Unaccentedness and the formation of prosodic structure in Lekeitio Basque

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Abstract:

In Lekeitio Basque, radical mismatches between the morphosyntactic phrase structure of a sentence and the phonological/prosodic phrase structure of the phonological output representation appear when one or more of the words of a sentence display(s) unaccentedness, i.e., lack(s) lexical accent. Evidence of these constituency mismatches is provided by the distribution of predictable phrasal edge tones and prosodic-structure-sensitive patterns of pitch downstep and upstep. A purely phonological, optimality theoretic analysis of the mismatches is given. This phonological analysis relies on assuming that morphosyntactic constituent structure is spelled out as prosodic constituent structure in the input representation of the phonology module and that a language-particular ranking of purely phonological constituency faithfulness and markedness constraints relates the constituency of the phonological input to the constituency of the phonological output representation.

Keywords:

Syntax-phonology constituency mismatches, unaccentedness, predictable edge tones, pitch upstep patterns, prosodic constituency markedness, prosodic constituency faithfulness, Lekeitio Basque

1. Introduction

While the role for a genuinely phonological/prosodic constituent structure in accounting for structure-sensitive phonological phenomena observed in phonological output representation has been widely recognized in phonological research, it is not necessarily assumed by scholars who come to the syntax-phonology interface from the vantage point of syntax. The highly influential proposals concerning phrasal stress patterns in Standard American and British English by Chomsky and Halle (1968) and by metrical stress theorists (Liberman and Prince (1977), Ladd (1980), and others) presumed a direct effect of syntactic constituency on phonological patterning. A direct effect of syntax on output phonological patterns has been assumed in a variety of works since (Kaisse 1985; Odden 1996; Seidl 2001; Dobashi 2003, 2020; Pak 2008; Wagner 2010; Samuels 2011; Scheer 2011, 2012; D'Alessandro and Scheer 2015). On the other hand, many authors have argued that the relation between syntactic constituency and structure-sensitive phonological phenomena is mediated by a properly phonological prosodic constituent structure. See, among others, Selkirk (1980a, 1980b, 1986, 2009, 2011), Nespor and Vogel (1986), Inkelas and Zec (1990), Truckenbrodt (1995, 1999), Frota (2000), Ito and Mester (2012, 2013, 2019), Elfner (2012, 2015), Ishihara (2014), Selkirk and Lee (2015), Bennett et al (2016, 2019), Kalivoda (2018), Bonet et al (2019), Lee and Selkirk (this volume).

This paper presents a new argument for making a fundamental distinction between the nature of the representation of phrase-level prosodic constituent structure in phonological representation and the nature of the representation of phrase-level constituent structure in the output of the morphosyntactic derivation, which interfaces with the phonology. In Lekeitio Basque, the absence of lexical accent tone in a word —unaccentedness-- can lead to substantial mismatches between the constituent structure of the phonological output representation and the constituent structure that is the output of the morphosyntax. In a nutshell, in the output phonological representation there is no phonological/prosodic phrase that consists only of unaccented words. A phrase of the morphosyntactic output representation that consists only of phonologically unaccented words does not have a corresponding phonological phrase (φ) representation in the output representation of the phonology.

Unaccentedness is an indisputably phonological property which has no plausible alternative characterization in syntactic terms. For unaccentedness to have an impact on the very presence of φ structure in the phonology would seem to indicate that this phrase structure should be understood as phonological, or prosodic, in kind. And indeed, Elordieta and Selkirk 2018 argue that the ranking of universal, independently motivated, purely phonological constraints in the phonology of Lekeitio Basque can account for the absence of any phonological phrase φ which dominates only unaccented words.[1] We will see below that the effect of the presence or absence of lexical tonal accent on the phonological/prosodic constituent structure of the sentence is observable both in the distribution of predictable phrasal edge tones in the phonological output representation and in the phonetic realization of patterns of relative pitch (downstep and upstep) that vary with phrasal organization.

The study undertaken here of mismatches between morphosyntactic and prosodic constituency that are the consequence of unaccentedness assumes a recent version of the Match theory of the relation between syntactic and prosodic constituency earlier proposed in Selkirk 2009, 2011 (see also Elfner (2012, 2015), Ito and Mester (2013, 2019, Kalivoda (2018)). In the recent version of Match theory assumed here, and also in Kratzer and Selkirk (2020) and Lee and Selkirk (this volume), the class of interface constraints calling for a match between morphosyntactic phrases and prosodic phrases (φ) belongs to a spell-out module, which gives phonological expression to the output representation of the morphosyntax (MSO) in the *input* representation of the phonology module of the grammar (call it PI). We take MSO to be the output of the final stage of the morphosyntax, which we assume includes any post-syntactic operations which alter the constituent structure or order of elements, such as those of Distributed Morphology (cf. among others Halle and Marantz 1993, Noyer 1997, Embick and Noyer 2001) and post-syntactic head movement operations (e.g., Harizanov 2014, Harizanov and Gribanova 2019, and references therein).

The idea that prosodic structure constituency at word-level and above forms part of the *input* representation of the phonological module of grammar (as well as the output representation, called here PO) is relatively new. Kratzer and Selkirk (2020) make the case for this idea on the basis of Standard American and British sentence prosody[2], and Lee and Selkirk

[1] See Selkirk (2011) for a sketch of the same proposal.

[2] In particular, Kratzer and Selkirk argue that the morphosyntactic feature [G], which is associated with a discourse-given phrasal constituent in the morphosyntactic structure of a sentence, is phonologically expressed as a *lack* of φ structure in PI for the [G]-marked phrase of MSO. Also in English, the possessive marker is phonologically expressed as /-z/ in PI, in position at the right edge of the phrase associated with it, e.g., *the queen of England's hat.*

(this volume) make the case on the basis of patterns of the spread of lexical H tones in sentences of the Bantu language Xitsonga. But the idea that the job of the phonological component of the grammar is to relate an input ('underlying') phonological representation to an output ('surface') phonological representation is as old as generative phonology (see e.g., Chomsky and Halle 1968), and is essential to optimality theoretic conceptions of phonology as well (Prince and Smolensky 1993, McCarthy 2001).

It's broadly understood that the PI representation of the phonology *per se* contains the lexical/underlying/PI representation of the morphosyntactic subconstituents of words, be they roots, or the morphosyntactic feature complexes that make up other 'morphemes'. For example, as we will see in section 2, in Lekeitio Basque the tonal property referred to as 'accent' is associated with a particular morpheme in its 'lexical', 'underlying' representation, but in the phonological output representation PO this accentual tone surfaces on the penultimate syllable of the larger word that contains the morpheme with which it is associated in PI. A more dramatic sort of example of the need to distinguish PI and PO representations comes from Xitsonga, where a H tone that forms part of the lexical/underlying/PI representation of a morpheme may spread into a following word of the sentence (Lee and Selkirk (this volume)).[3] Displacements of tone such as those in Xitsonga and Lekeitio Basque cannot even be characterized in a grammar without distinguishing PI and PO levels in phonology.

If the idea that there is an input representation PI for the phonological module of the grammar is not new, what's new, or not yet familiar, is the idea that the prosodic constituency that gives phonological expression to ('spells out') the morphosyntactic constituency of MSO forms part of the phonological input representation PI. We will see in sections 3 and 6 that assuming the presence of prosodic constituent structure in PI permits insightful analyses of all the documented phrasal constituency mismatches between MSO and PO that are due to the presence of unaccented words in the sentence in Lekeitio Basque.

2. Some basics of the lexical accent system of Lekeitio Basque

Lekeitio Basque is a local variety of the group of local pitch-accent varieties forming what is known in the literature as Northern Bizkaian Basque (NBB; cf. Hualde, Elordieta and Elordieta 1994; Hualde 1997, 1999; Elordieta 1997, 1998, 2003, 2015; Gussenhoven 2004; Elordieta and Hualde 2014, among others). In all varieties of NBB, there is a lexical contrast between accented and unaccented words (as in Tokyo Japanese). Accented words are traditionally called so because they surface with high pitch prominence on one of their syllables, whereas other words do not. These latter are the unaccented words. Accented words have at least one morpheme (root or affix) that is responsible for the presence of this accent tone within a word, 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.

In the particular variety of NBB on which we will base our analysis (the one of Lekeitio), a HL falling tone is always found on the penultimate syllable of an accented word in the output representation of the phonology (PO), regardless of the location of that syllable with respect to the lexically accented morpheme in the word. What this shows is that there is a designated,

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In PO it is given its ultimate prosodic structure position as enclitic to the preceding word, where it is submitted to the markedness constraints on consonant sequences that determine its output phonological representation.

[3] For further references on Xitsonga, also see Lee and Selkirk (this volume)

predictable, prosodic position for the association of the lexical accent tone in PO, and that this position is distinct from the position of the accent tone in the input phonological representation (PI).

A paradigm of accented words is found in (1). The following combinations of accented and unaccented morphemes are shown: bare accented root (1a); accented root + accented suffix (1b); unaccented root + accented suffix (1c); accented root + unaccented suffixes (1d). In PI, lexical accent is indicated by means of a superscripted HL to the right of the accented morpheme (root or affix). Consider the PO to be the pronunciation of the word in isolation. The HL accent is realized on the penultimate syllable of the word.[4]

(1) a. PI: *liburu*^{HL} PO: *libu*^{HL}*ru*
book

b. PI: *liburu*^{HL}*-ari*^{HL} PO: *liburua*^{HL}*ri*
book-DAT.PL

c. PI: *lagun-ari*^{HL} PO: *laguna*^{HL}*ri*
friend-DAT.PL

d. PI: *liburu*^{HL}*-a-n* PO: *liburu*^{HL}*an*
book-DET-LOC

In all of these words containing a lexically accented morpheme, there is a sole HL accentual fall in PO, and it coincides with the penultimate syllable. Moreover, regardless of the sentential context in which that lexically accented word may appear, that HL fall only appears on its penultimate syllable.

The picture is quite different with words which contain no lexical accent, either on the root or on an affix. Again, consider the PO to be a pronunciation of the word in isolation.

(2) a. PI: *lagun* PO: *lagun*^{HL}
friend

b. PI: *lagun-ari*^{HL} PO: *laguna*^{HL}*ri*
friend- DAT.PL

c. PI: *lagun-en-a* PO: *lagunena*^{HL}
friend-GEN.SG-DET.SG

In the case of (2b) the accent (HL) on the penultimate syllable is the lexical accent of the suffix. In the case of (2a) and (2c), where the word contains no lexical accent at all, a nonaccentual HL tone appears on the final syllable. This final HL tone appears only in unaccented words pronounced in isolation (3b) or immediately preceding the verb (4a). When not in such contexts, as in (4b), an unaccented word bears no final HL in PO:

[4] In following sections, the presence and location of the tonal accent is indicated by an orthographic acute accent, e.g., *libúru.*

(3) a. Nor ikusi dozu kalian?
who see AUX street-LOC
'Who have you seen in the street?'

b. Laguna^{HL}.
Friend-DET.SG
'The friend'

(4) a. Maixu^{HL}en lagunak^{HL} esan-dau.
teacher-GEN.SG friend-ERG.SG say AUX
'The teacher's friend has said (it)'

b. Maixu^{HL}en lagunak gusurra^{HL} esan-dau.
teacher-GEN.SG friend-ERG.SG lie-DET.SG say AUX
'The teacher's friend has told a lie'

Since word-level prosodic prominence in accented words is realized through a HL pitch fall, the descending F0 movement on the final syllable of lexically unaccented words in the contexts described above has been interpreted in the literature as a pitch accent, and has been transcribed as H*+L. Hualde et al. (1994) call the accent on the final syllable of unaccented words in these contexts a *sentential accent*, in the sense that the accent is not lexical, but a property of the sentence. Jun and Elordieta (1997) call it a *derived accent*, with the aim of underlining the difference with a lexical accent, which would be non-derived. Here we will argue for an alternative phonological analysis of the HL pitch fall on a lexically unaccented word in isolation, or preceding the sentence-final verb. It is better understood as an instance of an epenthetic edge tone that appears on the final syllable of the final φ of the utterance.[5]

In the case of (4b), where the unaccented word is neither in isolation or in position before the verb, there is no evidence of a HL on its final syllable. This fact has been amply documented in the literature (cf. Hualde et al. 1994; Elordieta 1997, 1998, 2003, 2007; Jun and Elordieta 1997; Gussenhoven 2004; Elordieta and Hualde 2014, among others), and will be illustrated again in sections 4.2 and 5.2. A generalization that will emerge in this paper is that unaccented words which do not precede the verb are contained in the same phonological phrase as a following word in PO. They never constitute phonological phrases on their own.

3. The spell-out of MSO phrases as *φ* in PI in Lekeitio Basque

This section focuses on the creation of prosodic constituency in the input phonological representation (PI) via spell-out out of the output constituent structure of the morphosyntax (MSO). We take MSO to be the morphosyntactic representation that is defined once all morphosyntax-driven movement operations have taken place. Section 3.1 reviews the

[5] Phonological markedness constraints on the relation between the edges of φ and tone provide pressure for the epenthesis of edge tones (cf. Kratzer and Selkirk 2020, section 6). Crosslinguistically, it is common for a predictable (epenthetic) tone or tonal complex to appear on the initial (left-edge) tone-bearing unit of a φ, or on the φ-final (right-edge) tone-bearing unit. In NBB, it's suggested here, the R-φ-edge HL tone appears only at the right edge of the *rightmost φ* of the sentence (see section 4.2 for more discussion.)

assumptions we will make concerning the aspects of MSO in Basque that are relevant to the prosodic constituent structure representation of PI. Section 3.2 explains why the particular interface constraint responsible for spelling out phrasal constituency in MSO as phonological phrase (φ) constituency in PI in Lekeitio Basque must be $\text{MatchPhrase}_{\text{LEX}}$ (Selkirk 2017, Kratzer & Selkirk 2020, Lee & Selkirk (this volume)).

3.1 Details of MSO representation in Lekeitio Basque

Lekeitio Basque is a verb-final language. This is illustrated by the simple SOV sentence in (5), where the verb follows two two-word argument phrases.[6]

(5) A sentence of Lekeitio Basque with two two-word arguments (subscripted a, b)

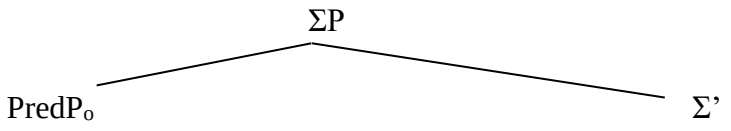
[[[Iráiden]	[lagúnak]]$_a$	[[arráñen]	[begídxak]]$_b$	[bota-dábes]]
Iraide.GEN.SG	friend.ERG.PL	fish.GEN.PL	eye.DET.PL	throw AUX

'Iraide's friends have thrown away the fish's eyes'

According to the recent proposal by Elordieta and Haddican (2018), the actual morphosyntactic constituent structure representation that is the output of the morphosyntactic derivation of this sentence is (6), which is significantly more complex than the pared down structure which is shown with the labelled bracketing in (5). Yet, we will argue, the prosodic constituency of the input phonological representation (PI) that spells out the morphosyntactic output constituency (MSO) in (6) is the prosodic constituent structure (12), which matches up with the syntactic labelled bracketing represented in (5).

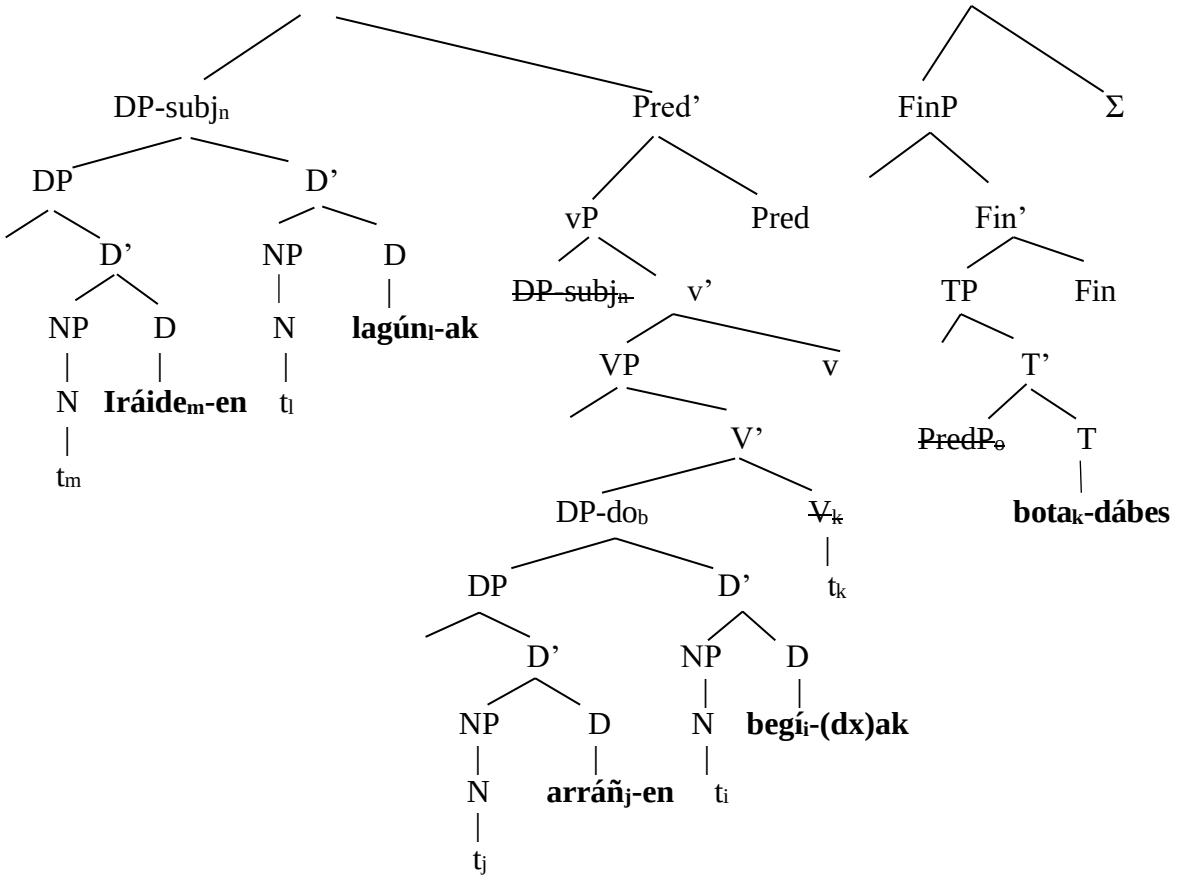
In the full tree representation in (6) a Pred(icate) P(hrase) that is the complement of the T(ense) head contains all the verbal arguments and the Verb Phrase. Elordieta and Haddican (2018: 428) call it an "extended VP" projection. Within PredP, the highest verbal argument is *v*P; the DP Subject (DP-subj) is in the specifier and the DP object (DP-do) is a complement of VP. DP-subj raises to the specifier position of PredP. For our purposes, the 'naming' of these phrasal nodes (DP, D', NP, VP, etc.) is just an expositional device; it reflects the feature projection line from head to phrase. As we will see below in section 3.2, what is important for the syntax-phonology interface is whether or not these phrases are headed by a word that contains a lexical category root from the set {N, A, V}, not the X-bar theoretic 'names' that are given to them in (6).[7]

(6) Morphosyntactic output structure of sentence (5):



[6] From here on, in order to facilitate reading, we indicate the location of word-level prominence with an acute accent mark on the penultimate syllable of the accented word or the accented verb + auxiliary sequence.

[7] Similarly, we assume no theoretic status for the terms 'specifier' and 'complement', which distinguish how high in the feature projection of a head the designated phrase lies.



Highest in the tree is the functional projection, ΣP, which houses the polarity of the sentence in its head Σ. The ΣP was proposed for Basque by Laka (1990), and is assumed for Irish and other languages as well (cf. Elfner 2012, 2015, among others). In order to satisfy the polarity features of the head Σ, PredP moves from its base-generated position as a complement of T to the specifier of ΣP, in a movement of the "predicate-fronting" type (see Elordieta and Haddican 2018 for details and arguments that cannot be presented here for lack of space).

An important aspect of the MSO structure presented here is the position of the lexical verb with respect to the auxiliary verb. Elordieta and Haddican (2018) leave the lexical verb *botak* in its in-situ position as head of V'; they assume that the auxiliary verb that follows it is located in the T head. Instead, we propose that the verb raises to T, in a head movement operation. The result of this movement is represented in (6) by the complex verbal head *bota-dábes*, in T.

There are two arguments for the positioning of the verb as part of the word dominated by T in MSO. The first concerns word phonology. Evidence from the phonology makes clear that the verb and the auxiliary form a single unit with respect to which the penultimate syllable location for appearance of lexical accent tone is defined (cf. section 2). Note first that if a verb without a following auxiliary contains the suffix realizing imperfective aspect, i.e., *-t(z)en*, there is an accentual pitch fall on the penultimate syllable of the word. Since all lexical verbal roots are lexically unaccented, as well as all perfective participial endings, the accent tone on the penultimate can only arise from the fact that the morpheme 'imperfective participle' is lexically accented. Thus, the sequence *eros-ten* 'buy-imperfective participle' in (7) is pronounced with penultimate accent, if the word is uttered in isolation or is not followed by the inflected auxiliary:

(7) eros-´ten > *erósten*
buy-IPFV

When the participial verb with the lexically accented imperfective morpheme is followed by an auxiliary, the sequence formed by the lexical verb and the auxiliary shows the tonal accent on the penultimate syllable of the whole sequence, not on the penultimate syllable of the participial verb. For example, if *erosten* is followed by an auxiliary such as *dotzazuz* (cf. (8)), which is lexically unaccented (i.e., it contains no lexically accented morphemes), there is a pitch fall on the penultimate syllable of the sequence formed by *erosten* and *dotzazuz*. We take this pattern as evidence for the raising of the lexical participial verb from within V' to the auxiliary in T (via head movement through the empty functional heads v and Pred), where together they constitute a single morphosyntactic word in MSO.[8]

(8) erosten dotzazuz > *erosten-dotzázuz*
buy.IPFV AUX
'you buy them to him/her'

We remind the reader that we take MSO to be the morphosyntactic constituent structure that reflects syntactic structure after all syntactic operations have taken place and also after any post-syntactic movements have taken place, such as post-syntactic head movement operations.[9]

The second argument for a morphosyntactic raising of the verb up to T concerns the phrasal phonology of the sentence. As we will see below in section 3.2 in the mapping from MSO to PI, the position of the verb in T within TP has the consequence that the verb is not contained in the same phonological phrase (φ) as the preceding material from PredP. Rather, as we will see, the verbal complex is spelled out as a φ on its own in PI. In section 4.2, however, a case will be made for assuming that the verb and the auxiliary lose φ status in PO (due to an interaction of phonological constraints) and instead merely form a prosodic word (ω) which is outside of the φ structure containing preceding material.

Finally, we assume N-to-D movement. A similar argument to the one for positing V-to-T movement is in order here. The determiner always forms a prosodic word with the preceding nominal or adjectival root, as evidenced by the fact that in the sequence formed by a lexically accented nominal or adjectival root and a determiner (and possible case marker(s)) the lexical accent tone always surfaces on the penultimate syllable of the whole sequence. This was shown in (1d) above, repeated here as (9):

(9) UR: *liburu*^{HL}*-a-n* SR: *liburúan* 'in the book'

[8] In syntactic terms, the explanation would be that T has an EPP feature that attracts the incorporation of a head. Another option would be to assume that the lexical verb stays in its base-generated position in V and the auxiliary cliticizes onto the verb in a post-syntactic operation. This is the position in Elordieta (2015). However, we believe that there are advantages in positing the verbal movement in syntax, reflected in MSO.

[9] For the reader's convenience we repeat the following passage from section 1: "… MSO [is] the output of the final stage of the morphosyntax, which we assume includes any post-syntactic operations which alter the constituent structure or order of elements, such as those of Distributed Morphology (cf. among others Halle and Marantz 1993, Noyer 1997, Embick and Noyer 2001) and post-syntactic head movement operations (e.g., Harizanov 2014, Harizanov and Gribanova 2019, and references therein)."

book-DET.SG-LOC

3.2 Spelling out MSO as PI in Lekeitio Basque

We are assuming in this paper that the interface between (morpho)syntax and phonology consists in spelling-out properties of the morphosyntactic output representation (MSO) as phonological properties of the input representation (PI) of the phonology *per se* (see also Selkirk 2017, Kratzer and Selkirk 2020, Lee and Selkirk (this volume)).[10] This is the place in the grammatical architecture where the interface constraints of Match Theory (Selkirk 2009, 2011) spell out (morpho-)syntactic word, phrase and clauses constituents as corresponding prosodic constituent types of phonological representation. The constraints are presented in (10), borrowed in their formulation from Kratzer and Selkirk (2020).

(10) a. *MatchWord*: For every Word in the morphosyntactic output representation MSO there is exactly one prosodic word ω that phonologically spells out the Word in the phonological input representation PI.

b. *MatchPhrase*: For every Phrase in the morphosyntactic output representation MSO there is exactly one phonological phrase φ that phonologically spells the Phrase out in the input phonological representation PI.

c. *MatchClause*: For every Clause in the morphosyntactic output representation MSO there is exactly one intonational phrase ι that phonologically spells out the Clause in the phonological input representation PI.

MatchPhrase spells out *every* phrase of MSO. It is not restricted to maximal phrasal projections (such as the XP-level of phrase structure that is posited in X-bar theory (Jackendoff 1977)), but applies to any constituent that counts as a phrase in MSO. A consequence is that the rich recursive embedding of phrases in MSO is reflected in recursive φ structure in the phonological input representation (PI).

A crucial aspect of the spell-out theory of the mapping from MSO to PI is that the Match constraints in (10) can in principle either hold of *any* syntactic projection, be it lexically or functionally headed, or, alternatively, *only* of projections whose heads contain lexical categories, i.e., N(oun), V(erb) and Adj(ective). A language may specify that it is the general version MatchPhrase that is at play in spell-out. In that case all syntactic phrases of MSO will be spelled out as φ of PI (see Elfner (2015)), regardless of the contents of their head. Or a language may specify that what's at play is $\text{MatchPhrase}_{\text{LEX}}$, which only spells out a syntactic phrase as φ if its head word contains a lexical category root (see Selkirk 2017, Lee and Selkirk (this volume)). We

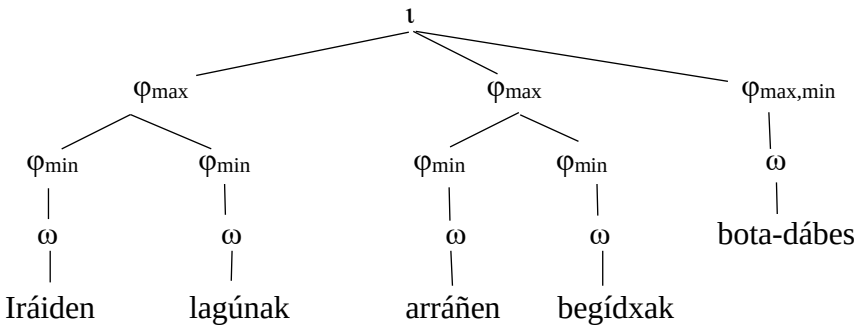
[10] Previous formulations of the syntactic-prosodic constituency interface assume a direct relation between syntactic constituency and the prosodic constituency of the phonological output representation PO (Selkirk 2009, 2011; Elfner 2012, 2015; Ito and Mester 2013; Selkirk and Lee 2015; Kalivoda 2018). For more discussion of these different versions of Match theory, see section 6.5.

are not assuming at present that there is an optimality theoretic ranking of these spell-out constraints, but only that languages select one or the other version of MatchPhrase.[11]

(11) MatchPhrase$_{LEX}$
For every Phrase in the morphosyntactic output representation MSO that is headed by word containing a lexical category root (N, V, A) there is exactly one *φ* in the input phonological representation PI that spells out that Phrase phonologically.

MatchPhrase$_{LEX}$ spells out the phrase structure of MSO in (6) as the φ structure of PI in (12):

(12)



The topmost phrase of (6) is ΣP—which counts as a 'clause' in Basque. It is spelled out as an intonational phrase, ι, in (12).[12] As for the daughters of ι in (12), they correspond to the phrasal constituents that are labelled DP-subj, DP-do and TP in (6), whose heads do contain lexical category roots. The words containing the functional heads of these phrases have incorporated a raised lexical category root, as explained above, and thus these phrases are spelled out as φ by MatchPhrase$_{LEX}$. As for PredP, it is not spelled out as a φ, because it is not headed by a word containing a lexical root, in conformity with MatchPhrase$_{LEX,}$ The same goes for all the other phrases in the MSO of (6)-- vP, v', VP, V', Σ', FinP, Fin'.

The important notational contrast between φ_{max} vs. φ_{min} seen in the phonological representation (12) requires explanation. We follow here Ito and Mester (2009 et seq), who have been at the forefront in demonstrating the recursivity of prosodic structure in phonology, and have shown the role for recursion-based subcategories of the syntax-grounded prosodic categories ι, φ, and ω in illuminating a broad range of phonological phenomena. In the prosodic constituent structure of PI for sentence (12), the three daughters of ι are φ_{max} (= maximal φ). A φ_{max} is not dominated by any other φ. The daughter φ of the first two φ_{max}, which correspond to the two argument phrases, also qualify as φ_{min} (= minimal φ). A φ_{min} immediately dominates no other φ, only ω (prosodic word). As for the φ corresponding to the complex verb, it is both maximal and minimal ($\varphi_{max,min}$).

Note that the failure to spell out the node labelled PredP in (6) as a φ in PI in a two-argument sentence like (6)/(12) is an important consequence of the choice of the interface

[11] For discussion of this issue, see section 3.4 in Lee and Selkirk (this volume).

[12] We leave open the discussion of whether it should be a higher projection such as Force Phrase that is mapped as ι. Such a projection is not represented in MSO in (6), as it is empty in terms of phonologically realized material, so for our purposes ΣP constitutes the higher syntactic projection, that would be mapped as ι.

constraint MatchPhrase$_{LEX}$ in the grammar of Lekeitio Basque. Because only phrases headed by words that contain a lexical category root are spelled out as φ, and PredPhrase is not such a phrase, in a sentence type like (6) the subject and object arguments would each correspond to a φ_{max}. A φ_{max} is daughter of ι, namely a φ not dominated by any other φ. (By MatchClause, ι spells out the 'clause' constituent of the sentence, labelled ΣP). If instead the non-lex-headed PredP of (6) were indeed spelled out as φ in the language, as the general MatchPhrase version of the constraint would require, the φ corresponding to the two argument phrases that are the daughters of PredPhrase in MSO would be daughters of a same mother φ in PI, the one corresponding to PredP. As a consequence, they would not each have the status of a φ_{max} in PI.

We will see in sections 4.1 and 5, that spelling out PredP as a φ by MatchPhrase, with the consequent lack of φ_{max} status for each of the two arguments of a sentence like (6), would make the wrong prediction about the patterns of pitch downstep and upstep observed in two-argument sentences in Lekeitio Basque. It would produce a nested φ structure that is identical to the nested φ structure that MatchPhrase would produce for a sentence with a single four-word verbal argument that consists of two two-word phrases, like that in (13).

(13) A sentence with a single argument (subscripted a) that contains two two-word phrases

[[[[Mirénen] [lagúnen]] [[libúru] [lodídxak]]]$_a$ [gustaten-dxáras]]
Miren.GEN.SG friend.GEN.PL book thick.DET.PL. like AUX
'I like Miren's friends' thick books'.

The data to be presented in sections 4.1 and 5.2-5.3 shows that this is an incorrect prediction. The one-argument and two-argument sentence types have significantly different phonetic interpretations, due to φ-structures that are predicted by the interface constraint MatchPhrase$_{LEX}$.

4. All-A sentences vs. all-U sentences in Lekeitio Basque

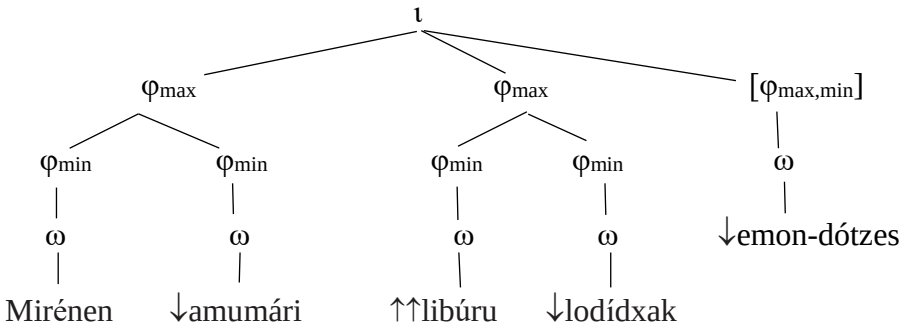
Our goal in this paper is to provide an account of unaccentedness-driven mismatches between the constituent structure of the morphosyntactic output representation MSO and the constituent structure observed in the output phonological PO representations in Lekeitio Basque. As background for this project, in section 4.1 we examine patterns of relative pitch in sentences containing only accented words: sentences with two two-word arguments (AA$_a$AA$_b$) and sentences containing a single argument consisting of two two-word phrases (AA-AA$_a$). The study of such cases by Elordieta 2015 shows that there are statistically significant quantitative distinctions in the patterns of φ-sensitive pitch downstep and upstep in these sentence types. As Elordieta observes, these differences in pitch profile testify to the contrasts in φ structure in PO that are (indirectly) predicted by MatchPhrase$_{LEX}$ on the basis of the MSO structures of these sentences.

4.1 *All-A sentences*

A two-argument, AA$_a$AA$_b$ sentence like that in (14a) was argued above to have the prosodic constituent structure in (12), repeated here in (14b):

(14) a. *Mirénen amúmari libúru lodídxak emon-dótzes*
Miren.GEN.SG grandmother.DAT.SG book thick.DET.PL give AUX
'They have given the thick books to Miren's grandmother.'

b. PO:

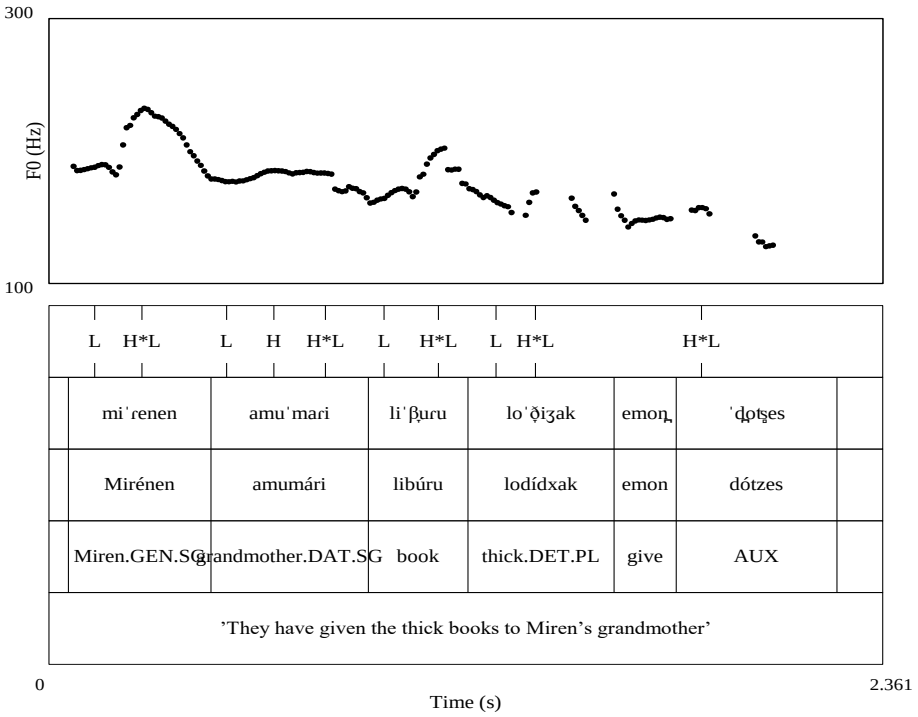


As a result of spell-out by MatchPhrase$_{LEX}$ the two arguments of the verb are sister φ_{max} in PI, both daughters of the intonational phrase (ι) that spells out the 'clause', namely ΣP, (see 3.2 above). The verb would also have the status of a φ following the analysis of the phrase structure presented in sec. 3 of the MSO of the sentence and its spell-out by MatchPhrase$_{LEX}$.

Evidence for the φ status of each of the four accented words in (14) comes from the presence of the LH rising tone that is positioned at the left edge of each φ The top row of the display in (15) contains the tonal transcription of the LH edge tones, which are predictable and epenthesized in φ-initial positions in Lekeitio Basque. Lexical H*L accent tones are also reflected in the pitch contour; the H* is positioned on the penultimate syllable of the ω of which it is a part in PO (cf. sec. 2).[13] The H of the LH edge tone is transcribed only when the location of the endpoint of the LH rise is clearly distinguishable from the H of the following H*L.

(15) Type AA_aAA_b: [A_1 A_2]$_a$ [A_3 A_4]$_b$ [verb] (= (6)/(12)/(14b))

[13] Not all the lexically accented words of (14)/(15) may have the status of phrases in the morphosyntax. On some syntactic analyses the adjective *lodídxak* may lack phrasal status. φ status in the phonological output representation PO for lexically accented words is an independent consequence of the phonology in Lekeitio Basque (Elordieta and Selkirk 2018). As Elordieta and Selkirk put it, a lexically accented word must bear φ-level stress prominence, and this is possible only if there is a φ in PO of which it is the (unique) head. So the φ that dominates an accented word in PO may have its source either in the phonological constraint ranking of a language, or in the spell-out of MSO phrase structure as φ-structure in PI, due to the interface constraint MatchPhrase$_{LEX}$.

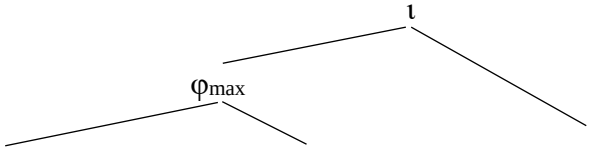


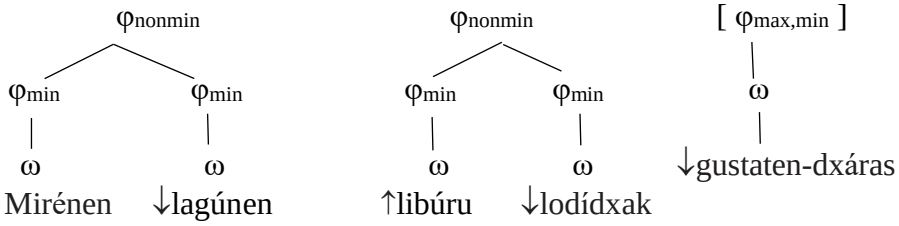
Evidence for the nested, recursive, φ structure posited in (14b) comes from patterns of downstep and upstep in the pitch contour of such sentences, visible in (15). The pitch value (F0) of the accented syllable of the second word *amumári* is significantly lower than (downstepped with respect to) the pitch of the preceding accent on *Mirénen.* On the other hand, upstep is observed on the accented syllable of the third word *libúru*, which has higher pitch than that of the immediately preceding accented word. Both the adjective and the verb following *libúru* show only downstep. Note that in the figure in (14b), downstep and upstep are informally indicated by the down and up arrows that appear at the left of the relevant words.

It turns out that a single-argument AA-AA_a sentence like that in (16) has a different pitch profile from the two-argument AA_aAA_b-type sentence in (14). Its syntactic phrase structure, which is shown above in (13), is spelled out by $\text{MatchPhrase}_{\text{LEX}}$ as the prosodic φ structure in (16b).

(16) a. Mirénen lagúnen libúru lodídxak gustaten-dxáras
Miren.GEN.SG friend.GEN.PL book thick.DET.PL. like AUX
'I like Miren's friends' thick books'.

b. PO





Note that in this single-argument sentence in (16), the pitch upstep observed at the left edge of *libúru* is marked with a single up-arrow, while in the case of the two-argument sentence in (14) that third word is marked with double arrows. This difference in informal notation stands for a significant difference in the amount of pitch upstep at this position, which is quantitatively established in Elordieta 2015 on the basis of controlled experimental investigation.

This systematic difference in the pitch profiles of the $AA_a\ AA_b$ and $AA\text{-}AA_a$ sentence types implies a systematic difference in the representation of the prosodic constituency in the output phonological representation of these sentences, which is submitted to phonetic interpretation. The relevant distinction in phrasal phonological representation would be produced by the constituency spell-out constraint $\text{MatchPhrase}_{\text{LEX}}$, as we can see in (16b) vs. (14b). This distinction in the number of φ_{max} (φ daughters of ι) in the two sentence types confirms that PredPhrase is not spelled out as a φ in phonological representation. If it were, there would be no such distinction in φ organization between the two-argument $AA_a\ AA_b$ sentence and the single-argument sentence type $AA\text{-}AA_a$.

We see here that an insightful characterization of the phrasal contexts in which different degrees of pitch upstep are produced is possible if the recursion-based subcategories of φ proposed by Ito and Mester (op.cit.) are assumed. Subcategories of φ provide just the contexts for the distinct degrees of pitch upstep that are observed in the sentence types above by Elordieta (2015). Simply put, pitch upstep is significantly greater at the left edge of a φ_{max} than it is at the left edge of a mere φ_{nonmin} (a φ that is neither minimal nor maximal). In $AA_a\ AA_b$ sentences like (14), each argument is a φ_{max}, while in the $AA\text{-}AA_a$ sentence type in (16), both AA sequences are φ_{nonmin} daughters of the φ_{max} representing the sole argument of the sentence.[14]

To summarize, the contrasts in pitch scaling seen in these two types of all-A sentences demonstrate an indirect effect of the morphosyntactic phrase structure of the sentence on the its phonetic interpretation. The effect of the constituent structure of MSO on phonetic interpretation is mediated by its spell-out as prosodic constituent structure in the input phonological representation PI (via the interface constraint $\text{MatchPhrase}_{\text{LEX}}$) and by the inheritance of that input prosodic structure of PI in the output phonological representation PO. It is also mediated by the phonetic interpretation of PO, which in Lekeitio Basque takes into account the particular

[14] As for the downstepping of the verb that is indicates with the down-arrow in both (14a) and (15b), it is not predicted, if indeed the verb has the status of a maximal φ in the phonological output representation PO. We return to this issue at the end of section 4.2.

status of a φ as maximal (φ_{max}) vs. merely nonminimal (φ_{nonmin}) in determining the relative pitch scaling for the elements of that φ structure.[15]

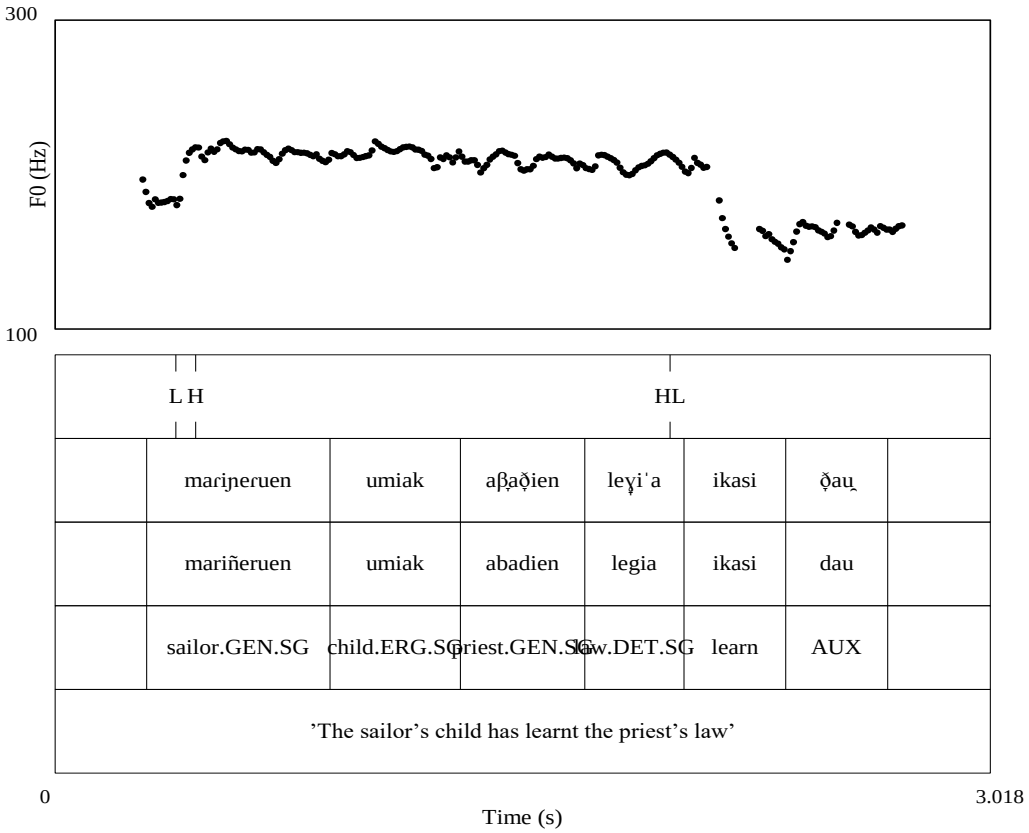
4.2 All-U sentences

The peculiarity of sentences in Lekeitio Basque that consist only of unaccented words preceding the verb is that there is just a single φ in such sentences, a φ that groups together the entire sequence of U words, but not the following verb. This $(UUUU)_{\varphi}$ structure is found in all-U sentences of the two-argument $UU_a\,UU_b$ type and of the single-argument $UU\text{-}UU_a$ type. Because the pitch scaling evidence in 4.1 shows that PredPhrase can not spelled out as a φ in Lekeitio Basque, it is not spell-out, but rather the phonology, that must provide an explanation for the single-φ status of the preverbal all-U word sequence.

Sentences with only U words preceding the verb have been experimentally investigated by Elordieta and Unamuno (2015), and we rely on the results of that study here. An example of a $UU_a\,UU_b$ type sentence is (17): *Mariñeruen umiak abadien legia ikasi-dau* 'The sailor's child has learnt the priest's law'. Its subject and object arguments consist of two unaccented (U) words each; its syntactic constituent structure in MSO is the same as that of the two-argument AA_aAA_b sentence in (14) above. A representative pitch contour is displayed in (17).

(17) Type UU_aUU_b: [[U_1][U_2]]**a** [[U_3][U_4]]**b** [verb-aux]

[15] For other theoretical alternatives to analyzing pitch scaling patterns with respect to depth of embedding of syntactic phrases or phonological phrases, the reader is referred to Ladd (1988), Truckenbrodt (2002, 2007), Féry and Truckenbrodt (2005) and Truckenbrodt and Féry (2015).



A LH rise, characteristic of the left edge of a φ, appears at the left edge of the UUUU sequence. The HL fall that appears on the final syllable of the U that precedes the verb is arguably an edge tone that's restricted to the right edge of the last φ of an intonational phrase ι.[16,17] Notably, there is no LH rise at the left edge of the sentence-medial UU_b argument phrase. Quite generally, in sentences like (17) where the preverbal phrase(s) consist(s) only of unaccented words, there is no phonological or phonetic evidence of any φ structure in PO that reflects the constituency of the preverbal arguments in MSO. (The same is true in all-U sentences where the four words are all part of a single morphosyntctic phrase consisting of two two-word phrases.) In Lekeitio Basque, it is unaccentedness that drives the existence of the striking constituency mismatches between MSO and PO representations like that illustrated in the pitch contour of (17).

[16] See Kratzer and Selkirk (2020, sec. 6) where the types of prosodic structure configuration in which constraint-driven tonal epenthesis occurs in the sentence are inventoried.

[17] The HL right-edge tone is absent from the final syllable of the preverbal word in Lekeitio Basque if that word carries a lexical HL accent tone on its penultimate syllable (cf. section 2). That absence/deletion of the HL edge tone can be ascribed to the OCP and be understood as a phonological effect. There is independent motivation for the OCP holding of a sequence of identical tones with quite difference sources in the grammar. For example, in Bengali, where a final verb always constitutes a φ (as well as a ω) the epenthetic L tone that normally marks the initial stressed syllable of a φ and the H tone that marks the right edge of a φ do not cooccur with a clause-level meaning-bearing LH morpheme that appears rightmost in the sentence. Rather, a H tone takes the place of the L tone that would normally be predicted on the initial stressed syllable. Hayes and Lahiri (1991) point out a number of such cases of the OCP in Bengali. Selkirk (2008) offers an explicit OCP account of such cases in Bengali.

Assuming that the syntactic constituency of MSO is spelled out by $\text{MatchPhrase}_{\text{LEX}}$ as prosodic constituency in the PI, as in (18), the mismatches between MSO and PO constituency would come about in the successive stages shown.

(18) MSO-PI-PO for sentence with UU_aUU_b syntax

MSO [[[[U][U]]**a** [[U][U]]**b**]$_{\text{PredP}}$ [[verb-aux]]$_{\text{'TP'}}$]$_{\text{clause}}$

PI $(_{\iota}$ ($(U)_{\varphi}$ $(U)_{\varphi}$ $)_{\boldsymbol{\varphi a}}$ ($(U)_{\varphi}$ $(U)_{\varphi}$ $)_{\boldsymbol{\varphi b}}$ $(\text{verb-aux})_{\varphi}$ $)_{\iota}$

PO $(_{\iota}$ $(^{\text{LH}}$ U U U U $^{\text{HL}})_{\varphi\text{-x}}$ $(\text{verb-aux})_{\omega}$ $)_{\iota}$

As we saw in the case of all-A sentences in 4.1, the interface constraint $\text{MatchPhrase}_{\text{LEX}}$ would spell out phrases of MSO only if the word that is the head contains a lexical category root. PredP is not such a phrase, and so is not spelled out as a φ. But the two argument phrases of (17) would each be spelled out as φ, as in the PI in (18). As for the 'TP' that contains the word consisting of the verb-aux sequence, it is a phrase that is headed by a word that, due to verb-raising, would contain a lexical (verbal) root. So it counts as a lex-headed phrase for $\text{MatchPhrase}_{\text{LEX}}$ (cf. (6) and the discussion in section 3.2). An explanation is needed for the disappearance in the PO of UUUU sentence types of the various φ nodes which would correspond to the predicted φ nodes of PI that spell out lex-headed phrases of MSO. The account of this mismatch that we propose is phonological in kind: an optimality theoretic ranking of phonological markedness constraints on PO with respect to phonological faithfulness constraints on the PI-PO relation.

Given our assumption that the phonological input representation PI contains the prosodic constituent structure that phonologically spells out MSO constituent structure, a set of prosodic constituency faithfulness constraints must hold of the correspondence between the PI (input) and PO (output) representations of a sentence. Elordieta and Selkirk 2018, Kratzer and Selkirk 2020 and Lee and Selkirk (this volume) provide further motivation for these prosodic constituent faithfulness constraints). MAX(φ) is a faithfulness constraint that calls for a φ of the input representation PI to correspond to a φ in the output representation PO. It should be seen as one of the general class of anti-deletion MAX constraints proposed by McCarthy & Prince (1995, 1999), though prosodic constituent faithfulness constraints were not entertained in that work.

(19) MAX(φ) [= 'No deletion of φ']
For any φ of PI there must be a corresponding φ in PO.

As a comparison of the PI and PO representations of (18) easily shows, the entire nested φ structure of the all-U argument phrases in PI is absent in PO. These 'deletions' of φ give rise to multiple MAX(φ) violations. As for the prosodic constituent status of the lexically unaccented verb in PO in example (17), the absence of any LH rise at the left edge of the verb suggests that the verb does not itself have the status of a φ in PO. Further discussion of the constituent status of the verb is taken up in the final paragraph of this section.

Note next that the sole φ in the PO of the sentence variously depicted in (17)-(18) has been 'inserted' in the phonology, since the $(UUUU)_{\varphi}$ is not present in the PI representation. This introduction of a new φ in PO that is not in PI would be a violation of the faithfulness constraint DEP(φ), which would be a member of the general family of anti-insertion, anti-epenthesis, DEP constraints posited by McCarthy & Prince (1995, 1999):

(20) DEP(φ) [= 'No insertion of φ']
For any φ of PO there must be a corresponding φ in PI.

As (18) shows, then, both MAX(φ) and DEP(φ) are violated in the PO of the UUUU sentence. The presence of that $(UUUU)_{\varphi}$ structure is empirically motivated by the appearance of the LH and HL tones in the sentence (illustrated in (17)), and by the absence of any structure-sensitive up or down pitch scaling within the UUUU sequence.

We need to look next at the phonological markedness constraints that could account for the distribution of φ constituency that is present in the PO of (18). In this paper we use the name NO-A-LESS-φ for the (set of) phonological markedness constraint(s) that embody the relation between (un)accentedness and φ status (cf. Elordieta and Selkirk (2018)).

(21) NO-A-LESS-φ [alternative name: $*(U^n)_{\varphi}$, where $n \geq 1$]
A φ must contain at least one accented word.

NO-A-LESS-φ ($*(U^n_{\varphi})$ for short) is a space-saving stand-in for the set of phonological markedness constraints that relate three aspects of the phonological representation: φ constituency, prosodic headedness (prominence) of φ and the presence of tonal accent on a prosodic head. Elordieta and Selkirk (2018) argue for the decomposition of NO-A-LESS-φ into a set of such constraints. These markedness constraints together provide an explanatory account of the φ-accent relation that is referred to by the descriptive cover term 'NO-A-LESS-φ'.

In the constraint tableau in (22), the markedness constraint NO-A-LESS-φ ($*(U^n)_{\varphi}$) is ranked higher than the prosodic constituency faithfulness constraints MAX(φ) and DEP(φ). This constraint ranking bears the brunt of the burden of accounting for the fact that the φ organization of the preverbal UUUU sequence in the PI of (18) is lost, and that a new, mismatching, $(UUUU)_{\varphi}$ appears in PO.

(22)

PI $_{\iota}(((U)_{\varphi} (U)_{\varphi})_{\varphi\text{-a}} ((U)_{\varphi} (U)_{\varphi})_{\varphi\text{-b}} (U_{verb})_{\varphi})_{\iota}$	PMC	NO-A-LESS-φ [= $*(U^n)_{\varphi}$]	MAX(φ)	DEP(φ)
PO a. $_{\iota}(((U)_{\varphi} (U)_{\varphi})_{\varphi} ((U)_{\varphi} (U)_{\varphi})_{\varphi} (U_{verb})_{\varphi})_{\iota}$	*	(U) (U) (U) (U) (U_{vb}) (UU) (UU)		
b. $_{\iota}(((U)_{\varphi} (U)_{\varphi})_{\varphi} ((U)_{\varphi} (U)_{\varphi})_{\varphi} U_{verb})_{\iota}$		(U) (U) (U) (U) (UU) (UU)	(U_{vb})[18]	

[18] Vb stands for verb

c. $_{\iota}(\ _{\varphi}(\ U\ \ U\ \ U\ \ U)_{\varphi\text{-x}}\ (U_{verb})_{\varphi}\ )_{\iota}$	*	(U_{vb}) $(UUUU)_{\varphi\text{-x}}$	(U) (U) (U) (U) (UU) (UU)	$*_{\varphi\text{-X}}$
⇒ d. $_{\iota}(\ _{\varphi}(\ U\ \ U\ \ U\ \ U\ )_{\varphi\text{-x}}\ U_{verb}\ )_{\iota}$		$(UUUU)_{\varphi\text{-x}}$	(U) (U) (U) (U) (U_{vb}) (UU) (UU)	$*_{\varphi\text{-X}}$
e. $_{\iota}(\ _{\varphi}(\ U\ \ U\ \ U\ \ U\ \ (U_{verb})_{\varphi}\ )_{\varphi\text{-y}}\ )_{\iota}$	*	(U_{vb}) $(UUUUU)_{\varphi\text{-y}}$	(U) (U) (U) (U) (UU) (UU)	$*_{\varphi\text{-Y}}$
f. $_{\iota}(\ _{\varphi}(\ U\ \ U\ \ U\ \ U\ \ U_{verb}\ )_{\varphi\text{-y}}\ )_{\iota}$	*	$(UUUUU)_{\varphi\text{-y}}$	(U) (U) (U) (U) (U_{vb}) (UU) (UU)	$*_{\varphi\text{-Y}}$
g. $_{\iota}(\ U\ \ U\ \ U\ \ U\ \ U_{verb}\ )_{\iota}$	*		(U) (U) (U) (U) (U_{vb}) (UU) (UU)	

In the evaluations of candidates in this tableau, the notations (U), (UU), etc. each stand for a violation mark assigned to instances of a φ consisting only of U that violate the constraint in the relevant column. For example, (UU) stands in for the * violation that would be assigned to a particular phrase φ that consists of two U.

The ranking $*(U^n)_{\varphi}$ >> MAX(φ), DEP(φ) ensures that candidates (a) and (b), which respect the lower-ranked faithfulness constraints, will be ruled out due to the higher ranked markedness constraint $*(U^n)_{\varphi}$. On the other hand, with their single preverbal (UUUU), candidates (c) and (d) radically reduce the number of violations of high-ranked $*(U^n)_{\varphi}$. Many violations of the lower-ranked MAX(φ) constraint are eliminated in (c) and (d); both do show a violation of DEP(φ) due to the insertion of the φ-x that groups the UUUU sequence. (d) is the optimal candidate. The distribution of edge tones, not included in the tableau, testify to the 'insertion' of a preverbal constituent: $(^{LH}UUUU^{HL})_{\varphi}$. As for the 'deletion' of the postulated φ for the unaccented verb, this is of course expected, given the high rank of $*(U^n)_{\varphi}$.

But this is not the end of the story. One question is why candidate (d) wins out over candidate (f), given that they have identical sets of violations with respect to the constraint ranking discussed so far. Note that in candidate (f), where *all* the U words of the sentence, including the verb, are included in a single inserted φ-y, there is comparable reduction in the number of violations of $*(U^n)_{\varphi}$. An additional constraint or constraints must be at play. Our hypothesis is that phonological markedness considerations are the source of the ungrammaticality of candidates *e* and *f*. This is indicated by the placeholder PMC in the tableau. What sort of prosodic markedness constraint(s) could be involved?

Here's what we know: There is a φ grouping together the preverbal U words of the sentence which has no source in the PredPhrase, or any other phrase, of the morphosyntax. Independent evidence from the all-A two-argument sentences in 4.1 shows that PredPhrase cannot be spelled out as a φ that would group together two verbal arguments. This case from Lekeitio Basque shows that Match constraints on the syntax-phonology interface can't be given responsibility for the appearance of this $(UUUU)_{\varphi}$ in PO. What pressure could there be in the phonology *per se* for the presence of that $(UUUU)_{\varphi}$ that is the daughter of ι in PO? It is plausibly the same phonological markedness constraint that is responsible for the crosslinguistically supported generalization that an intonational phrase (ι) must contain at least one φ, or that a φ must contain

at least one prosodic word (ω). Selkirk (1996) proposes such a constraint—confusingly named Headedness-- in the context of a proposal regarding phonological markedness constraints on domination and sisterhood in prosodic structure representations. Lee and Selkirk (2015) suggest that Match theory might make such a constraint superfluous. But this case from Lekeitio Basque shows that interface Match constraints can't do the job. The phonology itself must impose the prosodic domination requirement. We suggest rewording and renaming the constraint Headedness as PHRASALMINIMALITY:

(23) PHRASALMINIMALITY

a. An intonational phrase (ι) must contain at least one φ.

b. A phonological phrase (φ) must contain at least one ω.

PHRASALMINIMALITY is the prosodic markedness constraint that will rule out entirely the absence of any φ at all in the sentence. Ranked higher than DEP(φ), it would rule out the nonoptimal final candidate (g). Let's assume PHRASALMINIMALITY is one of the prosodic markedness constraints that the abbreviation PMC stands for in tableau (22).

The next question is why the φ that is 'inserted' in response to PHRASALMINIMALITY does not include the ι-final verb, as seen in the optimal candidate (d) in (22). Why is it that in Lekeitio Basque the final daughter constituent of a minimal ι must be a ω preceded by a φ?
Our hypothesis is that this prosodic phenomenon is of the same general type that is referred to as extrametricality. Extrametricality is a commonplace of word stress systems in which the syllables making up a prosodic word are organized into feet. In certain languages, including Latin and Classical Arabic, the final constituent of a prosodic word is a mere syllable that is immediately preceded by a foot: a foot cannot be final in these languages. Prince and Smolensky (1993) propose a constraint NONFINALITY(ι) to account for these cases of extrametricality. Our proposal is that the prosodic markedness constraint NONFINALITY(ι) in (24) is responsible for the fact that the φ that dominates a sequence of preverbal U words in Lekeitio Basque does not also dominate the verb, which must have the status of a mere ω[19].

(24) NONFINALITY(ι)

A φ may not be final in a minimal ι.

The ranking of NONFINALITY(ι) higher than the prosodic faithfulness constraint MAX(φ) would account for the 'deletion' of the φ node that parses the verb in PI.

Note that if NONFINALITY(ι) were higher ranked than the phonological markedness constraints that together call for an accented word in Lekeitio Basque to have the status of a φ (see Elordieta and Selkirk 2018), it would be predicted that a lexically accented verb that appears as the final daughter of ι in the input representation PI would also lack the status of a φ in PO and would therefore fail to exhibit a LH tone at its left edge in the output PO. The absence of any such LH rise would support our contention that the verbal complex is "extrametrical", merely an ω, not a φ. It would mean that NONFINALITY(ι) should be high-ranked in the language. We suggest that

[19] Thanks to one of the editors of this volume for suggesting the constraint NonFinality might be at play here.

NONFINALITY(ι) should also occupy the place of the mystery constraint PMC in the ranking in tableau (23), and in that way be given responsibility for the determining that the optimal candidate in tableau (23) is (d), not candidate (f).[20]

All the prosodic descriptions of Lekeitio Basque (and of Northern Bizkaian Basque in general) mention the fact that the verbal sequence formed by the lexical participial verb and the inflected auxiliary display a compressed (downstepped) pitch range in declarative utterances, and that the phonological contrast between accented and unaccented verbs is conveyed through the presence of a small rise on the syllable that gets the H*L accent (Hualde et al. 1994, Elordieta 1997, 1998, Elordieta et al. 1999, Gussenhoven 2004, Elordieta and Hualde 2014, among others). It has not yet been systematically investigated whether in an accented verb there is a LH rise whose peak is reached before the H* on the penultimate syllable of the verbal complex. But a pilot experiment was conducted in connection with the writing of this paper and it was determined that there is no such LH rise in the accented verb. So for the moment there is reason to tentatively conclude that a verb is indeed merely a ω, not a φ, as would be predicted by our constraint-based phonological analysis of the verb as "extrametrical."[21]

4.3 *Summary*

In the all-A sentences examined in 4.1, we observed contrasts in the phonological phrase (φ) composition of the PO of these sentences that were straightforwardly a reflection of contrasts in the MSO composition of the sentence in terms of phrasal constituents which are headed by words containing a lexical root. AA_aAA_b type sentences with two two-word arguments and single-argument AA-AA_a type sentences are realized with different pitch profiles. Our hypothesis is that in Lekeitio Basque the interface constraint $\text{MatchPhrase}_{\text{LEX}}$ spells out the phrasal constituency of MSO as φ constituency in the input PI representation for the phonology. The contrasts in phrase structure of lex-headed arguments in the MSO of the sentence are preserved as contrasting φ structure in PI. At the same time, though, as shown in 4.2, in all-U sentences, there is no reflection of that φ structure of PI in the output phonological representation PO.

What is clear at this point is that the strikingly mismatching single φ that groups together a sequence of preverbal unaccented words as $(UUUU)_\varphi$ in the PO of a sentence of Lekeitio

[20] In tableau in (22) the solid line reflects the crucial rankings that have been argued for here. Every constraint to the left of the line is higher ranked than every constraint to the right of the line. Any ranking between the constraints on one or the other side of the solid line appear not to play a role determining the prosodic structure of the optimal candidate (d) in (22).

[21] A reviewer points out that we need to provide an account of the fact that there is no 'extrametricality'-driven final 'dephrasing' when a sentence, or the utterance of a sentence fragment, ends in a branching phrase. For example, the utterance of conjoined noun phrases *W's X and Y's Z* that would correspond to a sequence ((U)(A)) ((U)(A)) in PI show the expected (UA) (UA) sequence of two minimal φ in PO. In such cases the final A not is peeled off as a single 'extrametrical' ω in order to satisfy NonFinality, with the preceding U forming part of the φ that precedes. Our suggestion is that the phonological constraint responsible for keeping the sentence-final branching φ intact in such cases is a type of prosodic structure faithfulness constraint that weighs against PI-PO pairs where the ω's of a same φ in PI are not together in that same φ in PO. We show in sections 6.3 and 6.4 that such input-output IDENT faithfulness constraints on the content of φ's have independent motivation in treatments of further types of constituency mismatches in the grammar of Lekeitio Basque.

Basque must be derived from a PI representation with a highly articulated preverbal φ structure that spells out (matches up with) the phrases of MSO whose head words contain lexical category roots. This φ structure in PI is what we must assume in order to account for the attested prosodic phrase structure in PO of the all-accented sentences examined in 4.1. It's moreover the φ structure of PI that we must assume in order to account for the mismatches seen in the AAUA sentence types to be examined in sections 5 and 6. As for the radical mismatch between the phrasal constituency of PO and PI in sentences whose preverbal argument phrase(s) consist only of lexically unaccented U words, the proposal we have put forward here is that the phonology *per se*, with its language-particular ranking of strictly phonological markedness and faithfulness constraints, can be held responsible. It is the phonological constraint ranking of Lekeitio Basque, which is schematically rendered in tableau (22)—mentioning only PMC instead of PHRASALMINIMALITY and NONFINALITY(ι), that conspires to disallow the appearance of any φ in PI that does not contain at least one accented word.

5. Further cases of constituency mismatch due to unaccentedness: the AAUA data

5.1 *Introduction*

The central empirical question of this paper is the role for the unaccentedness of a word in determining its place in the prosodic constituent structure of PO. The evidence from all-U sentences in the preceding section already shows that MSO argument phrases consisting only of U words cannot stand on their own as φ in PO. In order to test further the constraint-based phonological account of the 'de-phrasing' of [U] constituents argued for in section 4.2, we turn to an examination of the sentence types of (25).

(25) The AAUA minimal quadruplet— variation in argument count and phrasal composition

(i) Type I: Two two-word phrases (plus verb) (see (26))

[[A][A]]$_{a}$ [[U][A]]$_{b}$ verb

(ii) Type II: One two-word phrase and two one-word phrases (plus verb) (see (28))

[[A][A]]$_{a}$ [U]$_{b}$ [A]$_{c}$ verb

(iii) Type III: One phrase containing two two-word phrases (plus verb) (see (30))

[[[A][A]] [[U][A]]]$_{a}$ verb

(iv) Type IV: One three-word phrase and one one-word phrase (plus verb) (see (32))

[[[A][A]] [U]]$_{a}$ [A]$_{b}$ verb

The subscript labels *a,b,c* indicate verbal argument or adjunct phrases. Note that the preverbal phrases indicated in these Types are just the phrases of the MSO of this sentence that

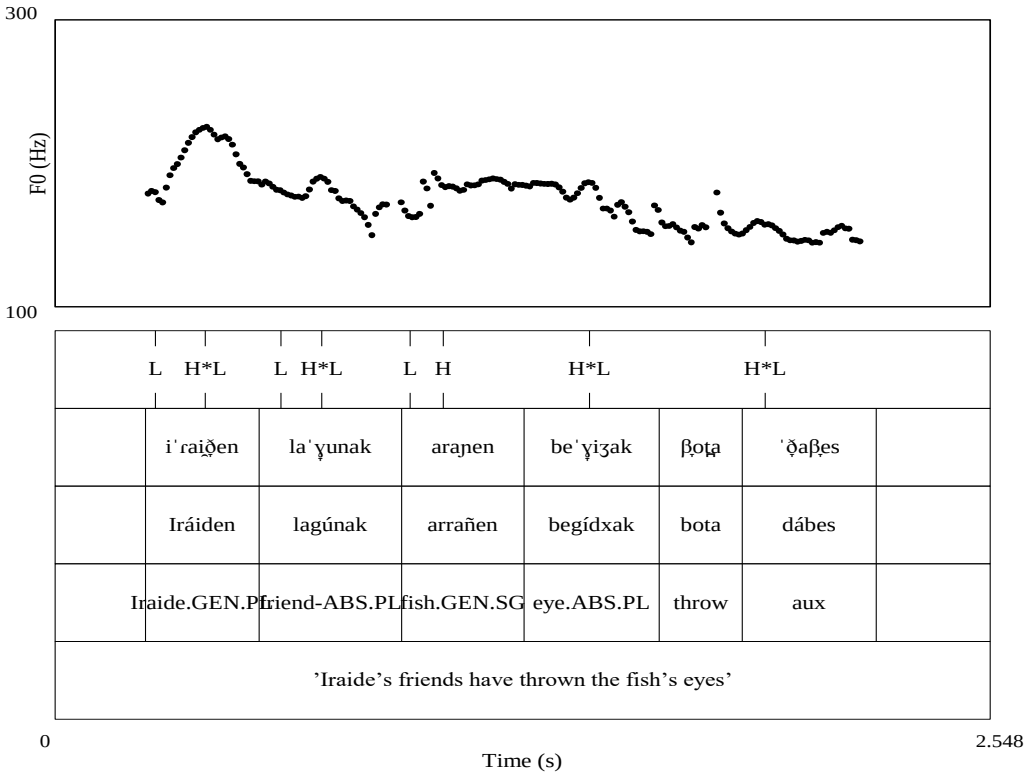
MatchPhrase$_{LEX}$ spells out as φ in PI. A bracketing for PredP, for example, is not included. This allows us focus attention on just the syntactic phrase organization that might potentially have an impact on the φ organization of these sentences. Concerning the use of a quadruplet of sentence types which all contain an initial [[A][A]] constituent preceding the [U] and an [A] following it, the medial position for the U would in principle allow for it to group either to the left or to the right in PO. As for the inclusion of an [[A][A]] constituent in sentence-initial position, this is because in Lekeitio Basque there is a prosodic markedness constraint that calls for the initial φ_{max} of an intonational phrase ι to be prosodically binary, i.e., to contain (at least) two φ_{nonmin} or φ_{min} (Elordieta (1997, 1998, 2007; Elordieta and Selkirk 2010). The status of [[A][A]] as a binary φ in PO would allow for any arrangement of the following [U] and [A] constituents in PO.

In section 5.2 we examine individual representative pitch tracks of the four sentence types of the AAUA quadruplet, all spoken by the same individual. An initial analysis of the φ structure of the PO of these types of examples will be based on the distribution of LH edge tones and the distribution of pitch upstep observed in each example. As we saw in section 4.1, these properties reflect both the presence and the depth of embedding of a φ in PO. In section 5.3, we will look at the results of a statistical analysis of the quantitative data concerning these properties that was obtained from a laboratory experiment involving three speakers and multiple recorded utterances of sentences of the various types.

5.2 *A phonological and phonetic analysis of representative utterances of AAUA sentence types*

Examples of utterances of the sentence types I-IV that will be examined in this section include a display like that in (26). The two two-word-argument Type I sentence is familiar from the discussion of all-A sentences in section 4.1 and provides a useful starting point. (26) is a pitch track of an utterance of the Type I AAUA sentence *Iráiden lagúnak arrañen begídxak bota-dábes* 'Iraide's friends have thrown the fish's eyes'. The schematic morphosyntactic representation for a Type I sentence from the set in (25) is given in the heading of (26).

(26) AAUA Type I : [[A_1][A_2]]$_a$ [[U_3][A_4]]$_b$ verb-aux



The vertical lines in the middle three tiers of figures such as this indicate the between-word dividing points in an utterance of the sentence. The three tiers provide the phonetic transcription, orthographic representation and glosses of each of the words of the sentence. The presence and location of LH left-edge tones and H*L accent tones is shown in the tonal tier at the top. In the case of the LH edge-tone, the vertical line marks the position of the L on the initial syllable of a φ. The position of the H of the LH rise is not fixed. It marks the right limit of the LH rise, which depends on how many syllables lie between the initial syllable of the φ and the penultimate syllable of the φ. The penultimate syllable of the accented word hosts the H*L pitch accent. A vertical line shows the locus of association of the H of the accent.[22]

The distribution of the LH edge-tones within a sentence of Type I allows us to observe that the [[U_3] [A_4]] object argument phrase *arrañen begídxak* has a LH rise at its left edge, and that there is no LH rise at the left edge of the A_4 word. Rather a high tone plateau extends from the H of the LH rise in the U_3 word to the H of the accent tone of the following A_4 word. The presence of the LH rise at the left edge of U_3 and lack of any LH rise at the edge of A_4 indicates that that U_3 and the following A_4 must together be analyzed as a minimal φ ($φ_{min}$), one which contains only prosodic words: $(ωω)_{φmin}$. This absence of φ status for A_4 is a first piece of evidence for a mismatch between the φ constituency of PO, on the one hand, and the phrase constituency of MSO (and its spell-out as the φ constituency in PI).

[22] In a bitonal accent, the tone followed by a star is the one that is associated with a stress/prominent syllable.

The distribution of pitch downstep and/or upstep in the utterance of a sentence is another source of evidence for the organization of φ constituency in PO, as we saw with the all-accented sentences examined in 4.1. In the pitch track of the Type I sentence in (29), within the subject phrase *Iráiden lagúnak* we observe downstepping of the pitch of A_2 (*lagúnak*) with respect to the preceding A_1 (*Iráiden*). This is expected since *lagúnak* is a φ_{min} that is sister to another φ_{min} within a higher φ (cf. discussion in section 4.1). We do not, however, observe any downstep between A_2 and A_3 (*arrañen*), the first word of the object phrase. Instead there is upstep between them. This presence of upstep indicates that *arrañen begídxak* is not merely a $\varphi_{min.}$ In that case it would undergo downstep with respect to A_2. Rather, accounting for the upstep observed in this case requires assuming that this object phrase is a φ_{max} in PO (as explained in sec. 4.1).

In summary, the evidence we have from examining the pitch contour of a Type I sentence is that the object argument *b* corresponds to a φ_{max} in PO in which the U_3 and A_4 constituents do not each constitute φ on their own—as would be the case if they were a sequence of two A in the same structure. The U_3 and the A_4 have lost any individual φ status in PO. (27) pairs the relevant phrase structure of the MSO of the Type I sentence with the φ structure in PO that is motivated by the pitch track in (29):

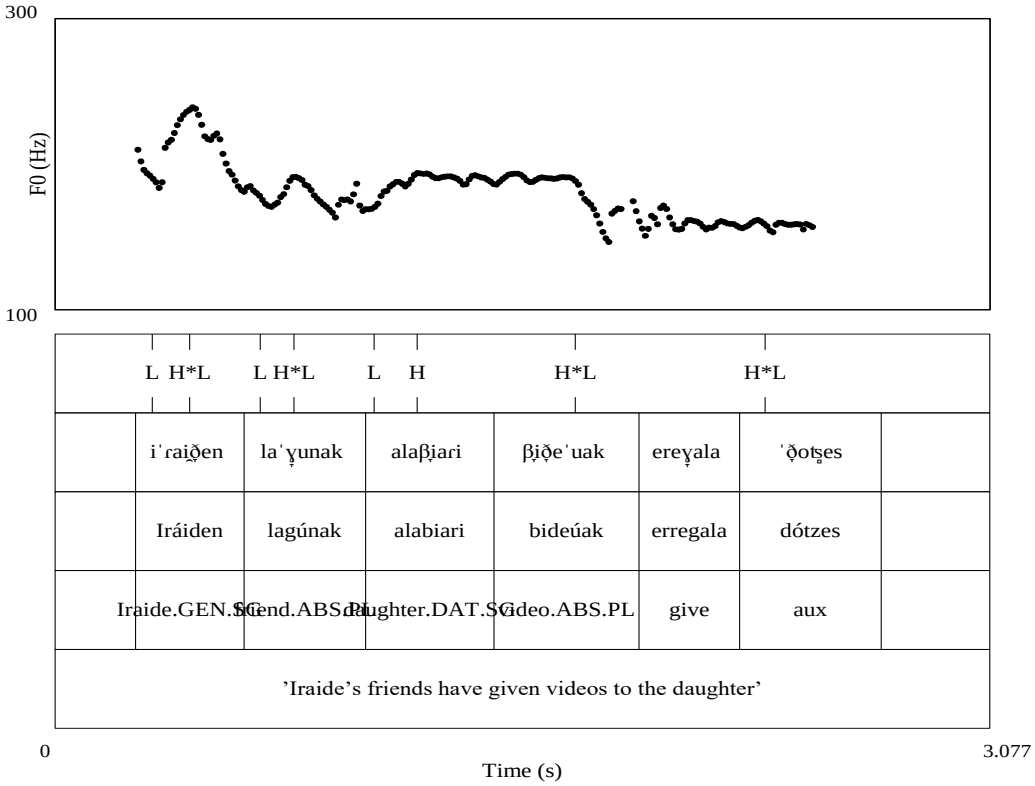
(27) Type I: $[\ [A_1][A_2]\ ]_{\mathbf{a}}\ [\ [U_3][A_4]\ ]_{\mathbf{b}}$ verb-aux

PO $\quad {}_{\iota}(\ ((^{LH}A_1\ )_{\varphi min} \downarrow(\ ^{LH}A_2)_{\varphi min})_{\boldsymbol{\varphi max}}\ \uparrow(^{LH}U_3\ A_4\ )_{\boldsymbol{\varphi max}}$ verb-aux $)_{\iota}$

This is a minor mismatch between the constituency of MSO and PO, one which leaves intact the expected correspondence between φ_{max} in PO and argument phrase(s) of MSO.

Consider next a three-argument sentence of Type II, one which contains an $[[A_1][A_2]]$ subject argument followed by an indirect object $[U_3]$, a direct object $[A_4]$, and finally the verb. (28) contains a pitch track of the Type II sentence *Iráiden lagúnak alabiari bideúak erregala-dótzes* 'Iraide's friends have given videos to the daughter'. The MSO phrases of the sentence that would be spelled out by MatchPhrase_{LEX} are represented in the heading.

(28) Type II: $[\ [A_1][A_2]\ ]_{\mathbf{a}}\ [U_3]_{\mathbf{b}}\ [A_4]_{\mathbf{c}}$ verb-aux



There are three arguments preceding the verb in MSO, while there are only two φ_{max} that precede the verb in PO. The $[U_3]_{\mathbf{b}}$ and $[A_4]_{\mathbf{c}}$ arguments of MSO together form a single φ_{max} in PO, just as they did in the Type I sentence in (27).

Note that in (28) there is a LH rise at the starting at the left edge of *alabiari*, U_3, and there is no LH rise at the left edge of A_3, *bideúak.* This shows that U_3 and A_4 form part of the same minimal φ. Moreover, $(U_3\ A_3)_{\varphi min}$ shows upstep; there is no downstepping between it and A_2, *lagúnak.* The PO for this Type II sentence appears to be identical to the PO of the Type I sentence. (29) pairs the relevant phrase structure of the MSO of the Type II sentence with the φ structure motivated by the pitch track in (28).

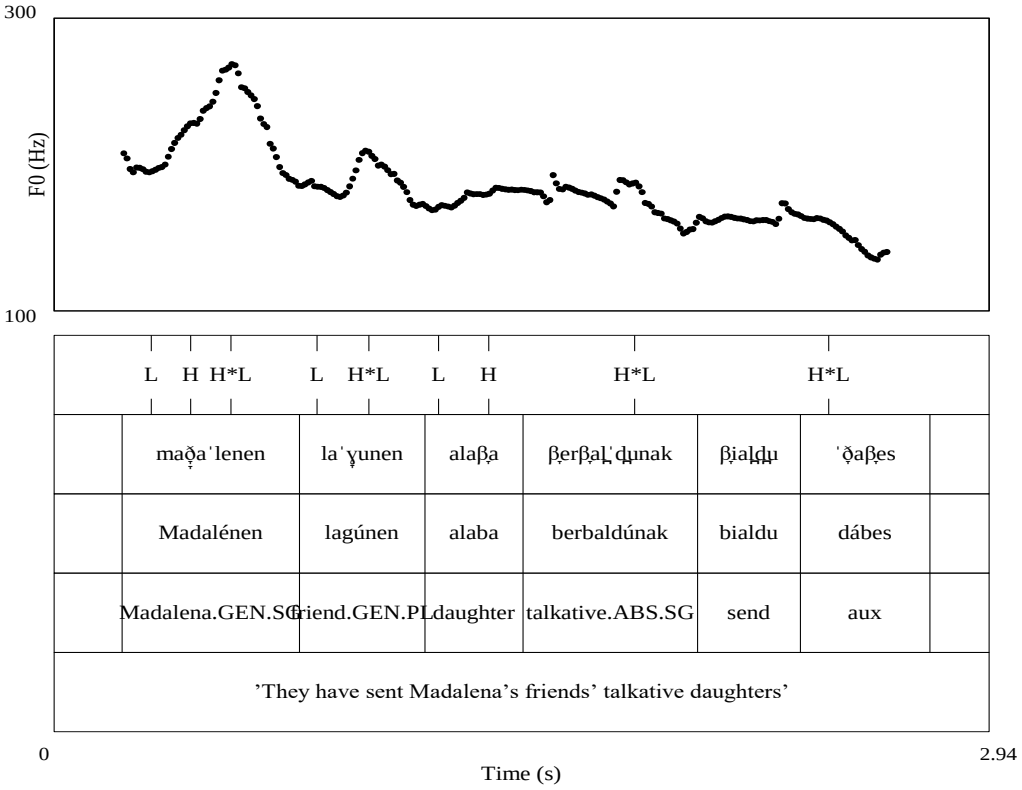
(29) Type II: $[\ [A_1][A_2]\ ]_{\mathbf{a}}\ [U_3]_{\mathbf{b}}\ [A_4]_{\mathbf{c}}$ verb

PO $\quad \iota(\ ((^{LH}A\ )_{\varphi min} \downarrow(\ ^{LH}A)_{\varphi min})_{\boldsymbol{\varphi max}}\ \uparrow(^{LH}UA\ )_{\boldsymbol{\varphi max}}$ verb-aux $)_\iota$

Turning now to (30), a sentence of Type III, it contains just a single verbal argument, unlike Types I, II and IV. In the case of (30) that single argument is a direct object: *Madalénen lagúnen alaba berbaldúnak bialdu-dábes* 'They have sent Madalena's friends' talkative

daughters'. The [[A_1][A_2]] and [[U_3]A_4] phrases together form a single argument constituent in MSO: $_{\mathbf{a}}$[[[A_1][A_2]] [[U_3]A_4]]$_{\mathbf{a}}$.[23]

(30) Type III: [[A_1][A_2]] [[U_3][A_4]]$_{\mathbf{a}}$ verb-aux



Note first that the absence of a LH edge tone at the left edge of A_4 indicates that U_3 and A_4 are sister ω within the same φ_{min}. This is not a surprise. We see a similar merging of U and A in Type I, where the [U] and [A] together form a phrase in MSO. The facts concerning pitch scaling, however, argue that the higher order φ structure in the PO of the Type III sentence is distinct from that of sentences of Types I and II. This can be seen in the pitch track in (30), where the entire span of the phrase *alaba berbaldúnak* that is formed by U_3 and A_4 is downstepped with respect to the pitch peak on *lagúnen,* A_2. This absence of pitch upstep means that the constituent *alaba berbaldúnak* is merely a φ_{min}, and so is subject to downstep. (31) pairs the relevant phrase structure of the MSO of the Type III sentence with the φ structure motivated by the pitch track in (30).

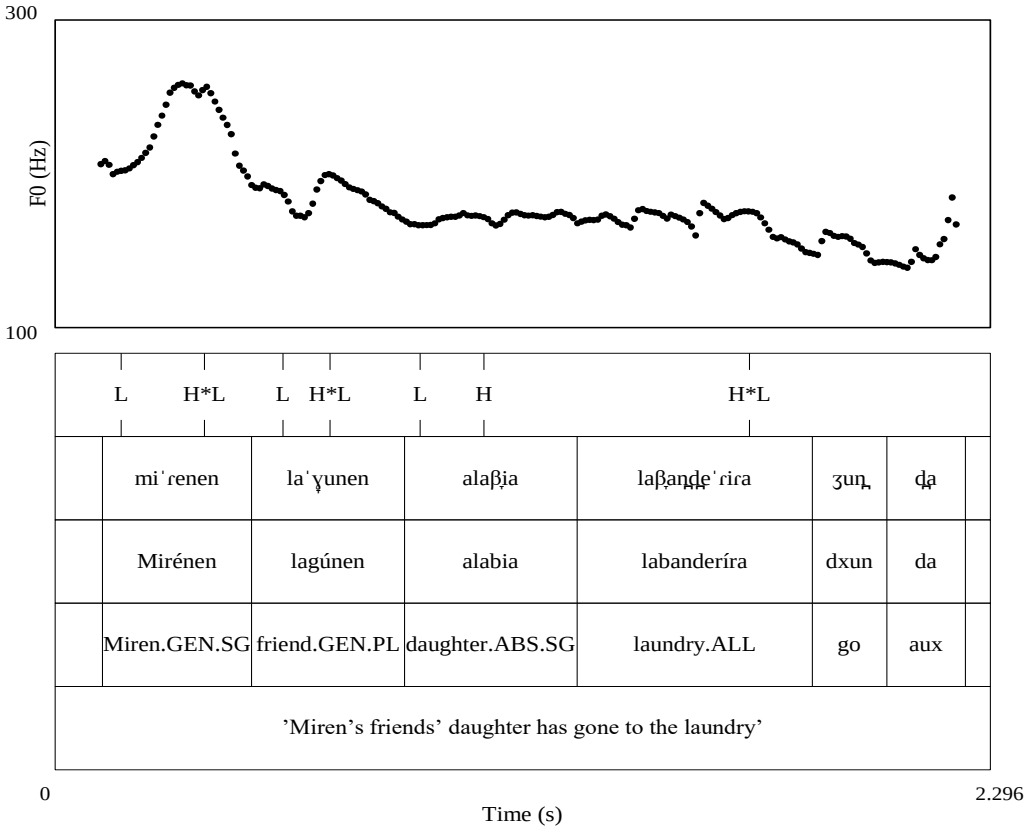
(31) Type III: [[A_1][A_2]] [[U_3][A_4]]$_{\mathbf{a}}$ verb-aux

[23] The fourth word in this Type III case is an adjective, which heads the adjective phrase [[U_3] A_4]. This lack of phrase status for a lexically accented adjective in MSO has no possible phonological consequences, since in any case, an accented word always acquires the status of a φ in PO, due to the phonological constraint system. See, e.g. Elordieta and Selkirk (2018).

PO $_{\iota}(\ (\boldsymbol{\varphi max}\ ((^{LH}A\ )_{\varphi min} \downarrow (\ ^{LH}A)_{\varphi min})\boldsymbol{\varphi nonmin} \downarrow (^{LH}UA)\boldsymbol{\varphi min}\ )\boldsymbol{\varphi max}$ verb-aux $)_{\iota}$

In our last case, Type IV, a three-word argument phrase containing [A_1], [A_2] and [U_3] is followed in the sentence by the postpositional phrase *labanderíra* 'to the laundry', which consists of just [A_4] alone: *Mirénen lagúnen alabia labanderíra dxun-da* 'Miren's friends' daughter has gone to the laundry'.

(32) Type IV: [[[A_1][A_2]] [U_3]]**a** [A_4]**b** verb



In the pitch track for this sentence type, the relation between U_3 and A_4 is particularly telling. We see a small LH rise from the initial syllable of the U_3 *alabia* to a position later in the same word from which a H plateau extends to the H of the accent on the penult of *labanderíra*, A_4. There is no initial LH rise on A_4. This tonal pattern means that U_3 and A_4 must form a minimal φ together. Such a φ structure creates a significant mismatch between the phrasal constituency of MSO and PO. Here the final word of a preceding phrase is grouped together with a word that constitutes an independent following phrase, while the earlier constituents of the preceding phrase remain grouped together in a distinct phrase. This 're-grouping' of U_3 and A_4 is illustrated in the PO of (33).

(33) Type IV: [[[A][A]] [U]]**a** [A]**b** verb-aux

PO: $((((^{LH}A_1)_{\varphi min} \downarrow(^{LH}A_2)_{\varphi min})_{\varphi nonmin} \downarrow(^{LH}U_3\ A_4)_{\varphi min})_{\varphi max}$ verb-aux)$_{\iota}$

As for the place of this $(U_3\ A_4)_{\varphi min}$ within the larger prosodic constituency of this sentence, we need to look at patterns of upstep and/or downstep. The observed lack of upstep between A_2 and U_3 implies that the constituent $(\omega\ \omega)_{\varphi min}$ that is formed by U_3 and A_4 forms part of same φ_{max} as the preceding complex genitive phrase *Mirénen lagúnen.* Indeed what we observe is a succession of downsteps through the sequence of φ_{min} that precede the verb. These are recorded with down arrows in the φ structure of (33). There is downstep of (A_2) *lagúnen* with respect to (A_1) *Mirénen,* and downstep of ($U_3\ A_4$) *alabia labanderíra* with respect to *lagúnen.* If instead *alabia labanderíra* were upstepped with respect to what precedes, this would be evidence of a φ_{max} status for this ($U_3\ A_4$) constituent. In that case, its pitch track would look like that seen with the Type I and Type II sentences. But in fact, as we will see in section 5.3, the pitch contour of the Type IV sentence is significantly different from those of the Types I and II, and similar to that of Type III. This is because the PO representations of Types III and IV are the same, as will be explained in section 6.

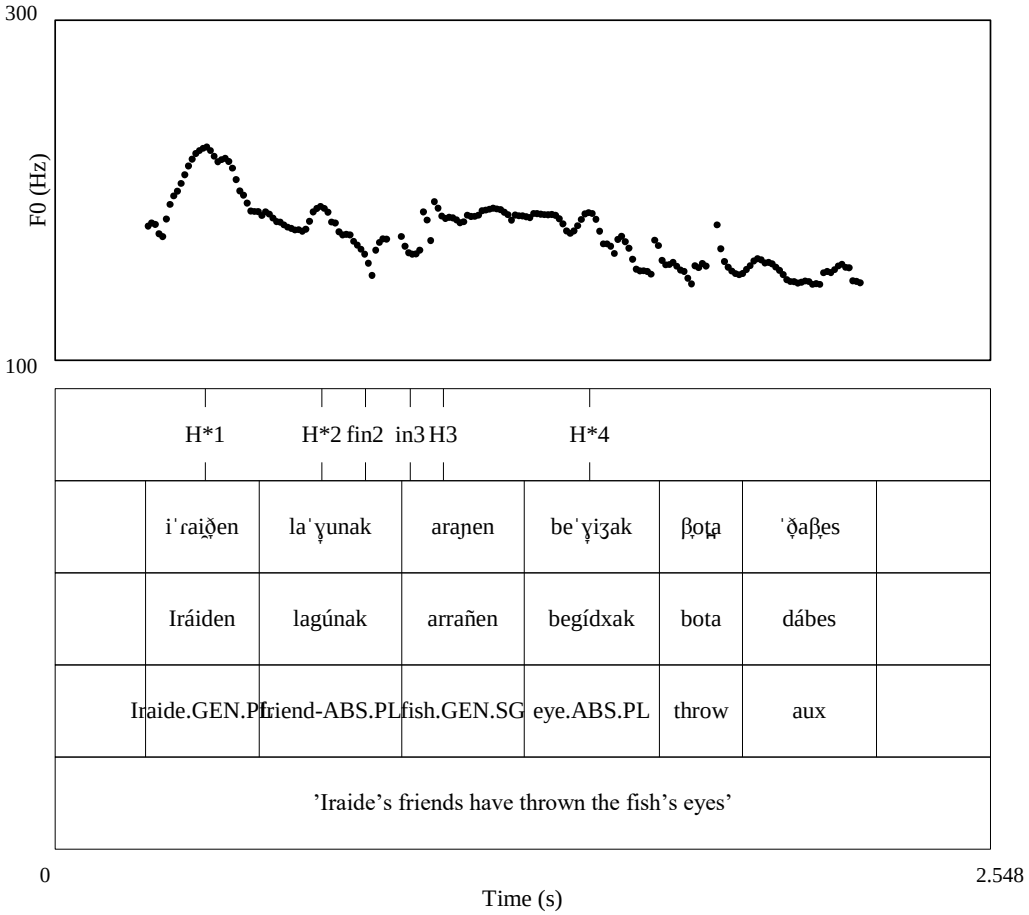
In section 5.3, we provide experimental evidence with quantitative data that helps establish the differences and similarities in the prosodic phrasing of sentences of Types I-IV. The conclusion will be that there is indeed a two-way distinction between the four sentences types: Types I and II display similar prosodic phrasings, different from Types III and IV, which themselves display similar prosodic phrasings.

5.3 Experimental evidence of the prosodic phrasing of sentence types I-IV

In an experiment designed to obtain quantitative data that could provide evidence for the prosodic phrasing of sentences of Types I-IV, we devised 5 sentences for each sentence type. We asked three native speakers of Lekeitio Basque (all female, ages 20-50) to pronounce each sentence in as natural a style as possible--as neutral, all-new ('broad focus') utterances. The total number of target sentences was 240 (4 sentence types x 5 sentences x 4 times x 3 speakers = 240 target sentences). There were also 720 filler sentences (i.e., three times as many filler sentences as target sentences). The total number of recorded utterances was 960, all in random order.

In the instance below of the display of the pitch track of the Type I sentence, the points at which the measurements required by this experiment are indicated with labels adapted for the purposes of the exposition. In the highest tier, the locus of each of the H-tone accented syllables in the $A_1A_2U_3A_4$ word sequence is indicated by a H*. H*1, for example, stands for the H* accent in A_1 (H* for short, as the pitch accent has been described as H*+L in the literature). H*2 stands for the H* accent in A_2. The point marked by H3 in U_3 marks the highest point of the contour extending between the LH left-edge tone appearing in U_3 and the H*4 of A_4. 'fin2' marks a measurement point in the final, post-H*2, syllable of A_2. 'in3' marks the measurement points in the initial syllables of U_3; it corresponds to the L of the LH edge-tone. The MSO of the sentence is indicated in the caption under the figure. The subject and the direct object are indicated with the subscripted labels DP-subj and DP-do, respectively, and the labels *a* and *b* in boldface are inserted in order to help keep track of the number of arguments in the sentence.

(34) Sample pitch track with tonal tier showing measurement points



Two phonetic calculations were made:

(i) The difference in F0 (measured in Hz) between H*2 and H3. H3 = the highest F0 value in the plateau in the UA sequence, excluding H*4. We abbreviate this calculation as *Diff. H*2 - H3*. With this measurement, the degree of downstep on the constituent formed by (U_3 A_4) with respect to H*2 (belonging to A_2) could be objectively observed. If there were downstep between the H*2 accent and the H3 of the LH rise, there would be a positive value for *Diff. H*2 - H3*. If there were upstep, the value would be negative.

(ii) The difference in F0 (measured in Hz) between H3 and the initial value of U_3, in3. We abbreviate this calculation as *Diff. H3 – in3*. With this measurement, the size of the LH rise at the left edge of the constituent formed by (U_3 A_4) could be objectively observed. The more positive the value of the subtraction, the larger the rise from L to H at the left edge of $(U_3\ A_4)_\varphi$, and the less positive the value, the smaller the rise from L to H at the left edge of $(U_3\ A_4)_\varphi$.

Both calculations returned an interesting, clear, two-way distinction. Types I and II had similar values for *Diff. H*2 - H3* and for *Diff. H3 – in3*. Types III and IV also had similar values for the same measurements.

For *Diff. H*2 - H3*, which measures downstep, Types I and II had values of 3 Hz and 7 Hz, respectively, for the pitch downtrend between H*2 of (… $A_2)_{\varphi max}$ and H3 in $(U_3\ A_4)_{\varphi max}$. This small amount of downtrend could be the result of the overall pitch declination in an utterance and is consistent with the predicted absence of downstep on the second of two φ_{max} sisters. Types III and IV, however, had values of 20 Hz and 18 Hz, thus indicating a substantial amount of downstep on $(U_3\ A_4)_{\varphi}$. A one-way ANOVA revealed a statistically significant difference between both groups [$F(3, 233)=57.340$, $p < .001$].

For *Diff. H3 – in3*, which measures the amount of φ-initial LH rise, Types I and II had values of 19 Hz and 17 Hz, respectively. That is, there was a substantial rise from L to H in $(U_3\ A_4)_{\varphi}$. Types III and IV, however, had values of 7 Hz and 9 Hz, and hence it seems that the rise from L to H was much smaller. A one-way ANOVA revealed a statistically significant difference between both groups [$F(3, 235)=38.848$; $p < .001$].

Summing up, what these results show is that $(U_3\ A_4)_{\varphi}$ is of the φ_{min} level in Types III-IV in PO (shown by the substantial amount of downstep, i.e. absence of upstep). By contrast, in the PO of Types I-II, $(U_3\ A_4)_{\varphi}$ appears to be of the higher level φ_{max} (while at the same time a $\varphi_{min,}$ in that it has only ω daughters). The significant upstep in F0 that is found at the right edge of $(U_3\ A_4)_{\varphi max,min}$ in Types I and II is due to its status as a maximal φ. Thus, the quantitative data reported here demonstrate that the individual pitch tracks of the utterances of sentences of Types I-IV that were examined in 5.1 are representative of a general pattern. They establish the solidity of the preliminary analyses made in section 5.1 of the prosodic φ structure of the output phonological representations (PO) of the four sentence types that are the object of our study.

6 Phonology-driven mismatches between PI and PO: the role for unaccentedness

In this section, we begin by showing that the PO φ structures attested in section 5 for the members of the AAUA quadruplet are indeed the optimal outcomes of the phonology, if we assume that there is a key role for the constraint ranking $*(U^n)_{\varphi}$ >> MAX(φ), DEP(φ). In section 4.2 this ranking was fundamental in accounting for the phrasal mismatches in UUUU sentences (cf. tableau (22)).

6.1 Sentence Type I: φ-deletion mismatches

The example sentence *Iráiden$_N$ lagúnak$_N$ arrañen$_N$ begídxak$_N$ bota-dábes$_V$* 'Iraide's friends have thrown the fish's eyes' from (26) in section 5.2 is an AAUA sentence of Type I. As we saw in section 5.2, the [[U][A]] phrase of MSO forms a single minimal φ in PO, one which immediately dominates only prosodic words: $(U_{\omega}\ A_{\omega})_{\varphi}$.[24] Since it is the spell-out constraint MatchPhrase_{LEX} that is operative in Lekeitio Basque, the MSO of this Type I sentence, (35), is spelled out in PI

[24] To declutter the visual presentation, bracketing for prosodic words, e.g. $(A)_{\omega}$, are not included in PI and PO representations.

without any φ that matches the PredPhrase, which dominates all the arguments of the sentence, but not the verb.

(35) MSO-PI-PO for Type I: *Iráiden$_N$ lagúnak$_N$ arrañen$_N$ begidxak$_N$ bota-dábes$_V$*

MSO [[[[A1][A2]]**a** [[U3][A4]]**b**]PredP [verb-aux]]ΣP (='clause')

PI ι(((A)φ(A)φ)**φa** ((U)φ(A)φ)**φb** (verb-aux)**φc**)ι

PO ι(((LHA)φ(LHA)φ)**φa** (LHUA)**φb** verb-aux)ι

'Iraide's friends have thrown the fish's eyes'

The change in φ structure from PI to PO involves just the second argument of the sentence: ((U)φ (A)φ)φ**b** → (LHUA)φ**b**. This constituency mismatch between PI and PO involves only loss of φ status in PO for the U and A constituents within argument *b*.

Judging by the intact φ status of the individual (A)φ constituents within the preceding φ-max ((A)φ (A)φ)φa in the PO of the same sentence, the unaccented status of the U in the second φ-max must be responsible for the nonoptimality of the faithfully phrased constituent *((U)φ (A)φ)φ in PO. Our constraint (21) NO-A-LESS-φ, abbreviated *(U^n)φ, comes into play here, but it cannot do the whole job. What rules out the nested *(U (A)φ)φ where only the U constituent has lost φ status in PO? The absence of φ status for the A word in the optimal (UA)φ requires a distinct explanation. We propose that the prosodic markedness constraint EQUALSISTERS is at play.

(36) EQUALSISTERS (Myrberg 2013) [Abbreviation: EQLSIS]
Sister nodes in prosodic structure are instantiations of the same prosodic category.

The tableau in (37) illustrates the role of this constraint. Violations of EQLSIS are indicated by a vertical line between the two sister prosodic categories that involve a violation of this constraint.

(37) Type I: MSO and Tableau (PI-to-PO)[25]

[[[[A1][A2]]DP-subj **a** [[U3][A4]]DP-do **b**]PredP [verb-aux]TP]clause

PI ι(**a**((A1)5 (A2)6)**a** **b**((U3)7 (A4)8)**b** ...)ι	EQLSIS	*(U^n)φ	MAX(φ)	DEP(φ)

[25] In all of the tableaux in this and the following sections, the sentence-final verbal complex is not shown. One principled reason for this is that, due to the "extrametricality" the verb, it must lie external to the φ organization of the AAUA words that precede. (Recall the discussion at the end of section 4.2.) Given this, and given the limitations of space in the tableaux, which include candidates that are entire sentences and a fair number of constraints occupying columns to the right, excluding the verb seemed desirable.

PO				
a. $_{\iota}($ **$_{a}$**$((A_1)_5\,(A_2)_6\,)$**$_{a}$** **$_{b}$**$(\,(U_3)_7\,(A_4)_8)$**$_{b}$** ...$)_{\iota}$		$*_7$		
b. $_{\iota}($ **$_{a}$**$((A_1)_5\,(A_2)_6\,)$**$_{a}$** **$_{b}$**$(\,U_3\,(A_4)_8\,)$**$_{b}$** ... $)_{\iota}$	$*_{3\|8}$		$*_7$	
$\Rightarrow$ c. $_{\iota}($ **$_{a}$**$((A_1)_5\,(A_2)_6\,)$**$_{a}$** **$_{b}$**$(U_3\,A_4)$**$_{b}$** ... $)_{\iota}$			$*_7\,*_8$	

In order to make the relations between the constituents of PI and PO in the tableaux that follow more readily readable and understandable, the four prosodic words (ω) in the sequence AAUA are subscripted with the numerals 1, 2, 3, 4 in both PI and PO; they are not given ω brackets. The brackets of the φ's which immediately dominate these ω's or other φ's are given the subscripts 5,6,7,8,9,0. The subscript letters a,b,c identify φ's corresponding to the φ-max's of the sentence in PI. And the subscript letters x,y,z identify any φ's which are inserted in PO and thus correspond to no φ of PI.

As we see in the tableau in (37) the constraints $*(U^n)_{\varphi}$ and EQLSIS are in competition with and outrank the simple prosodic structure faithfulness constraint MAX(φ), which calls for a φ in the input representation PI to correspond to a φ in the output representation PO. The optimal candidate in (37) is (c), where the high-ranked markedness constraints $*(U^n)_{\varphi}$ and EQLSIS are both satisfied due to loss of φ status for the U and for the following A.

6.2 Sentence Type III: φ-deletion mismatch

This similar, limited, PI-PO mismatch-- $(\,(U)\,A\,)_{\iota} \rightarrow (\,U\,A\,)_{\iota}$ -- is found in a Type III sentence like *Madalénen lagúnen alaba berbaldúnak bialdu-dábes* 'They have sent Madalena's friends' talkative daughters', whose PI tree is shown in (16) in section 4.1. In such a sentence, the phrasal constituent containing U and A is preceded by a two-word genitive phrase within the same single verbal argument of the sentence. Note also that the adjective, which is the nonphrasal head of the AdjP, is not itself spelled out as a φ in PO, only as ω. Recall that for reasons of space and for clutter reduction, as a convention, we do not label the A and U words with ω. The numbers 1-4 indicate which the words are.

(38) MSO-PI-PO for Type III: *Madalénen$_N$ lagúnen$_N$ alaba$_N$ berbaldúnak$_A$ bialdu-dábes$_V$*

MSO $[\,[\,[[A_1][A_2]]\,[[U_3]\,A_4]\,]_{\mathbf{a}}\,]_{\text{PredP}}$ [verb-aux] $]_{\Sigma\text{P (='clause')}}$

PI $_{\iota}($ **$_{\varphi a}$**$(\,((A)_{\varphi}(A)_{\varphi})_{\varphi}\,((U)_{\varphi}A)_{\varphi}\,)$**$_{\varphi a}$** (verb-aux)**$_{\varphi b}$** $)_{\iota}$

PO $_{\iota}($ **$_{\varphi a}$**$(\,((A)_{\varphi}\,(A)_{\varphi}\,)_{\varphi}\,(UA)_{\varphi}\,)$**$_{\varphi a}$** verb-aux $)_{\iota}$

'They have sent Madalena's friends' talkative daughters'

In this sentence type, as with a sentence of Type I, the only PI-PO mismatch is of the φ-'deletion' variety: $((U)_{\varphi}\ A)_{\varphi}$ in PI becomes $(U\ A)_{\varphi}$ in PO. Candidate (c) in tableau (39) for the Type III sentence is chosen as optimal by the same constraint ranking as in (37).

(39) Type III: MSO and Tableau (PI-to-PO)

[[[[A_1][A_2]] [[U_3] [A_4]]]**a**]$_{PredP}$ [verb-aux]]$_{\Sigma P}$ (='clause')

PI $_{\iota}($ **a**$($ $(_8\ (A_1)_5\ (A_2)_6)_8\ (_9\ (U_3)_7\ A_4\ )_9\ )$**a** ...$)_{\iota}$	EQLSIS	$*(U*)_{\varphi}$	MAX(φ)	DEP(φ)
PO a. $_{\iota}($ **a**$($ $(_8\ (A_1)_5\ (A_2)_6\ )_8\ (_9\ (U_3)_7\ A_4\ )_9\ )$**a** ...$)_{\iota}$		$*_7$		
b. $_{\iota}($ **a**$($ $(_8\ (A_1)_5\ (A_2)_6\ )_8\ (_9\ U_3\ (A_4)_0\ )_9\ )$**a** ...$)_{\iota}$	$*_{3\|8}$		$*_7$	$*_0$
⇒ c. $_{\iota}($ **a**$($ $(_8\ (A_1)_5\ (A_2)_6\ )_8\ (_9\ U_3\ A_4\ )_9\ )$**a** ...$)_{\iota}$			$*_7$	

6.3 Sentence Type II: φ-deletion and φ-insertion combine

We turn next to an AAUA sentence of the Type II variety: *Iráiden lagúnak alabiari bideúak erregala-dótzes* 'Iraide's friends have given videos to the daughter'. It contains three arguments and has the MSO in (40). In section 5 we saw from the distribution of the LH rise in the PO of a Type II sentence, that the U and the following A, which correspond to the second and third argument phrases of the MSO, form a single minimal φ in PO, one which immediately dominates only prosodic words: $(\ U\ A\ )_{\varphi min.}$ As daughter of ι, this phrase also qualifies as a maximal φ. In other words, the PO of the Type II sentence is identical to that of Type I.

(40) MSO-PI-PO of Type II: *Iráiden*$_N$ *lagúnak*$_N$ *alabiari*$_N$ *bideúak*$_N$ *erregala-dótzes*$_V$

MSO [[[[A_1][A_2]]**a** [U_3]**b** [A_4]**c**]$_{ApplP}$]$_{PredP}$ [verb-aux]]$_{\Sigma P}$ (='clause')

PI $_{\iota}(\ ((A)_{\varphi}(A)_{\varphi})_{\varphi\mathbf{a}}\ (U)_{\varphi\mathbf{b}}\ (A)_{\varphi\mathbf{c}}\ (\text{verb-aux})_{\varphi}\ )_{\iota}$

PO $_{\iota}(\ (([^{LH}A)_{\varphi}([^{LH}A)_{\varphi})_{\varphi\mathbf{a}}\ ([^{LH}UA\ )_{\varphi\mathbf{x}}\ \text{verb-aux}\ )_{\iota}$

'Iraide's friends have given videos to the daughter'

Though in the PO of this 3-argument sentence type the φ structure is identical to the φ structure of the two-argument sentence of Type I above, this time the joining of the U and A as sister ω's within a minimal φ involves the presence in PO of a φ, subscripted with x, that is not the 'same' φ as any in the input PI. This φ_x in PO might well involve a violation of the

faithfulness constraint DEP (φ). In that case, the empirically attested 'merged' φ of PO would emerge as optimal, given the constraint ranking that is so far in play:

(41) Type II: MSO and Tableau (PI-to-PO)

[[[[A_1][A_2]]**a** [[U_3]**b** [A_4]**c**]$_{ApplP}$]$_{PredP}$ [verb-aux]]$_{\Sigma P}$ (='clause')

PI $_{\iota}$(**a**((A_1)$_5$ (A_2)$_6$)**a** **b**(U_3)**b** (**c** A_4)**c** ...)$_{\iota}$	EQLSIS	*(U*)$_{\varphi}$	MAX(φ)	Dep(φ)
PO				
a. $_{\iota}$(**a**((A_1)$_5$ (A_2)$_6$)**a** **b**(U_3)**b** **c**(A_4)**c** ...)$_{\iota}$		*$_b$		
b. $_{\iota}$(**a**((A_1)$_5$ (A_2)$_6$)**a** U_3 **c**(A_4)**c** ...)$_{\iota}$	*$_{a\|3\|c}$		*$_b$	
c. $_{\iota}$(**a**((A_1)$_5$ (A_2)$_6$)**a** **x**(U_3 (A_4)**c**)**x** ...)$_{\iota}$	*$_{3\|c}$		*$_b$	*$_x$
⇒ d. $_{\iota}$(**a**((A_1)$_5$ (A_2)$_6$)**a** **x**(U_3 A_4)**x** ...)$_{\iota}$			*$_b$ *$_c$	*$_x$
e. $_{\iota}$(**z**((A_1)$_5$ $_y$((A_2)$_6$ U_3)$_y$)**z** **c**(A_4)**c** ...)$_{\iota}$	*$_{6\|3}$		*$_a$ *$_b$	*$_z$ *$_y$
f. $_{\iota}$(**z**((A_1)$_5$ (A_2 U_3)$_y$)**z** **c**(A_4)**c** ...)$_{\iota}$			*$_a$ *$_b$ *$_6$	*$_y$ *$_z$

The lower rank of the prosodic faithfulness constraints DEP(φ) and MAX(φ) with respect to the prosodic markedness constraints EQLSIS and *(U^n)$_{\varphi}$ has the interesting result that sentences of both Types I and II end up with identical prosodic structures in PO, with (UA)$_{\varphi}$ as the final preverbal constituent. The pitch contours and statistical analysis of section 5 testify to the identity of the POs of the Type I and Type II cases. Note that EQLSIS has two different functions here: it rules out the nested φ structure in the φ labelled x in candidate (c), and it rules out the φ-ω-φ sequence in candidate (b).

We have not yet accounted for the ungrammaticality of the two other candidates *e* and *f*, in which the medial U has instead been incorporated into the prosodic constituent that matches up with the preceding subject phrase. In candidate *e* the medial U is adjoined to the second A of the subject phrase, creating a new φ_y; a new φ_{max}, labelled *z*, is thereby created, and the φ_a that spelled out the subject phrase in PI is supplanted. Candidate *f* shows these violations of constituency faithfulness constraints, and the additional violation of MAX(φ) that would be entailed by the elimination of the EqualSisters violation attested in candidate *e*.

The simple ranking of the markedness constraints on prosodic constituent structure (EQLSIS and *(U*)$_{\varphi}$) higher than the simple prosodic constituency faithfulness constraints MAX(φ) and Dep(φ) suffices to account for the optimality of the combined φ-insertion and φ-deletion mismatches which put together the (U) and (A) of two argument phrases of PI to create a single new (UA)$_{\varphi}$ in PO. So this same simple constraint ranking succeeds in accounting for the output φ structures of three members of the AAUA minimal quadruplet.

But before we move on to the final sentence type of the AAUA quadruplet, there's an alternative to the analysis of the Type II case that must be considered. Suppose that the φ in PO that is labelled with subscript x is instead the same φ as the φ labelled $(A_4)_{\mathbf{c}}$ in the PI representation, and that in PO that $\varphi_{\mathbf{c}}$ has expanded to include the preceding U: $(U\ A_4)_{\mathbf{c}}$**.** This would mean that optimal candidate (d) does not violate Dep(φ). Instead it would violate a faithfulness constraint of the IDENT family (McCarthy and Prince 1994,1999), which would evaluate the sameness of the phonological properties of corresponding units (here, φ constituents) of PI and PO. We suggest there is an IDENT constraint that calls for the sequence S_q of prosodic words (ω) in a φ in PO to be identical to the word sequence of that φ in PI.

(42) IDENT(S_q-OF-φ) [= "No change in sequence of ω's in a φ"]

The sequence S_q of one or more prosodic words (ω) in a φ of PI is the same as the sequence S_q of ω in that φ in PO.

Given that IDENT (S_q-OF-φ) must be a member of the universal constraint repertoire, we will need to determine whether its addition to the constraint ranking that already is already playing a role in our analysis would have any undesirable results, if we make the necessary assumption that a candidate containing an 'expanded $\varphi_{\mathbf{c}}$'-- namely $(U\ A_4)_{\mathbf{c}}$ -- belongs to the set of candidates for PO status in the case of a Type II sentence instead of the candidate $(U\ A_4)_{\mathbf{x}}$ seen above in tableau (99).

(43) Type II: MSO and Tableau (PI-to-PO) [Revised]

[[[[A_1][A_2]]$_{\mathbf{a}}$ [[U_3]$_{\mathbf{b}}$ [A_4]$_{\mathbf{c}}$]$_{\text{ApplP}}$]$_{\text{PredP}}$ [verb-aux]]$_{\Sigma\text{P (='clause')}}$

PI $_{\iota}(\ _{\mathbf{a}}((A_1)_5\,(A_2)_6\,)_{\mathbf{a}}\ \ _{\mathbf{b}}(U_3)_{\mathbf{b}}\ \ (_{\mathbf{c}}\,A_4)_{\mathbf{c}}\ \ldots\ )_{\iota}$	EQLSIS	$*(U*)_{\varphi}$	MAX(φ)	Dep(φ)	IDENT (S_q-OF-φ)
PO					
a. $_{\iota}(\ _{\mathbf{a}}(\ (A_1)_5\,(A_2)_6\,)_{\mathbf{a}}\ \ _{\mathbf{b}}(\ U_3)_{\mathbf{b}}\ \ _{\mathbf{c}}(A_4)_{\mathbf{c}}\ \ldots\ )_{\iota}$		$*_{\mathbf{b}}$			
b. $_{\iota}(\ _{\mathbf{a}}(\ (A_1)_5\,(A_2)_6\,)_{\mathbf{a}}\ \ U_3\ \ _{\mathbf{c}}(A_4)_{\mathbf{c}}\ \ldots\ )_{\iota}$	$*_{\mathbf{a}\|3\|\mathbf{c}}$		$*_{\mathbf{b}}$		
c. $_{\iota}(\ _{\mathbf{a}}(\ (A_1)_5\,(A_2)_6)_{\mathbf{a}}\ \ _{\mathbf{x}}(U_3\ (A_4)_{\mathbf{c}}\ )_{\mathbf{x}}\ \ldots\ )_{\iota}$	$*_{3\|\mathbf{c}}$		$*_{\mathbf{b}}$	$*_{\mathbf{x}}$	
⇒ d. $_{\iota}(\ _{\mathbf{a}}(\ (A_1)_5\,(A_2)_6)_{\mathbf{a}}\ \ _{\mathbf{c}}(\ U_3\,A_4\,)_{\mathbf{c}}\ \ldots\ )_{\iota}$			$*_{\mathbf{b}}$		$*_{\mathbf{c}}$
e. $_{\iota}(\ _{\mathbf{z}}(\ (A_1)_5\,_{\mathbf{y}}(\ (A_2)_6\ \ U_3)_{\mathbf{y}}\,)_{\mathbf{z}}\ \ _{\mathbf{c}}(A_4)_{\mathbf{c}}\ \ldots\ )_{\iota}$	$*_{6\|3}$		$*_{\mathbf{a}}\ *_{\mathbf{b}}$	$*_{\mathbf{z}}\ *_{\mathbf{y}}$	
f. $_{\iota}(\ _{\mathbf{z}}(\ (A_1)_5\,(A_2\ \ U_3)_6\,)_{\mathbf{z}}\ \ _{\mathbf{c}}(A_4)_{\mathbf{c}}\ \ldots\ )_{\iota}$			$*_{\mathbf{a}}\ *_{\mathbf{b}}$	$*_{\mathbf{z}}$	$*_6$

The addition of IDENT(S_q-OF-φ) to the repertoire of faithfulness constraints holding of φ structures in PI and PO still yields (d) as the optimal candidate under the assumption that the φ

containing the UA sequence is the same in PI and PO. The overall count of faithfulness violations incurred by (d) has simply changed columns, from Dep(φ) in (99) to IDENT(S_q-OF-φ) in (43).

6.4 Sentence Type IV: A complex deletion and insertion mismatch

In the Type IV sentence, a more radical mismatch between the PI and PO representations is found. In MSO a three-word AAU argument is followed by a single-word A argument. This organization of two argument phrases is spelled out by $\text{MatchPhrase}_{\text{LEX}}$ as the φ organization in the PI of (44). In the PO output of this sentence type, however, all the words of this AAUA sequence are all contained within a single, mismatching, φ-max (see (33) in section 5).[26] These mismatches in constituency are visible in the φ structure representations in (44). In PO, the whole sequence AAUA is grouped in a single φ_y that does not correspond to a φ in PI. Recall that PredPhrase is *not* spelled out as a φ in PI. As for the preverbal adjunct phrase $[A_4]_{\mathbf{b}}$, in PO it joins with the head noun U_3 of the preceding three-word subject phrase to form a minimal φ in which they are sisters: $(UA)_{\boldsymbol{\varphi}}$. This $(UA)_{\boldsymbol{\varphi}}$ forms part of the new φ_y that contains the entire AAUA sequence.

(44) MSO-PI-PO of Type IV: *Mirénen$_N$ lagúnen$_N$ alabia$_N$ labanderíra$_N$ jun-da$_V$*

MSO [[[[[A_1][A_2]] [U_3]]$_{\mathbf{a}}$ [A_4]$_{\mathbf{b}}$]$_{\text{PredP}}$ [verb-aux]]

PI $_{\iota}$(((A_1)$_{\varphi}$ (A_2)$_{\varphi}$)$_{\varphi}$ (U_3)$_{\varphi u}$)$_{\boldsymbol{\varphi a}}$ (A_4)$_{\boldsymbol{\varphi b}}$ (verb-aux)$_{\varphi}$)$_{\iota}$

PO $_{\iota}$($_{\boldsymbol{\varphi y}}$((($A_1$)$_{\varphi}$ (A_2)$_{\varphi}$)$_{\varphi}$ (U_3 A_4)$_{\boldsymbol{\varphi b}}$)$_{\boldsymbol{\varphi y}}$ verb-aux)$_{\iota}$

'Miren's friends' daughter has gone to the laundry.'

But we will see that the simple system of ranked constraints developed so far does *not* provide an explanation for why a Type IV sentence has the φ structure ((A)(A)) (UA))$_{\varphi\text{-max}}$ in PO—the same as the Type III sentence in (40). This is revealed in tableau (45) below. The current constraint ranking does not derive the correct output. It fails to deliver as optimal the candidate in which all of the preverbal constituents and the sequence of AAUA they contain form part of the same single φ_{max}.

(45) Type IV: MSO and Tableau (PI-to-PO) [*Constraints and their ranking predict* incorrect *PO*]

MSO: [[[[[A_1][A_2]] [U_3]]$_{\mathbf{a}}$ [A_4]$_{\mathbf{b}}$]$_{\text{PredP}}$ [verb-aux]]$_{\Sigma\text{P}}$ (='clause')

PI $_{\iota}$(**a**(((A$_1$)$_5$ (A$_2$)$_6$)$_9$ (U$_3$)$_7$)**a** **b**(A$_4$)**b** ...)$_{\iota}$	EQLSIS	*(U^n)$_{\varphi}$	MAX (φ)	DEP (φ)	IDENT (S_q-OF-φ)

[26] Recall from the discussion in section 5.3 that the pitch contours of Type IV sentences are statistically indistinguishable from the pitch contours of sentences of Type III (such as in (30)).

PO a. ι(**a**(9 ((A1)5 (A2)6)9 (U3)7)**a** **b**(A4)**b** ...)ι		*7			
b. ι(**a**((9 (A1)5 (A2)6)9 U3)**a** **b**(A4)**b** ...)ι	*9|3		*7		
c. ι(**9**((A1)5 (A2)6)**9** U3 **b**(A4)**b** ...)ι	*9|3|b		*7 *a		
d. ι(**9**((A1)5 (A2)6)**9=φmax** **x**(U3(A4)b)**x=φmax** ...)ι	*3|b		*7 *a	*x	
⇒ INCORRECT e. ι(**9**((A1)5 (A2)6)**9=φmax** **b**(U3 A4)**b=φmax** ...)ι			*7 *a		*b
f. ι(**y**(9((A1)5 (A2)6)9 x(U3 (A4)b)x)**y=φmax**...)ι	*3|b		*7 *a	*x*y	
⇒ CORRECT g. ι(**y**(9((A1)5 (A2)6)9 b(U3 A4)b)**y=φmax** ...)ι			*7 *a	*y	*b

For the sake of brevity, we have taken the merging of U_3 and A_4 as a φ_{min} in PO to be the case where, in PO, the U_3 that constitutes φ_u in PI is (re)grouped within the same φ_b that contains A_4 in PI, namely as **b**(U_3 A_4)**b**. As we saw in the preceding section, there are options for analyzing the 'merging' of two φ of PI as a single φ in PO, though the outcomes have the same number of faithfulness constraint violations.

Looking at the tableau, it appears that "extracting" the U out of the initial φ_{max} of the sentence and "incorporating" it into the second φ_{max} is not permitted. This is apparently too great a violence of constituency faithfulness, one which the combined forces of the simple faithfulness constraints MAX(φ), DEP(φ) and IDENT(S_q-OF-φ) do not capture. We suggest that an additional faithfulness constraint is at play, a positional faithfulness constraint[27] which protects the integrity of the initial phrasal constituent of the sentence:

(46) IDENT (S_q-OF-ι-INITIAL-φ_{max})

> The sequence S_q of the prosodic words (ω) in the PI representation of the ι-initial φ_{max} of a sentence must be contained in the ι-initial φ_{max} of the PO representation of the sentence.

With a high ranking of the faithfulness constraint IDENT (S_q-OF-ι-INITIAL-φ_{max}), as shown in (47), the analysis of the Type IV mismatch is at hand.

[27] Other documented types of positional faithfulness in phonology include, for example, the tendency for the tonal or segmental properties of phonological units that are initial in a constituent of PO to remain faithful to the corresponding properties in PI (Beckman (1996), Barnes 2006, McCarvel and Kaplan 2019).

(47)
MSO: [[[[[A_1][A_2]] [U_3]]**a** [A_4]**b**]$_{PredP}$ [verb-aux]]$_{\Sigma P}$ (='clause')

PI $_{\iota}$(**a**(((A$_1$)$_5$ (A$_2$)$_6$)$_9$ (U$_3$)$_7$)**a** **b**(A$_4$)**b** ...)$_{\iota}$	EQLSIS	*(U^n)$_{\varphi}$	IDENT (S$_q$-OF $_{\iota}$(φ_{max}	MAX (φ)	DEP (φ)	IDENT (S$_q$-OF-φ)
PO						
a. $_{\iota}$(**a**(9 ((A$_1$)$_5$ (A$_2$)$_6$)$_9$ (U$_3$)$_7$)**a** **b**(A$_4$)**b** ...)$_{\iota}$		*$_7$				
b. $_{\iota}$(**a**((9 (A$_1$)$_5$ (A$_2$)$_6$)$_9$ U$_3$)**a** **b**(A$_4$)**b** ...)$_{\iota}$	*$_{9\|3}$			*$_7$		
c. $_{\iota}$(**9**((A$_1$)$_5$ (A$_2$)$_6$)**9** U$_3$ **b**(A$_4$)**b** ...)$_{\iota}$	*$_{9\|3\|b}$		*U$_3$	*$_7$ *$_a$		
d. $_{\iota}$(**9**((A$_1$)$_5$ (A$_2$)$_6$)**9=φmax** **x**(U$_3$(A$_4$)$_b$)**x=φmax** ...)$_{\iota}$	*$_{3\|b}$		*U$_3$	*$_7$ *$_a$	*$_x$	
e. $_{\iota}$(**9**((A$_1$)$_5$ (A$_2$)$_6$)**9=φmax** **b**(U$_3$ A$_4$)**b=φmax** ...)$_{\iota}$			*U$_3$	*$_7$ *$_a$		*$_b$
f. $_{\iota}$(**y**(9((A$_1$)$_5$ (A$_2$)$_6$)$_9$ $_x$(U$_3$ (A$_4$)$_b$)$_x$) **y=φmax**...)$_{\iota}$	*$_{3\|b}$			*$_7$ *$_a$	*$_x$*$_y$	
⇒ g. $_{\iota}$(**y**(9((A$_1$)$_5$ (A$_2$)$_6$)$_9$ $_b$(U$_3$ A$_4$)$_b$)**y=φmax** ...)$_{\iota}$				*$_7$ *$_a$	*$_y$	*$_b$

The nonoptimal candidates (c), (d) and (e) all violate IDENT (S$_q$-OF-ι-INITIAL-φ_{max}). In them U$_3$ does not form part of the ι-initial φ_{max} of the PO. That is lethal, due to the high rank of IDENT (S$_q$-OF-ι-INITIAL-φ_{max}) that is posited in (47). The best of these three nonoptimal candidates is (e), which does satisfy the high-ranked prosodic markedness constraints. Yet (e) does not win out over candidates (f) and (g), which also satisfy the high-ranked markedness constraints, even though it fares better than (f) and (g) with respect to the faithfulness constraint DEP(φ). But in candidates (f) and (g), the 'misparsing' of A$_4$ as part of the preceding, enlarged, ι-initial φ_{max} of PO, allows them to satisfy the higher ranked IDENT (S$_q$-OF-ι-INITIAL-φ_{max}). This is because the sequence of three ω's of the ι-initial φ_{max} in PI — A$_1$ A$_2$ U$_3$ --- are contained in the ι-initial φ_{max} in PO in both cases. It's candidate (g) that is optimal because its newly minted $_x$(U$_3$ A$_4$)$_x$ in PO also satisfies the prosodic markedness constraints EQLSIS.

There is a plausible motivation for the existence of the crucial faithfulness constraint IDENT (S$_q$-OF-ι-INITIAL-φ_{max}). In a language like Lekeitio Basque, where MatchPhrase$_{LEX}$ is responsible for spelling out the phrasal constituents of MSO as φ in PI, verbal arguments and adjuncts are each spelled out as φ_{max}. We have seen in sections 4.1 and 5.2-5.3 that the φ_{max} status of a phrase is reflected in the presence of pitch upstep at its left edge. If we make the plausible assumption that phonetic and phonological cues to the prosodic constituent structure of

PO are taken into account in the psycholinguistic parsing and comprehension of a sentence (Frazier et al (2006)), it would be plausible to hypothesize that a phonological theory of prosodic structure faithfulness constraints might seek to minimize in PO any loss of information about MSO constituency that is conveyed by the φ_{max} status of constituents in PI (cf. section 3.2). In the *non-optimal* candidate (e) in (47) the newly formed $(UA)_{\varphi max}$ constituent in PO would be pronounced with upstep, a salient phonetic property which would flag this egregiously mismatching constituent as a $\varphi_{max,}$ creating a pitfall for the proper parsing and comprehension of the sentence. IDENT (S_q-OF-ι-INITIAL-φ_{max}) rules out that sort of mismatch.[28]

6.5 Faithfulness to φ_{max} status is a phonological phenomenon, not a matter for Match theory

The success of a phonological PI-PO faithfulness constraint that makes appeal to the maximal status of a φ in explaining the mismatch in Type IV can be taken as an argument for the MSO-PI-PO model of the relation between MSO and PO. In this model, MSO has influence on the structure of PO only through its relation to the representation of φ structure in PI. And it's only in phonological representation (both in PI and in PO) that the notion of φ maximality that's relevant to restricting constituency mismatches is independently motivated.

In an article that assumes the earlier Match theory of the interface between prosodic constituency and (morpho)syntactic constituency, put forward in Selkirk (2009, 2011), Ishihara (2014) exploits a somewhat different idea of faithfulness to phrasal maximality in his account of an important syntax-phonology constituency mismatch in Tokyo Japanese.[29] Would the availability of this alternative theory of faithfulness remove the motivation for the MSO-PI-PO theory of the MSO-PO relation that the solution for the constituency mismatches from the Type IV sentences of Lekeitio Basque seems to provide?

In Selkirk 2011 Match constraints on the MSO-PO interface were construed (admittedly rather loosely) as faithfulness constraints which could interact in a constraint ranking with phonological markedness constraints on PO. In their work on the syntax-phonology interface, Ito and Mester (2012, 2013, 2019), Ishihara (2014) and Kalivoda (2018) among others have adopted the Selkirk (2011) theory of the MSO-PO interface between syntactic constituency and prosodic constituency in grammar. In that theory, syntax-phonology interface constraints like MATCHPHRASE serve as the analogue of phonological faithfulness constraints: they interact with prosodic markedness constraints like BINARITY or EQUALSISTERS in determining the prosodic

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[28] IDENT (S_q-OF-ι-INITIAL-φ_{max}) does however allow for a mismatch that incorporates A_4 into the initial φ_{max} of ι, where A_4 would be downstepped with respect to the preceding A_2. The above speculation that the place of prosody in a theory of parsing/comprehension might provide some basis for a theory of prosodic structure faithfulness in phonology would seem to imply an asymmetry in the effects of downstep and upstep in the parsing/comprehension of a sentence. Assessing the well-foundedness of this idea is obviously outside the scope of this paper.

[29] In Tokyo Japanese, a left-branching single argument phrase with four accented words- [[[[A][A]] [A]] [A]] -- corresponds to a φ_{max} in PO which immediately dominates two two-word φ-- (((A) (A)) ((A) (A))) . The necessary appearance in PO of a φ corresponding to the uppermost XP of the argument phrase is attributed by Ishihara to the constraint in (31), which would hold of the relation between MSO and PO.

constituent structure properties of PO. Ito and Mester 2019 explicitly construe the interface constraints Match(Phrase, φ) and Match(φ, Phrase) as the equivalent of MAX(φ) and DEP(φ).

However, within the MSO-PO interface theory it doesn't seem that there would be a possible analogue of the phonological faithfulness constraint IDENT (S_q-OF-ι-INITIAL-$φ_{max}$). The phonological faithfulness being called for in IDENT (S_q-OF-ι-INITIAL-$φ_{max}$) is possible only in the MSO-PI-PO model, because it holds between one phonological representation and another, between PI and PO, in which the notion $φ_{max}$ is well defined. The notion of phrasal maximality exploited in the constraint is purely phonological: A φ is maximal only if it is not dominated by another φ. And this notion of a maximal φ in phonological representation is independently motivated. The hypothesis that prosodic subcategories like $φ_{max}$, $φ_{min}$, and $φ_{nonmin}$ play a role in phonology is broadly supported by cross-linguistic evidence from structure-sensitive phonological and phonetic phenomena, as has been argued vigorously in the literature on sentence phonology since it was proposed by Ito and Mester (2012). A contrast between $φ_{max}$ and $φ_{min}$, for example, is again shown to play a role by the evidence from Lekeitio Basque concerning pitch upstep reported in Elordieta 2015 and in section 4.1 of this paper.

The variety of constituency faithfulness that Ishihara (2014) hypothesizes is faithfulness between a $φ_{max}$ of the output phonological representation PO of a sentence and an XP_{max} of the syntactic representation. The constraint proposed by Ishihara is (48):

(48) MatchPhrase-Max – Match(XP_{max}, $φ_{max}$) (Ishihara (2014, 11)

> A maximal lexical phrase in syntactic constituent structure (a lexical XP that is not immediately dominated by another lexical XP) must be matched by a corresponding maximal prosodic constituent in phonological representation (a PPhrase that is not immediately dominated by another PPhrase, $φ_{max}$).

But Ishihara doesn't offer any evidence that the notion 'maximal lexical phrase' in syntactic representation is independently motivated by either syntactic or semantic phenomena. While the descriptive generalization embodied in (48) may be true, a case still needs to be made that the notion 'maximal lexical phrase' and the interface constraint MatchPhrase-Max – Match(XP_{max}, $φ_{max}$) that depends on it are needed in linguistic theory.

For the moment, then, we take the success of the purely phonological theory of faithfulness between the PI and PO in accounting for the constituency mismatches of the Type IV sentences of Lekeitio Basque to provide evidence of the value of a phonological input representation PI in accounting for aspects of prosodic structure formation in the grammar. This, along with the ample independent evidence for both the PI and PO levels of representation from other types of phonological phenomena, provides important support for the MSO-PI-PO model of the 'P-side' of the grammar.

7. Syntax has an effect on PO only through PI: the MSO-PI-PO model

In this paper we've seen that an indubitably phonological property like the unaccentedness of a word in a sentence of Lekeitio Basque has an impact on the formation of the φ structure of PO, which determines both the phonological distribution of edge tones in PO and the phonetically determined patterns of pitch upstep in the sentence. Lack of lexical accent is responsible for very significant mismatches between the MSO constituency that is the output of the morphosyntax of the grammar and the prosodic constituency of the phonological output representation PO. The purely phonological account we have provided for these constituency mismatches relates the phonological input representation PI to the output representation PO via a language-particular ranking of phonological constraints, constraints which refer only to properties of phonological representation. Accounting for *all* these types of mismatch has required us to assume that the direct impact of MSO is indeed on prosodic constituency in the *input* phonological representation PI, rather than on the prosodic constituency of the output phonological representation PO. This is in principle not a dramatic move, though one that has not been entertained until recently. The general proposal is that the morphosyntactic constituency that is the output of the morphosyntax (MSO) is spelled out (i.e., given phonological expression) as the prosodic constituency of the PI input representation of the phonological module, just as the roots and morphosyntactic feature bundles of MSO are spelled out (given phonological expression) in PI. Further consequences of the MSO-PI-PO model for sentence phonology are examined in Kratzer and Selkirk (2020) and in Lee and Selkirk (this volume, sections 3-4).

It is a consequence of the serial MSO-PI-PO model of the 'P-side' of the Chomskyan Y-model of grammar that the constraints that define the output PO representation of the phonological module are defined solely in terms of the (phonological) properties of the input and output phonological representations, PI and PO. An obvious prediction of the serial MSO-PI-PO model is that the (morpho)syntactic constituency of MSO can have *no direct effect* on the output phonological representation PO. This looks like an appealingly restrictive model of the phonology *per se.* Indeed this is the model that has been presumed in standard generative phonology. It implies that there can be no interaction in the phonology module between Match constraints on the syntax-phonology interface and phonological markedness constraints that hold of PO, contrary to what was proposed in the original Match theory of the syntactic constituency/prosodic constituency interface. Quite generally it means that no type of information about any aspect of morphosyntactic representation MSO can have any *direct* impact on the phonological properties of PO, only on the phonological properties of PI. The spelling out of MSO constituency as prosodic constituency in PI gives plenty of possibilities for an *indirect* influence of MSO constituency on the phonology and phonetics of PO, however. The range of possibilities depends on just how much the language-particular ranking of prosodic markedness constraints and prosodic faithfulness constraints in the phonology permits the prosodic constituency of PO to reflect the prosodic constituency of PI. As we've seen in Lekeitio Basque, given its phonological constraint ranking, the lack of lexical accent tone in individual words can lead to great losses in the prosodic structure reflection of the phrasal constituency of the morphosyntactic output representation MSO in the phonological output representation PO.

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