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Doing without [tense/lax] in English*

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Kwon, Young-Kook. 2011. Doing without [tense/lax] in English. *Linguistic Research* 28(3), 605-624. In the phonological account of the vowel system of English, there has been controversy over whether or not the feature pair [tense/lax] is required as a distinctive feature, along with [long/short]. While several phonologists since Chomsky and Halle (1968) have made use of [tenseness] along with [length], others including Lass (1976) and Durand (2005) have either dismissed [tense/lax] as contentless or maintained that it is not required as part of the English vowel inventory. In this paper, we attempt to contribute to the position that [tense/lax] as a distinctive feature can be dispensed with at least in the phonological account of the English vowel system. We will also present an optimality-theoretic account of various surface realizations of English vowels. We will show that all surface vowel patterns of English can be derived without resorting to the feature [tense/lax]; thus some major constraints such as μμ↔tense and *V[lax]# posited by previous studies including Lee (2003) can be eliminated from the English vowel system for the sake of simplicity. **(Dongduk Women's University)**

Key words tenseness, length, English, constraints, optimality

1. Introduction: English Vowels

It is well-known that tenseness and length co-occur in English vowels. In the phonological account of the English vowel system, however, there has been controversy over whether the features [tense/lax] and [long/short] are both needed or we can do without [tense/lax] for the sake of simplicity. Since Chomsky and Halle (1968), many (generative) phonologists have made use of tenseness along with length (Kahn 1976, Halle 1977, Halle and Mohanan 1985, Hammond 1999, more recently Lee 2003, among others). In contrast, Lass (1976:9-10) dismisses [tense/lax] as "contentless dichotomizing operator" and Durand (2005) also claims that this feature is not required as part of the English vowel inventory.

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The aim of this paper is two fold. One is to contribute to the position that [tense/lax] as a distinctive feature can be dispensed with at least in the phonological characterization of the English vowel system. Another aim is to propose an optimality-theoretic account of various surface realizations of English vowels including so-called “long tense, short lax, long lax and shot tense vowels,” without referring to [tense/lax] in the constraint system.

In this paper, the vowel system of General American English (GA) is chosen for the analysis and provided in (1) with examples.

(1) a. The basic vowel system of English (Wells 1982, Giegerich 1992, Green 2001)

<table>
<tr><td>short</td><td colspan="2">long</td></tr>
<tr><td>ɪ ɛ æ ʌ/ə ʊ a</td><td>a:</td><td>i: e: o: ɔ: u: aɪ aʊ ɔɪ</td></tr>
<tr><td colspan="2">lax</td><td>tense</td></tr>
</table>

b. Vowel types of English with examples

short lax	long lax	(long) tense	short tense
/ɪ/ bit /ɛ/ bet /æ/ pat /ʌ/ butt /ʊ/ put /a/ stop	/a:/ spa	/i:/ beat /e:/ bait /o:/ boat/ /ɔ:/ bought /u:/ boot /aɪ/ bite /aʊ/ bout /ɔɪ/ boy	/i/ create /u/ situation

Tenseness and length usually correlate with each other in English in such a way that lax vowels tend to be short whereas tense counterparts are long. As (1b) illustrates, however, a long lax vowel /a/ is attested in stressed syllable and high long tense vowels of English /i:,u:/ may end up being short in unstressed syllable. Thus, it seems that we must recognize the four vowel types of “short lax, long lax, short tense and long tense” in a detailed discussion of English vowels.

The question is then whether or not we will need both feature sets of [tense/lax] and [long/short] in English phonology under a constraint-based theory like Optimality Theory (OT). By establishing a partial grammar with a small group of well-formedness and faithfulness constraints that have been commonly used in OT literature and that do not refer to the feature [tense/lax], we will argue that [tense/lax] as a distinctive feature may be eliminated from the phonology of English vowels.

The paper is organized as follows. In section 2, a few previous works on [tense/lax] and [long/short] in English vowel system are introduced and one of them is evaluated. Our own position and analysis of the distributional patterns in (1) are presented in section 3. Section 4 is the summary and conclusion of the paper.

2. Previous Works

As mentioned in previous section, there have been several tenseness/length-related studies in literature of English vowels since Chomsky & Halle (1968) including Kahn (1976), Halle (1977), Halle and Mohanan (1985), and Durand (2005). Within the framework of OT, important contributions have been made by Green (2001), Hammond (1999), Moren (1999) and more recently Lee (2003). In this section we review Lee (2003), who solely provides an analysis of all four surface vowel types related to tenseness and length, i.e. long tense, short lax, long lax and shot tense vowels.

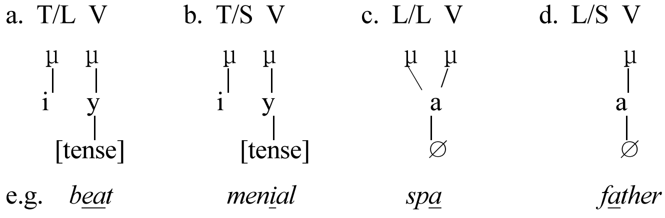
2.1 Lee (2003)

Lee (2003) strongly adheres to the position that [tense/lax] is independent of [long/short] and thus both feature pairs are required in the English vowel system. He lists four possible combinations of tenseness and length as to English vowels.

(2) Four possibile vowel types
  a. tense long (T/L): Can**a**dian, c**o**ne; tof**u**, buffal**o**, happ**y**
  b. lax short (L/S): Canada, m**e**t, g**oo**d, c**o**nic
  c. tense short (T/S): men**i**al, affil**i**ate, man**u**al, sens**u**al
  d. lax long (L/L): sp**a**, sh**a**, p**aw**, mac**aw**

These four vowel types are, according to Lee, represented as follows.

(3) Surface vowel types of English (Lee 2003:1101)



Tense vowels, both long and short, are assumed to have a glide /y,w/, which are to translated as [tense] unlike lax counterparts. Lee also assumes that these four surface vowels types are derived from, or based on, the following two underlying structures.

(4) Underlying structures of English vowels (Lee 2003:1101)

a. Long vowel b. Short vowel

What is intriguing is that only length, but not tenseness, appears in Lee's underlying representations. In his OT-theoretic derivation of the four surface vowels types from the two underlying structures in (5), Lee proposes eleven constraints in all, including the following six basic ones.

(5) Basic constraints

a. μμ↔TENSE: If long, then tense; if tense, then long.
b. FT-BIN: Feet mush be binary under syllabic or moraic analysis.
c. *VV: Long vowels are prohibited.
d. *Final-C-μ: The final consonant is weightless.
e. IDENT(Tense): Correspondent segments in input and output are identical for the feature [Tense].
f. WT-IDENT: Corresponding segments should be identical for weight.

A proper ranking of these constraints guarantees the surface form with a tense long vowel and a lax short vowel.

(6) Tense long vowels: Canadian, cone, bate

/be$_{\mu\mu}$t/ ‘bate’	FT-BIN	μμ↔TNS	*VV	IDENT(TNS)
☞a. Tense | (be$_{\mu\mu}$)t [be:t]			*	*
b. ∅ | (be$_{\mu\mu}$)t		*!	*	
c. ∅ | (bel)t	*!			

(7) Lax short vowels: Canada, bet, conic

/be$_{\mu}$t/ ‘bet’	FT-BIN	μμ↔ TNS	WT-IDENT	*Final-C-μ	*VV	IDENT (TNS)
☞a. ∅ | (be$_{\mu}$t$_{\mu}$) [bɛt]				*		
b. ∅ | (be$_{\mu\mu}$)t		*!			*	
c. ∅ | (be$_{\mu}$)t	*!					
d. Tense | (be$_{\mu\mu}$)t			*!		*	*

The ranking argument in the two tableaux above seems to be very straightforward: optimal outputs (6a) and (7a) each beats out all the other candidates in the tableau either by violating no high-ranked constraints.

In order to derive the tense short vowel type, which occurs in unstressed syllable, Lee (2003) adds four new constraints.

(8) a. NON-FIN(Σ’): No prosodic head of PrWd is final in PrWd.
b. *HIATUS(NON-INITIAL): Two heterosyllabic VV sequence is disallowed in word-medial position.
c. ALL-FT-RIGHT: The right edge of every foot is aligned with the right edge of some prosodic word.

d. PARSE-σ: All syllables must be parsed by feet.

Two representative tableaux are given below to show the effect of these new constraints.

(9) Tense short vowels: colonial, affiliate, gabion, manual, sensual

/kolo$_\mu$ni$_\mu$ + æ$_\mu$l/	FT-BIN	NON-FIN (Σ’)	*HIATUS	ALL-FT-R	μμ↔ TNS	WT-IDNT
☞a. Tns Tns ko.(lóʊ$_{\mu\mu}$. niy$_\mu$) æ$_\mu$l				*	*	*
b. Tns Tns ko.(lóʊ$_\mu$. niy$_\mu$) æ$_\mu$l				*	**!	
c. ∅ ∅ ko.(ló$_\mu$. ni$_\mu$) æ$_\mu$l			*!	*		
d. ∅ ∅ (ko$_\mu$.lo$_\mu$.)(níy$_{\mu\mu}$) æ$_\mu$l				**!	*	*

The constraint FT-BIN is violated by no candidates as the strings in parenthesis of every candidate are bimoraic. With the prosodic head located in the middle of the word, NON-FIN(Σ’) is also observed in all candidates. For the same reason, however, all the candidates must violate the constraint ALL-FT-RIGHT requiring for the right edge of every foot to be aligned with the right edge of the prosodic word. It is obvious that, without the first high-ranked three constraints in (9), candidate (9a) would be impossible to be the final winner.

Also, the effect of PARSE-σ is illustrated in the following tableau.

(10) Tense short vowels: colonial, affiliate, gabion, manual, sensual

/gæ$_\mu$bi$_\mu$ + ə$_\mu$n/	FT-BIN	NON-FIN(Σ’)	*HIATUS	ALL-FT-R	PARSE-σ	μμ↔ TNS	WT-IDNT
☞a. Tns Tns (géy$_{\mu\mu}$ biy$_\mu$)ə$_\mu$n				*	*	*	*
b. ∅ Tns gæ$_\mu$ (bíy$_{\mu\mu}$)ə$_\mu$n				*	**!		*

(10b) fares better for all the constraints except PARSE-σ, which is fatally violated twice by the first and the last unsyllabified strings in (10b).

In order to derive lax long vowels /aː,ɔː/, Lee (2003) continues to add a constraint barring the featural co-occurrence between [Tense] and [+low].

(11) *[Tense,+low]: Co-occurrence of [Tense] and [+low] is disallowed.

(12) Lax long vowels: spa, sha, paw, macaw

/spa_{μ}/	FT-BIN	NON-FIN(Σ')	*HIATUS	ALL-FT-R	*[Tns, +low]	PARSE-σ	μμ↔ TNS	WT-IDNT
☞a. ∅ | ($\text{spa}_{\mu\mu}$)		*					*	*
b. Tns | ($\text{spa}_{\mu\mu}$)		*			*!			*

The tableau shows the importance of *[Tense,+low], without which candidate (12b) would beat (12a), the anticipated winner.

Finally, in order to account for the predominance of tense long vowels in word-final open syllables, Lee (2003) resorts to another constraint requiring a general ban of lax vowels in word-final position.

(13) *V(Lax)]$_{\text{PrWd}}$: Lax vowels are disallowed in word-final position

The effect of this constraint is shown in the following tableau.

(14) Tense long vowels in word-final open syllable: potat<ins>o</ins>, tomat<ins>o</ins>, buffal<ins>o</ins>

/bʌfəl o$_{\mu}$/	FT-BIN	NON-FIN(Σ')	*HIATUS	ALL-FT-R	*[Tns, +low]	μμ↔TNS	*V (Lax)	WT-IDNT
☞a. Tns | (bʌfə) loʊ$_{\mu\mu}$				*				*
b. Tns | (bʌfə) lo$_{\mu}$				*		*!		
c. Tns | (bʌfə)(lóʊ$_{\mu\mu}$)		*!		*				*
d. ∅ | (bʌfə) lo$_{\mu}$				*			*!	

With no violation of the given constraints except for ALL-FT-RIGHT, Candidate (14d) would beat the anticipated winner (14a) unless *V(Lax)]$_{PrWd}$ is posited.

Based on these series of analysis of four surface vowel types of English, Lee (2003:1111) proposes an ultimate constraint hierarchy.

(15) Final constraint ranking:[1]
FT-BIN, NON-FIN(Σ'), *HIATUS, <ins>*[Tense, +low]</ins> ≫
PARSE-σ, <ins>*V(Lax)]PrWd,</ins> <ins>μμ↔TENSE</ins> ≫
*FINAL-C-μ, WT-IDENT, <ins>IDENT(Tense),</ins> *VV

Despite its success in capturing the four possible vowel types of English combined with [tense/lax] and [long/short], Lee's (2003) analysis seems to face a few problems. First, complexity. His constraint system is overly complex, with 11 constraints to derive four vowel types. This might be due to the fact that he tries to include in his analysis not only corelation between [tense/lax] and [long/short] but also stress and foot structure of English (e.g. NON-FIN(Σ'), ALL-FT-RIGHT). Second, contradiction. Lee (2003:1100) specifically mentions that "tenseness and length are independent of each other", but he in his analysis heavily relies on the constraint μμ↔TENSE referring to the "interdependence" rather than "independence"

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[1] PARSE-σ is accidentally omitted in Lee's final constraint hierarchy.

between [tenseness] and [length]. Further contradiction stems from his constraint IDENT(Tense) and his assumption about two underlying distinctions in (4) to account for four vowel types in (3). IDENT(Tense) as a faithfulness constraint between input and output presupposes the existence of [tense/lax] in the underlying form but Lee's system does not show it. Lastly, some of his constraints are somewhat loosely defined (e.g. "ALL-FT-RIGHT: The right edge of every foot is aligned with the right edge of some prosodic word.").

3. Analysis

3.1 Preliminaries

The rather complicated distributional properties of the English vowel system in (2) above look more interesting when they are considered in relation with syllable structure and stress.

(16) Stressed vowels (based on Polgárdi 2009:1)

	syl. type	(i) short lax	(ii) long tense	(iii) long lax
internal	(a) _ $CV	[sɪti] 'city'	[mi:tɚ] 'meter' [ɔ:təm] 'autumn'	?
	(b) _ $CCV	[mækroʊ] 'macro'	[maɪkroʊ] 'micro' [ɔ:dri] 'Audrey'	?
	(c) _ C$CV	[vɛktɚ] 'vector'	*	?
	(d) _ $V	*	[poʊɪt] 'poet'	*
final	(e) _ #	*	[braʊ] 'brow'	[spa:] 'spa'
	(f) _ C#	[fʊt] 'foot'	[fu:d] 'food'	*
	(g) _CC#	[gʌlp] 'gulp'	*	*

(17) Unstressed vowels (based on Polgárdi 2009:1)

	syl. type	short tense vowels [i, u]
internal	(a) _ $CV	*
	(b) _ $CCV	*
	(c) _ C$CV	*
	(d) _ $V	[kr**i̲**eɪt] ‘create’, [kəloʊn**i̲**əl] ‘colonial’ [sɪtʃ**u̲**eɪt] ‘situate’, [vɪʒ**u̲**əl] ‘visual’
final	(e) _ #	*
	(f) _ C#	*
	(g) _CC#	*

The table in (16) shows that the distribution of the [tense/lax] vowels in stressed positions relies more or less on syllable structure and stress. Short lax vowels may not occur before another vowel (16-d-i) and in syllable-final position (16-e-i), except in (16-a-i). In contrast, tense vowels may not occur in a closed syllable (16-c-ii; 16-g-ii), except in (16-f-ii). The long lax vowel /a:/ is similar to tense vowels in that it may not occur in a closed syllable (16-c,g-iii). Unable to occur before another vowel, however, /a:/ is similar to short lax vowels (16-d-iii). On the other hand, table (17) suggests that in unstressed positions the usual long tense high vowels [i:,u:] tend to be shortened to [i,u] respectively before another vowel across the syllable.

We in the next section attempt to account for the occurrences and non-occurrences as appear in (16) and (17) within the framework of OT and show that the analysis can be done without the feature [tense/lax].

3.2 A New Analysis

We begin this section with the assumptions which the current analysis is based on. First, for the sake of simplicity, we assume that stress and syllable structure have already been determined. Second, we assume that only the weight ([long/short]), but not the color ([tense/lax]), is specified in underlying form.[2] Third, a stressed short vowel in C**V̲**CV sequence (e.g. *city* [síti]) is assumed to be ambisyllabic for a reason

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[2] For English, with minimal pairs such as *hit/heat or fist/feast*, [long/short] or [tense/lax] must be specified in the underlying form. We assume in this paper that only [long/short] must be included in the underlying form, but not [tense/lax].

to be clear later. Lastly, as for the low back vowels /ɔ:,a(:)/, we follow Green (2001) in assuming that /ɔ:/ is a tense long vowel whereas /a(:)/ is basically a short lax vowel but can be a long lax one only when necessary.[3]

These assumptions and the distributional properties mentioned in section 3.1 can be submitted to an OT analysis by means of several interacting constraints, of which the basic ones are listed below.

(18) Basic constraints
a. stress-to-Weight(STW): Stressed syllables must be heavy.
b. *3μ: Trimoraic syllables are disallowed.
c. Weight-by-Position(WBP): A consonant in the coda projects a mora.
d. *Final-C-μ: The word-final C is extrasyllabic.
e. IDENT(μ): Output vowels must have the same weight as their corresponding inputs.

Two syllable well-formedness constraints STW and *3μ, often used in literature only with a slightly different definition, are assumed to be undominated and thus highest-ranked in the current constraint hierarchy (cf. Moren 1999; Gussenhoven 2009). WBP requiring a coda consonant to be moraic may often be violated, being ranked lower than *3μ. *Final-C-μ is nothing but a restatement of extrasyllabiciy, which has been around since Clements and Keyser (1983). IDENT(μ) is a faithfulness constraint requiring the weight identity between an input and its output.

Now we turn to each of the surface vowel patterns at hand and present an OT analysis.

3.2.1 Long Tense Vowels

The distributional property of long tense vowels in (16i) is repeated here for expository convenience.

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[3] Disagreement is often found in literature on how to classify /ɔ:,a(:)/: whereas Lee (2003) considers both long lax vowels, Hammond (1999) treats them as tense vowels. Adopting Hammond's classification would simply balk to our analysis or at least make it boring because if all short vowels are lax and all long vowels tense, then there would be no "lax long vowels" nor "tense short ones."

(19) Stressed vowels

stressed	syl. type	long tense	
internal	(a) _ $CV	[miːtɚ] [ɔːtəm]	‘meter’ ‘autumn’
	(b) _ $CCV	[maɪkroʊ] [ɔːdri]	‘micro’ ‘Audrey’
	(c) _ C$CV	*	
	(d) _ $V	[poʊɪt]	‘poet’
final	(e) _ #	[braʊ]	‘brow’
	(f) _ C#	[fuːd]	‘food’
	(g) _CC#	*[4]	

To summarize the distributional patterns, tense long vowels may occur in an open syllable word-internally and word-finally (cf. 19a,b,d,e); they may not occur in a closed syllable word-internally (cf. 19c); word-finally, they may occur before a single C, which must be extrasyllabic (cf. 19f).

The following tableau illustrates how the occurrence of tense long vowels in word-internal position is readily captured.

(20) Long tense vowels (word-internal): me.ter, au.tumn, mi.cro, Au.drey.

/mai$_{\mu\mu}$kroʊ/	STW	*3μ	IDENT(μ)
☞a. m**ai**$_{\mu\mu}$.kroʊ			
b. m**ai**$_{\mu\mu}$**k**$_{\mu}$.roʊ		*!	▨
c. m**ai**$_{\mu}$[k$_{\mu}$]roʊ			*!

Candidate (20a) beats out the others by violating no constraints at all. (20c) with an ambisyllabic /k/ *does* satisfy two high-ranked STW and *3μ but it still loses as its stressed vowel has lost one mora, in violation of IDENT(μ).

The non-occurrence patterns in (19c,g) are simply due to the undominated syllable well-formedness constraint *3μ. In both cases, the stressed vowel and the moraic coda would make a syllabically ill-formed 3-mora structure. In order to account for the fact that tense vowels may occur before a single C word-finally, the

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[4] Words like *beast* [bi:st] ([i$_{\mu\mu}$ + st]#) are apparent exceptions to (5g). But showing peculiar behaviour in many other languages as well (Dutch, German, French, etc.), coronal clusters like /st/ are often considered moraless by many scholars.

full battery of constraints in (18) is required.

(21) Long tense vowels (word-final): brow; food; poet [póʊ.it] (5e,f,d)

/fu$_{\mu\mu}$d/	STW	*3μ	*Final-C-μ	WBP	IDENT(μ)
☞a. f**u**$_{\mu\mu}$d				*	
b. f**u**$_{\mu\mu}$d$_{\mu}$		*!	*		
c. f**u**$_{\mu}$d$_{\mu}$			*!		*

Candidate (21b) is immediately eliminated because it incurs a violation of the undominated *3μ. The ranking "*Final-C-μ ≫ WBP," crucial for candidate (21a) to win over (21c), must be an OT-theoretic expression of the extrasyllabicity of the word-final coda.

As for the occurrence of a long tense vowel before another vowel (19d), we will discuss it in section 3.2.4 along with the nonoccurrence of a lax vowel in the same environment.

3.2.2 Short Lax Vowels

Let us now turn to short lax vowels, starting with their distributional properties.

(22) Short lax vowels

stressed	syl. type	short lax	
internal	(a) _ $CV	[s**ɪ́**ti] [m**á**li]	'city' 'Molly'
	(b) _ $CCV	[m**æ**kroʊ]	'macro'
	(c) _ C$CV	[v**ɛ**ktɚ]	'vector'
	(d) _ $V	*	
final	(e) _ #	*	
	(f) _ C#	[f**ʊ**t]	'foot'
	(g) _CC#	[g**ʌ**lp]	'gulp'

A few distributional patterns are to be noted: Short lax vowels may close a syllable (22c); they may occur in CVC(C)V syllable (22a, b); they may not occur in syllable-final position (22e); they may not occur before another vowel (22d). The following tableau illustrates how the current constraint hierarchy can readily capture the fact that short lax vowels can occur in closed syllable (i.e. 22c).

(23) Short lax vowels: vector

/vɛ$_\mu$ktɚ/	STW	*3μ	*Final-C-μ	WBP	IDENT(μ)
☞a. vɛ$_\mu$k$_\mu$.tɚ					
b. vɛ$_{\mu\mu}$k.tɚ				*!	*
c. vɛ$_{\mu\mu}$k$_\mu$.tɚ		*!			*
d. vɛ$_\mu$k.tɚ	*!			*	

Candidate (23a) emerges as the optimal output by violating no constraints at all.

On the other hand, the string such as C**V**C(C)V (i.e. 22a,b) with a stressed short lax vowel is often syllabified as /CV.C(C)V/ in literature. However, this syllabification is not possible in the current account with the assumption of ambisyllabicity, as the following tableau shows.

(24) Short lax vowels: city, Molly, macro (22a,b)

/mæ$_\mu$kroʊ/	STW	*3μ	*Final-C-μ	WBP	IDENT(μ)
☞a. mæ$_\mu$[k]$_\mu$roʊ					
b. mæ$_\mu$.kroʊ	*!				
c. mæ$_{\mu\mu}$.kroʊ					*!
d. mæ$_{\mu\mu}$k$_\mu$.roʊ		*!			*

Candidate (24b), which often counts as a legitimate syllabification in other works, may never be optimal due to its fatal violation of the undominated constraint STW. Instead, candidate (24a) with an ambisyllabic coda in the first syllable and with no constraint violation easily emerges as the winner.

The fact that short lax vowels may not occur in final position (i.e. 22e, *CV) nor before another vowel (i.e. 22d, *CV.V) must easily be captured by the current constraint hierarchy with STW playing the central role.

3.2.3 Long Lax Vowel

In this section, we pay attention to the long lax vowel /a:/ in (16iii), repeated below.

(25) Long lax vowel

stressed	syl. type	long lax
internal	(a) _ $CV	?
	(b) _ $CCV	?
	(c) _ C$CV	?
	(d) _ $V	*
final	(e) _ #	[spa̲:̲] ‘spa’
	(f) _ C#	*
	(g) _CC#	*

This table clearly suggests that /a/ is basically a short lax vowel but lengthened in word-final open syllable. The sole occurrence of the long lax vowel /a:/ in this position must be easy to explain under the current constraint hierarchy. For instance, the input /spa$_{\mu}$/ must always surface as [spa$_{\mu\mu}$] in order to satisfy the undominated highest-ranked constraint STW.

3.2.4 Short Tense Vowels (in unstressed syllable)

Now turning to short tense vowels /i,u/, let us consider the following table.

(26) Short tense vowels

unstressed	syl. type	short tense vowels [i, u]
internal	(a) _ $CV	*
	(b) _ $CCV	*
	(c) _ C$CV	*
	(d) _ $V	[kr**i̲**eɪt] ‘create’, [kəloʊn**i̲**əl] ‘colonial’ [sɪtʃ**u̲**eɪt] ‘situate’, [vɪʒ**u̲**əl] ‘visual’
final	(e) _ #	*
	(f) _ C#	*
	(g) _CC#	*

We can see from (26) that the two high tense long vowels /i:,u:/ shorten to tense short vowels /i,u/ respectively when and only when they occur in unstressed syllable and followed by another vowel across the syllable boundary (e.g. [kr**i̲**.éɪt]). Following Lee (2003), let us first assume that short tense vowels are underlyingly monomoraic, and consider the following tableau.

(27) colonial [kəlóʊniəl]

/kəloʊni$_{\mu}$əl/	STW	*3μ	*Final-C-μ	WBP	IDENT(μ)
☞a. kə.lóʊ.**ni**$_{\mu}$.əl			*		
b. kə.lóʊ.**ni**$_{\mu\mu}$.əl			*		*!

Again, the ranking argument may readily be made: candidate (27a), only with the violation of *Final-C-μ, wins over (27b) which incurs additional faithfulness constraint IDENT(μ). This type of account turns out to be problematic once we assume a different input (i.e. /kəloʊni$_{\mu\mu}$əl/) for the sake of the fundamental OT principle, "Richness of the Base," as the following tableau illustrates.

(28) colonial [kəlóʊniəl]

/kəloʊni$_{\mu\mu}$əl/	STW	*3μ	*Final-C-μ	WBP	IDENT(μ)
a. kə.lóʊ.**ni**$_{\mu}$.əl			*		*!
💣 b. kə.lóʊ.**ni**$_{\mu\mu}$.əl			*		

When positing a different input /kəloʊni$_{\mu\mu}$əl/, the constraint hierarchy justified above makes a wrong prediction. For a solution to this problem we can resort to another well-formedness constraint, proposed by Gussenhoven (2009) and Moren (1999).

(29) Weight-to-Stress (WTS): Heavy syllable must be stressed.

We assume in this paper that WTS is also undominated in the current constraint ranking system. The effect of WTS is shown in the following tableau.

(30) colonial [kəlóʊniəl]

/kəloʊni$_{\mu\mu}$əl/	STW	WTS	*3μ	*Final-C-μ	WBP	IDENT(μ)
☞a. kə.lóʊ.**ni**$_{\mu}$.əl				*		*
b. kə.lóʊ.**ni**$_{\mu\mu}$.əl		*!		*		

Candidate (30a) beats out (30b) in which the underlined heavy syllable is left unstressed, in violation of the high-ranked WTS.

Apparently, however, this new constraint hierarchy still may not prevent a candidate like [kə.lóʊ.**n̲ɪ̲**$_{\mu}$.əl] with the short lax vowel [ɪ] from surfacing as another optimal output along with candidate (30a) having the short tense vowel [i]. The following tableau illustrates the case at hand.

(31) coloni̲al [kəlóʊni̲əl]

/kəloʊni$_{\mu\mu}$əl/	STW	WTS	*3μ	*Final-C-μ	WBP	IDENT(μ)
☞a. kə.lóʊ.**n̲i̲**$_{\mu}$.əl				*		*
☞b. kə.lóʊ.**n̲ɪ̲**$_{\mu}$.əl				*		*

That is, [nɪ$_{\mu}$] with a short lax vowel fares as well as [ni$_{\mu}$] in constraint violation. In order to deal with this problem, we need to add another constraint *Hiatus, previously mentioned in (Lee 2003) and Polgárdi (2009).

(32) *Hiatus: The heterosyllabic VV sequence is prohibited.

Now with *Hiatus added to our current constraint system, let us consider the tableau in (33), in which short tense vowels and short lax ones are differentiated from each other with regard to their surface structure (Cf. Lee 2003; also (3) in section 2).

(33) coloni̲al [kəlóʊni̲əl]

/kəloʊni$_{\mu\mu}$əl/	STW	WTS	*3μ	*Final-C-μ	*Hiatus	WBP	IDENT(μ)
☞a. kə.lóʊ.**n̲i̲y̲**.əl | μ				*			*
b. kə.lóʊ.**n̲ɪ̲**.əl | μ				*	*!		*

We assume along with Lee (2003) that short tense vowels /i,u/ have, for their second part of the nucleus, the glide /y,w/ respectively, which share the single mora with the first part of the nucleus /i,u/ (cf. (3) in section 2). The effect of *Hiatus is very clear: candidate (33b) with the heterosyllabic VV sequence (i.e. [nɪ.əl]) violates this constraint, but (33a) avoids its violation due to the existence of [y] between two vowels. As a result, (33a) must be chosen as the optimal output.

It is to be noted, however, that adding the constraint *Hiatus does not affect the result of the ranking arguments in previous sections because the higher-ranked, undominated constraints STW, WTS, and *3µ will have played a major role in choosing the winner before *Hiatus steps in. Let us consider the following tableau in case.

(34) poet [pów.ɪt]

/pow$_{\mu\mu}$ɪt/	STW	WTS	*3µ	*Final-C-µ	*Hiatus	WBP	IDENT(µ)
☞a. p**ów**.ɪt | | µ µ				*			
b. p**ów**.ɪt |/ µ	*!			*			*
c. p**ó**.ɪt | µ	*!			*	*		*

The fact that candidate (34a) with a long tense vowel [ow$_{\mu\mu}$] does not violate *Hiatus is not crucial here because the optimality of candidate (34a) is already guaranteed by its satisfaction of all the three undominated, high-ranked constraints.

4. Conclusion

We have argued in this paper that although [tense/lax], along with [long/short], might be needed as a classificatory term, it does not play any crucial role in the phonological account or derivation of the four surface vowel types of English (i.e. long tense, short tense, long lax and short lax vowels). As for the phonological account of these four surface vowels, we have presented an OT-theoretic partial grammar or a constraint hierarchy.

(35) Final constraint ranking: STW, WTS, *3µ ≫ *Final-C-µ,
*Hiatus ≫ WBP, IDENT(µ)

These constraints have been introduced and motivated independently in many OT-theoretic works on the phonology of Germanic languages including Dutch, German as well as English. More importantly, without resorting to a constraint referring to [tense/lax] feature, we have been able to account for all four possible surface vowel types. Thus, we have reached the conclusion that [tense/lax] can be dispensed with at least in the OT-theoretic phonological account of English vowels.

References

Chomsky, N. and M. Halle. 1968. *The Sound Pattern of English*. New York: Harper & Row.

Clements, N. and J. Keyser. 1983. *CV Phonology: A Generative Theory of the Syllable.* Cambridge, Mass: The MIT Press.

Durand, P. 2005. Tense/lax, the vowel system of English and phonological theory. Carr, P., J. Durand and C. Ewen (eds.) *Headhood, Elements, Specification and Contrastivity.* Amsterdam: John Benjamins: 77-98.

Giegerich, H. 1992. *English Phonology: An introduction*. Cambridge University Press.

Green, A. 2001. The tense-lax distinction in English vowels and the role of parochial and analogical constraints. *Linguistics in Potsdam* 15.

Gussenhoven, C. 2009. Vowel duration, syllable quantity, and stress in Dutch. Hanson, K. and S. Inkelas (eds.) *The Nature of the Word: Studies in Honor of Paul Kiparsky*. Cambridge, Mass: The MIT Press: 181-198.

Halle, M. 1977. Tenseness, vowel shift and the phonology of back vowels in modern English. *Linguistic Inquiry* 8: 611-625.

Halle, M. and K. Mohanan. 1985. Segmental phonology of modern English. *Linguistic Inquiry* 16: 57-116.

Hammond, M. 1999. *The Phonology of English: A Prosodic Optimality-Theoretic Approach.* Oxford University Press.

Kahn, D. 1980. *Syllable-Based Generalizations in English Phonology*. Garland, New York.

Lass, R. 1976. *English Phonology and Phonological Theory*. Cambridge University Press.

Lee, JY. 2003. Tenseness and length in English Phonology. *English Language and Literature* 49(5): 1093-1114.

Moren, B. 1999. Distinctiveness, Coercion, and Sonority: A Unified Theory of Weight. A doctoral dissertation, University of Maryland at College Park.

Polgárdi, K. 2009. The distribution of vowels in English and trochaic proper government. ms.

Wells, J. 1982. *The Accents of English.* Cambridge University Press.

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