UC Santa Cruz
Hana-bana (花々): A Festschrift for Junko Ito and Armin Mester

Title
Notes on prosodic headedness and tone in Tokyo Japanese, Standard English and Northern Bizkaian Basque

Permalink
https://escholarship.org/uc/item/7q03m9qm

Authors
Elordieta, Gorka
Selkirk, Elisabeth

Publication Date
2018-10-01

Peer reviewed

NOTES ON PROSODIC HEADEDNESS AND TONE IN TOKYO JAPANESE, STANDARD ENGLISH, AND NORTHERN BIZKAIAN BASQUE*

GORKA ELORDIETA
University of the Basque Country (UPV/EHU)
University of California, Santa Cruz

ELISABETH SELKIRK
University of Massachusetts Amherst

This paper explores how the notion 'prosodic head' comes into play in providing an account for certain facts concerning the distribution of tonal pitch accents in Tokyo Japanese, Standard American and British English, and Northern Bizkaian Basque. Building on evidence from I&M on Tokyo Japanese, it is argued that there is a class of violable phonological markedness constraints on the headedness of prosodic constituents. A class of markedness constraints calling for a prosodic head/abstract prominence to be associated with tone is also motivated. Together, these constraints play a role in accounts of tone epenthesis on prosodic heads or displacement of lexical tone to prosodic heads that are found in both 'pitch accent languages' and in 'intonation languages'. These two prosodic headedness-related constraint types also play a role in accounting for the disappearance of expected phonological phrasing in cases of the absence of tonal 'accent' and the related absence of word-level prosodic headedness.
Keywords: prosodic head, tone, Japanese, English, Basque

1 Introduction

This paper explores how the notion 'prosodic head' comes into play in providing an account for certain facts concerning the distribution of tonal pitch accents in Tokyo Japanese, Standard American and British English, and Northern Bizkaian Basque. We have been prompted to put thoughts on paper at this point by the stimulating account of unaccentedness and accentedness in Tokyo Japanese loanwords by Ito and Mester (2016) (I&M, henceforth), and by the opportunity to engage with their account that this festschrift volume in their honor presents.

We assume that a prosodic constituent is headed if a unique daughter constituent is designated as its head.[1] ($f'\,f$)$_{PW}$ and (f')$_{PW}$ each represent prosodic words with a head foot,[2] ($\sigma'\,\sigma$)$_f$ and (σ')$_f$ each

[1] One of the general "constraints on prosodic domination" put forward in Selkirk (1996) was, unfortunately, called Headedness, in a departure from prior usage of that term. This constraint Headedness required that a prosodic constituent immediately dominate a constituent at the next level down in the Prosodic Hierarchy. It had no function in identifying one of the daughter feet of a prosodic word as the 'prosodic head' of that word, for example.

[2] In this paper, in general, the head status of a daughter is indicated by a superscript prime symbol. I&M utilize an acute accent mark to indicate the head syllable of a foot, but not to indicate the head foot of a prosodic word, as we see in (6) which is repeated here from their paper.

represent feet with a head syllable, and so on. The notion 'head' can be thought of as encoding an abstract notion of prominence. Prosodic constituent headedness is key to an understanding of the distribution of a variety of phonological and phonetic properties within an utterance.[3] In Tokyo Japanese, I&M propose, the head syllable of a prosodic word (i.e. the syllable that is the head of the foot that is the head of a prosodic word) must carry a pitch accent. In Standard American and British English, by contrast, the head syllable (of the head foot) of a prosodic word is phonetically interpreted as "stressed"; it has greater duration, intensity, etc., than non-head syllables. But, though pitch accenting of the head is not a word-level phenomenon in Standard English, the head syllable of a phonological phrase is necessarily associated with a tonal pitch accent, whether it be a default H* or a pitch accent that is an intonational morpheme (Ladd 1996/2008; Truckenbrodt 2007). A system of constraints on prosodic headedness and its reflexes in phonological representation and phonetic interpretation has to make sense of these, and other, crosslinguistic differences.

The questions we want to address in this paper concern the nature of phonological markedness constraints that make appeal to the notion prosodic head. Specifically: What is the nature of any phonological constraint(s) on the relation between a prosodic head and the tone(s) referred to as pitch accents? Also to be considered: Can a prosodic constituent not have a head? Is there a class of potentially violable phonological markedness constraints that call for prosodic constituents to immediately dominate a head constituent? I&M have opened the door to a discussion of these questions in arguing that the absence of tonal pitch accent (unaccentedness) in Tokyo Japanese loanwords is a consequence of the absence of a word-level prosodic head or 'prominence peak' in words with the particular prosodic structure profile which is associated with lack of accent.

In implementing their analysis of unaccentedness and accentedness in Tokyo Japanese loanwords, I&M propose that WordAccent is the constraint that is violated when word-level head/prominence is absent. This constraint is stated as in (1):

(1) WordAccent [WdAcc]   (I&M, p. 485)

   A prosodic word contains a prominence peak.

   (Violated by prosodic words not having a prominence peak (peak = primary stress or pitch accent, in Japanese: High*Low))

We suggest in this paper that the constraint WdAcc should instead be factored into two distinct constraints, both of which appeal to the notion prosodic head. The violable constraint (2) that calls for a prosodic word to be headed can take the place of I&M's WdAcc constraint in the analysis of the presence or absence of a 'prominence peak' in Tokyo Japanese loanwords (cf. tableaux in section 1):

(2) ProsodicWord:Head [ω:Hd]

   A prosodic word must have a unique daughter constituent that is its head.

   (Violated by any prosodic word which lacks a daughter designated as its head.)

   [The colon in the constraint name stands for the '⇒' of logical implication.]

   Like WdAcc in the I&M account, ω:Head would be violable.

---

[3] Abstract headedness/prominence appears to have an impact on more than stress and tone (see, e.g. Broselow and McCarthy 1983 on infixation to a position adjacent to a head foot, Beckman 1996 on positional faithfulness and Smith 2002 on positional augmentation). We believe it to be an open question at this point just what the set of phonological or phonetic phenomena is, cross-linguistically, whose distribution depends on prosodic headedness.

As for the H*L pitch accent that is phonologically associated with the head of a prosodic word in surface phonological representation in Tokyo Japanese, a distinct phonological markedness constraint (3) can be given responsibility for the predictable presence of H*L in the surface representations of loanwords:

(3) Head-Mora-of-Prosodic Word: Tone   [Hdμ(ω):Tone]

>   The head mora (μ) of a prosodic word (ω) must be associated with some tone.
>   [The head μ of ω is the head mora of the head syllable of the head foot of ω.]

>   The constraint is violated if the head mora (μ) of a prosodic word ω is not associated with a tone.

Constraint (3) can simply be added to a revised I&M analysis of Tokyo Japanese loanwords, providing an explicit account of the association of predictable tone to the head mora of the word.

The notions 'prosodic head' and 'tone' are appealed to throughout I&M's paper. Perhaps I&M intend their formulation of WordAccent as it pertains to Japanese in (1) as a convenient shorthand for a conjunction of the two constraints in (2) and (3), one conjunct calling for the presence of the prosodic head and the other calling for tone to be associated to that head. In the next sections, the advantages of assuming distinct constraints of the types (2) and (3) and the distinct phonological representations of tone and prosodic headedness (or 'prominence') that are implied by these will become clear. With them, we can account for certain important aspects of the relation between tone, headedness/prominence and prosodic constituency in Tokyo Japanese, Standard English and Northern Bizkaian Basque.

It should be said, for clarification, that the notion 'head' in prosodic phonology is not the same notion as in syntax. In syntax, the properties of higher order constituents are projected from a lexical or functional category item, which is referred to as the head of those constituents. A syntactic constituent VP, for example, would not exist if it dominated no verb (or trace of a verb). In prosodic structure, by contrast, there are independent sources in the grammar for the prosodic constituents that play a role in phonological representation (and which may or may not be headed). One source of prosodic constituency are markedness constraints that are proper to the phonology itself — those that call for the grouping of segments into syllables or for the grouping of syllables into feet. A different source of prosodic constituency in the phonological representation of a sentence is its syntactic constituent structure. The proposal made by Selkirk (2009, 2011), referred to as Match Theory, is that the phonological constituents prosodic word, phonological phrase and intonational phrase are in effect the phonological expression of the corresponding syntactic constituents word, phrase and clause (the former are 'grounded' in the latter). In other words, the notion 'head' in prosodic phonology is defined in terms of prosodic constituents that themselves have an independent source in the grammar. So, a phrasal constituent in syntax is headed, as a matter of theoretical necessity, but the same is not true of prosodic constituents.

A yet further clarification concerning the notion of 'head' in prosodic phonology is needed. Constraint (2) defines 'head' in terms of immediate domination (the mother-daughter relation). In the statement of (3) the 'head mora' that must be tone-bearing is not directly dominated by prosodic word. The expression 'head mora of prosodic word' is intended as shorthand for 'head mora of the head syllable of the head foot of prosodic word'. We need to go one step further on the road to clarification of the notion 'head' and make explicit what's implied in using the expression 'head mora of π' (where π is any prosodic category):
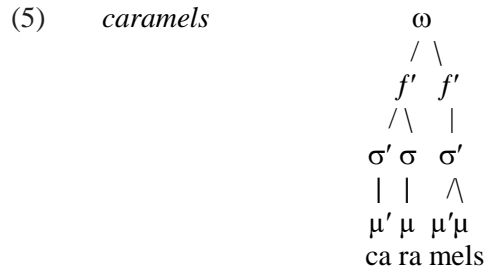
(4) The Head Chain Condition (see Selkirk 2007)[4]

>   A prosodic constituent π^b qualifies as the head of its mother constituent π^a if there is a prosodic constituent π^c which is the head of π^b.

---

[4] The idea behind this Head Chain Condition on headedness is made explicit in Selkirk (2007), though not under this name or formulation.

The Head Chain Condition says that a mother constituent π^a may be headed only if it dominates a chain of heads "all the way down". Satisfying constraint (2) ω:Hd means that a prosodic word must have a head mora, and heads at every prosodic level in between, as illustrated in (5). In this representation, head constituents are marked with a prime symbol at the upper right.

(5)   *caramels*
```
                    ω
                   / \
                  f′  f′
                 /\   |
               σ′ σ   σ′
               |  |   ∧
               μ′ μ  μ′μ
               ca ra mels
```

A last clarification is perhaps necessary. While we are adopting the hypothesis of the violability of the constraint ω:Hd, (2), that requires the presence of a head daughter for a prosodic word ω, adopting the Head Chain Condition (4) imposes the requirement, that, when defined, a head must have the property that it dominates a chain of heads below it. The Head Chain Condition can be thought of as a "hardware commitment"; it is not a violable constraint.

Despite there being no theoretical necessity for the presence of a prosodic head in a phonological constituent, putting forward ω:Hd as a violable constraint, as suggested above, does go counter to common phonological thinking on this matter. As McCarthy (2003, 110) points out, "The existence and uniqueness of the head foot [of a prosodic word] are usually taken to be axiomatic — universal properties of GEN, rather than violable constraints". The importance of Ito and Mester's empirical investigation of the distribution of accentedness and unaccentedness in Tokyo Japanese loanwords is that it leads to the conclusion that the head of a prosodic word is not defined in the case of unaccented words, whether loanwords or native. They show that whether or not a prosodic constituent is headed arguably involves a language-particular choice in the ranking of violable constraints.

In what follows, we will also show the broader empirical coverage of our proposal to decompose I&M's constraint WordAccent into the two constraints ω:Head ("A prosodic word must have a unique daughter constituent that is its head") and Hdμ(ω):Tone ("The head mora of a prosodic word must be associated with some tone"). First, the introduction of epenthetic pitch accent at the phrasal level in Standard American and British English (section 3) motivates the constraint Hdμ(φ):Tone, providing independent evidence for a larger constraint family Hdμ(π):Tone to which Hdμ(ω):Tone would belong, and at the same time it motivates the constraint φ:Head calling for a φ to be headed, which is a member of the same general constraint family π:Head to which the proposed ω:Head would belong. Second, we will argue that the "dephrasing" of unaccented φ in Northern Bizkaian Basque receives an explanation if we assume (i) that the dephrasing is the language-particular consequence of the violation of the constraint φ:Head and (ii) that the violation of φ:Head is the consequence of the absence of a head for that φ, that is due to the absence in an unaccented ω of the tone that would be required for a daughter ω to itself be headed. Sections 3 and 4 are dedicated to fleshing out the analyses that are synopsized here.

2   Tone and prosodic headedness in Tokyo Japanese

We will first briefly review I&M's analysis of unaccentedness (and accentedness) in Tokyo Japanese loanwords. The core component is a constraint-based account of the foot and prosodic word structure exhibited in loanwords, which bring with them no lexical properties beyond the segmental makeup. I&M's account persuasively characterizes the prosodic configurations in which the prosodic head ('prominence peak') of a word is defined, and those where it is not. Their proposal is that a H*L accent appears just in loanwords where word-level prosodic headedness has representation, that there is no H*L

accent in words where the head syllable (or head mora) of the word is not defined. Their important insight is that the *lack* of prosodic headedness can play a key role in explaining phonological patterning. In what follows we implement this analysis using the constraints ω:Hd (2) and Head-μ(ω):Tone (3) instead of the constraint WordAccent.

The table in (6), repeated here from I&M, p. 485, shows representative cases of Tokyo Japanese loanwords consisting of light (single-mora) syllables only, organized into head-initial trochaic feet. The examples illustrate the generalization established by I&M that, with the exception of words with four syllables, words with three or more light syllables have a tonal accent that falls on the antepenultimate syllable, which is the head syllable of the rightmost (binary) foot in the word. Any prosodic pattern showing antepenultimacy effects naturally leads to the hypothesis that the prosodic structure of the word includes a trochaic (left-headed) head foot that is one syllable away from the right edge of the word. In addition to the foot representation that is the basis of antepenultimate prominence, the organization of the initial two syllables into feet within the words in (6) (p. 485) reflects I&M's solution to the two questions raised by the systematic unaccentedness of four-light-syllable words. On the one hand, (i) why is it that four-light-syllable words do not show the antepenultimate pattern? On the other, (ii) why is it that unaccentedness (lack of tonal accent) accompanies the departure from that pattern?

(6) [From I&M, 485]

Accented			Unaccented	Accented		
1L	2L	3L	4L	5L	6L	7L
^{1}(Ĺ)	^{2}(ĹL)	^{3}(ĹL)L	^{0}(LL)(LL)	^{3}(LL)(ĹL)L	^{3}(LL)L(ĹL)L	^{3}(LL)(LL)(ĹL)L
(dó)	(pári)	(bána)na	(riha)(biri)	(kuri)(súma)su	(meto)ro(póri)su	(ana)(kuro)(nízu)mu
(ré)	(páte)	(góri)ra	(ame)(rika)	(asu)(fáru)to	(eko)no(mísu)to	(namu)(ami)(dábu)tu
(mí)	(mémo)	(sháto)ru	(kari)(suma)	(pia)(nísu)to	(asu)pa(rága)su	(abu)(suto)(ráku)to

I&M's answer to question (i) is that, in Japanese, satisfaction of the constraint Initial Foot, which parses the first two syllables of a prosodic word into a foot, plays a key role in determining the absence in four syllable words of the footing which results in antepenultimate prominence. The other key element of I&M's answer to question (i) is their argument that the lack of a head foot altogether (and resultant lack of tonal accent) is the consequence of a constraint ranking which places a *violable* constraint calling for a prosodic word to be headed (their constraint WordAccent, our constraint ω:Hd (2)) *below* all the constraints that define the distribution of feet in a word. We will see this in the tableau below in (8).

Aside from WordAccent, the set of constraints that I&M exploit in their account have commonly played a role in defining the distribution of feet in the languages of the world.[5] They are given in (7), corresponding to (17) in I&M (p. 485):

(7)   [From I&M: 485]

---

[5] InitialFoot is what gives the initial footing in the five syllable English word *àbracadábra* — (àbra)ca(dábra) with secondary word prominence on the initial syllable. But, as the English pronunciation of *A(méri)ca* with antepenultimate word prominence shows, InitialFoot would appear to be subordinated to Rightmost and Nonfinality(Ft′) in the grammar of English.

a. *WORDACCENT (WDACC)*

A prosodic word contains a prominence peak. Violated by prosodic words not having a prominence peak (peak = primary stress or pitch accent, in Japanese: High*Low).

b. *RIGHTMOST*

*FT′ . . . FT . . .]ω   Violated by any foot following the head foot within the prosodic word. This is the *End Rule (Final)* of Prince 1983, in a version modeled on the foot-based restatement in McCarthy 2003:111.

c. *NONFINALITY(FT′) (NONFIN(FT′))*

*FT′]ω   Violated by any head foot that is final in its prosodic word (Prince and Smolensky 1993:45).[27]

d. *INITIALFOOT (INITFT)*

*ω[o   A prosodic word begins with a foot (Ito and Mester 1992:31, McCarthy and Prince 1993:81). Violated by any prosodic word whose left edge is aligned with the left edge, not of a foot, but of an unfooted syllable.

e. *PARSE-σ*

*o   All syllables are parsed into feet (Prince and Smolensky 1993:62). Violated by unfooted syllables.

f. *NOLAPSE*

*oo   Syllables are maximally parsed. Violated by two consecutive unparsed syllables.

I&M propose that in Tokyo Japanese these constraints are ranked as in the tableau in (8), from I&M's (18), on page 486. (The superscript numbering at the left edge of a candidate indicates the locus of the head syllable of the head foot of the word, counting from the end.) We see in (8) that the parsing of 4-light-syllable words into two feet, both of which lack prominence, is optimal.

(8)   [From I&M: 486]

	INITFT	NOLAPSE	NONFIN(FT′)	RIGHTMOST	WDACC	PARSE-σ
/amerika/ ► a. ⁰[(ame)(rika)]					*	
b. ⁴[(áme)(rika)]				*!		
c. ²[(ame)(ríka)]			*!			
d. ⁴[(áme)rika]		*!				**
e. ³[a(méri)ka]	*!					**

In the optimal candidate (a), the four light syllables of the PWd are parsed as two feet, with neither foot having the status of the head foot of the PWd. For this reason there is no violation of either Rightmost or Nonfinality(Ft′) in (a); both these constraints govern only the distribution of the head foot (Ft′) of a prosodic word. The headless candidate (a) is optimal because it is the only candidate which does not violate any of the set of constraints determining the distribution of feet, and these all dominate the lower-ranked constraint WordAccent. Each of that set of higher-ranked constraints displays a violation in one of

the other, nonoptimal, candidates, where the head of prosodic word is defined.[6] Our modest suggestion is that WordAccent should be supplanted by the constraint ProsodicWord:Head (ω:Hd), which explicitly calls for the headedness of prosodic word, and, more importantly, would be a member of a larger constraint family, including Foot:Head (*f*:Hd), PhonologicalPhrase:Head (φ:Hd), etc. whose members would be expected to play a role in cross-linguistic typology.

As for question (ii) concerning the absence of tone (pitch accent) in the four-syllable words, this absence may simply be understood as due to the absence of a ω-head ('prominence peak' in I&M's terms). Our suggestion is that the absence of the ω-head in the four-light-syllable loan cases means the absence of any pressure from the markedness constraint Hdµ(ω):Tone (3) for there to be a tone (accent) associated with the head mora of the PWd, hence the unaccentedness of the four-syllable cases in (8).

Turning to accented words of 3, 5, or 6 syllables, for example, in each type of case there is an optimal candidate in which *all* the relevant constraints on PWd-internal prosodic structure are satisfied. This includes the constraints determining the organization and distribution of feet in the word — InitialFoot, NoLapse, NonFin(Ft′), Rightmost — as well as the constraint WordAccent (or our ω:Hd), which calls for the PWd to be headed. Candidate (a) is the optimal candidate in (9) (from I&M's (20), p. 487) for the 3-syllable word and candidate (d) is the optimal candidate for the 5-syllable word. In these optimal cases, the PWd has a daughter which is a head foot which has a daughter which is a head syllable (which has a daughter which is the head mora (consistent with the Head Chain Condition in (4) above).

(9) [From I&M: 487]

			IɴɪᴛFᴛ	NoLᴀᴘꜱᴇ	Nᴏɴꜰɪɴ(Fᴛ′)	Rɪɢʜᴛᴍᴏꜱᴛ	WᴅAᴄᴄ	Pᴀʀꜱᴇ-σ
/banana/	▶ a.	³[(bána)na]						*
	b.	⁰[(bana)na]					*!	*
	c.	²[ba(nána)]	*!		*!			*
/baruserona/	▶ d.	³[(baru)(séro)na]						*
	e.	⁰[(baru)(sero)na]					*!	*
	f.	⁵[(báru)(sero)na]				*!		*
	g.	²[(baru)se(róna)]			*!			*
	h.	⁵[(báru)serona]		*!				***
	i.	⁴[ba(rúse)(rona)]	*!			*!		*

As for the predictable, arguably epenthetic, tonal accent H*L which accompanies the head syllable of the head foot in the surface phonological representation of these word types, we take it to be epenthetic, present in surface phonological representation as a consequence of a phonological markedness constraint that governs the tone-head or tone-prominence peak relation, namely Hdµ(ω):Tone in (3).

In other words, in the case of loanwords, which are assumed to lack lexical tone, the surface tonal pitch accent is only epenthetic, appearing in response to the high-ranked prosodic markedness constraint Hd-µ(ω):Tone, which would be violated were there no such epenthesis. This constraint must, of course,

---

[6] It would have been helpful for the reader for the head foot to have been marked in the candidates with a prime symbol, consistent with the notation supplied in the definition of the head-foot-sensitive constraints Rightmost and Nonfinality(Ft′) in I&M's (17), i.e. our tableau in (8).

dominate the tonal faithfulness constraint Dep(Tone) (Myers 1997), which weighs in against the epenthesis of tone in surface representation.[7]

(10)   Hdμ(ω):Tone >> Dep(Tone)   (ranking in loanword vocabulary)

In summary, we have proposed a slight revision of I&M's analysis of accentedness and unaccentedness in loanwords in Tokyo Japanese which substitutes the constraint PWd:Head (ω:Hd) for I&M's constraint WordAccent. The two reasons for that are: (i) ω:Hd makes more explicit the idea that it is the abstract property of prosodic headhood that is at issue, and (ii) ω:Hd implies the existence of a family of violable constraints on the headedness of prosodic constituents. We have also introduced a markedness constraint Head-μ-of-PWd: Tone (also written as Hdμ(ω):Tone) that explicitly calls for the head mora/syllable of a prosodic word to have a tone associated with it in surface representation. It turns out that these two types of constraint provide a good basis for addressing a variety of further aspects of the phonology of 'accent', both in Tokyo Japanese and in Standard English and Northern Bizkaian Basque.

Let us briefly consider the relation between ω-headedness and tone in inflected verbs and nouns of the native vocabulary in Japanese. An important fact is that verb and adjective roots are either lexically accented or unaccented. We take this to mean that (lexical) tone may, or may not, form part of the underlying, input, representation of these native roots. At the same time, the location of the syllable where the lexical tonal accent appears in surface representation is determined by general principles: the accent appears in antepenultimate position. Indeed, the constraints in (7) on the distribution of the (head syllable of) the head foot of PWd-head correctly predict that the antepenultimate position in surface representation within the PWd corresponding to the inflected verbs and adjectives of the native vocabulary is the position in which a lexical accent/tone belonging to the root morpheme in underlying representation will appear.

The examples in (11) from I&M (p. 474-5) illustrate the antepenultimate position of the lexical accent in inflected verbs of the native vocabulary (a HL tone representation of the verb's lexical accent appearing in its underlying and surface position has been added by us).

(11) Accented surface forms with verb root with lexical accent:

a.   Underlying representation of verb root with accent: [tabe]^{HL} 'eat'
b.   Surface representation of verbal PWd containing accent

     ta'be-ta 'ate'   *tabe-sa'se-ta* 'made to eat'   *tabe-sase-ra're-ta*   'was made to eat'
     HL   HL   HL

In the case of unaccented verb or adjective roots, by contrast, the inflected surface form lacks any tone/accent, as seen in (12). In particular, there is no epenthesis of tone/accent in antepenultimate position (unlike in loanwords).

(12) Unaccented surface forms with verb root with *no* lexical accent [ire] 'insert':

     ire-ta 'inserted', *ire-sase-ta* 'made to insert', *ire-sase-rare-ta* 'was made to insert', etc.

In the verb forms in (11), then, the prosodic structure constraints of (7) are responsible for the presence and location of a prosodic word head, as in loanwords. The constraint Head-μ-of-ω: Tone (= Hdμ(ω):Tone) is not the "source" of the surface tone associated with the ω-head, however. Rather, the constraint Hdμ(ω):Tone seemingly provides the pressure for the attested *shift* of the lexical tone/accent from the verb root to the antepenultimate head syllable of the ω. In this case, Hdμ(ω):Tone would

---

[7] With Dep(Tone) and other constraints on input-output correspondence in the representation of tone, Myers (1997) extends to tonal faithfulness the McCarthy and Prince (1995) correspondence theory of segmental faithfulness.

dominate tonal faithfulness constraints that would (a) call for the lexical tone to remain in its lexical location, or (b) rule against any surface association of a tone to a mora/syllable which is not present in underlying representation. These would be the constraints Max(Assoc) and Dep(Assoc) proposed by Myers (1997) (see also Yip 2002: 82-6), following the format of correspondence constraints in McCarthy and Prince (1995). Also playing a role, obviously, is the constraint Max(Tone) which rules against deletion of underlying tone.

(13) Max(Assoc):   A tone association in the input must have a correspondent in the output. [Myers 1997: 865]

(14) Dep(Assoc):   An association in the output must have a correspondent in the input. [Myers 1997: 861]

(15) Max(Tone):   A tone in input representation must have a correspondent in output representation.

The ranking in (16) would predict the displacement of lexical tone from the verbal root to the antepenultimate head syllable of the verb seen in (11):

(16)   Hdμ(ω):Tone, Max(Tone) >> Max(Assoc), Dep(Assoc)

Turning now to the case of lexically toneless (unaccented) verbs and adjectives in (12), as the shift of tone/accent to the antepenultimate syllable in (11) shows, there should be no obstacle to the defining of the ω-head when the verb root has no lexical accent. Yet that putative ω-head would be unaccompanied by a surface tonal accent. This violation of Headμ(ω):Tone) is not seen in the class of loanwords, where lexical tone/accent is absent throughout and epenthesis is systematically permitted. We must assume that the tonal faithfulness constraint Dep(Tone) dominates Hdμ(ω):Tone in order to guarantee the absence of epenthetic accent (tone) in native verbs or adjectives whose roots are not lexically accented:

(17)   No tone ('accent') epenthesis on PWd-head in native verbs and adjectives

          Dep(Tone) >> Hdμ(ω):Tone

The constraint ranking in (17) is the opposite of that in (10), which allows for the epenthesis of tonal accent in the case of loanwords. But this apparent 'inconsistency' in ranking should be permitted. As Ito and Mester (2002, 2009) have argued in earlier work, permitting variation in constraint ranking for well-defined strata of the vocabulary of a language allows for principled accounts of language-internal morphological strata-related variation in phonological patterning.

Summarizing, the facts about Tokyo word prosody that have been reviewed above suggest a major advantage of a tonal representation of 'accent' that is distinct from the representation of antepenultimate prosodic headedness. Characterizing (pitch) accent as tone allows for familiar, independently motivated constraints from the analysis of tone languages to play the role that we expect them to have in any language where the relation between tone and prosodic headedness is constraint-governed. These are (a) tone-related faithfulness constraints, which regulate the correspondence relation between tones ('accents') in the input and output representations of phonology (Myers 1997 and others), and (b) tone-related markedness constraints which regulate, among other things, the relation between tone and prosodic structure (e.g. between tone and prosodic constituent heads or edges).

The relation between tone/accent and prosodic headedness in Tokyo Japanese that we have discussed so far involved the constraint Hdμ(ω):Tone. It was taken to be the force behind tonal epenthesis (the presence of 'accent') on the antepenultimate head syllable of the PWd in the phonology of loanwords. It was also taken to be the force behind the shift of lexical tone/accent to the antepenultimate

locus of PWd-head in accented verbs and nouns of the native vocabulary. It remains to be seen if this is the sole type of constraint on the prosodic head-tone relation in Tokyo Japanese as well as crosslinguistically. Might there be motivation as well for a constraint in the other direction, requiring that a tone be associated to a prosodic head, e.g. Tone:Hdμ(ω)? I&M do indeed suggest early on in their paper (p. 485) that such a constraint is needed for Japanese.

Perhaps a constraint Tone:Hdμ(ω) is needed for an account of the exceptional surface locations of lexical accent in native nouns in Japanese that are neither in the antepenultimate location of the head syllable of prosodic word, e.g. *kokóro* 'heart', nor even in the position of a head (light) syllable of a foot, e.g. *atamá* 'head', *hashí* 'bridge'. What is it that accounts for the lexical tone remaining in situ in these cases? Might it be that, if the tone cannot come to the prosodic head, the prosodic head comes to the tone, and so arrives in an exceptional position? A constraint Tone:Hdμ(ω), accompanied by appropriate ranking of tonal faithfulness constraints, could indeed force this to happen.[8]

But before assuming that the existence of this additional constraint on the tone-head relation is motivated by exceptional accenting in the native nouns of Tokyo Japanese, one should also consider an alternative proposal. Along the lines of Smith (2001), could a higher ranking of faithfulness constraints in native nouns account for the lack of tonal accent shift to the 'normal' antepenultimate position of prosodic heads that is seen in native native verbs and adjectives? For native nouns, could it be that Hdμ(ω):Tone and the tonal faithfulness constraints Max(Tone), Max(Assoc) and Dep(Assoc), ranked in (16), are all higher ranked than the prosodic constraints in (7) which, appropriately ranked among themselves, would call for the prosodic head of the word to fall in antepenultimate position? Such a proposal would be in the spirit of the Ito and Mester (2002, 2009) theory of lexical stratum-specific ranking for faithfulness constraints. But it is not for us to pursue that question.

In the sections that follow on tonal accent and its relation to prosodic headedness, we look at Standard English and Northen Bizkaian Basque. We suggest that there is further motivation for constraints of the Hdμ(π):Tone variety (where 'π' stands for any constituent of the prosodic hierarchy), but no evidence for the Tone:Hdμ(π) variety. We also will see additional evidence for violable prosodic markedness constraints of the π:Head variety, in the spirit of I&M's contribution to our understanding of this issue.

3 Standard British and American English

In Standard British and American English tonal "pitch accents" are not lexical properties of the words themselves or of any of the word's component morphemes.[9] There are meaning-bearing "intonational" pitch accents (see e.g. Pierrehumbert and Hirschberg 1990), which on their own should be understood as morphemes consisting only of tone. These will not concern us here. It is the non-meaning-bearing, phonologically predictable, H tone pitch accent of Standard American and British English (typically written H*) that is of most direct relevance here. The central generalization, illustrated in (18c), is that, in a sentence which is pragmatically neutral in its utterance context and whose constituents are all discourse-new, a surface H tone necessarily appears on a syllable that is the head of a prosodic word (ω) that is moreover the head of a phonological phrase (φ).

---

[8] Several authors have proposed constraints with a somewhat familiar flavor, calling for an accent (or tone, in our terms) to be associated to the head of a phonological word or phrase. Basically, "if accented, then head of ω or φ" (Yip 2002; de Lacy 2002; Hellmuth 2006; Selkirk & Elordieta 2010; Selkirk 2011, 2014; Bennett and Henderson 2013; Elordieta 2015; Ito and Mester *in press*, among others). Although such constraints are not framed in the same model that we are proposing here, they point to the existence of a family of constraints which would require that a tone be associated to a head (at some level).

[9] Most of the repertoire of pitch accents of Standard English (see Pierrehumbert 1980, for example) should be understood as tonal morphemes, morphemes whose underlying phonological representation consists only of tone. Plausibly a variety of discourse particles, these tonal morphemes carry meanings that relate to the pragmatic force of a sentence in particular discourse circumstances (see e.g. Ladd 1980; Pierrehumbert and Hirschberg 1990; Bartels 1999; and especially Constant 2014). The surface distribution of these tonal morphemes in the sentence would be in part determined by their place in the morphosyntactic representation of the sentence, where they contribute to the semantic/pragmatic interpretation of the sentence.

This generalization, due to Ladd (1996/2008), Truckenbrodt (2006), Féry and Samek-Lodovici (2006) and others,[10] can be accounted for if it is assumed that the phrasal constituent structure of the sentence along with prosodic-headedness-related phonological constraints of the sort discussed in the preceding section are at play in determining the tonal properties of the "intonational contour" of neutral all-new sentences in Standard English.

A simple case is that of the all-new declarative SVO sentence with the syntactic representation in (18a). This merely all-new sentence lacks any constituent that is morphologically marked as a contrastive FoCus or as Given in the discourse; there is, moreover, no morphological marking of newness or "information focus" (see Kratzer and Selkirk 2018/submitted). The syntactic phrases and words of (18a) that are headed by lexical items — namely noun, adjective, verb — are given expression as phonological phrases (φ) in the corresponding underlying phonological representation (18b) by Match constraints on the interface between syntactic and phonological constituency (see Selkirk 2009, 2011, 2017; Elfner 2015; Selkirk and Lee 2015; Bennett, Elfner and McCloskey 2016, among others). The syllable and foot structure of (18c) is determined by a language-particular ranking of constraints on the output representation, while the higher order constituency is inherited from the input due to prosodic structure faithfulness constraints, which are unviolated in this particular case. (In the surface phonological representation (18c), for clarity, the prosodic constituent structure is represented as a tree instead of the equivalent labeled bracketing given in (18b)).[11]

As the underlying and surface phonological constituency in (18b) and (18c) show, we are considering a two-step derivation from surface to prosodic constituency, following Selkirk and Lee (2017) and Kratzer and Selkirk (2018/submitted). In a first step, the surface syntactic structure derived as the output of syntactic operations of merge and move serves as the input to the mapping to the underlying phonological representation, which contains all idiosyncratic segmental and tonal properties of the morphemes in the syntactic structure as well as a prosodic structure. This prosodic structure is obtained from the application of the set of Match constraints that are proposed as correspondence constraints in the theory of the mapping between syntactic and prosodic constituents known as Match Theory: Match-Word, Match-Phrase and Match-Clause (Selkirk 2009, 2011). In a second step, the underlying phonological representation serves as input to a surface phonological representation which is the winning candidate among a series of candidates that converge or diverge with respect to the underlying representation in different ways and that are evaluated by ranked faithfulness and markedness constraints. It is in this second step that segmental and prosodic phonology *per se* occurs (sandhi phenomena, tonal spreading and shifting, insertion of boundary tones, etc.). Thus, after the mapping from syntactic to prosodic constituency, the relationship is between input and output phonological representations, with blindness to syntactic representation. Match constraints have the generative role from syntactic to prosodic structure devised in Match Theory, and do not operate at the phonological level per se.

This serial view of the derivation between surface syntactic structure and surface prosodic structure departs from previous assumptions in Match Theory itself, in which the derivation takes place in just one step. Match constraints evaluate output prosodic structures from an input syntactic structure together with phonological faithfulness and markedness constraints (Selkirk 2009, 2011; Elfner 2012, 2015; Ito and Mester 2013; Elordieta 2015; Bennett et al. 2016). Following Selkirk and Lee (2017), and also Kratzer and Selkirk (2018/submitted), we believe it is theoretically more appropriate to treat Match constraints as generators of underlying prosodic representation from syntactic representation rather than as faithfulness constraints. In phonology proper, there are prosodic faithfulness constraints such as Max(π) and Dep(π) that govern the correspondence between input and output prosodic structure.

---

[10] These works show that Selkirk (1984, 1995) and Gussenhoven (1983) were wrong in bypassing syntactic structure as the basis for generalizations concerning the distribution of pitch accents.

[11] We follow the commonly held assumption that function words are not parsed phonologically as prosodic words, and that function word-headed phrases do not have the status of phonological phrases in the phonology. Thus, a function word like 'the' will be incorporated into the prosodic constituent of the sentence adjoining to the ω to its right or directly to the φ above it, to satisfy language-specific phonological constraints on surface phonological representation (Selkirk 1996). We leave open at this point just where the determiner is located in the tree in (18c).
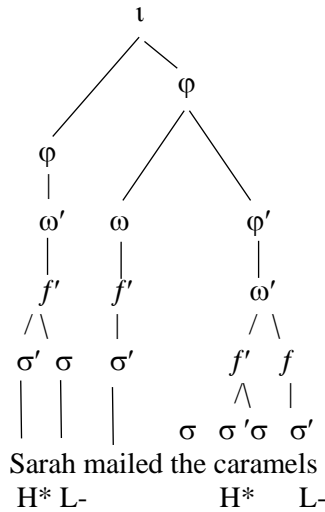
(18) *Syntax*

    a.   [[[Sarah]$_N$]$_{NP}$ [[mailed]$_V$ the [[caramels]$_N$]$_{NP}$]$_{VP}$]

    Phonology

    b. Underlying   (((Sarah)$_\omega$)$_\varphi$ ((mailed)$_\omega$ the ((caramels)$_\omega$)$_\varphi$)$_\varphi$)$_\iota$

    c. Surface

Sarah mailed the caramels
H* L-   H*   L-

       As a consequence of Match constraints on the syntax-phonology interface and a language-particular ranking of a variety of familiar types of phonological constraints discussed in the preceding section, it is predicted that a H pitch accent necessarily falls just on the head mora of the φ that correspond to the subject and object phrases. A H tone does not obligatorily fall on the verb, which is not itself a φ in this sentence.

       Phonological markedness constraints of the π:Head family — namely φ:Head, ω:Head, *f*:Head — are responsible for the head status of a prosodic constituent. Headedness is represented by prime symbols in the surface representation (18c).[12]

       As for the surface tones, the markedness constraint Hdμ(φ):Tone can be held responsible for the appearance of a H tone in association with the (head mora of) the head syllable of the head foot of the head prosodic word of a φ in (18c), a tone typically referred to as a 'pitch accent' in the literature on English intonation. Since the appearance of a H tone on the head syllable of a phonological phrase is necessary in Standard English, a markedness constraint such as Hdμ(φ):Tone (19) must provide pressure for this epenthesis, and it must dominate the tonal faithfulness constraint Dep(Tone). Thus, Hdμ(φ):Tone >> Dep(Tone).

(19) Headμ-of-φ:Tone   [= Hdμ(φ):Tone]

    The head mora of a φ must be associated with a tone.

       The related constraint Hdμ(ω):Tone, which we suggested above is responsible for the epenthesis of accentual tone in Tokyo Japanese loanwords must be lower ranked than Dep(Tone) in Standard

---

[12] To account for the assignment of head status to the φ daughter of φ within the recursive φ structure corresponding to the recursive LexP structure of the VP, Kratzer and Selkirk (2018/submitted) propose a constraint Unequal Sisters Prominence, which favors headship for whichever daughter is higher in the hierarchy of prosodic categories.

English. This is because in Standard English it is not necessary for a prosodic word which is *not* the head of φ to have a tonal accent associated with its head syllable:[13]

(20) Standard English

  Hdµ(φ):Tone >> Dep(Tone) >> Hdµ(ω):Tone

  The generalization that a tonal pitch accent appears on the head of every phonological phrase (φ) of an all-new sentence of Standard English (one where no constituent is Given) is underscored by the systematic appearance of H* on the head of phonological phrases that are medial in a sentence, both nonfinal and post-verbal. The post-verbal direct object phrase and the sentence-final indirect object in an all-new sentence like (21) both systematically appear with H* pitch accents.[14]

(21) Syntax: [I've [[sent]$_V$ my [[payment]$_N$]$_{NP}$ to the [[doctor]$_N$]$_{NP}$]$_{VP}$]

  Phonology:

  UR (I've ((sent)$_\omega$ my ((payment)$_\omega$)$_\varphi$ to the ((doctor)$_\omega$)$_\varphi$)$_\varphi$)$_\iota$

  SR (I've ((sent)$_\omega$ my ((payment)$_\omega$´)$_\varphi$ to the ((doctor)$_\omega$´)$_\varphi$´)$_\varphi$)$_\iota$

  <H> H* L- H* L-

Details of the syntax of the double object constraint, in which the objects are co-constituents of a "small clause" phrase will not concern us here.[15] What is important is that each of the two objects necessarily has a H tone on the head syllable of the φ that it corresponds to in phonological representation.

  Turning now to the L- boundary tone that, by default, follows the H* tone associated with the right edge of a phonological phrase (φ), as seen in the sentences (18) and (21), it too can be understood as epenthetic. A phonological markedness constraint like (22) that calls for the right edge of a phonological phrase to be "demarcated" by a tone plausibly has responsibility for the surface presence of the L edge tone. It too would outrank Dep(Tone).

(22) R-Edgeµ-of-φ:Tone [= R-Edgeµ(φ)]

  A mora that lies at the right edge of a φ must be associated with a tone.[16]

  It should be said that neither the constraint R-Edgeµ-φ:Tone, nor the Hdµ(φ):Tone constraint, specifies the quality (H or L) of the required tone. We assume that there are independent markedness constraints that make H the natural choice for a head-associated tone, or that make a L the natural choice for an edge tone of φ if the head tone of φ is H, and so on (see Hayes and Lahiri 1991, de Lacy 2002, Selkirk 2007 on such questions).

  To complete the account of the tones that constitute the phonological representation of the intonational contour of all-new pragmatically neutral declarative sentences like (18) and (21) in Standard

---

[13] The case of optional H tone accent on the verb in the sentence in (21) will be discussed below.
[14] See experimental evidence on this point in Katz and Selkirk (2011).
[15] See Harley (1995, 2002) on the syntactic analysis of double object constructions in English.
[16] In the earlier work by Pierrehumbert (1980) and Beckman and Pierrehumbert (1986), the prosodic phrase edge at which the L-boundary tone appears was identified as an Intermediate Phrase (as opposed to the lower-level Accentual Phrase). Ito and Mester (2013) have subsequently demonstrated that a single phonological phrase type φ suffices to represent presumed contrasts between the Intermediate and Accentual phrase in Tokyo Japanese, if the assumption is made that φ-structure is recursive. An Accentual Phrase would be a φ that immediately dominates no other φ, whereas the Intermediate Phrase might be a φ that is either nonminimal or maximal in the recursive structure. When it comes to English, simply referring to the right edge of as a φ is adequate for the characterization of the distribution of the post-H* L- boundary tone.

English, we must explain the optional presence of H tone on the verb in such cases, which is indicated by the < > brackets in (21). Our hypothesis is that this is an optional phrase-initiality effect, due to a constraint that combines both a prosodic edge condition and a prosodic head condition:

(23) Headμ-of-ω@L-Edge-of-φ:Tone   [= Hdμ(ω)@L-Edge(φ):Tone]

       The head mora of a ω at the left edge of φ must bear a tone.

This constraint would belong to the same constraint family that includes the constraint responsible for the surface presence of the LH edge-head tone of Modern Irish. According to Elfner (2012, 2015) and Bennett et al. (2016), this LH tone falls on the head mora of the prosodic word that lies at the left edge of a nonminimal φ.[17] In Irish, the relevant constraint appears not to be violated. The optionality of the edge-head H tone in Standard English indicates that the ranking of the edge-head tone markedness constraint with respect to the Dep(Tone) faithfulness constraint in Standard English is subject to variation.

       In summary, the tonal patterning in surface phonological representations of pragmatically neutral sentences of Standard English is predictable on the basis of prosodic constituency, the reliable headedness of prosodic constituents, and unviolated markedness constraints of various types that govern the relation between tone and prosodic constituent heads and/or edges. The constraint system predicts where epenthetic tones will appear in the sentence, in cases like pragmatically neutral declaratives, where no morphemic tones are at issue.

       Our proposal in this paper is that tonal markedness constraints like Hdμ(φ):Tone and Hdμ(ω):Tone, which require that a prosodic head be associated with a tone, play a central role in the "pitch accent languages" Tokyo Japanese and Northern Bizkaian Basque (see section 3) as well as in "intonational", "stress accent" languages like English. And so do tonal faithfulness constraints like Dep(Tone). The different language-particular rankings of phonological constraints in the grammars of these different language types should make a significant contribution to a cross-linguistic theory of tonal patterning. In an explanatory phonological theory of tonal typology, these language-particular grammatical constraint rankings would combine with language-particular differences in whether tone may be "lexical" (a meaningless contrastive phonological property of morphemes with segmental content), "morphemic" (the sole phonological expression of a morpheme), or epenthetic (having no place in the phonological expression of morphemes in the input representation).

       Where does "stress" fit into the typological picture that is being sketched here? If "stress" is itself not a phonological property, but rather a particular set of phonetic properties that interpret the headedness of a prosodic constituent, then it might be expected that the phonological property of a head's bearing a "pitch accent" (tone) should *not* preclude the phonetic interpretation of that head with the various "stress"-related properties of duration, intensity, spectral tilt and so on. This is indeed what we see in Standard English. A number of studies have shown, for example, that vowels bearing the "primary stress" of a word are longer than vowels bearing the "secondary stress" of a word, and have shown, moreover, that the same is true whether or not the primary stress bears a tonal accent or not (Huss 1978; Sluijter and van Heuven 1996; de Jong 2004; Okobi 2006; Sugahara 2012). Bearing tonal accent in Standard English means that the tone-bearer is the head of a phonological phrase. Moreover, the amount of phonetic "stress" effects like duration increases with the degree of phrasal prominence (i.e. the level of prosodic headedness) of a tonal-accent-bearing syllable (Katz and Selkirk 2011). Understanding "stress" to be a phonetic property whose "degree" varies according to level of prosodic headedness makes it difficult to see the presence or absence of tonal accent, which is a categorical property of phonological representation, through the same typological lens as "stress accent". In our account of the distribution of

---

[17] Additional cases of head-edge default tones come from Frota's (2000) study of the tonal properties of sentences in European Portuguese, where, for example, a tonal pitch accent is always associated with the head of the final prosodic word of an intonational phrase, even in cases where that word is discourse-given and follows a contrastive FoCus word bearing greatest prosodic prominence. Myrberg (2010) makes a similar case from standard Swedish, where the initial word of an intonational phrase will systematically bear a tonal pitch accent on the prosodic head of the word.

default, epenthetic, tonal "pitch accent" in Standard English, no appeal has been made to the notion "stress". As in Tokyo Japanese and as will see next in Lekeitio Basque, in Standard English it is constraints referring only to the abstract property of prosodic headedness that contribute to determining the presence and distribution of "pitch accent" tones in surface phonological representation.

4 Northern Bizkaian Basque

In this section we will analyze the prosodic phrasing pattern of unaccented words in Northern Bizkaian Basque (NBB) within the system of constraints related to prosodic headedness and the association of tones to prosodic heads presented and discussed in this paper. As already reported in the literature, unaccented words in NBB cannot form independent φs by themselves. A φ with an unaccented word must contain at least one accented word in addition (Elordieta 1997, 1998, 2007a, 2007b; Jun and Elordieta 1997; Gussenhoven 2004; Elordieta and Hualde 2014, among others). But a principled explanation for the existence of such a pattern is still missing. In this section we will see that the interaction between prosodic markedness constraints such as φ:Hd and Hdμ(φ):Tone and prosodic faithfulness constraints such as Dep(Tone) and Max(φ) provide an explanation for the prosodic behavior of unaccented words within sentences in NBB.

As documented in the references above (among others), in NBB, there is a lexical contrast between accented and unaccented words, like in Tokyo Japanese. Accented words are traditionally called so because they surface with prosodic prominence in one of their syllables, whereas other words do not; these are the unaccented words (cf. the references above). Accented words have at least one morpheme (root or affix) that is responsible for this "accent", hence the term "accented morpheme" to refer to these morphemes. The lexical property of accent is plausibly represented with the HL tone that manifests itself in the surface position of prosodic prominence, though no accounts before this one have assumed this lexical tonal representation of accent.

In the particular variety of NBB on which we will base our analysis (the one of Lekeitio), main prosodic prominence is always found on a fixed syllable in an accented word, regardless of the location of that syllable with respect to the accented morpheme. This syllable is the penultimate of the whole word, which may consist of a bare root with no overt affix or a root plus one or more affixes. A falling accent HL surfaces on this penult syllable. What this shows is that there is a designated position for the surface association of the lexical accentual tone.

A full paradigm of word-level accentuation and lack of accentuation is found in (24). UR stands for 'underlying representation' and SR stands for 'surface representation'. An apostrophe before a root or affix in UR indicates that it is lexically accented, i.e. it has a lexical HL accent. The location of the HL accent in SR is indicated with an acute accent mark over the prominent syllable. (24a-f) illustrate the following combinations of accented and unaccented morphemes: bare accented root (24a); bare unaccented root (24b); accented root + accented suffix (24c); unaccented root + accented suffix (24d); accented root + unaccented suffixes (24e); unaccented root + unaccented suffixes (24f).

(24) a.   UR: *'liburu*   SR: *libúru* 'book'
               HL

   b.   UR: *lagun*   SR: *lagun*   'friend'

   c.   UR: *'liburu-'ari*   SR: *liburuári*   'to the books'
               HL   HL -dative pl.

   d.   UR: *lagun-'ari*   SR: *lagunári*   'to the friends'
                  HL -dative pl.

e.   UR: *'liburu-a-n*   SR: *liburúan*   'in the book'
          HL   -det.-ines.

f.   UR: *lagun-en-a*   SR: *lagunena*   'of the friend'
          -gen.sg.-det.sg.

We take the fact that the lexical accent of accented words always appears on the penultimate syllable regardless of its location in underlying representation to be evidence in support of the idea that accented words have a prosodic/phonological head. That prosodic head is the mora that is the head of the syllable that is the head of a trochaic foot that is the head of the word, in a prosodic structure represented schematically as (… (σ′ σ) ′)ω. The head mora of this word hosts the accentual HL tone in the surface.

As for whether unaccented words lack such a ω head, there is no evidence from Lekeitio Basque pointing directly to the absence of ω-headedness that is comparable to the evidence from Tokyo Japanese loanwords. In the loanword subset of the Tokyo Japanese vocabulary, unaccentedness is limited to four mora words (in the subset where only words with light syllables are at issue). I&M argue that these are prosodically analyzed as consisting of a two-foot sequence which violates no constraint on word-internal prosodic structure except for the requirement for ω-headedness (WordAccent), which is low ranked, and violated in these words. Thus, I&M show, lack of ω-headedness means lack of tonal accent in loanwords, while presence of a ω-head entails presence of accent. What we seek to show in this section is that, by assuming that unaccented words in Lekeitio Basque do indeed lack a prosodic head (though not for the same reasons as in Tokyo Japanese), we have an important part of the answer to the question why a phonological phrase φ may not consist solely of unaccented words.

It should be pointed out that, given the constraint system that we have been exploiting up to now in this paper, it is virtually a trivial matter to derive the absence of ω-headedness in unaccented words in Lekeitio Basque. Hdμ(ω):Tone requires the head mora of a prosodic word to bear a tone; if the word has no lexical tone, one could be epenthesized, in principle. But Dep(Tone) plays a crucial role: the lexical property of being toneless (unaccented) is preserved by Dep(Tone) in the surface representations of words consisting only of lexically toneless morphemes, as we saw above. What then about the headedness of an unaccented prosodic word? If the constraint ω:Hd were ranked below both Hdμ(ω):Tone and Dep(Tone), the candidate that lacks ω-headedness would be optimal, as seen in the tableau in (25). In the absence of direct evidence against foot construction in unaccented words, we will assume that unaccented words also have feet which are trochees, as with accented words. Since Hdμ(ω):Tone requires that the head mora of a word must bear a tone, and since Dep(Tone) bans the insertion of a tone, the best candidate is one in which the prosodic word does not have a head. That is candidate (c) in (25). The absence of a head is indicated by the absence of an apostrophe at the right edge of the ω. In Lekeitio Basque, then, the absence of any lexical tone in a ω results in the absence of the prosodic word head.[18]

(25)

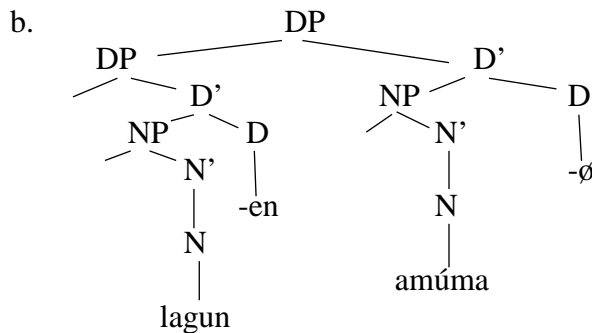| (CVCVCVCV)ω	Dep(Tone)	Hdμ(ω):Tone	ω:Hd
a. ((σ′ σ) (σ′ σ)′)ω HL	*!		
b. ((σ′ σ) (σ′ σ)′)ω		*!	
➔ c. ((σ′ σ) (σ′ σ))ω			*

---

[18] The source of the lack of ω-headedness in NBB is different from that of Tokyo Japanese loanwords, where none of the accents is lexical, but is epenthesized by default. Since Dep(Tone) must therefore be low-ranked in the subgrammar for loanwords, the absence of accentual tone (and of headedness) in a word must have another source in the grammar. I&M attribute it to a ranking of constraints on the internal prosodic structure of words over the constraint calling for ω-headedness, which result in the lack of prosodic headedness in the particular case of four-light-syllable loanwords.

We argue in what follows that the presence or absence of a prosodic head in words in NBB is directly responsible for the difference in phonological phrasing between accented and unaccented words in the language. The idea is that, in NBB, a φ that exclusively dominates unaccented word(s) lacks a head daughter ω, on principled grounds, because, in NBB, an unaccented prosodic word is not itself headed. Given the Head Chain Condition in (4), a particular ω cannot be the head of a φ if that ω does not itself have a head. There must be "heads all the way down".

Consider the prosodic structure analysis of a simple nominal construction in which an unaccented word is a syntactic phrase located in the specifier of a Determiner Phrase (DP), followed by an NP complement of the Determiner that consists of an accented word. This would be the surface syntactic structure of such constructions:

(26) a.   DP[DP[lagunen]   NP[amúma]]
                friend-gen.sg.   grandmother
              'the friend's grandmother'

b.

```
                        DP
          DP                        D'
               D'            NP              D
      NP          D               N'          |
          N'      |                |          -ø
          |      -en               N
          N                        |
          |                      amúma
        lagun
```

At Spell-Out, the mapping from the surface syntactic structure to the input phonological structure would give the prosodic structure in (27), after the application of Match-Phrase, which maps each syntactic maximal projection (XP) onto a phonological phrase (φ). As in Elordieta (2015), we assume that in NBB all XPs, lexical or functional, are mapped as φs, and we assume with Elfner (2012, 2015) that only XPs that exhaustively dominate overt terminal elements will be mapped. The DP in the specifier position does not get mapped as a φ because it does not dominate any overt terminal element that is not also dominated by NP. On the other hand, the genitive case marker -en is attached as an enclitic to the base to its left, the root *lagun*:

(27)   UR   φ
                    φ   φ
                    | |
                    ω   ω
 | |
                 lagunen   amúma
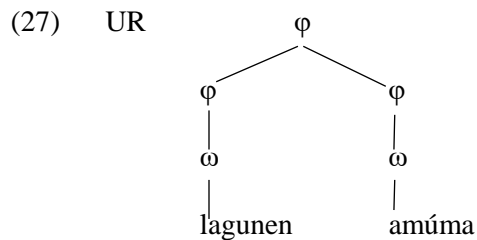
However, the observed output for that structure type in NBB does not retain the structure in (27) in surface representation. Rather, the unaccented word appears to be grouped in a single φ with the following accented word. (28) shows the pitch contour of a phrase of the type in (27).

(28)

```
               σ σ σ σ      σ σ σ σ
             unaccented    accented
```
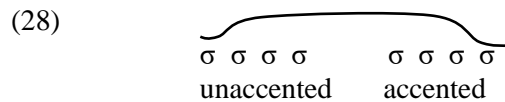
It begins with a pitch rise, then a high pitch plateau is observed from the beginning of the unaccented word until a pitch fall is realized on the syllable with the accentual HL tone. The LH rise is analyzed by Elordieta (1997, 1998) as a L boundary tone appearing at the left edge of a phonological phrase and a phrasal H tone, in a similar vein to the sequence found in Tokyo Japanese (Pierrehumbert & Beckman 1988). If the accented word were itself a φ, as expected on the basis of the underlying (27), then a LH rise should appear at its left edge. But it does not. Elordieta (1997, 1998, 2007a, 2007b), Jun and Elordieta (1997) and Elordieta and Hualde (2014) have assumed that the unaccented word forms one prosodic constituent together with the following word. This constituent has been called an Accentual Phrase, which Elordieta (2015) re-characterizes as a minimal phonological phrase or φ$_{min}$, after Ito and Mester's (2013) convincing revision of the taxonomy of prosodic constituents. What is needed now is an explanation for why the underlying φ structure in (27) that is produced by the MatchPhrase constraint should surface as the single φ structure in (29):

(29)   SR
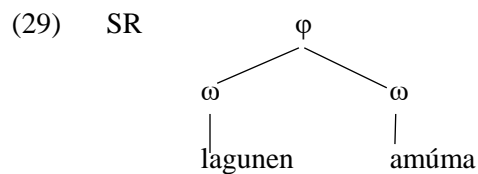
It should be noted that in a comparable DP structure with internal phrases consisting each of an accented word, the underlying dual φ structure of (27) is maintained. We see this in the surface representation (30) of the phrase *alában liburúak* 'the daughters' books'

(30)   SR
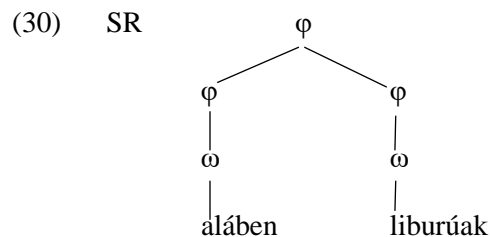
What is clear is that the unaccented status of the initial word in (27) is driving the change in φ structure seen between (27) and (29).

How can we explain the surface loss in (29) of the underlying φ which dominates the unaccented word *lagunen* in (27)? Our strategy is to adopt the assumption we introduced above that in NBB an unaccented prosodic word lacks a head in surface representation. This was seen to be the consequence of the ranking of Dep(Tone) and Hdμ(ω):Tone over ω:Hd in (25). Because it is the violation of the constraint ω:Hd that is crucial to the our proposal concerning the loss of φ status in unaccented words, we will not have to take the higher ranked Dep(Tone) and Hdμ-ω:Tone into consideration below.

Given our assumption that the prosodic constituents φ and ω form part of the underlying representation as a consequence of the constraints MatchPhrase and MatchWord (cf. section 3), the surface loss of the underlying φ dominating the unaccented ω in (29) constitutes a violation of an input-output faithfulness constraint (McCarthy and Prince 1995). This would be the prosodic constituent faithfulness constraint Max(φ):

(31) Max(φ):   A phonological phrase φ of input representation must correspond to a phonological phrase of the output representation.

Max(φ) is violated in the output representation of the unaccented word in (29). Our hypothesis is that Max(φ) is violated because it is lower ranked than the constraint φ:Hd, which calls for φ to be headed.

There is a second loss of φ in the case of (29), namely the loss of the φ which dominated the accented word in underlying representation. This loss, we would argue, is due to the constraint Strong Start (Selkirk 2011, Elfner 2012, 2015, Bennett et al. 2016), which is violated by a prosodic structure configuration where the initial daughter of a constituent is of a category lower in the prosodic hierarchy than that of the constituent that follows it. Simply eliminating at the surface the φ corresponding to the φ-initial unaccented word in (27) would create an ungrammatical, non-optimal, structure for the surface representation of the whole DP, one in which the unaccented prosodic word ω would be sister to and followed by a φ that dominates the accented word that follows:

(32)   * φ
         / \
        ω φ

Thus, StrongStart must also be ranked higher than the faithfulness constraint Max(φ). It is the constraint-ranking ω:Hd, φ:Hd, StrongStart >> Max(φ) which derives the result that the underlying prosodic structure (27) consisting of a φ dominating a daughter sequence of underlying unaccented φ followed by accent φ surfaces as a single φ immediately dominating a sequence of unaccented and accented words. In the tableau in (33), for the sake of convenience, we have used the symbol U to stand for "a prosodic word which contains no lexical accent, and hence is not headed", while the symbol A stands for "a prosodic word which contains a lexical (and surface) accent, and hence is headed". The prime symbols at the right edges of the φs indicate that the φ in question is headed.

(33)

φ(φ(U) φ(A)) HL	ω:Hd	φ:Hd	StrongStart	Max(φ)
a. φ(φ(U ′) φ(A ′) ′) HL	*U	*U!		
b. φ(φ(U) φ(A ′) ′) HL	*U	*U!		
c. φ(φ(U φ(A ′) ′) HL	*U		*!	*U
➔ d. φ(φ(U A ′) ′)	*U			*U *A

It was hypothesized earlier in this section that ω:Hd is violated in the case of unaccented words in Lekeitio Basque, due to the particular ranking of constraints in (25). The tableau in (33) incorporates this assumption about the non-headedness of an unaccented word, and shows the consequences for the dephrasing of an underlying U-only φ. The constraint ω:Hd is included in this tableau simply in order to show that none of the unaccented words U are headed. What is crucial is that when a U also has the status of a φ, there is a violation of φ:Hd in any candidate where that U is parsed as a φ. In (33), candidates (a) and (b) both show the same violations of ω:Hd and φ:Hd, despite the difference in the marking of φ-head for (U ′) in (a) and the absence of that φ-head marking (U) in (b). They show the same violations of φ:Hd because in both (a) and (b) the assumption is made that ω:Hd is violated, i.e. that the U itself has no head. According to the Head Chain Condition stated above, for a φ to be headed, it must contain a ω that is its head, but this ω cannot be a U, which is not headed itself. Since this is not the case, by assumption, candidate (a) violates φ:Hd for the same reason that (b) does. It is headless, despite the (illicit) head-marking of φ(U ′). As for the two candidates (c) and (d) where the U does not have the status of a φ, Strong Start rules out the candidate where the A word retains its φ status. So what emerges as optimal is the candidate where U and A are sisters within a φ, and both have lost their underlying φ status.

In the last part of this section, we will consider the behavior of unaccented words when they constitute syntactic phrases independent of the phrase containing the word that follows. We will present two sentence types with three arguments preceding the verb, with the order Subject-Indirect Object-Direct Object-Verb. In the first type, the subject is composed of two accented words, the indirect object is a single unaccented word, and the direct object has one accented word. This is one of the sentence types examined in an experimental investigation of the prosodic behavior of unaccented words at the sentential level that is reported in Elordieta and Selkirk (2016). An example is illustrated in (34):

(34) CP/FinP[DP[DP/NP[Mirénen] NP[amúmak]]   ApplP[DP/NP[amari] vP[DP/NP[liburúak]]]   emon dotzoz]
           Miren-gen   grandmother-erg.sg.   mother-dat.sg. books-abs.pl. give aux
           'Miren's grandmother has given the books to the mother'

The subject contains two accented words (*Mirénen amúmak* 'Miren's grandmother'), the indirect object contains the unaccented word *amari* 'to the mother', and the direct object contains an accented word (*liburúak* 'the books'). The verb is *emon dotzoz* 'has given', with the participial verb *emon* 'give' and an auxiliary inflected for person, number and tense. The crucial aspect of this sentence is that the unaccented word is now in a different syntactic argument from the following accented word, unlike in the simple construction presented above in (26b) where the unaccented word is a genitive phrase within a DP containing the NP with the accented word.

In syntax, the indirect object is in a higher projection than the direct object, but they are both dominated by the same phrase (see references cited in in Elordieta 2015). In this paper we are going to assume that the verb is not in the same phrase with the two objects (departing from Elordieta 2015). Schematically, the syntax of these sentences is represented as in (35).

(35)   [[[A] [A]] [[U] [A]] Verb]

(36) represents the mapping from the syntactic structure in (35) to an input prosodic structure, with Match Phrase operating on the mapping, as well as the observed surface prosodic structure. For reasons of simplicity, we are only including XPs that matter to us, which are those that contain the unaccented and accented words, as well as the preceding subject. In surface phonological representation, we leave the φ corresponding to the subject as φ(.....), and we ignore the verb.

(36)   Syntactic surface representation: [[[[A] [A]]   [[U] [A]]]   Verb]
        Underlying prosodic representation: ι(φ(φ(φ(A) φ(A)) φ(φ(U) φ(A))) Verb)
                                                        HL   HL   HL
        Surface representation: φ(.....) φ(U A′)

Elordieta and Selkirk (2016) show that, as with Us within a same argument, the observed output is one in which the U word in the indirect object φ groups in a single φ with the A word realizing the direct object. That is, the unaccented word does not form an independent φ but is grouped in the same φ with the word that follows, even if it is in a different argument. The head of the φ containing U and A in surface phonological representation is the A word, which is headed (i.e. it has a head foot, with a head syllable and a head mora). The pattern that is observed is the same as the one for UA sequences in one argument, above in (28).

The reason for not positing a φ boundary between the U and the A word is that there is no initial intonational rise from the initial to the second syllable in the A word, similar to the sequences of an unaccented word and an accented word in a single argument reviewed above. That is, given the absence of a LH rise at the left edge of the A word, there is no evidence for positing a φ boundary at the left edge of A.

The observed output incurs in two violations of Max(φ), as φ(U) and φ(A) are lost from the input, but Max(φ) is crucially lower ranked than the other constraints. For reasons of space, we will not run a

detailed review of all the candidates and their performance with respect to the set of ranked constraints relevant in this paper. We leave this for our upcoming paper Elordieta and Selkirk (in preparation).
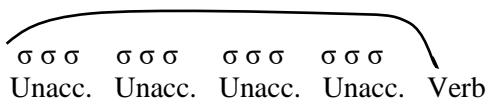
The last sentence type we look at briefly constitutes a particularly interesting case. Unamuno and Elordieta (2015) carried out an experimental investigation of sentences composed entirely of unaccented words. One of the sentence types has four unaccented words before the verb, divided in two arguments. That is:

(37)   [[[U] [U]] [[U] [U]] Verb]

The underlying prosodic representation, after the application of Match Phrase, would have φs corresponding to each syntactic phrase:

(38)   Underlying representation: ₁(φ(φ(U) φ(U)) φ(φ(U) φ(U))   Verb)

However, the prosodic output observed by Unamuno and Elordieta (2015) is one where there is a pitch rise observed at the left edge of the whole sequence, signaling the beginning of a φ, and there is a high tone plateau until the right edge of the last U word, where the pitch level drops, right before the verb. There are no LH boundary tones at the left edge of any of the U words. That is, there is no LH boundary tone at the left edge of any of the non-initial φs in (38):

(39)

$$\sigma\,\sigma\,\sigma \quad \sigma\,\sigma\,\sigma \quad \sigma\,\sigma\,\sigma \quad \sigma\,\sigma\,\sigma$$
Unacc. Unacc. Unacc. Unacc. Verb

This prosodic contour indicates that the four U ωs are grouped in one φ. Such an output constitutes a dramatic departure from the underlying prosodic representation in (38):

(40)   Surface representation: (φ(U U U U) Verb)

As with the example of the sentence type in (36), our intention in this paper is not to provide a detailed analysis of the syntactic organization of the argument phrases in sentences of type (37). Nor do we undertake to show just how the surface prosodic structure of the preverbal arguments in (39) derive from an underlying phonological representation like (40). That is beyond the scope of this paper, but will be treated in an upcoming paper.

In the grand scheme of things, the observed "dephrasing" in Lekeitio Basque of underlying phonological phrases that consist only of lexically unaccented words provides eloquent testimony to the effects of properly phonological markedness constraints on the surface representation of prosodic structure. That surface prosodic structure is dramatically nonisomorphic to the syntactically grounded phonological phrase structure produced by MatchPhrase and MatchWord constraints in underlying representation. This nonisomorphism is the result, in part, of a phonological constraint ranking in which the prosodic markedness constraint φ:Hd that calls for a φ to be headed outranks the prosodic faithfulness constraint Max(φ), that calls for an underlying φ (one that matches an interfacing syntactic phrase).

5   Summary and looking ahead

Our purpose in this paper has been to argue for two classes of violable prosodic-headedness-sensitive markedness constraints: the family π:Head of constraints calling for a prosodic constituent π to be headed and the family Hdμ(π):Tone that calls for the head mora of a π to be associated with some tone. In the first section on Tokyo Japanese, we reviewed and concurred enthusiastically with Ito and Mester's (2016) argument that words in Tokyo Japanese that lack tonal accent in surface representation are words that are

not prosodically headed in surface representation. In the final section on Lekeitio Basque, also a "pitch accent language", the lack of prosodic headedness in lexically toneless, unaccented, words is held responsible for the surface absence of phonological phrases which consist only of such unaccented, unheaded words. This is not a surprising finding, given the interconnectedness of prosodic constituency, prosodic headedness and tone that is embodied in the constraint families π:Head and Hdμ(π):Tone. In the medial section on the "intonational language" Standard English, we saw that satisfaction of prosodic headedness requirements at both the φ and the ω level, complemented by the necessary satisfaction of the constraint that a φ-head be associated with a tone, provides an account of the distribution of default pitch accenting in pragmatically unmarked sentences in the language. It does seem then that giving constraints on prosodic headedness and on the head-tone relation a central place in accounts of tonal distribution might open up a promising avenue to an insightful typology of tonal patterning in the words and sentences of the languages of the world.

References

Bartels, C. (1999). *The intonation of English statements and questions: A compositional interpretation.* London: Routledge.

Beckman, J. (1996). *Positional faithfulness.* PhD dissertation, University of Massachusetts Amherst.

Beckman, M. and Pierrehumbert, J. (1986). "Intonational structure in Japanese and English". *Phonology* 3, 255-309.

Bennett, R., Elfner, E., and McCloskey, J. (2016). "Lightest to the right: An apparently anomalous displacement in Irish". *Linguistic Inquiry* 47, 169-234.

Bennett, R. and Henderson, R. (2013). "Accent in Uspanteko". *Natural Language and Linguistic Theory* 31, 589-645.

Broselow, E. and McCarthy, J. (1983). "A theory of internal reduplication". *The Linguistic Review* 3, 25-88.

Constant, N. (2014). *Contrastive topic: Meanings and realizations.* PhD dissertation, University of Massachusetts Amherst.

de Jong, K. (2004). "Stress, lexical focus, and segmental focus in English: Patterns of variation in vowel duration". *Journal of Phonetics 32*, 493-516.

de Lacy, P. (2002). "The interaction of tone and stress in Optimality Theory". *Phonology* 19, 1-32.

Elfner, E. (2012). *Syntax-prosody interactions in Irish.* PhD dissertation, University of Massachusetts Amherst.

Elfner, E. (2015). "Recursion in prosodic phrasing: Evidence from Connemara Irish". *Natural Language and Linguistic Theory* 33, 1169-1208.

Elordieta, G. (1997). "Accent, tone, and intonation in Lekeitio Basque". In F. Martínez-Gil & A. Morales-Front (eds.), *Issues in the phonology and morphology of the major Iberian languages*, 3-78. Washington, D.C.: Georgetown University Press.

Elordieta, G. (1998). "Intonation in a pitch accent variety of Basque". *ASJU-International Journal of Basque Linguistics and Philology* 32, 511-569.

Elordieta, G. (2007a). "A constraint-based analysis of the intonational realization of focus in Northern Bizkaian Basque". In T. Riad and C. Gussenhoven (eds.), *Tones and Tunes:* Volume I, *Typological studies in word and sentence prosody*, 199-232. Berlin: Mouton de Gruyter.

Elordieta, G. (2007b). "Minimum size constraints on intermediate phrases". *Proceedings of the 16th International Congress of Phonetic Sciences*, 1021-1024. Saarbrucken: ICPhS.

Elordieta, G. (2015). "Recursive phonological phrasing in Basque". *Phonology* 32, 49-78.

Elordieta, G. and Hualde, J. I. (2014). "Intonation in Basque". In S.-A. Jun (ed.), *Prosodic Typology II: The phonology of intonation and* phrasing, 405-463. Oxford: Oxford University Press.

Elordieta, G. and Selkirk, E. (2016). "The phrasing of lexically unaccented words in Lekeitio Basque". Paper presented at *Tone and Intonation in Europe 2016*, University of Kent, September 1-3, 2016.

Elordieta, G. and Selkirk, E. (in preparation). "Unaccented words and prosodic phrasing in Lekeitio Basque".

Féry, C. and Samek-Lodovici, V. (2006). "Focus projection and prosodic prominence in nested foci". *Language* 82, 131-150.

Frota, S. (2000). *Prosody and focus in European Portuguese: Phonological phrasing and intonation.* London: Routledge.

Gussenhoven, C. (1983). "Focus, mode and the nucleus". *Journal of linguistics* 19, 377-417.

Gussenhoven, C. (1984). *On the grammar and semantics of sentence accents*. Dordrecht: Foris Publications.

Gussenhoven, C. (2004). *The phonology of tone and intonation*. Cambridge: Cambridge University Press.

Harley, H. (1995). *Subjects, events, and licensing*. PhD dissertation, Massachusetts Institute of Technology.

Harley, H. (2002). "Possession and the Double Object Construction". *Yearbook of Linguistic Variation* 2, 29-68.

Hayes, B. and Lahiri, A. (1991). "Bengali intonational phonology". *Natural Language and Linguistic Theory* 9, 47-96.

Hellmuth, S. (2006). *Intonational pitch accent distribution in Egyptian Arabic*. PhD dissertation, School of Oriental and African Studies, University of London.

Huss, V. (1978). "English word stress in the post-nuclear position". *Phonetica* 35, 86-105.

Ito, J., and Mester, A. (2002). "One phonology or many? Issues in stratal faithfulness theory". In The Phonological Society of Japan (ed.), *Phonological Studies* 5, 121-126. Tokyo: Kaitakusha.

Ito, J., and Mester, A. (2009). "Lexical classes in phonology". In M. Shigeru and M. Saito (eds.), *Handbook of Japanese Linguistics*, 84-106. Oxford: Oxford University Press.

Ito, J. and Mester, A. (2013). "Prosodic Subcategories in Japanese". *Lingua* 124, 20-40.

Ito, J. and Mester, A. (2016). "Unaccentedness in Japanese". *Linguistic Inquiry* 47, 471-526.

Ito, J. and Mester, A. (in press). "Match Theory and prosodic well-formedness constraints". Revised version to appear in H. Zhang (ed.), *Proceedings of Tianjin Prosody Conference*. London: Routledge.

Jun, S.-A. and Elordieta, G. (1997). "Intonational structure of Lekeitio Basque". In A. Botinis, G. Kouroupetroglou and G. Carayiannis (eds.), *Intonation: Theory, models and applications*, 193-196. Athens, Greece.

Katz, J. and Selkirk, E. (2011). "Contrastive focus vs. discourse-new: Evidence from phonetic prominence in English". *Language* 87, 771-816.

Kratzer, A. and Selkirk, E. (2018). "Deconstructing Information Structure". Ms, University of Massachusetts Amherst and University College London. [downloadable as lingbuzz/004201]. *Submitted.*

Ladd, D. R. (1980). *The structure of intonational meaning: Evidence from English*. Bloomington: Indiana University Press.

Ladd, D. R. (1996/2008). *Intonational phonology*. Cambridge: Cambridge University Press.

Liberman, M. and Prince, A. (1977). "On stress and linguistic rhythm". *Linguistic Inquiry* 8, 249-336.

McCarthy, J. and Prince, A. (1995). "Faithfulness and reduplicative identity". In J. Beckman, L. Walsh Dickey and S. Urbanczyk (eds.), *Papers in Optimality Theory. University of Massachusetts Occasional Papers* 18, 249-384. Amherst, Mass.: Graduate Linguistic Student Association.

Myers, S. (1997). "OCP effects in Optimality Theory". *Natural Language and Linguistic Theory* 15, 847-892.

Myrberg, S. (2010). *The Intonational Phonology of Stockholm Swedish*. PhD dissertation, Stockholm University.

Okobi, A. (2006). *Acoustic correlates of word stress in American English*. PhD dissertation, Massachusetts Institute of Technology.

Pierrehumbert, J. (1980). *The phonology and phonetics of English intonation*. PhD dissertation, Massachusetts Institute of Technology.

Pierrehumbert, J. and Beckman, M. (1988). *Japanese tone structure*. Cambridge, Mass.: MIT Press.

Pierrehumbert, J. and Hirschberg, J. (1990). "The meaning of intonational contours in the interpretation of discourse". In P. Cohen, J. Morgan, and M. Pollack (eds.), *Intentions in Communication*, 271-311. Cambridge, Mass.: MIT Press.

Selkirk, E. (1984). *Phonology and syntax: The relation between sound and structure.* Cambridge: MIT Press.

Selkirk, E. (1995). "Sentence prosody: Intonation, stress, and phrasing". In J. Goldsmith (ed.), *The handbook of phonological theory*, 550-569. Cambridge: Blackwell Publishers.

Selkirk, E. (1996). "The prosodic structure of function words. In J. L. Morgan and K. Demuth (eds.), *Signal to syntax: Bootstrapping from speech to grammar in early acquisition*, 187-213. Hillsdale, NJ: Lawrence Erlbaum Associates.

Selkirk, E. (2007). "Bengali intonation revisited: An optimality theoretic analysis in which FOCUS stress prominence drives FOCUS phrasing". In C. Lee, M. Gordon and D. Büring (eds.), *Topic and focus: Cross-linguistic perspectives on meaning and intonation*, 215-244. Dordrecht: Springer.

Selkirk, E. (2009). "On clause and intonational phrase in Japanese: The syntactic grounding of prosodic constituent structure". *Gengo Kenkyu* 136, 35-73.

Selkirk, E. (2011). "The syntax-phonology interface". In J. Goldsmith, J. Riggle and A. Yu (eds.), *The Handbook of Phonological Theory* (2nd ed.), 435-484. Cambridge: Blackwell Publishers.

Selkirk, E. (2017). "Syntactic constituency spell-out through Match constraints". Paper presented at the Workshop *"Syntax-Prosody in OT"*, University of California, Santa Cruz, November 19, 2017.

Selkirk, E. and Elordieta, G. (2010). "The role for prosodic markedness constraints in phonological phrase formation in two pitch accent languages". Paper presented at *Tone and Intonation in Europe* 4, Stockholm University, September 9-11, 2010.

Selkirk, E. and Lee, S., eds. (2015). Special issue of *Phonology* 32.

Selkirk, E. and Lee, S. (2017). "Grammatical sources for syntax-phonology mismatches: The case of Xitsonga". Ms, University of Massachusetts, Amherst and International Christian University.

Sluijter, A. M. C. and van Heuven, V. J. (1996). "Spectral balance as an acoustic correlate of linguistic stress". *Journal of the Acoustical Society of America* 100, 2471.

Smith, J. (2001). "Lexical category and phonological contrast". In R. Kirchner, J. Pater, and W. Wikely (eds.), *PETL 6: Proceedings of the Workshop on the Lexicon in Phonetics and Phonology*, 61-72. Edmonton: University of Alberta.

Smith, J. (2002). *Phonological augmentation in prominent positions*. PhD dissertation, University of Massachusetts Amherst.

Sugahara, M. (2012). "Phonetic evidence for prosodic word prominence in American English". In T. Borowsky, S. Kawahara, M. Sugahara and T. Shinya (eds.), *Prosody matters: Essays in honor of Elisabeth Selkirk*, 208-236. London: Equinox.

Truckenbrodt, H. (2006). "Phrasal Stress". *The Encyclopedia of Languages and Linguistics* 9, 572-579.

Truckenbrodt, H. (2007). "The syntax-phonology interface". In P. de Lacy (ed.), *The Cambridge handbook of phonology*, 435-456. Cambridge: Cambridge University Press.

Unamuno, L. and Elordieta, G. (2015). "The phrasing of sequences of unaccented words in Northern Bizkaian Basque". Poster presented in *Phonetics and Phonology in Europe 2015*, University of Cambridge, June 29-30, 2015.

Yip, M. (2002). *Tone*. Cambridge: Cambridge University Press.