The use of prosody as a diagnostic for syntactic structure: The case of verb-initial order*

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1 Introduction

The central question addressed in this chapter concerns the extent to which prosodic structure can be used as a diagnostic for syntactic structure. I take as a point of departure that prosodic structure reflects syntactic structure, although this correspondence is sometimes opaque (Itô and Mester 2012; Selkirk 2011; a.o.). (Apparent) non-isomorphisms between syntactic and prosodic structure are argued to arise for a variety of reasons, including i) eurhythmic constraints favoring, e.g. binary prosodic units and prosodic units comprised of matching prosodic categories (Mester 1994; Myrberg 2013), ii) intrinsic properties of prosodic structure, e.g. the Strict Layer Hypothesis (e.g. Selkirk 1984), and iii) the timing of Spell Out (e.g. Seidl 2001; Wagner 2010, 2015; Newell 2008). A major challenge, then, in developing prosodic arguments to support or refute syntactic analyses is to discern when prosody transparently reflects syntax, verses when the correspondence between syntax and prosody is obscured by phonological, architectural, or mapping constraints.

The case study used to assess the efficacy of applying acoustic cues to prosodic constituency as a diagnostic for syntactic structure comes from the realm of verb-initial (V1) languages. The main syntactic accounts of V1 languages can be categorized according to whether they i) base-generate VOS and derive VSO or ii) base-generate SVO and derive both VSO and VOS. Within the second type of account, some achieve the final V1 configuration via phrasal movement, while others use head movement. Syntactic movement makes testable prosodic predictions for the reason that it i) alters syntactic constituency, which by hypothesis corresponds to prosodic constituency, and ii) increases the distance between syntactic elements, which can be expected to correspond to an increase in boundary strength.

The specific data under consideration come from two understudied, V1 languages: Ch'ol (Mayan) and Niuean (Polynesian). Both Ch'ol and Niuean display VOS/VSO alternations (described in Section 2), which makes these languages particularly appropriate for evaluating the prosodic predictions of different syntactic accounts of V1 order. Section 3 addresses the competing accounts of V1 order under consideration in this chapter—right-side specifiers, VP-raising and V^0-raising—and articulates the testable prosodic predictions these syntactic accounts make.

Section 4 reviews the prosodic data first reported in Clemens 2014a, 2014b and Clemens and Coon 2018b and rules out the right-side specifier account on the basis of the prosodic evidence. Section 5 discusses the limitations of using prosodic data to distinguish between the VP- and V^0-raising accounts, concluding that a deeper understanding of the prosodic systems of Ch'ol and Niuean would increase the efficacy of using prosody as a syntactic diagnostic for these languages.

2 VSO/VOS Alternations in Ch'ol and Niuean

Although Niuean (Polynesian) and Ch'ol (Mayan) are not genetically or geographically connected, the considerations that determine the order of clausal constituents in these languages are related. This section reviews the data and generalizations from the literature on the topic of VOS/VSO alternations. VOS constructions of this sort are also referred to as pseudo noun incorporation (PNI) constructions after Massam's (2001) seminal account. For both Niuean and Ch'ol, the functional structure associated with the object determines the relative order of the subject and object in verb-initial structures. In clauses with two overt post-verbal arguments, DP objects follow the subject, while NP objects precede the subject. See Seiter 1980 and Massam 2001 for Niuean, Coon 2010 and Vázquez Álvarez 2011 for Ch'ol, and Clemens and Polinsky 2018 and Clemens and Coon 2018a for an explicit comparison between this type of alternation in the Mayan and Polynesian language families.

2.1 Ch'ol VSO/VOS

Mayan languages are verb-initial, almost without exception; however, clauses containing two postverbal arguments are exceedingly rare. Two independent considerations conspire to prevent VSO and VOS clauses from surfacing. First, verbal arguments, especially subjects, frequently surface *before* the verb in positions associated with topic and focus. Second, the prevalence of argument drop means that one and possibly both arguments in a transitive clause are often unexpressed. Nonetheless, speakers both use VSO and VOS clauses and offer robust intuitions about their acceptability.

In VOS clauses in Ch'ol, objects may not appear with determiners or demonstratives; however, numeral classifiers and possessed nouns are allowed in this position (Coon 2010). The relevant generalization is that D^0-level material is banned from occurring with VOS objects. When a transitive clause takes two full-DP arguments, the preferred order is VSO. In the examples that follow,[1] note how the presence of the demonstrative *ili* covaries with the position of the object.

(1) a. Tyi i-kuch-u   [S aj-Maria] [O ili   si'   ].
         PFV 3ERG-carry-ss   CL-Maria   DEM wood
         'Maria carried this wood.'

     b. Tyi i-kuch-u   [O si'   ] [S aj-Maria].
         PFV 3ERG-carry-ss   wood   CL-Maria
         'Maria carried wood.'   (Coon 2010:355)

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[1]Less common abbreviations used in this chapter are as follows: CL = classifier; COMTV = comitative; DEP.T = dependent tense; DIR = directional; RP = resumptive pronoun; ss = status suffix

Although the object is bare, it is clear that this is not an instance of morphological incorporation, because the relevant objects can be shown to be phrasal. In (2) note that bare objects can be modified in VOS position.

(2) a. Tyi i-tsäñ-ä   [O kolem chityam] [S jiñi wiñik].
        PFV 3ERG-kill-ss   big   pig   DET man
        'The man killed a big pig.'
     b. Tyi i-mäñ-ä   [O pejtyelel tyumuty] [S jiñi alob].
        PFV 3ERG-buy-ss   all   eg   DET boy
        'The boy bought all the eggs.'   (Coon 2010:360)

In VSO constructions and VO constructions with a DP object, adverbial elements, e.g. *abi* 'yesterday' in (3a) can occur in the immediately postverbal position. This position is unavailable when the object is bare, indicating that the verb and the bare object form a constituent in VOS constructions and VO constructions with an NP object (as in 3b). When the object is bare, these types of adverbial elements must follow the object (3c).

(3) a. Tyi i-kwuts'-u abi   [O ili   pisil   ].
        PFV A1-wash-ss yesterday DEM clothes
        'I washed these clothes yesterday.'
     b. *Tyi i-kwuts'-u abi   [O pisil   ].
        PFV A1-wash-ss yesterday   clothes
        Intended: I washed these clothes yesterday.
     c. Tyi i-kwuts'-u [O pisil   ]   abi.
        PFV A1-wash-ss   clothes yesterday
        'I washed clothes yesterday.'   (Coon 2010:367)

2.2 Niuean VSO/VOS

As observed by Coon (2010), the factors that determine the relative order of the subject and the object in Ch'ol's verb-initial transitive clauses are quite similar to those in Niuean, as reported in Seiter (1980) and Massam (2001). First, VOS objects must be bare. For Niuean, this means that they lack all prenominal functional structure, including possessors, number marking, and most notably case markers.[2] In contrast, VSO objects are always marked for case. Compare the canonical VSO word order of Niuean transitive clauses shown in (4a) to the VOS clause, (4b), in which the object surfaces next to the verb and is not marked for case. The VOS constructions are famously referred to as pseudo noun incorporation by Massam (2001).

(4) a. kua tā   [S he tama] [O e   tau fakatino].
        PFV draw   ERG child   ABS PL picture
        'The child has been drawing pictures.'
     b. kua tā   [O fakatino] [S e   tama].
        PFV draw   picture   ABS child
        'The child has been drawing pictures.'   (Seiter 1980:70)

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[2]I take the fact that VOS objects in Ch'ol can surface with certain prenominal functional structure, whereas Niuean allows none, to reflect differences in the nominal structure of the two languages, as opposed to differences in the availability of VOS.

The size of the object in Niuean VOS constructions is larger than N^0 as evidenced by the fact that VOS objects can be modified. The examples that follow show objects modified by an adjectival phrase (5a), a coordinate phrase (5b), and a nonfinite relative clause (5c).

(5) a. Ne onoono [$_O$ vaka   mahaki toili] [$_S$ a   Fisi] he   uaafo.
         PST watch   canoes huge   large   ABS Fisi LOC wharf

     'Fisi is watching extremely large canoes at the wharf.'

    b. Ne tō   [$_O$ talo mo   e   tau futi   kehekehe   ] [$_S$ a   Togia].
        PST plant   taro comptv ABS PL bananas different.varieties   ABS Togia

     'Togia planted taro and different kinds of bananas.'

    c. Ne kumi   [$_O$ mena ke   kai ai] [$_S$ a   lautolu].
        PST look.for   thing DEP.T eat RP   ABS 3PL

     'They looked for something to eat.'   (Clemens 2019:6)

Finally, different postverbal particles in Niuean surface in the immediately post-verbal position in VSO clauses, but follow the object in VOS clauses. The examples in (6) show the directional particle *mai* in these two positions.

(6) a. Ne aka mai [$_S$ he   tama] [$_O$ e patuō].
         PST kick DIR   ERG child   ABS   stone

     The child kicked the stone towards me.

    b. Ne aka [$_O$ patuō] mai [$_S$ e   tama].
        PST kick   stone   DIR   ABS child

     The child kicked a stone/stones towards me.   (Clemens 2019:5)

2.3   Comparing word order alternations in Ch'ol and Niuean

The main similarities between Ch'ol and Niuean can be summarized as follows. Word order variation is determined by the functional structure associated with the object: VSO clauses contain full DP objects, whereas bare objects surface immediately after the verb. Next, in VOS clauses, the object is bare, but it is nonetheless phrasal. Finally, the verb and the bare, phrasal object form a surface constituent in VOS clauses.

There are also a handful of noteworthy differences between Ch'ol and Niuean that Clemens and Coon (2018a) connect to the argument status of NP objects in these languages. First, VOS clauses are fully transitive in Ch'ol, while in Niuean, they appear in an intransitive frame. Second, VOS is pragmatically marked in Niuean. In contrast, predicates freely take bare NPs in Ch'ol, and VOS is the more basic of the two verb-initial word orders. Finally, bare NP arguments in Ch'ol can be referential, individuated, and definite, unlike Niuean, in which bare NP objects lack these characteristics and the event in these constructions receives a durative or frequentative interpretations.[3]

Clemens and Coon (2018a) account for these differences between Ch'ol and Niuean by appealing to the idea that languages differ according to whether NPs may serve as true arguments of the verb (Chierchia 1998, Bošković 2008 and sources cited therein). NP arguments in Ch'ol are true arguments of the verb that may be of type ⟨ e ⟩ and combine with the predicate via

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[3]According to younger speakers, the durative/frequentative reading is non-obligatory and the PNI argument *can* be interpreted as specific given the right context. This suggests a change in progress. See Clemens 2019 for a more in depth discussion of the types of theoretical questions this type of change raises.

FUNCTIONAL APPLICATION. In contrast, Niuean NP arguments NP objects are not true arguments; they combine with their predicates via RESTRICT (Chung and Ladusaw 2003). Instead of saturating an argument slot, NP objects restrict the denotation of the predicate.

One final difference between VOS clauses in these languages pertains to the type of arguments that can participate in these constructions. For Niuean, the term VOS, which I have been using to refer to this type of clause, is something of a misnomer, because these constructions are not restricted to prototypical objects. Many of Niuean's internal arguments–direct objects, middle objects,[4] and instrumentals, but not pronominal objects, unaccusative subjects, or CP complements—can surface in these constructions. The VSO/VOS alternation was shown for a direct object in (4), and examples are given for a middle alternation in (7) and an instrumental alternation in (8). Note that *vaka* 'canoe' and *vakalele* 'airplane' surface as a bare NPs in (7b) and (8b). In contrast, in (7a) and (8a), *vaka* and *vakalele* surface with prepositional case.

(7) a. Ne onoono [$_S$ a   au] [$_O$ ke he tau vaka] he uaafo.
         PST watch   ABS 1SG   GL LOC PL canoe   LOC wharf
         'I watched the canoes at the wharf.'

     b. Ne onoono [$_O$ vaka] [$_S$ a   au] he uaafo.
         PST watch   canoe   ABS 1SG   LOC wharf
         'I watched canoes at the wharf.'   (Based on Clemens 2019:8)

(8) a. Ne fano [$_S$ a   Togia] [$_I$ he vakalele] ki Niue.
         PST go   ABS Togia   LOC airplane   GL Niue
         'Togia went to Niue on the airplane.'

     b. Ne fano [$_I$ vakalele] [$_S$ a   Togia] ki Niue.
         PST go   airplane   ABS Togia   GL Niue
         'Togia went to Niue by airplane.'   (Based on Clemens 2019:9)

The fact that different types of arguments can appear in VOS/PNI clauses, will not be discussed in more depth here. See instead Clemens (2014a, 2019) and Massam (2013) for Niuean and Collins (2016) for a related problem in Samoan.

3   Towards testable prosodic predictions

The purpose of this section is two-fold: first, I will introduce the competing syntactic approaches to the word order alternation introduced earlier in the chapter. Second, assuming one specific theory of the syntax-prosody interface, I will outline the different prosodic structures predicted to correspond to different syntactic derivations. The result of this effort is that the differences between the right-side specifier, VP-raising, and V^0-raising accounts of verb-initial word order and VSO/VOS alternations can be translated into testable prosodic predictions.

3.1   Competing accounts

This subsection reviews three of the most common ways to derive verb-initial word order with a special emphasis on how these accounts handle the types of alternations discussed in the previous section. For a more in-depth overview of verb-initial languages and their syntax see Carnie

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[4]For a discussion of middle constructions in Niuean and related languages see Chung 1978, Seiter 1980, Massam 2001, Tollan 2018, and Clemens 2019.

and Guilfoyle 2000, Carnie, Dooley and Harley 2005, Chung 2006, 2017, Clemens 2014a, and Clemens and Polinsky 2017.

3.1.1 Right-side specifiers

Right-side specifier accounts of verb-initial order have played an important role in Mayan syntax since Aissen 1992 and England 1991. This type of approach is found in the Austronesian literature as well, including an in-depth proposal for the Polynesian language Māori (Chung 1998), but right-side specifiers are less commonly adopted in accounts of Austronesian word order.

Right-side specifier accounts generate the subject in a rightward oriented specifier, i.e. VOS is the base order. In order to derive VSO, DP objects are displaced above and to the right of the subject. Specific right-side specifier accounts differ as to which specifiers are oriented to the right and which (if any) are oriented to the left. They also differ with respect to the landing site of the object VSO contexts. Note, however, that the structures in (9) abstract away from these details.

(9) a. Right-side specifier: VOS
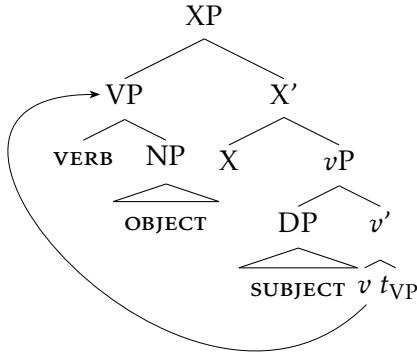

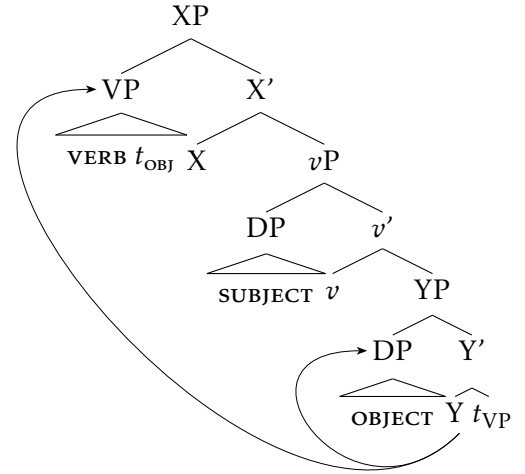b. Object postposing: VSO
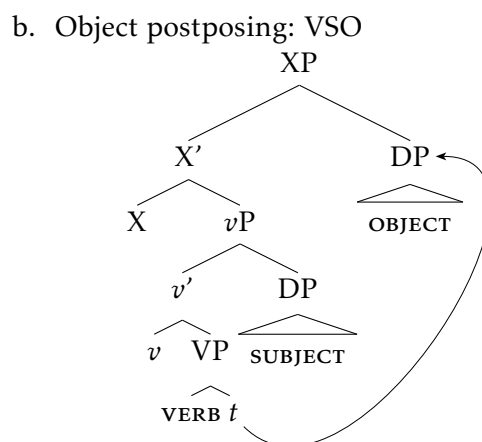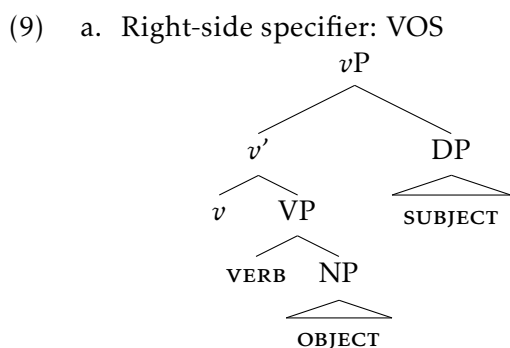
3.1.2 VP-raising

VP-raising is featured prominently in accounts of verb-initial order in the Austronesian literature. Specific examples from Polynesian languages include Niuean (Massam 2001, et seq.), Hawaiian (Medeiros 2013), and Samoan (Collins 2016). VP-raising has also been proposed for Mayan languages, most notably for Ch'ol in Coon 2010.

According to this type of account, SVO is base-generated, but a phrase containing the verb and the object moves above the subject. The resulting order is VOS. In VSO order, the object is said to evacuate the XP that moves to the more anterior position. Specific VP-(remnant)-raising accounts differ according to the identity of the XP that raises (e.g. VP or *v*P) as well as where the relevant XP moves. A schematized version of this type of analysis is shown in (10):

(10) a. VP-raising: VOS

XP
VP   X'
VERB NP   X vP
OBJECT   DP v'
SUBJECT v t_{VP}

b. VP-remnant-raising: VSO

XP
VP   X'
VERB t_{OBJ} X vP
DP v'
SUBJECT v YP
DP   Y'
OBJECT Y t_{VP}

3.1.3 V^0-raising

The V^0-raising derivation of verb-initial word order is considerably more common in the Austronesian literature than in the Mayan literature. Clemens and Coon (2018a) propose the first V^0-raising account of Mayan. Focusing on just the Polynesian branch, V^0-raising has been proposed for Māori (Pearce 2002, Waite 1989), Tongan (Custis 2004, Otsuka 2000, 2005), and more recently, Niuean (Clemens 2014a, 2019).

According to most V^0-raising accounts, SVO is base-generated, but the verb undergoes a series of head-to-head movements that result in a VSO clause. The ultimate landing site of the verb depends on the specific language and account.

For languages with alternating VSO and VOS word order, object scrambling is frequently called upon to explain VOS order (e.g. Otsuka 2002, 2005 for Tongan and Rackowski and Richards 2005 for Tagalog.) However, we can rule out the scrambling-based derivation of VOS for Ch'ol and Niuean on the basis of the fact that the verb and the object form a surface constituent in these languages. Recall from the data in examples (3) and (6), that adverbs (Ch'ol) and postverbal adverbial particles (Niuean) cannot surface between the verb and the bare NP in VOS constructions, although they can surface in the immediately post-verbal position VSO contexts. For now, a V^0-raising derivation is only shown for VSO order (11):

(11) V^0-raising: VSO

XP
VERB vP
DP v'
SUBJECT $t_{v+\text{V}}$ VP
t_{V} DP
OBJECT
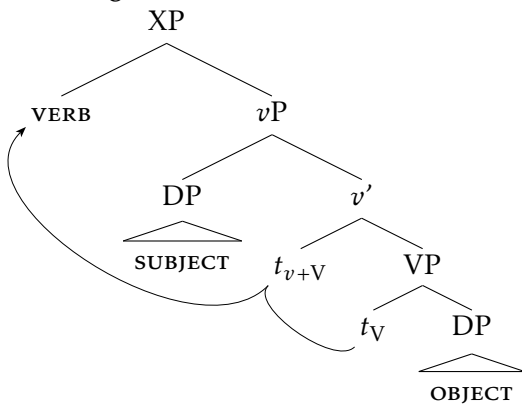
Instead of discussing scrambling further, I pair the V^0-raising account of VSO with a prosodic restructuring account of VOS (Clemens 2014a, 2019; Clemens and Coon 2018a) that

relies on a constraint proposed in Clemens (2014a): Argument-φ. This proposal is introduced briefly here; see the papers just cited, especially Clemens 2019, for a more in-depth discussion.

On the Argument-φ, prosodic restructuring account, VOS is the result of a non-syntactic reordering of NP objects. In other words, for at least some languages, pseudo noun incorporation is actually *prosodic* noun incorporation. The movement of the verb into initial position is syntactic: the verb undergoes a series of head movements in the syntax. When phases are sent to Spell Out, prosodic structure must be built in such a way that it satisfies Argument-φ. This constraint, defined in (12), has the effect of requiring the verb and its object to be pronounced in the same phonological phrase.

(12)   Argument Condition on Phonological Phrasing (Clemens 2014a, 2019)
       A head H with a categorial feature [C] and head C with the same [C] feature must constitute a φ-phrase.

The underlying theoretical assumptions of this approach are as follows: Categorial selection (C-selection) receives an Agree-based account (Chomsky 1965; Emonds 2000; Adger and Svenonius 2011). Furthermore, I adopt the position that Agree establishes a lasting link between the probe and the goal (Pesetsky and Torrego 2007). As such, when a syntactic head (the probe), selects an element with a [C] feature (the goal), that [C] feature is recoverable from both the probe and the goal.

The upshot is that the prosodic grammar identifies head-argument pairs by lexical category, necessitating that lexical class features are visible at Spell Out. This type of VOS structure, i.e. PNI constructions, can be thought of as a prosodic phenomenon that shows category-specific effects (Kaisse 1985, Nespor and Vogel 1986, Smith 2011 and sources cited therein). So when the prosodic component of the grammar identifies a categorical feature shared between two elements, e.g. a verb and its NP complement, they are linearized in such a way that it is possible to pronounce them in the same φ-phrase, i.e. in VOS order.

On the other hand, the prosodic constraint in (11) will only cause the clause to linearize as VOS if both instantiations of the relevant feature are visible during the same Spell Out cycle. Assuming then that DPs are phases (Chomsky 2001; Dobashi 2003; Svenonius 2004; Hiraiwa 2005), a DP complement is assigned prosodic structure in a different cycle than the c-selecting verb. Once prosodic structure is assigned, lexical class features delete. So, the fact that VSO ever surfaces is the failure of Argument-φ to apply in cases where the shared feature is not visible during the same Spell Out cycle.

For the purposes of this section, the take away message is that the position of the verb in VSO/VOS clauses can be uniformly derived via V^0-raising. The variable order of the subject and the object is the result of the interaction between the lexical category of the object, the timing of Spell Out, and the effect of Argument-φ on linearization.

3.2   Syntax-prosody mapping

The framework I use to translate these different syntactic derivations into prosodic predictions is Match Theory (Selkirk 2011). Match Theory is an indirect reference approach to the syntax-prosody interface. For examples of work that adopt this framework see e.g. Bennett et al. 2015, 2016, 2019; Clemens 2014a, 2019; Elfner 2012, 2015; Ito and Mester 2013; Myrberg 2013; Tyler 2019. Explanations of the basic tenets of Match Theory as well as its contextualization of the theory in the broader syntax-prosody literature can be found in articles such as Bennett and Elfner 2017 and Elfner 2018.

MATCH constraints require that syntactic constituents correspond to prosodic constituents and vice versa. These constraints also make specific category predictions about which syntactic and prosodic units are connected, as shown in (13):

(13) Schematization of MATCH CONSTRAINTS (Based on Selkirk 2011)
     a. Syntactic head (X^0) $\longleftrightarrow$ Prosodic word (ω)
     b. Syntactic phrase (XP) $\longleftrightarrow$ Phonological phrase (φ)
     c. Illocutionary phrase (CP/IP) $\longleftrightarrow$ Intonational phrase (ι)

One prediction of MATCH THEORY is that prosodic structure should reveal the same type of recursion as syntactic structure, as supported by recent work including Elfner 2012; Féry 2011; Féry and and Schubö 2010; Féry and Truckenbrodt 2015; Itô and Mester 2010; Wagner 2005, 2010. In other words, the most basic premise of MATCH THEORY is that syntactic and prosodic structure have the same form. However, in many cases, prosodic structure is non-isomorphic with the underlying syntax. By hypothesis, non-isomorphism is always the result of the need to satisfy independent constraints on prosodic well-formedness. MATCH constraints are construed as violable in the context of Optimality Theory (Prince and Smolensky 1993). When one or more MATCH constraints is outranked by a competing prosodic constraint, nonisomorphic structure is the result.

Before turning to the specific prosodic predictions, it is necessary to clarify a few additional assumptions. First, we will assume no redundant prosodic structure (see Elfner 2012 for further discussion). In (14), XPs embedded in unary-branching XP ultimately map onto a single φ-phrase, because prosodic categories which do not correspond to phonological content are not shown.[5]

(14) No redundant recursive structure

     ZP φ
     | |
     YP $\longrightarrow$ φ $\longrightarrow$ φ
     | |
     XP φ
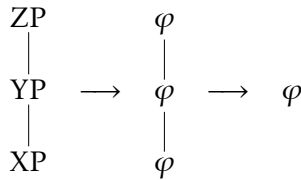
A perhaps less controversial assumption is that terminal nodes that do not correspond to phonologically overt material are not assigned prosodic structure. (Again, see Elfner 2014 for further discussion). This principle is schematized in (15).

(15) No empty categories

          XP
        ⟋   ⟍
    YP t $\longrightarrow$ φ
    | |
    Y ω
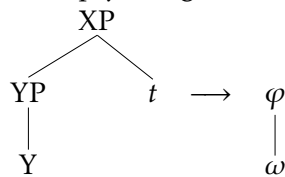
Finally, MATCH THEORY is underspecified for bar-level syntax. Note that (13) specifies the prosodic mapping of phrases and heads, but not specifiers. We will begin with the assumption that the X'-node does not have an associated prosodic category, resulting in tertiary prosodic branching, as shown in (16).

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[5]See Wagner (2005, 2010, 2015) and references in Bennett and Elfner to apper and Elfner 2018 for arguments that this type of embedding is in fact realized in the prosodic structure.

(16) Bar-level mapping

```
        XP                              φ
       /  \                            /|\
      A    X'          ⟶            A  B  C
          /  \
         B    C
```
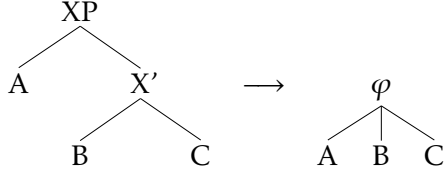
Prosodic structure is often flatter than syntactic structure (see sources in Bennett and Elfner 2019 and Elfner 2018); nonetheless, it is sometimes the case that binary branching is preferred in prosodic structure. In cases where tertiary branching is predicted, but not realized, the assumption is that a higher ranking eurhythmic constraint privileging binary prosodic structures is ranked higher than the relevant Match constraint.
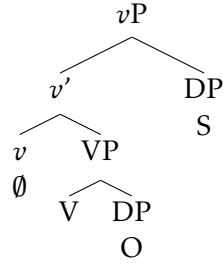
Match Theory and these additional assumptions form the basis on which the prosodic predictions for different syntactic derivations of V1-structures are articulated in the remainder of this section.

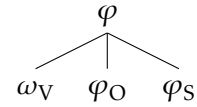### 3.2.1 Right-side specifiers

Recall from 3.1.1, that on a right-side specifier account of VOS the subject is generated to the right of the predicate. The structure in (17) is somewhat abbreviated as the higher clausal projections do not help differentiate competing accounts. The predicted prosodic structures are built on the basic tenets of Match Theory with the three additional principles outlined in the previous section (no recursive prosodic structure, no empty categories, tertiary branching of the bar level).

(17) Syntax-prosody mapping: Right-side specifier VOS

    a. Syntax   b. Prosody

```
           vP                                     φ
          /  \                                   /|\
        v'    DP                              ω_V  φ_O  φ_S
       /  \    S
      v    VP
      ∅   /  \
         V   DP
              O
```
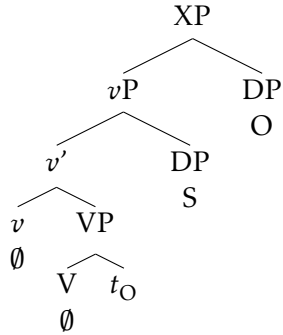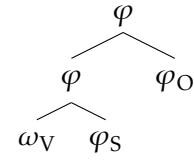
In order to form a VSO clause from a base, right-side specifier account of V1-order, the object is post-posed. This is shown in (18). Although there is variation in the realization of different right-side specifier accounts, I assume that the object must be postposed at least as high as the next projection (labeled simply as XP) in order to avoid a minimality violation.

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(18) Syntax-prosody mapping: Right-side specifier VOS

a. Syntax

```
           XP
          /  \
        vP    DP
       /  \    O
      v'   DP
     / \    S
    v   VP
    ∅   / \
       V   t_O
       ∅
```

b. Prosody

```
        φ
       / \
      φ   φ_O
     / \
    ω_V φ_S
```

The primary prosodic difference between (17) and (18) pertains to the strength of the boundary delimiting the two post-verbal arguments in the case of VSO, but not VOS. This is shown linearly in (19), where the prosodic boundary corresponding to the right edge of the *v*P is emphasized.

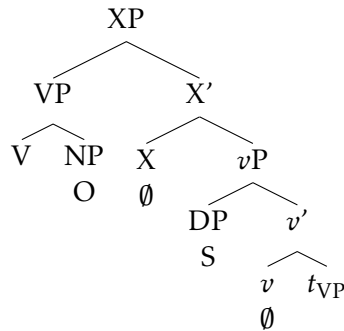(19) Prosodic predictions: Right-side specifier
    a. $\big(\ $ V   (O)   (S) $\big)$
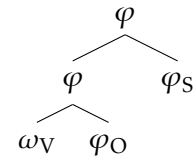   b. $\big(\ $ V   (S) $\big)$ (O)

3.2.2 VP-raising

Turning to the VP-raising account of VOS, the VP, which contains the verb and the object, is raised above the subject. Prosodically speaking, this movement results in the prediction that the subject should be realized in a φ-phrase distinct from the one containing the verb and the object. The prosodic structure predicted to correspond to the VP-raising account of VOS is shown in (20). Note that, in the prosodic structure, the φ-phrase containing the subject appears to be 'higher' in the clause than the VP's φ-phrase, even though the VP is shown to raise above the subject in the corresponding syntactic structure. The reduction of redundant prosodic structure creates this effect, but there is no meaningful sense in which the φ-phrase containing the subject is prosodically 'higher' than the φ-phrase in which the VP is pronounced.

(20) Syntax-prosody mapping: VP-raising VOS

a. Syntax

```
          XP
         /  \
       VP     X'
      /  \   /  \
     V   NP X   vP
         O  ∅  /  \
             DP    v'
              S   /  \
                 v   t_VP
                 ∅
```

b. Prosody

```
        φ
       / \
      φ   φ_S
     / \
    ω_V φ_O
```
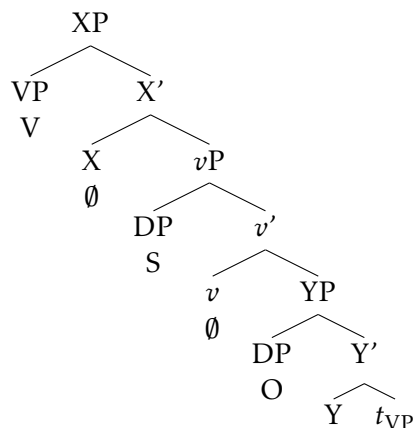
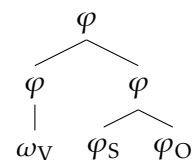In order to form a VSO clause on the basis of a VP-raising account of V1-order, the object

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is evacuated from the VP before the VP moves into its higher position. Subsequently, the two post-verbal arguments are predicted to surface in a φ-phrase independent of the verb. Note that the verb itself should also form a φ-phrase, as it is contained inside of the VP and, all else being equal, XPs map onto φ-phrases.

(21) Syntax-prosody mapping: VP-raising VSO

a. Syntax

```
            XP
          /    \
       VP        X'
       V        /  \
              X      vP
              ∅     /  \
                  DP     v'
                  S     /  \
                       v     YP
                       ∅    /  \
                          DP    Y'
                          O    /  \
                              Y   t_VP
```

b. Prosody

```
            φ
          /   \
        φ       φ
        |      /  \
       ω_V   φ_S   φ_O
```

As before, the primary prosodic difference between (20) and (21) is schematized in (22). In the case of the VOS clause, the verb and the object are predicted to form a prosodic constituent to the exclusion of the subject and in the VSO clause, the subject and the object are predicted to form a prosodic constituent to the exclusion of the verb. This is shown linearly in (22), where the prosodic boundary corresponding to the right edge of the vP is emphasized.

(22) Prosodic predictions: VP-raising
   a. $\big($V (O)$\big)$ (S)
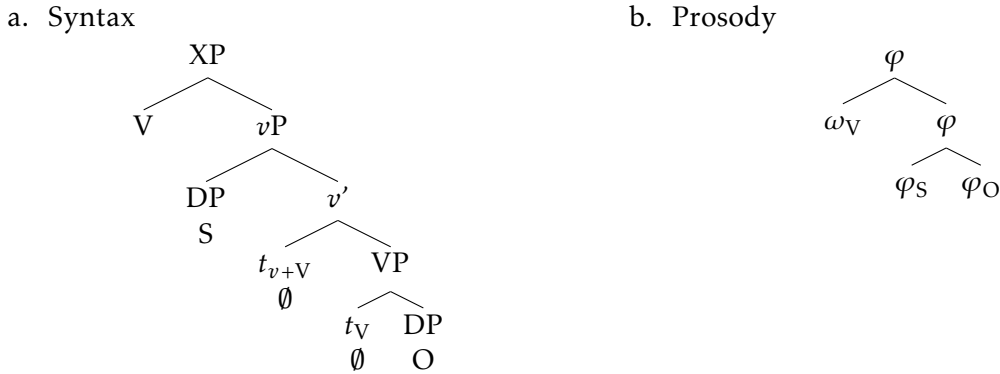   b. (V) $\big($ (S) (O) $\big)$

3.2.3 V^0-raising

Finally, when it comes to the V^0-raising account of verb-initial order combined with the Argument-φ account of VOS, we expect the syntax-prosody mapping shown in (23). Note that the resulting prosodic structure is indistinguishable from the one formed on the basis of VP-raising as was shown in (20):

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(23) Syntax-prosody mapping: V^0-raising VOS

    a. Syntax $\longrightarrow$ Argument-φ $\longrightarrow$ b. Prosody

```
           XP                                              φ
          /  \                                            / \
         V    vP                                         φ   φ_S
             /  \                                       / \
           DP    v'                                   ω_V  φ_O
           S    /  \
             t_{v+V}  VP
               ∅     /  \
                    t_V  DP
                    ∅    O
```
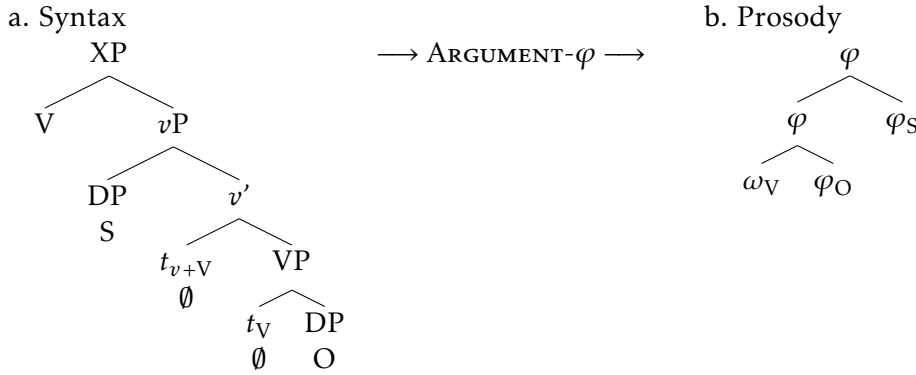
The prosodic predictions for the V^0-raising account are also quite similar to the VP-raising predictions when we consider VSO clauses. Note that the primary difference pertains to the prosodic category of the verb: in the case of VP-raising, we predict a φ-phrase, whereas in the case of V^0-raising we predict a prosodic-ω.

(24) Syntax-prosody mapping: V^0-raising VSO

    a. Syntax   b. Prosody

```
           XP                                              φ
          /  \                                            / \
         V    vP                                         ω_V  φ
             /  \                                            / \
           DP    v'                                        φ_S  φ_O
           S    /  \
             t_{v+V}  VP
               ∅     /  \
                    t_V  DP
                    ∅    O
```

With respect to the predictions for major prosodic constituency of VSO and VOS clauses, V^0-raising and VP-raising look very similar. Compare (25) to (22).

(25) Prosodic predictions: V^0-raising
    a. (V   (O))   (S)
    b.   V ((S)   (O))

3.3 Interim discussion

The prosodic predictions of the VP-raising and V^0-raising accounts only diverge in VSO clauses and only at the level of the prosodic category of the verb, not at the level of prosodic constituency, per se. All else being equal, the VSO verb should map onto a φ-phrase in the VP-raising analysis and a prosodic-ω in the V^0-raising analysis. For this reason, I will conflate the VP- and V^0-raising analyses into a single 'verb movement' analysis until Section 5 when I address the difference between the prosodic predictions of the VP- and V^0-raising accounts directly.

    For now, I focus on the clear differences between the verb movement and right-side spec-

ifier accounts of verb-initial order that arise when comparing VSO and VOS clauses. The right-side specifier account predicts a strong boundary between the subject and object in VSO clauses. In the syntax, the object is displaced and adjoined higher in the clause. This movement means that the object surfaces in a higher XP than the verb and the subject. By contrast, in VOS clauses, after either i) VP-raising or ii) V^0-raising plus the application of Argument-φ, the verb and the object form a constituent to the exclusion of the subject. Subsequently, we would expect to find a strong prosodic boundary between the object and the subject in VOS clauses if the clause were derived via verb movement.

The prosodic predictions can be summarized as follows: a strong boundary between the arguments in a VSO clause would constitute positive evidence for the right-side specifier account; a strong boundary between the arguments in a VOS clause would constitute positive evidence for verb movement. These predictions are schematized in (26):

(26) Positive prosodic evidence for opposing syntactic accounts
 a. Right-side specifier account: V S $)\varphi$ O
 b. Verb movement accounts: V O $)\varphi$ S

On a right-side specifier account, the verb and the subject remain vP internal in VSO clauses, and so one might expect that the verb and the subject were phrased together in VSO clauses derived via rightward postposing of the object. On the verb movement accounts, the verb and the object are predicted to form a prosodic constituent in VOS clauses. Therefore the absence of a boundary between the verb and the subject in VSO clauses would support the right-side specifier account of V1 order, while the absence of a boundary between the verb and the object would support the verb movement accounts.

In the next section, data from Ch'ol (Clemens and Coon 2018b) and Niuean (Clemens 2014a, 2014b) are used to test these predications.

4 The data

4.1 Ch'ol

The Ch'ol data presented in this chapter were first published as Clemens and Coon (2018b). They were collected as part of a larger project investigating sentential prosody in Ch'ol (see also Lesure and Clemens 2017 and Clemens and Coon 2018a; Clemens et al. 2018).

4.1.1 Methodology

The specific data discussed here represent the speech of four native speakers of the Tila variety of Ch'ol who also speak Spanish. Included in the study are three women and one man, all of whom were between the ages of 20 and 40 years old at the time of recording.

Despite difficulty recruiting participants who read in Ch'ol, the experimental methodology used to collect the data was reading-based, because this type of study makes it possible to control for phonological and prosodic confounds, such as sonority, meter, and utterance position. Furthermore, as mentioned in Section 2, Ch'ol speakers infrequently use sentences with two overt arguments, and so a reading-based study made it possible to collect data on these clause types.

Materials consisted of eleven items. With four conditions per item, there were 44 unique test sentences. Test sentences varied according to word order: VOS (with NP objects) and VSO clauses (with DP objects). In addition, the size of the object was manipulated: half of the test

sentences included a nominal modifier and half did not. An example of the four conditions for one item is shown in (27):

(27) a. VOS

Tyi i-mäñ-ä   [$_O$ lima] [$_S$ jiñi alob] tyi   Salto.
PFV 3ERG-bought-ss   lima   DET boy   PREP Salto

'The boys bought limas in Salto.'

b. VO$_{MOD}$S$_{MOD}$

Tyi i-mäñ-ä   [$_O$ k'äñk'äñ lima] [$_S$ jiñi ch'äyem alob] tyi   Salto.
PFV 3ERG-bought-ss   yellow   lima   DET tired   boy   PREP Salto

'The tired boy bought yellow limas in Salto.'

c. VSO

Tyi i-mäñ-ä   [$_S$ jiñi alob] [$_O$ ili   lima] tyi   Salto.
PFV 3ERG-bought-ss   DET boy   DEM lima   Salto

'The boy bought these limas in Salto.'

d. VS$_{MOD}$O$_{MOD}$

Tyi i-mäñ-ä   [$_S$ jiñi ch'äyem alob] [$_O$ ili   k'äñk'äñ lima] tyi   Salto.
PFV 3ERG-bought-ss   DET tired   boy   DEM yellow   lima   PREP Salto

'The tired boy bought these limas in Salto.'

To the extent that it was possible, target sentences were sonorant-rich, but Mayan phoneme inventories contain many obstruents. Target sentences also included adverbial material in final position to make it less likely that clause-final effects would occur on constituents of interest. Head nouns and modifiers were bisyllabic.

4.1.2 Results

The types of cues to prosodic constituency discussed in this section were chosen for either i) frequently cueing the presence of prosodic boundaries cross-linguistically, e.g. phrase-final lengthening (i.e. relative duration) and the distribution of pauses, or ii) being a common indicator of prosodic boundaries in Mayan languages (see Bennett 2016), e.g. high boundary tones.

Beginning with duration, Clemens and Coon 2018b found a significant difference in duration between the unmodified VOS object and the VSO subject (Paired T-Test; $p < 0.005$), although no durational differences between modified post-verbal arguments was found (28). No difference was found in terms of the duration of the verb in VOS as compared to VSO conditions (29).

(28) Ch'ol post-verbal argument duration

	UNMODIFIED	MODIFIED
VOS	**52 *ms***	49 *ms*
VSO	**48 *ms***	48 *ms*

(29) Ch'ol verb duration

	UNMODIFIED	MODIFIED
VOS	69 *ms*	68 *ms*
VSO	70 *ms*	68 *ms*

When comparing the duration of the unmodified VOS object and unmodified VSO subject, note that the effect size (4 *ms*) is below the perceptibility threshold (Stevens 2000), suggesting that phrase-final lengthening is a mechanical effect of prosodic planning (Myers and Hansen 2007). Final lengthening is correlated with boundary strength (see sources cited in Bennett and Elfner 2019), so the fact that final lengthening does not occur on VSO subjects indicates that the boundary between arguments in VSO order is weaker than the boundary between the arguments in VOS order. Recall that verb movement analyses predict a relatively stronger boundary between the object and subject in VOS order, while the right-side specifier account predicts a relatively stronger boundary between the subject and object in VSO order.

Transitioning to intonation, Ch'ol utterances are realized with a series of pitch excursions corresponding to the edges of a prosodic boundary larger than the level of the word and smaller than the level of the utterance. As discussed at greater length in Clemens and Coon (2018b), while utterance boundaries are also marked H%, L% boundary tones are more common in this position. L% boundary tones also appear clause-internally, but only when they precede a pause. This suggests that a diagnostic for Ch'ol φ-phrases is the presence of H%, while ι-phrases are marked L% in most cases, but H% in others.

Using H% boundary tones as a diagnostic, we find evidence that there is a boundary after *both* the immediately post-verbal argument in both VOS and VSO order (see pitch tracks in (31)). However, the immediately post-verbal argument in VOS order has a significantly higher F0 than the immediately post-verbal argument in VSO order. Consider (30), which shows the time-normalized pitch contour of the first argument following the verb in both VSO and VOS order.

(30)   Time-normalized pitch contour on first argument for Ch'ol (Clemens and Coon 2018b)
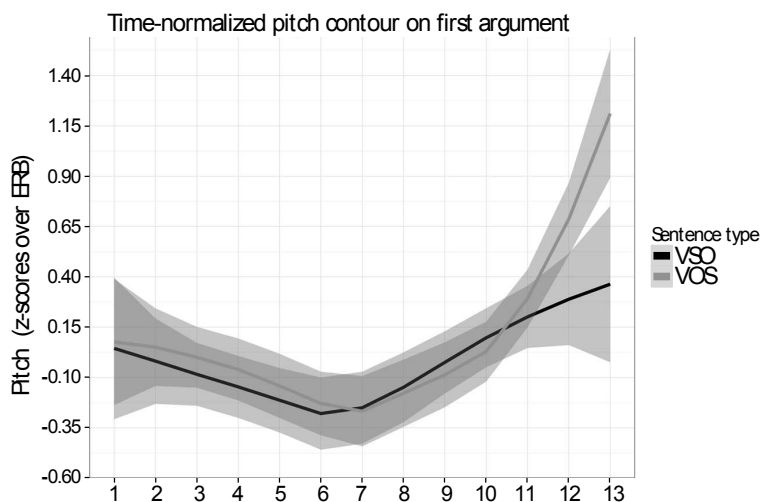
This pattern is very similar to the one seen in the discussion of the duration data. Data from peak F0 in boundary tones suggest that a stronger boundary is found between the object and subject in VOS order than in VSO order. See the discussion in Bennett and Elfner 2019 on gradient cues to prosodic boundaries including those involving fundamental frequency. As before, this difference in boundary strength is taken as support for O)φ S phrasing, which is consistent with the verb movement analyses, as opposed to S)φ O phrasing, as predicted by the right-side specifier account.

Looking now at the realization of verbs in V1 clauses and the implications for prosodic constituency, we find evidence that the verb and the object form a prosodic unit in VOS order.
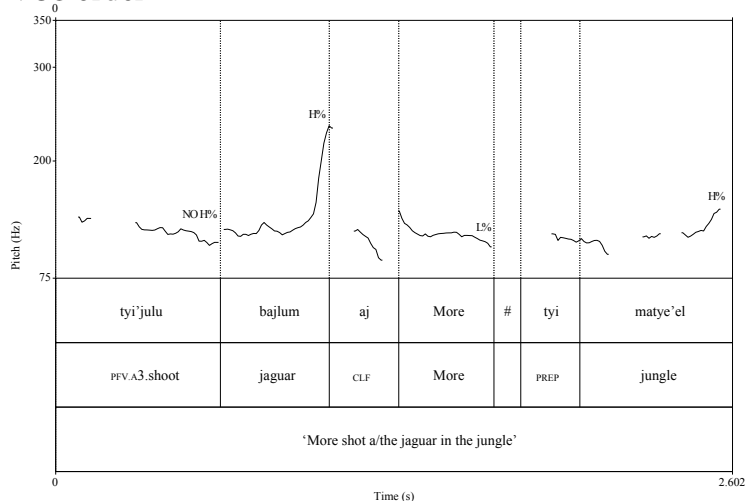
The verb in VSO clauses bears a H% (31a), but the verb in VOS clauses does not (31b). This suggests that the verb in VSO clauses, but not VOS clauses, is pronounced at the right-edge of a φ-phrase. Instead, the verb in VOS clauses is phrased with the object.

(31)   An example pitch track of Ch'ol VSO and VOS (Clemens and Coon 2018b)

   a. VSO order
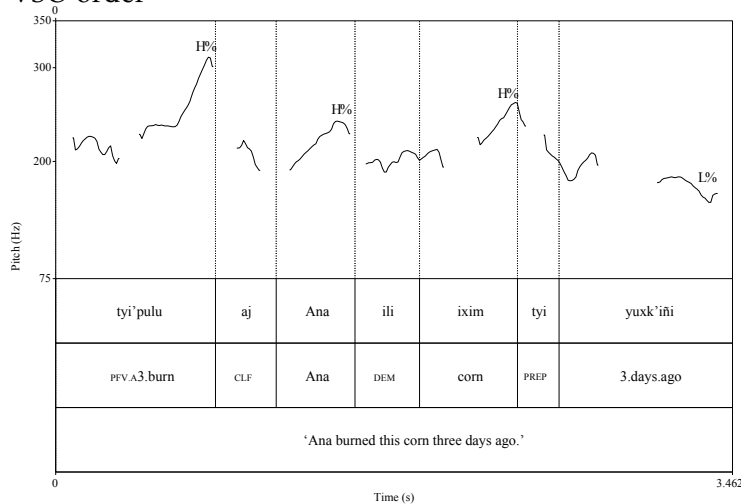
   b. VOS order

Next, the distribution of pauses supports a prosodic analysis where the verb and the object form a prosodic constituent. The number of pauses that occur in these data is quite small, which is not surprising given the controlled nature of the study. Nonetheless, a clear pattern arises: speakers pause before all argument and VP-modifier positions with one exception: the position preceding the object in VOS clauses (32). The distribution of pauses in these data suggests that the preferred phrasing of VOS clauses the Ch'ol is one in which there is no boundary between the verb and the object.

(32)   Distribution of pauses in Ch'ol data

	_ ARG 1	_ ARG 2	_ VP-MODIFIER
VOS	0	5	6
VSO	5	6	3

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In sum, we find support for a verb movement analysis of V1 order from different types of acoustic data. Pitch and duration data reveal a strong prosodic boundary between the object and subject in VOS clauses. The distribution of H% tones and pauses support a prosodic analysis in which the verb and the object form a prosodic unit in VOS clauses, which is also consistent with the verb movement accounts. In contrast, there is no evidence that the subject and object are delimited by the type of boundary one might expect if the object were postposted in VSO clauses.

Finally, Lesure (2015) and Lesure and Clemens (2017) investigate Vázquez Álvarez's (2011) impressionistic report that Ch'ol sonorants are devoiced word-finally. They find that voice quality in sonorants is indeed an indicator of word-level boundaries, but that acoustic measures (e.g. intensity, F0, and H1-H2) support a 'tense voice' analysis (in the sense of Keating and Garallek (2015) and Keating et al. (2015), as opposed to a devoicing analysis. Relevant to present purposes is the fact that tense voice exhibits differential behavior at the boundaries of different levels of the prosodic hierarchy. Sonorants in Ch'ol show a significant three-way contrast between word-medial, word-final/phrase-medial, and phrase-final sonorant H1-H2 values. Lesure (2015) and Lesure and Clemens (2017) were working with the same data set and assuming the same prosodic constituency. One would expect that if the prosodic constituency were incorrect, Lesure (2015) and (Lesure and Clemens 2017) would have failed to find positional sensitivity in the voice quality of sonorants.

4.2   Niuean

The Niuean data presented in this chapter were first published as Clemens 2014a and Clemens 2014b, and they are also discussed in Clemens 2019.

4.2.1   Methodology

This section reports on a reading-based study of VOS clauses (known as PNI structures in the literature) and their VSO counterparts in Niuean. As previously stated, this methodology lends itself to the careful control of phonological variables. The data presented here come from five native-speakers of Niuean and were recorded in Auckland, NZ. All participants in this study are Niuean-English bilinguals who were born on the island of Niue, but immigrated to New Zealand as adolescents or adults. These data represent the speech of four women and one man.

Materials consist of fifteen items that include an equal distribution of verbs that can combine with either a i) direct object, ii) middle object, or iii) instrumental argument in VOS order. With four conditions per item, there were 60 unique test sentences. Test sentences varied according to word order: VOS (with NP objects) and VSO clauses (with DP objects). Finally, the size of the object varied: half of the test sentences included a complex object and half did not. An example of four conditions for one item is shown in (33):

(33) a. VOS

Na tō   [$_O$ talo] [$_S$ e   magafaoa] he māla.
PST plant   taro   ABS family   LOC farm

'The family planted taro on the farm.'

b. VO$_{MOD}$S

Na tō   [$_O$ talo mo   e   tau fiti   ] [$_O$ e   magafaoa] he māla.
PST plant   taro COMTV ABS PL flower   ABS family   LOC farm

'The family planted taro and flowers on the farm.'

c. VSO

Na tō   [$_S$ he   magafaoa] [$_O$ e   talo] he   māla.
PST plant   ERG family   ABS taro   LOC farm

'The family planted the taro on the farm.'

d. VSO$_{MOD}$

Na tō   [$_S$ he   magafaoa] [$_O$ e   talo mo   e   tau fiti   ] he   māla.
PST plant   ERG family   ABS taro COMTV ABS PL   flower   LOC farm

'The family planted the taro and flowers on the farm.'

4.2.2 Results

The cues to prosodic constituency explored for Niuean are similar to the ones considered in the case of Ch'ol. Some of these are known to cue the presence of prosodic boundaries cross-linguistically, e.g. phrase-final lengthening (i.e. relative duration) and the distribution of pauses. Work on related languages suggested that the distribution of pitch accents would also be a productive line of investigation (DeLacy 2003 for Māori and Vicenik and Kuo 2010 for Tongan).

Clemens (2014a, 2014b) reports that Niuean sentences are produced with a series of H*L-tunes. The H* falls on the most prominent syllable of the rightmost prosodic-ω of the phrase, and the pitch falls immediately thereafter.[6]

As was true for Ch'ol, we find acoustic evidence supporting a prosodic analysis in which both subjects and objects are aligned with the right edge of a φ-phrase in both VOS and VOS orders (see pitch tracks in (36a) and (36b)), along with an appreciable difference between the boundary strength (expressed as F0) with respect to the object in VOS constructions as compared to the subject in VSO constructions. Charts summarizing these pitch results are given in (37):

(34)   Maximum F0 on postverbal argument in *Hz* for Niuean

	ABS	MID	INST	Mean
VOS	230	215	220	222
VSO	216	198	208	207

The maximum F0 value on the constituent that follows the verb is significantly higher in the VOS condition than it is in the VSO condition (Paired T-Test; $p < 0.0001$). This finding represents a perceptually salient difference of an average of 15 Hz (see Stevens 2000 on just-noticeable F0 difference). This result holds for each argument type as well (Paired T-Test; $p = 0.01$ for absolutives; $p < 0.001$ for middles; and $p = 0.015$ for instrumentals).

The fact that the object in VOS clauses is realized with a greater pitch excursion than the subject in VSO clauses indicates that the boundary following the VOS object is stronger than the boundary following the VSO subject. The results from pitch maxima on postverbal arguments in VSO and VOS order therefore support a verb movement analysis.

Clemens (2014a, 2014b) also reports a difference in the intonational properties of the verb in VOS as compared to VSO clauses. Summarizing data are shown in (35):

(35)   Maximum F0 on verb in *Hz* for Niuean

|	ABS	MID	INST	Mean
VOS	210	203	209	207
VSO	225	232	228	228

---

[6]Brown and Tukuitonga (2018) argue that the H* pitch accent is anchored to the predicate not the φ-phrase.

On a direct comparison of the VOS condition and the VSO condition, the maximum F0 value on the verb is significantly higher in the case of VSO than it is in the case of PNI (Paired T-Test; $p < 0.0001$). The same pattern is found for each type of VOS/VSO pair. For each argument type, the maximum F0 on the verb is higher in the VSO condition than in the VOS condition (Paired T-Test; $p < 0.005$ for absolutives; $p < 0.0005$ for middles; and $p < 0.005$ for instrumentals). These statistically significant findings represent the perceptually salient difference of 21 Hz.
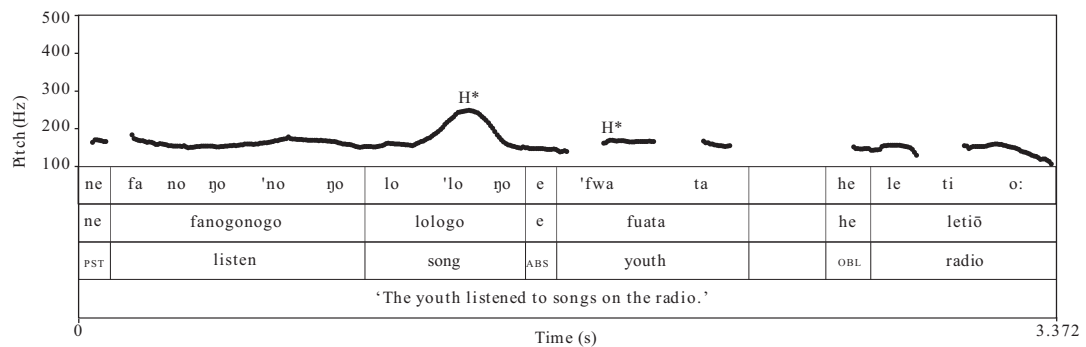
The quantitative analysis of the Niuean data confirms the apparent difference between the intonational contours of VOS as compared to VSO clauses: the verb is realized with a H* pitch accent in VSO, but not VOS order.

(36)   An example pitch track of Niuean VSO and VOS (Clemens 2014b)

a. VSO order
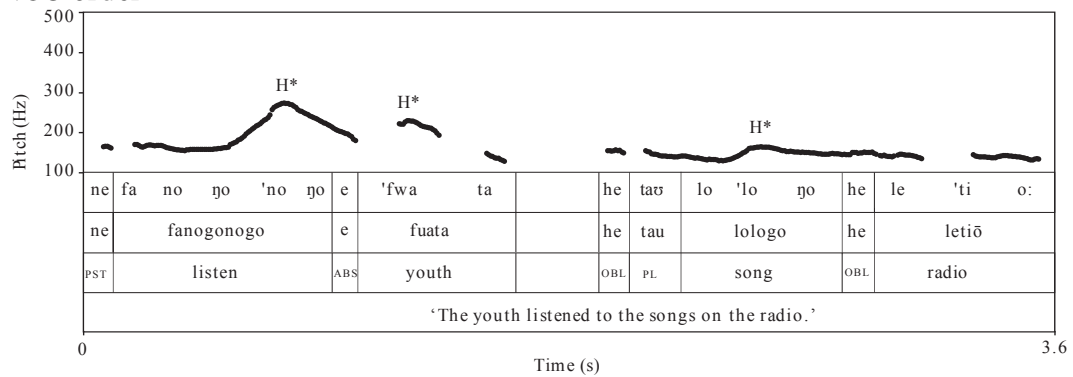
b. VOS order

As discussed earlier, the fact that the verb and the object are realized as a prosodic unit is consistent with the verb movement analyses. Data from duration lend further support to this type of syntactic approach. Clemens (2014a, 2014b) finds that the verb in the VSO condition is significantly longer than the verb in the VOS condition (Paired T-Test; $p < 0.0005$). This general finding holds for each of the different argument conditions as well (Paired T-Test; $p = 0.016$ for absolutives; $p = 0.08$ for middles; and $p < 0.005$ for instrumentals). There is no difference between the modified and unmodified conditions with respect to the duration of the verb.[7]

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[7]We cannot compare the duration of the immediately postverbal argument in VSO and VOS as we did for Ch'ol, because the Niuean items were not as well controlled for syllable count and only the objects were modified in the modified condition.

(37) Niuean verb duration

	VSO	VOS
Abs	60 *ms*	56 *ms*
Mid	77 *ms*	75 *ms*
Inst	62 *ms*	51 *ms*
Mean	66 *ms*	61 *ms*

As was also true for the Ch'ol data, the difference in duration between the verb in VSO constructions and the verb in VOS constructions reaches statistical significance, but the size of the effect is below the perceptibility threshold (Stevens 2000). Speakers are therefore unlikely to be using phrase-final lengthening as a cue for prosodic constituency, but the lengthening may reflect planning.

Finally, the distribution of pauses in these data lend some support to a prosodic analysis in which the verb and the object are realized in the same φ-phrase. Pauses were 2.5 times more likely to occur after VS verbs (n=10) than after PNI verbs (n=4), as shown in (38).

(38) Distribution of pauses in Niuean data

	_ Arg 1	_ Arg 2	_ VP-Modifier
VOS	4	18	27
VSO	10	16	28

As reported by Clemens (2014a, 2014b), in cases where a pause occurred after a verb in VOS order, the pause was preceded by a modified argument. No pauses between verbs and unmodified arguments in VOS order occurred in these data. This suggests that a constraint on the size of prosodic constituents may also be at play, although intonation and duration do not appear to be influenced by this type of consideration.

In sum, acoustic data from Niuean support a verb movement analysis of V1 order. Data from pitch maxima reveal a strong prosodic boundary between the object and the subject in VOS clauses, which supports an analysis in which the verb and the object form a prosodic unit in VOS clauses. Furthermore, data from pitch, duration, and the distribution of pauses indicate that the verb and the object in VOS order form a prosodic constituent. In contrast, there is no evidence that the subject and object are delimited by the type of boundary one might expect if the object were postposted in VSO clauses.
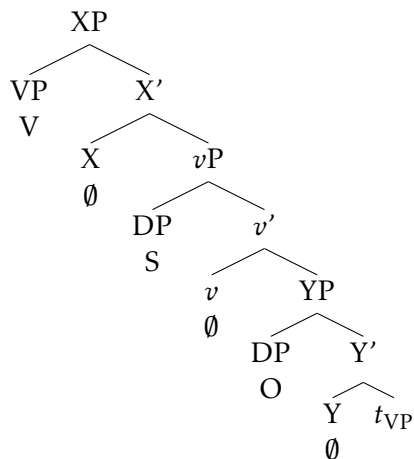
4.3 Interim summary

For both Ch'ol and Niuean we find no evidence in support for the right-side specifier account of V1 order. Specifically, we were looking for a strong boundary between the subject and the object in VSO order, arising from the movement of the object into a vP-external position above the subject. Instead, what we find is evidence in support of verb movement. First, there is evidence for a relatively stronger boundary after the object in VOS order than there is after the subject in VSO order. Furthermore, the verb and the object form a prosodic constituent in VOS clauses. The VOS findings are compatible with both the VP-raising and V^0-raising accounts of V1 order. The next section focuses on the implications of VSO verb phrasing for the two movement-based accounts of V1 order.
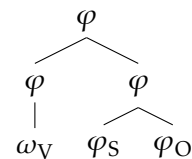
5 Differentiating verb movement accounts

Recall that the prosodic predictions of the VP-raising and V^0-raising accounts only diverge in VSO clauses, and only at the level of the prosodic category of the verb. As explained in Section 3, all else being equal, the VSO verb should map onto a φ-phrase in the VP-raising analysis and a prosodic-ω in the V^0-raising analysis. The difference between the two accounts is illustrated in the syntax-prosody mapping shown in (39) and (40) repeated from (21) and (24).
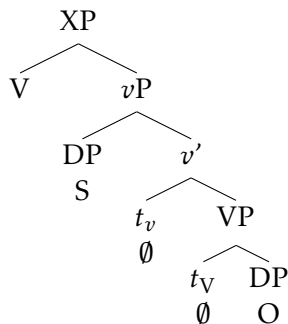
(39) Syntax-prosody mapping: VP-raising VSO

    a. Syntax
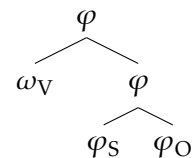   b. Prosody

```
            XP                                               φ
          /    \                                           /   \
        VP     X'                                        φ      φ
        V     /  \                                       |     /  \
             X    vP                                     ω_V  φ_S  φ_O
             ∅   /  \
               DP    v'
               S    /  \
                   v    YP
                   ∅   /  \
                     DP    Y'
                     O    /  \
                         Y   t_VP
                         ∅
```

(40) Syntax-prosody mapping: V^0-raising VSO

    a. Syntax
                                                    b. Prosody

```
            XP                                               φ
          /    \                                           /   \
        V      vP                                        ω_V    φ
              /  \                                             /  \
            DP    v'                                         φ_S   φ_O
            S    /  \
               t_v   VP
               ∅    /  \
                   t_V   DP
                   ∅     O
```

        Section 4 reported on strong evidence from Niuean and somewhat inconclusive evidence from Ch'ol that the verb comprises its own φ-phrase in VSO order. For Niuean, this is indicated by the presence of a H* on the syllable of the verb bearing lexical stress as well as lengthening on the verb in VSO clauses. For Ch'ol, there is no lengthening of the VSO verb, but there is evidence for a H% boundary tone on the verb in VSO clauses.

        VSO verbs show the acoustic characteristics of φ-phrases, and taken at face value, this could be seen as support for the VP-fronting analysis. However, at least three different eurhythmic considerations with broad cross-linguistic support could explain why, what should be a prosodic-ω (assuming syntax-prosody isomorphism), might instead be realized as a φ-phrase in this specific position. Each of these considerations will be discussed in turn.

The first type of eurhythmic consideration that could explain the emergence of a noni-somorphic prosodic structure in the present case is the cross-linguistic preference for prosodic constituents whose first subsconstituent is equal to or greater than the one that immediately follows it (Werle 2009; Selkirk 2011; Elfner 2012, 2018; Bennet et al. 2016). This constraint is known as Strong Start and is formalized in (43):

(41) Strong Start (Selkrik 2011)
      A prosodic constituent optimally begins with a leftmost daughter constituent which is not lower in the prosodic hierarchy than the constituent that immediately follows.

In other words, prosodic constituents comprising two prosodic units belonging to different prosodic categories are optimally ordered so that the higher category precedes the lower.[8] Note that the prosodic structure predicted by the VP-raising account (42a) satisfies Strong Start in a way that the prosodic structure predicted by the V^0-raising account (42b) does not. Specifically, in (42b), the ω corresponding to the verb is lower on the prosodic hierarchy than its sister, a φ-phrase, and so the eurhythmic consideration behind Strong Start is violated.

(42) Prosodic predictions for VSO clauses
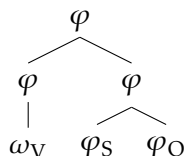
      a. VP-raising   b. V^0-raising
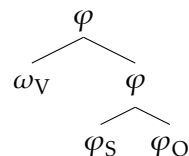
The prosodic structures shown in (42) also differ with respect to their adherence to a second eurhythmic consideration referred to as Equal Sisters (Myrberg 2010, 2013; Bennett et al. 2016).

(43) Equal Sisters (Myrberg 2013)
      Sister nodes in prosodic structure are instantiations of the same prosodic category.

According to Equal Sisters prosodic structures with matching subcomponents are preferred over those with subcomponents belonging to different prosodic categories. Tying this back to (42), a prosodic constituent with two daughter φ-phrases (42a) satisfies Equal Sisters, whereas a prosodic constituent with one prosodic-ω daughter and one φ-phrase daughter, as in (42b), violates Equal Sisters.

Finally, while it is commonly assumed that head movement results in the formation of a complex head that is realized as a single prosodic-ω, it is likely that size restrictions on prosodic-ωs might take precedence over syntax-prosody isomorphism, at least in some cases. Just as there are minimal size restrictions on prosodic-ωs, languages are known to display maximal size restrictions as well (DeLacy 2004; Ketner 2006; Itô and Mester 2007). A size-based explanation for why a prosodic-ω might be realized as a φ-phrase is probably more likely to hold for Niuean than Ch'ol, based on the relative number and size of the X^0s argued to participate in head movement (compare Clemens and Coon 2018a and Clemens 2019).

To conclude this section, the prosodic data presented in this chapter cannot conclusively distinguish between the movement-based accounts of V1 order, because it is impossible to rule

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[8]The prosodic hierarchy assumed here is $\iota > \varphi > \omega$.

out a number of eurhythmic constraints that might override syntax-prosody isomorphism in the case discussed here. However, the purpose of this section was not to argue for the VP-raising analysis or the V^0-raising analysis on the basis of prosodic data,[9] but rather to discuss the types of confounds that can arise when applying acoustic cues to prosodic constituency as a diagnostic for syntactic structure. If eurhythmy were obscuring the underlying syntactic structure, it should be possible to amass independent prosodic evidence supporting or refuting the effect of eurhythmic constraints like Strong Start and Equal Sisters.

6   Conclusion

The primary goal of this chapter was to apply prosodic data to an outstanding problem in syntax, and in doing so, demonstrate how prosody can be a helpful tool in diagnosing syntactic structure. The particular syntactic problem addressed here was the derivation of verb-initial order in two genetically unrelated languages—Ch'ol (Mayan) and Niuean (Polynesian)—with overlapping word order patterns. Researchers have accounted for verb-initial order in languages in these families via i) right-side specifiers, ii) VP-raising, and iii) V^0-raising. Each of these approaches to V1 word order results in specific predictions about prosodic constituency in VSO and VOS clauses. In this chapter, I articulated those predictions and evaluated them based on work first published as Clemens 2014b and Clemens and Coon 2018b.

For both languages under consideration, acoustic data from duration, intonation, and the distribution of pauses support a prosodic analysis where the verb and the object form a constituent in VOS clauses and the verb comprises a unique φ-phrase in VSO clauses, as schematized in (44).

(44)   Prosodic phrasing of VOS and VSO clauses in Ch'ol and Niuean
   a. $\big($V   (O)$\big)$ (S)
   b.   (V)   (S)   (O)

These findings were used to rule out the right-side specifier account of V1 order, and, as such, demonstrated how an argument based on prosodic constituency can successfully reduce the hypothesis space available to syntactic analyses. However, because there can be a many-to-one correlation between syntactic input and prosodic output, the insight gained from prosodic constituency fell short of distinguishing between the two movement accounts. This type of problem can be addressed by using a variety of methodologies in search of converging evidence, e.g. using syntactic and prosodic argumentation in tandem (see e.g., see Clemens and Coon 2018a and Clemens 2019 on these specific languages), and by collecting and analyzing more prosodic data in order to get a better grasp on the prosodic systems of individual languages. A deeper understanding of a language's prosodic system as a whole will make it easier to distinguish between cases where prosodic structure directly reveals the underlying syntactic structure verses times when a eurhythmic repair to prosodic constituency is obscuring the underlying syntactic structure.

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[9]See Clemens and Coon 2018a and Clemens 2014a, 2019 for syntactic arguments in support of V^0-raising.

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