Frequency and stress preservation: Encoding Frequency in OT

Hye-Sun Cho
(Seoul National University)

Cho, Hye-Sun. 2004. Frequency and stress preservation - Encoding Frequency into OT. SNU Working Papers in English Language and Linguistics 3, #.-#. This paper attempts to show frequency effect on English word stress with corpus-based study, and to incorporate frequency into Optimality Theoretic grammar. I propose the constraint ID-Stress (fg and the hierarchy ID-Stress (fg >> Clash-Head >> ID-Stress. Even though frequency alone is not the absolute factor in stress assignment in that other factors such as morpheme-specificity are also influential, it is clearly an interesting aspect in English stress phenomena. (Seoul National University)

Keywords: frequency, stress, cyclicity, ID-Stress, Stress Clash, primary stress, secondary stress, reduction

1. Introduction

Since English stress is involved with various idiosyncratic patterns, it is almost impossible to give a complete account despite the volume of studies that have been done so far. The first pioneering work by Chomsky and Halle (1968) explains English stress as a product of interaction between cyclic and non-cyclic rules. This account, however, cannot be applied to all English word; it is not difficult to find apparent exceptions. The rule-based theory like this is destined to fail especially in case of English stress since it has abundant exceptions that cannot be measured by only a set of rules. In this sense, it is not exaggeration that Optimality Theory is more suitable than rule-based approach in explaining English stress pattern. Optimality Theory has succeeded in giving more improved account for, for example, metrical stress by Generalized Alignment (McCarthy and Prince 1993). Nevertheless, English stress is yet far from being fully explained. Since English stress is basically involved with lots of lexical-idiomsyncrasies, we need a tool to handle these lexical differences.

Against this backdrop, Pater (2000) proposes a lexically-specific constraint, which is applied to a set (S1 or S2) of words to explain lexically-specific English secondary stress. This is one-step advanced
approach in that we can apply different constraints and rankings to different lexical items. However, how do we know whether a word belongs to S1 or S2? If the answer is that S1 tolerates violation of ‘Clash-Head while S2 does not, it can be circular reasoning.

To avoid hasty generalization that lexically-specific constraints exist, we should consider factors that should not be overlooked. One of them is frequency, as proposed by Hammond (2003), which proves that the more frequent the form is, the more likely it is to undergo vowel reduction. This paper further investigates frequency effects on English stress by corpus-based study and proposes how to incorporate frequency into grammar.

2. Previous studies
2.1 Chomsky and Halle (1968)

Chomsky and Halle (1968) shows the effect of stressed vowel in the first cycle on the stresses in the second cycle. They illustrate phonetic effects of the rules of the transformational cycle. The vowel in the second syllable of *condense* is stressed, and this is reflected in the nominalized word *condensation* in the next cycle. Another effect of cyclicity is vowel reduction. Consider the examples below.

(1) (a) [\textsuperscript{1}\textsubscript{1}condens\textsuperscript{2}\textsuperscript{2}\textsubscript{3}At\textsuperscript{4}ion\textsuperscript{1}N]  (b) [\textsuperscript{1}devast\textsuperscript{2}At\textsuperscript{3}tion\textsuperscript{1}N]

<p>| | | | |</p>
<table>
<thead>
<tr>
<th></th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>2</td>
<td>1</td>
<td></td>
</tr>
<tr>
<td>2</td>
<td>3</td>
<td>1</td>
<td></td>
</tr>
<tr>
<td>3</td>
<td>4</td>
<td>1</td>
<td></td>
</tr>
</tbody>
</table>

The second vowel in (1a) *condensation* is unstressed but remains unreduced because it is the primary stress in the first cycle. The corresponding vowel of (1b)*devastation*, in contrast, is reduced, as it bears no stress in the first cycle. Thus, it seems that the primary stress in the first cycle is preserved in the second cycle. However, the cyclic stress preservation approach has been criticized by Halle and Vergnaud (1987) and Halle and Kenstowicz (1991) since it should assume considerable exceptions.
2.2 Halle and Kenstowicz (1991)

Contrary to Chomsky and Halle (1968), Halle and Kenstowicz (1991) indicates that the cyclic stress preservation occurs only in a limited set of words such as conversation. It also applies to the words like contemplation which does not bear any stress in the first cycle contemplate. However, this is not true for the cases like the following.

(2) (a) affirmation, confirmation, conservation, consultation, conversation, information, lamentation, preservation, transportation, usurpation  
(b) affirm, confirm, conserve, consult, converse, inform, lament, preserve, transport, usurp

The second syllables of (2a) have no stress though they are the primary stresses in the previous cycle as in (2b). Cyclic stress preservation of Chomsky and Halle (1968) is awkward for these cases.

Halle and Kenstowicz (1991) propose that the subsidiary stresses are assigned by a noncyclic rule that metrifies the string of unmarked syllables preceding the cyclically assigned stress. Therefore, they view the stress rules of English as (3). English primary and secondary stresses are assigned in the different levels of cycle: cyclic and noncyclic respectively. The metrification direction for the primary stress is from right to left, and vice versa for the secondary stress.

(3) Cyclic Stress Erasure Convention  
    Stress heavy syllables  
    Metrification (right to left)  
    Conflation  

    Noncyclic Stress heavy syllables (lexically restricted)  
    Metrification (left to right)

The rule assigning stress to heavy syllables operates in both the cyclic and the noncyclic blocks but its operation in the latter stratum is lexically restricted, applying in condensation, deportation, incantation, Halicarnassus, but not in compensation, transformations, information, serendipity. In sum, cyclic and noncyclic rules are applied partially on the lexical basis.
2.3 Pater (2000)

Let us now turn to an Optimality-theoretic account for English secondary stress. Since Optimality Theory does not admit the concept of derivation, cyclic and noncyclic rules cannot mean a lot any more. Only surface form is important to decide whether a syllable is stressed or not. Whether the syllable of the base form has stress or not is far from the focus. Yet still, the stress of the base form can be considered even though not always respected in the form of OO constraints (Bena 1997). English has a tendency to avoid clash between adjacent syllables, which is translated into the constraint like "Clash-Head. The interaction of these two constraints is the main force that decides whether a syllable bears subsidiary stress or not.

The examples in Pater (2000) can be classified as follows. The words in (4) never preserve the base stress, (5) preserve the stress of the base, and stem-stress is variably preserved in (6).

(4) Stem-stress NOT preserved
    inför - information
    tränspört - trånsportation
    tränstörn - trånsformation
    sýgment - sýgmentation
    consúlt - consúlitation
    consérve - consérvation
    convérse - convérsación
    confirm - confirmación
    lámént - láméntation
    phonét - phonétian
    cosméct - cosméctian

(5) Stem-stress preserved
    communál - communality
    cçonglóbate - cçonglóbation
    créáte - crétivity
    denóté - denótation
    exclúsive - exclúsivity
    exhúme - exhúmation
    immóbile - immóbility
    condénse - condénsation
    contést - contéstation
    délést - déléstation
    doméstic - domésticity
    elástic - elásticity
    incrúst - incrústation
    infést - inféstation

(6) Variably preserved
    advántage - advántageous (K-, W-)
    augmente - augmenteation (K+, W-)

1) Clearly, this must be an improvement from rule-based theory. In rule-based point of view, stress preservation should take place in all words. If some do not observe the rule, they must be regarded as exceptions.
authéntique - authénticity (K, W+)

In (5), stem-stress is preserved even though first and second syllables induce stress clash. In terms of constraint, Idem-Stress is ranked higher than *Clash-Head.

(7) Idem-Stress
If a is stressed, then f[a] must be stressed.

(8) *Clash-Head
No stressed syllable may be adjacent to the head syllable of the Prosodic Word.

The higher-ranked Idem-Stress in this case is applied only to the words like (5). Pater (2000) proposes a lexically-specified constraint ID-Stress-S1 and lists the words like (5) in the set S1, and S1 = {condensation, apartmental, chimpanzee}. The ranking is as follows:

(9) ID-Stress-S1 >> Parse >> *Clash-Head >> ID-Stress

Conversely, stem-stress is never preserved in the examples (4), nor the stresses clash each other. It means that to avoid stress clash is more important than to preserve stem-stress. For the lexical items like this example, Pater (2000) proposes another lexically-specific constraint. *Clash-Head-S2. S2 contains lexical words such as (4). What follows is the overall grammar proposed by Pater (2000).

(10)
2.4 Hammond (2003)

The main idea of Hammond (2003) is that lexical frequency of the stem can affect the pronunciation of a derived word. He cites Fidelholzt (1975): frequency affects reduction of initial heavy syllables. Compare the high-frequency word *astronomy* with the lower-frequency word *gastroscopy*. The initial vowel of the former high-frequency word is reduced while the latter is not. Besides that, he argues rhythm is more likely in higher-frequency phrases than in lower-frequency phrases, as in *bamboo curtain* (high frequency) and *bamboo fence* (lower frequency).

To test frequency effect on vowel reduction, he collected English nouns ending in *-ation*, along with their putative bases, e.g. *transformation* from the Brown Corpus2). The result is that the more frequent the base form is, the more likely the derived form is to undergo reduction. Note that Hammond (2003) argues this kind of frequency effect is not what we would expect. Rather, a naive relation of frequency and reduction should be deemed such that the more frequent the base form is, the less likely the corresponding vowel of the derived word undergoes reduction, for we hear the full vowel of the base form more often. This is exactly an inverse of what really happens. He states it as an *inverse function of lexical frequency*. However, this is doubtful, which I will discuss later in 3.2.

The next task is to encode frequency in the grammar. He did not directly incorporate frequency into the grammar, but merely make it *heeded* by the grammar. Citing Pater (2000), the effect of cyclicity is obtained through the correspondence constraint Icent-Stress-51, where specific lexical items are specified in the constraint. The words listed in 51 are those that preserve stem-stress, following the inverse function of lexical frequency.

For example, the word *representation* has sufficiently high frequency enough to undergo vowel reduction, and thus it is not included in 51. On the other hand, the word *exaltation* is sufficiently infrequent to block vowel reduction. Hence it is included in 51. In this way, frequency has become incorporated or at least heeded in the grammar.

Hammond indicates some problems involving Pater (2000). First, it does not generalize to new words. For maximally infrequent forms (i.e. a new word that has not yet been heard), how can they be listed among the forms referred to by Icent-Stress-51 when the form has not been even heard yet? The

---

2) Brown Corpus has approximately 1 million American English words, developed in 1960's
second problem is that it cannot be applied to phrasal rhythm.

The solution proposed by Hammond is as follows: Instead of listing lower-frequency words in the faithfulness constraint Ident-Stress (\(\ldots\)), list high-frequency words in the markedness constraint Clash-Head (\(\ldots\)). The difference is that now the most frequent items are indicated by the constraint. This solution can treat the new-word problem mentioned above, for we do not need to consider a new word at all. Look at the tableau (11).

\[\begin{array}{|c|c|c|}
\hline
\text{transformation} & \text{Clash-Head}(\ldots) & \text{Ident-Str} \\
\hline
\text{transformation} & \ast & \\
\hline
\text{exaltation} & \text{Clash-Head}(\ldots) & \text{Ident-Str} \\
\hline
\text{exaltation} & \ast & \\
\hline
\end{array}\]

Since \textit{transformation} is more frequent than \textit{exaltation}, \textit{transformation} is listed in the constraint Clash-Head (\(\ldots\)), but \textit{exaltation} is not. Therefore, \textit{exaltation} vacuously satisfies Clash-Head (\(\ldots\)).

Two problems arise from this analysis. First, admitting the motivation for lexically-specific markedness constraint rather than faithfulness constraint, it seems unnatural to list less marked items. Clearly, the \('_-_-_'\) pattern is less marked than \('_-_-_'\) since rhythm rule to avoid stress clash is predominant in English. It is more natural to list or mark the marked items and do nothing with unmarked items. Second, the way he encoded frequency is not direct though his objective is modeling frequency effects with OT. Rather, his solution can be viewed as mere description of S1 and S2 of Pater (2000) in terms of frequency.

In this respect, I will answer to these problems: i) in my solution, more marked items (i.e. less frequent items) will be affected by the specific constraint, ii) frequency will be \textit{directly} encoded in the grammar. Let us turn to the next section for my proposal.

3. Research and Results

This section pursues answering two questions: "Is \textit{frequency} an effective factor in English secondary stress?" and "If so, how can the \textit{frequency} factor
be encoded in the grammar?” Each subject is discussed in the following subsections 3.1 and 3.2 respectively. The tool and corpora used are as follows:

- Tool: Wordsmith 4.0.0.93 (2003-11-24) for Windows 95/98/NT/2000/XP
- Corpora:

```
<table>
<thead>
<tr>
<th></th>
<th>Corpus</th>
<th>Words</th>
<th>Year</th>
</tr>
</thead>
<tbody>
<tr>
<td>BROWN</td>
<td>Brown Corpus of American English</td>
<td>1 million</td>
<td>1960's</td>
</tr>
<tr>
<td>FROWN</td>
<td>Freiburg-Brown Corpus of American English</td>
<td>1 million</td>
<td>1990's</td>
</tr>
</tbody>
</table>
```

For larger data size, I use two corpora, BROWN and FROWN together (total 2 million words). They are American English words from 1960's and 1990's.

### 3.1 Frequency effect

The fact that frequency is influential in stress assignment is apparent on the basis of the previous studies such as Fidelholtz (1975) and Hammond (2003). To verify that frequency is influential, I perform a corpus-based research with the data from Pater (2000: 264). The original data is slightly modified: I reclassified the words that show variations in both (1a) and (c) into (b). Three groups are classified according to stressness of initial vowel: (a) stressless (b) stressless or stressed (variable) and (c) stressed. The number on the right of each word is raw counts searched in BROWN and FROWN Corpus. The assumption is that less frequent words have initial stress in order to make the word distinctive and sound clear.
(a) Stressless:

- example
- except
- entire
- concern
- advantage
- executive
- advance
- extreme
- protect
- convention
- conduct
- express
- enjoy
- promote
- obtain

(b) Stressless / stressed (variable):

- project
- produce
- conflict
- accept
- object
- concrete
- admit
- abstract
- profound
- acknowledge
- obscure
- proceed
- absurd
- adverse
- absorb
- eccentric
- accessible
- accelerate
- administer
- adversity
- abnormal
- profess
- adhere
- abdominal
- obscene
- emphatic
- extraneous
- obstruct
- accessory
- obsequious
- enlarge
- compose
- compulsion
- condemn
- concur
- confer
- convention
- endow
- propel
- embody
- compress
- enlighten
- entice
- excursion
- prolong
- accentuate
- admonish
- adverbial
- proliferate
- absolve
- abstruse
- concoct
- concordance
- obverse
- progenitor
- abduct
- abhor
- abstemious
- admixture
- concelebrate
- etc.
What we expect is the frequency average to be (a)>(b)>(c). The result average is (a)=55.03, (b)=25.53, (c)=0.39. This is exactly as we expected. The more frequent a word is, the more likely the initial vowel is reduced.

We can also see that the distribution of frequency is different from each group as shown in the following graph (13). Each dot represents each word in (12). The words with no stress in the initial position (12a) show wide distribution and the highest frequency. The words in (12b) appear in between two groups. The words of (12c) have strikingly low frequency, emerging at the bottom line.

The graph (13) apparently shows the tendency that stress-initial words are infrequent. Now let us turn to English secondary stress, which is the
main concern of this paper.

3.2 English Secondary Stress

To prove the relation of frequency and English secondary stress, I counted each word in the examples above (4) and (5) in 2.3. (4) is the examples of stress non-preservation, and (5) is those of stress preservation. Therefore, we expect (4) to be frequent and (5) to be infrequent. Look at the count result below (14) and (15). The number on the right to the word means its count in corpora.

(14) Examples of stem stress non preservation (´´ ´´ type)

inform 21 - information 542 confirm 37 - confirmation 14
convèrse 5 - conversation 109 sègment 32 - segmentation 1
transpört 38 - transport 97 lamènt 5 - lamentation 1
consèrve 10 - conservation 60 phonètìc2 - phènetìcian 0
transfòrm 23 - transformation 56 cosmétic 9 - cosmètician 0
consulti 28 - consultation 20

Frequency Average (for derived words only) - 81.82

(15) Examples of stem-stress preservation (´´ ´´ ´´ type)

créète 166 - crèativity 24 exclùsìve 50 - exclusìvìty 1
condèsè 2 - condènsation 8 exhàme 0 - exhàmation 0
elàstìc 8 - elàstìcity 5 immòbìle 2 - immòbìlìty 4
domèsÌìc 159 - domèsÌìcity 4 contèstì 49 - contèstìation 0
immòbìlì 2 - immòbìlìty 4 détèstì 1 - détèstìation 0
commùnìal 16 - communìality 0 increstì 0 - increstìation 0
cònglòbatìe 0 - conglòbatìon 0 infèstì 1 - infèstìation 2
denòte 19 - denòtìation 0

Frequency Average (for derived words only) - 3.43

Following is the graph showing the frequency distribution by secondary- unstressed group (14) and stressed group (15). Each dot represents each word in (14) and (15). Similarly to the graph (13) in 3.1, the frequency of the stressed group of words is very low. The words in (14) that
do not preserve the stem-stress are distributed with high frequency.

What differs from Hammond is that only the frequency of derived word is the concern. I assume that the frequency of stem has nothing to do with the stress of derived word, which means stem and derived word exist independently. There is possibility that this may be wrong. However, the advantage of my assumption is that we do not have to worry about the inverse function of lexical frequency, mentioned 2.4. In other words, secondary stress that takes place despite of stress clash depends on how frequent the derived word is, not how frequent the stem of the derived word is.

The diagram (17) below will make clear what I argue. Frequency means familiarity. If we are familiar to a word, we do not need to refer to its stem any more. Conversely, if we are not familiar to a word, which means that the word has lower-frequency, we should depend on any related word, i.e. stem.
3.3 Encoding frequency in the grammar

As we have seen, frequency is an influential factor for stress assignment. Now the final task is to incorporate frequency into the grammar. To do this, I propose the following constraint and ranking.

(18) ID-Stress($f \lesssim t$)

Preserve stem-stress if the frequency $x$ of the input is smaller than $t$ (threshold).

*Threshold* is the minimum frequency that stem-stress may not be preserved.

(19) ID Stress ($f \lesssim t$) $>>$ *Clash Head $>>$ ID Stress

Instead of lexically-specifying a constraint, frequency determines whether the ID-Stress ($f \lesssim$ constraint is applied or not. The value $t$ is the
threshold, and it should be determined before evaluation. If the frequency of the input is lower than the threshold, it should obey ID-Stress \( f \leq \). In this way, if the frequency is not as high as the threshold, stem-stress will be preserved at the cost of stress clash.

It is most reasonable to use the highest frequency value in the stress-preservation group as threshold, for if the frequency is higher than that, stress will not be preserved. The highest count of the stem-stress preservation group (15) is 24 for cre\_ativ\_ity. To normalize, this raw count is divided by total number of words, 20000. Therefore, the normalized frequency is \( \frac{24}{20000} = 0.0012 = 0.12\% \). I will use this percentage value to mean frequency (\( f \)), for example, \( f = 0.12 \) for cre\_ativ\_ity. Since this is the highest frequency in the stress preservation group, this is the threshold frequency (\( f = 0.12 \)). Now we have the constraint ID-Stress (\( f \leq 12 \)) in CON.

Look at the following tableau. Since \( f \) value (0.28) of transformation is bigger than \( f (0.12) \), the ID-Stress (\( f \leq 12 \)) is non-applicable. Therefore, the candidate that violates *Clash-Head cannot be selected as optimal, so the (70a) is selected. On the other hand, the \( f \) value (0.01) of exaltation is smaller than \( f (0.12) \). Thus ID-Stress (\( f \leq 12 \)) is activated in evaluation, and candidate (d) is selected as optimal output.

<table>
<thead>
<tr>
<th>transformation ( f = 0.28 )</th>
<th>ID-Stress ( f \leq 0.12 )</th>
<th>*Clash-Head</th>
<th>ID-Stress</th>
</tr>
</thead>
<tbody>
<tr>
<td>a. [trans*form]ation</td>
<td>N/A</td>
<td>*</td>
<td></td>
</tr>
<tr>
<td>b. [trans*form]ation</td>
<td>N/A</td>
<td>*</td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>exaltation ( f = 0.01 )</th>
<th>ID-Stress ( f \leq 0.12 )</th>
<th>*Clash-Head</th>
<th>ID-Stress</th>
</tr>
</thead>
<tbody>
<tr>
<td>c. [ex*alt]ation</td>
<td>*</td>
<td>*</td>
<td></td>
</tr>
<tr>
<td>d. [ex*alt]ation</td>
<td>*</td>
<td>*</td>
<td></td>
</tr>
</tbody>
</table>

Note that frequency is crucial, but not absolute. According to my analysis, the stress non-preservation examples above in (14) should have considerably high frequency. Problem arises in the cases of phonetician and co\_smetician. The corresponding vowels have primary stress as follows.

(21) phon\_etic: phon\_etician \( f = 0.00 \)  
     cos\_met\_ic: co\_smetician \( f = 0.00 \)
They both belong to (14) and must be frequent since they do not preserve stress of the stem. However, contrary to expectation, neither of them is found in the current corpora, which means they are infrequent words. The following tableau selects the wrong output if we use the same constraints as (20). The leftward * indicates wrong output.

\[(22)\]

<table>
<thead>
<tr>
<th>/cosmetician/f=0.00</th>
<th>ID-STRESS (f ≤ 0.12)</th>
<th>*CLASH-HEAD</th>
<th>ID-STRESS</th>
</tr>
</thead>
<tbody>
<tr>
<td>[cosme][t]cian</td>
<td></td>
<td>*</td>
<td></td>
</tr>
<tr>
<td>[cos][mê][t]cian</td>
<td></td>
<td>*</td>
<td></td>
</tr>
</tbody>
</table>

This can be explained in morphology. Let us assume that a morpheme-specific constraint *Clash-Head (-ian), ranked higher than the frequency constraint ID-Stress (f < 0.12). Because the value of *cosmetician is 0.00, ID-Stress (f ≤ 12) is applied and violated. However, higher-ranked *Clash-Head (-ian) is applied since cosmetician ends with -ian. In (23), the correct output is selected because it satisfies the highest ranked constraint *Clash-Head (-ian). The same explanation holds in case of phonetician.

\[(23)\]

<table>
<thead>
<tr>
<th>/cosmetician/f=0.00</th>
<th>*CLASH-HEAD (-ian)</th>
<th>ID-STRESS (f ≤ 0.12)</th>
<th>*CLASH-HEAD</th>
<th>ID-STRESS</th>
</tr>
</thead>
<tbody>
<tr>
<td>[cosme][t]cian</td>
<td></td>
<td>*</td>
<td>*</td>
<td></td>
</tr>
<tr>
<td>[cos][mê][t]cian</td>
<td>*</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

It may seem problematic if you notice the frequency of confirmación and transformación in (14). The frequency of both words is as follows.

\[(24)\]

<table>
<thead>
<tr>
<th>Raw data</th>
<th>Frequency</th>
</tr>
</thead>
<tbody>
<tr>
<td>a. confirmación</td>
<td>14</td>
</tr>
<tr>
<td>b. transformación</td>
<td>56</td>
</tr>
</tbody>
</table>

The frequency of (24a) is smaller than t and (24b) is bigger than t. However, they belong to the same group of words, that is, stress
non-preservation examples. Both of them have the same ending -ation, which means that morphology cannot explain them as in the case of cosmetician.

In our theory, should be bigger than for both (24a) and (24b) belong to the same stress non-preservation group. Therefore, we can assume that the frequency of (24a) confirmation is counted wrong in the first place. To prove this, I extended corpora with LOB and FLOB in addition to BROWN and FROW.

The total number of words is now 40000, doubled from 20000. I search for confirmation again and get the raw count of 44. The value is then $44/40000=0.0011=0.11\%$ ($t=0.11$).

Since the corpora are extended double, the threshold must also be recalculated on the basis of 40000 words. The threshold word creativity is researched in the extended corpora and found the raw count of 33. The value is then $33/40000=0.0008=0.08\%$ ($t=0.08=t$). Now that $t=0.08$, ID-Stress ($f \leq 0.08$) is not applicable to confirmation since $f=0.11$ ($f>t$).

What we know from the above is that the larger and more precise the corpus is, the more correct result we get. We have seen that the frequency of confirmation is different when researched with 2000 words and with 40000 words. Thus the problem is with the size and preciseness of the corpora, not with the frequency theory in this paper.

4. Conclusion

Chomsky and Halle (1968) and Halle and Kenstowicz (1991) provide cyclicity account for English primary and secondary stress. To account for English secondary stress, Pater (2000) proposes the lexically-specific constraint. Recently, Hammond (2003) argues that frequency is crucial in determining stress placement. English secondary stress is a result of interaction of two forces: one for stem-stress preservation, the other for avoidance of stress clash. To avoid stress clash is more natural. However, infrequent words keep stem-stress to make them distinctive, tolerating stress clash.

This paper tried to show frequency effect on English word stress with

---

<table>
<thead>
<tr>
<th></th>
<th>London-Ost-Bergen Corpus</th>
<th>1 million words</th>
<th>1960's</th>
</tr>
</thead>
<tbody>
<tr>
<td>LOB</td>
<td>FLOB</td>
<td>1 million words</td>
<td>1990's</td>
</tr>
</tbody>
</table>

3) LOB and FLOB are British English corpora, which contains 1 million words each.
corpus-based study, and o incorporate frequency into Optimality Theoretic grammar, proposing the constraint ID-Stress \( f \leq \) and the hierarchy ID-Stress \( f \leq \) & & ID-Stress. Even though frequency alone is the absolute element in stress assignment in that other factors such as morpheme-specificity are also influential, it is clearly an interesting aspect in English stress phenomena.

References


Hye-sun Cho
ruby.lily@knou.ac.kr