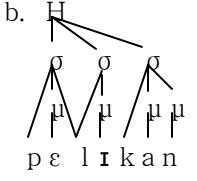
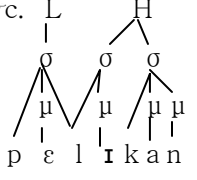
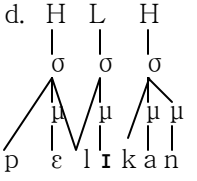
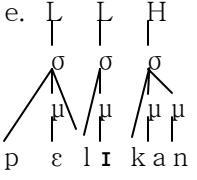
(52) cylinder /sɪlɪndə/

/sɪlɪndə/	$\begin{matrix} * & \sigma \\ \mu & / \\ & l \end{matrix}$	One-H-Pw	W-t-T	Non finality	Iambic
a.	*!				
b.					*!
c.					
d.			*!		*
e.		*!	*		

In (52a), the first syllable has a mora (μ) so it violates the geminate [l] constraint, and in (52b), H tone is not imposed on the second syllable, which is the head syllable is the iambic foot. Therefore it violates the iambic constraint. In (52d), H tone is not imposed on the second heavy syllable so it violates the Weight-to-Tone constraint. Finally, in (52e), there is no H in the all three syllables so it violates the One-H-Pw constraint. The optimal output is, therefore, (52c) in which H tone is imposed only on the penultimate syllable.

Next, the analysis of the words in which the first syllable has a geminate [l], the second syllable is light and the final is heavy, is provided in (53).

(53) pelican /pɛlɪkən/

/pɛlɪkən/		*Monotone	One-H-Pw	W-t-T	Non finality	Iambic	Align R
a. 	*!	*				*	
b. 		*!				*	
c. 							
d. 			*!			*	
e. 						*!	

In (53a) the first syllable has a mora so it violates the geminate [l] constraint and in (53b) H tone is imposed on the all three syllables so it violates the *Monotone constraint. In (53d) H tone is imposed on the first and the final syllables so it violates the One-H-Pw constraint. Finally, in (53e), H tone is not imposed on the second syllable which is the head syllable of iambic foot. Therefore it violates the Iambic constraint. The optimal output is, therefore, (53c) in which the first syllable having a geminate [l] does not have a mora. Therefore it functions as a light syllable and H tone is imposed on the final, heavy and the penultimate syllable.

According to the analyses of this section, the constraint ranking for SK di- and tri- syllabic word tone patterns is as below.

(54) The final constraint ranking of SK Korean di- and tri- syllabic loanword tone patterns.

4.4 Quadri- and Mono- syllabic word

In SK quadri-syllabic loan words, syllable weight plays a crucial role in the tone realization as in di- and tri- syllabic words.

First, if the first syllable is heavy, H tone is imposed on the first three syllables (e.g. **sɛn.di.wi.tʃi** (sandwich, HHHL)). Secondly, if the final syllable is heavy, H tone is imposed on the second, third and final syllables (e.g. **pa.i.ɔl.lɪn** (violin, LHHH)). Third, H tone is imposed on the penultimate and antipenultimate syllable in the other cases (e.g. **sɪ.na.rɪ.ɔ** (scenario, LHHL)).

These tone patterns could be accounted by the constraints which are already used for the analysis of di- and tri- syllabic loan words.

First, as shown in **sɛn.di.wi.tʃi** (sandwich, HHHL) and **pa.i.ɔl.lɪn** (violin, LHHH), if H tone is imposed on the first or penultimate syllable H tone spreads rightwards. This phenomenon can be explained by the Align R constraint as provided in the previous section. For instance, as in **sɛn.di.wi.tʃi** (sandwich, *HHLL), if H tone is imposed on the first two syllable it violates the Align R constraint twice so it is ruled out. In **pa.i.ɔl.lɪn** (violin, *LHHL), H tone is imposed on the second and third syllables so it violates the Align R constraint once and as the result it is ruled out. In **sɪ.na.rɪ.ɔ** (scenario, *LHLL), H tone is imposed only on the second syllable so it violates the Align R constraint twice and it is ruled out. In **sɪ.na.rɪ.ɔ** (scenario, *LLHL), H tone is not imposed on the second syllable so it violates the Iambic constraint and it is ruled out.

As shown above, SK quadri-syllabic loan word tone patterns could be accounted by the same constraints which are already used for the analysis of di- and tri- syllabic words.

The analysis of the words in which all four syllables are light is as in (55).

(55) Light-Light-Light-Light (scenario)

/sɪ.na.rɪ.ɔ/	*Monotone	One-H-Pw	W-t-T	Non finality	Iambic	Align R
a. HLLL					*!	***
b. LHLL						**!
c. LLHL					*!	*
d. LLLH				*!	*	
e. HHLL					*!	**
f. LHLH						*
g. LLHH				*!	*	
h. HLLH		*!		*	*	
i. HHHL					*!	*
j. LHHH				*!		
k. HHHH	*!			*	*	

In (55a), (55c), (55e) and (55i), H tone is not imposed on the head syllable of the iambic foot so these candidates violate the Iambic constraint. In (55b), H tone is imposed on the second syllable, so it violates Align R twice. In (55d), (55g) and (55j), H tone is imposed on the final light syllable, so these candidates violate the Non-finality constraint. In (55h), H tone is imposed on the first and the final syllable, so it violates the One-H-Pw constraint. Finally, in (55k), H tone is imposed on the all four syllables, so it violates the *Monotone constraint.

The optimal output is, therefore, (55f) in which H tone is imposed on the second and third syllable when the all four syllables are light.

Finally, SK mono-syllabic loan words have one H tone in a word (e.g. *ʃʊt* (shoot, H), *kəp* (cup, H), *ka* (car, H)). This can be accounted by the One-H-Pw constraint which means every prosodic word has at least one High tone.

5. Conclusion

In this paper we have provided an analysis of SK loan word tone patterns. To do this we first have collected 2265 English loan words as well as other foreign loan words in the Southern Kyungsang Korean and have classified the collected words on the basis of component syllable weight and number.

Secondly, to judge the tone patterns of the collected words, we interviewed four SK native speakers. As a result we found out that while SK native words in which tone patterns of each word are specified in the lexicon so they are unpredictable, the tone patterns of SK loan words are predictable with syllable weight playing a crucial role in the assignment of High tone.

Third, before the analysis of the SK loanword tone patterns, we have compared SK loan word tone patterns and SK native tone patterns and recognized the tone inventory of SK native words is almost same as that of SK loan words. And we have also discussed previous research about NK native and loan words, which belong to the same pitch accent language with SK, for the analysis of SK loan word tone patterns of the paper.

Finally, we have adopted Optimality theory in which all the phonological phenomena are explained as the result of interaction of constraints, therefore, we could provide an explicit and integral account about the tone patterns of SK di-, tri- and quadri- syllabic loan words.

One can view the tone pattern on loan words in SK as an instance of The Emergence of the Unmarked. We assume that loan words do not have lexically specified tone patterns and therefore an unmarked tone pattern that makes crucial reference to an iambic foot structure emerges. We leave for further research the issue of other evidence for iambic foot structure in SK.

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