The possibilities and limitations of using prosody to diagnose head movement

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Workshop on the Status of Head Movement in Linguistic Theory
Stanford University, Department of Linguistics
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Introduction
Why prosody matters
The role of prosody in language

Intonational and rhythmic patterns in language

- Prosody conveys different types of information:
  - Individual-level
    - Emotional state
    - Attitude
  - Discourse-level
    - Register
    - Genre
Individual-level: Examples

Ch’orti’ (Depositor in AILLA: Fought)

CAA004R180
CAA004R182
Discourse-level

Sicoli (2010) on the prosodic encoding of register in Mesoamerica:

- **High-pitch**
  - Politeness/respect: Tzeltal (Brown and Levinson 1987)
  - Politeness/deference and leave-taking: Tojolabal (Furbe 1988)
  - *Avoided* with children: K’iché (Pye 1986)

- **Breathy voice**
  - Infant-directed-speech: K’iché (Pye 1986)
  - Scolding and imperatives: Tzeltal, Tojolab’al (references in Sicoli 2010)

- **Creaky voice**
  - Commiseration: Tzeltal (Brown and Levinson 1987)
Discourse-level: Examples

Mam (Depositor in AILLa: Oxlajuuj Keej Maya’ Ajtz’iib’)

<table>
<thead>
<tr>
<th>MAM005R082</th>
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</thead>
<tbody>
<tr>
<td>MAM005R083</td>
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</tbody>
</table>
In addition to individual- and discourse-level information, prosody also encodes **grammatical information**:

- Utterance type
- Focus
- Constituency
Prosody resolves string ambiguities.

Chuj (Notes)

(1) 

<table>
<thead>
<tr>
<th>PQLATRINA</th>
<th>DECLATRINA</th>
</tr>
</thead>
<tbody>
<tr>
<td>a. Ay mach t’a latrina?</td>
<td>b. Ay mach t’a latrina.</td>
</tr>
<tr>
<td>EXT someone in latrine</td>
<td>EXT someone in latrine</td>
</tr>
<tr>
<td>Someone’s in the latrine?</td>
<td>Someone’s in the latrine.</td>
</tr>
</tbody>
</table>
Grammatical-level: Information Structure

➤ Prosody resolves string ambiguities
(Examples taken from joint work-in-progress with Jessica Coon, Carol-Rose Little, and Morelia Vázquez Martínez.)

(2) a. **Prompt:** Chuki ta’ ujtyi ak’bi?
   **Response:** Ak’bi jiñi alob tyi kuchu ixim. [111]
   yesterday DET boy DET carry corn
   ‘Yesterday, the boy carried corn.’

b. **Prompt:** Chuki ta’ ikuchu alob ak’bi?
   **Response:** Ak’bi alob tyi kuchu ixim. [115]
   yesterday boy DET carry corn
   ‘Yesterday, the boy carried CORN.’
Grammatical-level: Constituency

Prosody resolves string ambiguities.

The hungry ones include Indy and Bobby and Beatrice ate.
- The hungry ones include Indy and Bobby and Beatrice ate
- The hungry ones include Indy and Bobby and Beatrice ate

I distracted the child with the dinosaur.
- I distracted the child with the dinosaur
- I distracted the child with the dinosaur
Prosody conveys information about speakers, discourse and grammatical structure; the grammatical information that prosody encodes includes utterance type, focus, and syntactic constituency.

Goals for this talk

- Bring prosodic evidence to bear on problems related to syntactic structure and constituency
- Explore the possibilities and limitations of this type of methodology
- Present findings from a study of sentence-level prosody in two understudied, V1 languages: Ch’ol and Niuean
VSO/VOS alternations
Ch’ol and Niuean

Pacific Ocean Sprachbund?

Niuean (Oceanic)  Ch’ol (Mayan)
Ch’ol and Niuean similarities

Ch’ol and Niuean:

- Both languages are generally V1
- They display VSO/VOS alternations
- Alternations conditioned by the structure of the object

For both languages…

- Presence of certain functional structure on the object yields VSO
- Absence of that functional structure on the object yields VOS
VOS/VSO alternations in Ch’ol (Coon 2010)

- NP objects occur in VOS clauses; DP objects occur in VSO clauses
- VOS objects may not appear with determiners, demonstratives; certain classifiers are allowed in this position

(3)  

a. Tyi i-kuch-u [OBJ si’ ] [SUB aj-Maria ].  
PVF A3-carry-SS wood CLF-Maria  
‘Maria carried wood.’

b. *Tyi i-kuch-u [OBJ ili si’ ] [SUB aj-Maria ].  
PVF A3-carry-SS DEM wood CLF-Maria  
Intended: ‘Maria carried this wood.’

c. Tyi i-kuch-u [SUB aj-Maria ] [OBJ ili si’ ].  
PVF A3-carry-SS CLF-Maria DEM wood  
‘Maria carried this wood.’
VOS/VSO alternations in Ch’ol (Coon 2010)

This is not morphological incorporation:

- Bare objects are phrasal (NP not N°)
- Modifiers are possible

Complex object

(4) a. Tyi i-tsäñs-ä [OBJ *kolem chityam*] [SUB *jiñi wiñik*].
    PFV A3-kill-SS big pig DET man
    ‘The man killed a big pig.’

b. Tyi i-mäñ-ä [OBJ *pejtyelel tyumuty*] [SUB *jiñi alob*].
    PFV A3-buy-SS all egg DET boy
    ‘The boy bought all the eggs.’
VOS/VSO alternations in Ch’ol (Coon 2010)

The verb and the object are a surface constituent

- Adverbs that can follow the verb in VSO constructions or in VO<sub>DP</sub> constructions, cannot intervene between the verb and an NP object

### Location of adverbs

(5)  

a. Tyi k-wuts’-u abi [OBJ ili pisil].  
P'FV A1-wash-SS yesterday DEM clothes  
‘I washed these clothes yesterday.’

b. *Tyi k-wuts’-u abi [OBJ pisil].  
P'FV A1-wash-SS yesterday clothes  
Intended: ‘I washed these clothes yesterday.’

c. Tyi k-wuts’-u [OBJ pisil] abi.  
P'FV A1-wash-SS clothes yesterday  
‘I washed these clothes yesterday.’
VOS/VSO alternations in Niuean (Massam 2001)

- NP objects occur in VOS clauses; DP objects occur in VSO clauses
- VOS objects may not appear with case markers or classifiers

(6) a. Kua fakahū [OBJ tohi ] [SUB e ekekafo].
   PFV send letter ABS doctor
   ‘The doctor sent a letter.’

   b. *Kua fakahū [OBJ e tohi ] [SUB he ekekafo].
      PFV send ABS letter ERG doctor
      Intended ‘The doctor sent the letter.’

   c. Kua fakahū [SUB he ekekafo] [OBJ e tohi ].
      PFV doctor ERG doctor ABS letter
      ‘The doctor sent the letter.’
VOS/VSO alternations in Niuean (Massam 2001)

This is not morphological incorporation:

- Bare objects are phrasal (NP not N°)
- Modifiers are possible

Complex objects

(7) a. Kua onoono [OBJ fakatino mahaki toili] [SUB e tama].
    PFV look.at pictures huge large ABS child
    ‘The child is looking at extremely large pictures at school.’

b. Ne tō [OBJ talo mo e tau fiti] [SUB e magafaoa].
    PST plant taro COMTV ABS PL flower ABS family
    ‘The family planted taro and flowers.’
VOS/VSO alternations in Niuean (Massam 2001)

The verb and the object are a surface constituent

- Adverbs and postverbal particles that can follow the verb in VSO constructions, cannot intervene between the verb and an NP object

Complex objects

(8) a. Takafaga [OBJ ika ] tūmau ni [SUB a ia ].
  hunt  fish  always EMPH  ABS 3SG
  ‘He is always fishing.’

b. Takafaga tūmau ni [SUB a ia ] [OBJ ika ].
  hunt  always EMPH  ABS 3SG  fish
  ‘He is always fishing.’ (Seiter 1980)
Differences between Ch’ol and Niuean VOS

Differences between Ch’ol and Niuean VSO/VOS alternations:

- **VOS** more common in Ch’ol; **VSO** more common in Niuean
- Ch’ol case marking is fully *transitive* in VOS; Niuean case marking is *intransitive* in VOS
- Objects in Ch’ol VOS can be **specific and fully referential**; objects in Niuean VOS are *non-specific and non-referential*
Syntactic analyses
Types of analyses

① **Right-side specifier**
- **Mayan:** Aissen 1992, England 1991
- **Polynesian:** Māori (Chung 1998)

② **VP-raising**
- **Mayan:** Ch’ol (Coon 2010)
- **Polynesian:** Niuean (Massam 2001, et seq.); Hawaiian (Medeiros 2013); Samoan (Collins 2016)

③ **V^0^-raising**
- **Mayan:** Ch’ol, (Clemens 2014, Clemens and Coon 2016)
- **Polynesian:** Māori (Pearce 2002, Waite 1989); Tongan (Custis 2004, Otsuka 2000, 2005); Niuean (Clemens 2014)
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Right-side specifier — VOS

The subject is generated in a rightward oriented specifier, which yields a VOS clause.

The vP constituent consists of the verb, the object, and the subject.

(9)

```
IP
  \( I \rightarrow vP \)
  \( v' \rightarrow vP \)
  \( v \rightarrow VP \)
    \( \text{VERB} \rightarrow \text{NP} \)
      \( \text{OBJ} \rightarrow \text{SUBJ} \)
      \( \text{NP} \rightarrow \text{VP} \)
```

Clemens

Prosody and head movement
Right-side specifier — VSO

(10)

- The subject is generated in a right-side specifier.
- DP objects are displaced to the right of the subject, yielding a VSO clause.
- The vP constituent consists of the verb and the subject, but *not* the object.
SVO is base-generated, and a phrase containing the verb and the object move above the subject (shown as VP).

The vP constituent consists of just the subject (the moved VP contains both the verb and the object).
(12) 

**VP-Raising — VSO**

- DP objects move out of the VP
- The VP raises after the object moves (remnant movement), resulting in a VSO clause
- The vP constituent consists of the subject and the object, but *not* the verb
The verb undergoes head movement, yielding a VSO clause.

The vP constituent consists of the subject and the object, but *not* the verb.
Object scrambling (e.g., Otsuka 2002, 2005; Rackowski and Richards 2005)

We can rule this out when the object and the verb form a surface constituent.
V⁰-Raising — VOS: ARG-ϕ

Post-syntactic, prosodic shift (Clemens 2014)

- The movement of the verb into initial position is syntactic; VOS is the result of prosodic restructuring
  - The syntax is VSO (derived via X⁰-raising)
  - The prosody requires a (V O)ϕ constituent
  - So the clause is linearized VOS

- The prosodic grammar includes a condition that requires head-complement pairs to be phrased together

The Argument Condition on Phonological Phrasing

(15) **ARG-ϕ**: A head H with a categorial feature [C] and head C with the same [C] feature must constitute a ϕ-phrase.
V⁰-Raising — VOS

The intuition behind ARG-φ is found elsewhere in the literature, what is different about the proposal in Clemens (2014) is that this constraint can be involved in linearization:

- Sense Unit Condition (Selkirk 1984)
- Selectional Contiguity (Richards 2016)
- COMPLEMENT-φ (Henderson 2012)
- COMPLEMENT-ω (Werle 2004)
Some questions you may have... 

How does PF make reference to head-complement pairs?
- C-selection as Agree (Chomsky 1965; Adger and Svenonius 2011)
- Agree establishes a lasting link between the probe and the goal (Pesetsky and Torrego 2007)

What about VSO clauses?
- The timing of spell-out is different for DP and NP arguments, because D⁰ is a phase head (Svenonius 2004; Hiraiwa 2005)
- Once a phase is spelled-out categorial features are no longer accessible
Interim Discussion

For now...

- The similarities between the **raising** analyses (modulo scrambling) are more important than the differences:
  - VOS: the verb and object are vP-external, the subject is vP-internal
  - VSO: only the subject and object remain vP-internal

- In contrast, for the **right-side** specifier analysis . . .
  - VOS: the verb, subject, and object remain vP-internal
  - VSO: the verb and subject are vP-internal, the object is vP-external

These differences will ultimately allow us to distinguish between the **raising** and **right-side** analyses with prosodic information

*Differences between V⁰- vs. VP-raising are temporarily on hold.*
Syntax–prosody mapping
Match Theory
Match Theory (Selkirk 2011)

- An indirect reference theory of the syntax-prosody interface
  - Prosodic structure refers to the organization of prosodic units
  - Intonational phrase (ι) > phonological phrase (φ) > prosodic word (ω)
Match Theory (Selkirk 2011)

Match theory integrates seemingly disparate findings about the syntax-prosody interface:

- **Prosodic structure is recursive**

- **Prosodic structure is flatter than syntactic structure**

Match constraints require that syntactic structure and prosodic structure correspond, but constraints on prosodic well-formedness may be prioritized.
Match Theory (?)

The input (syntactic structure) corresponds to the output (prosodic structure)

<table>
<thead>
<tr>
<th>Syntactic head ($X^0$)</th>
<th>→</th>
<th>Prosodic word ($\omega$)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Syntactic phrase (XP)</td>
<td>→</td>
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</tr>
</tbody>
</table>
1. No redundant recursive structure

Prosodic categories which do not correspond to phonological content are not shown:

\[
\begin{align*}
\text{ZP} & \quad \varphi \\
\mid & \quad \mid \\
\text{YP} & \quad \varphi \quad \varphi \\
\mid & \quad \mid \\
\text{XP} & \quad \varphi
\end{align*}
\]
Additional assumptions (Elfner 2012)

2. No empty categories

Terminal nodes without phonologically overt material are not assigned prosodic structure:

```
XP
 / \
X   t
```

```
ϕ
```

```
ω
```
3. What about the bar-level?

Match Theory is underspecified for bar-level syntax; we will start with a tertiary mapping.

\[
\begin{array}{c}
\text{XP} \\
A \quad X' \\
B \quad C
\end{array} \quad \Rightarrow \quad \begin{array}{c}
\varphi \\
A \\
B \\
C
\end{array}
\]
Predictions
Right-side specifiers: Syntax-prosody mapping

(16) 
```
(YP)
  \( Y' \)
  \( Y' \)
  \( V \)
  \( t_v \)
  \( V \)
  \( X'P \)
  \( XP \)
  \( DP \)
  \( O \)
```

(17) 
```
(YP)
  \( X'P \)
  \( XP \)
  \( X'P \)
  \( V \)
  \( t_v \)
  \( t_o \)
```

\[ \phi \]

\[ \omega \]

\[ \phi O \]

\[ \phi S \]

\[ (V(O)(S)) \]

\[ (V(S))(O) \]
Raising: Syntax-prosody mapping

(18)

\[
\begin{array}{c}
\text{XP} \\
\text{XP}_i \\
\text{V} \\
\text{NP} \\
\text{O} \\
\text{DP} \\
\text{S} \\
\text{t}_{vp}
\end{array}
\quad \Rightarrow \quad
\begin{array}{c}
\varphi \\
\omega \\
\varphi_O \\
\varphi_S \\
\varphi
\end{array}
\Rightarrow (V(O))(S)

(19)

\[
\begin{array}{c}
\text{XP} \\
\text{(XP)} \\
\text{V} \\
\text{t}_o \\
\text{DP} \\
\text{S} \\
\text{XP} \\
\text{DP} \\
\text{O} \\
\text{t}_{xp}
\end{array}
\quad \Rightarrow \quad
\begin{array}{c}
\varphi \\
\omega \\
\varphi_S \\
\varphi_O
\end{array}
\Rightarrow (V)((S)(O))

Clemens
Prosody and head movement
Summary
## Summary of syntax–prosody mapping

### VSO constituency predictions

<table>
<thead>
<tr>
<th>Right-side specifier:</th>
<th>((V S) (O))</th>
</tr>
</thead>
<tbody>
<tr>
<td>Raising:</td>
<td>((V) (SO))</td>
</tr>
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### VOS constituency predictions:

<table>
<thead>
<tr>
<th>Right-side specifier:</th>
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</tr>
</tbody>
</table>
## Summary of syntax–prosody mapping

<table>
<thead>
<tr>
<th>Evidence for right-branching:</th>
<th>Boundary between the subject and the object in VSO</th>
</tr>
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Prosodic Studies
Ch’ol

Prosodic category of the verb
Methodology

Participants

- Data from this study (Clemens and Coon to appear) come from four native-speakers of Ch’ol:
  - 3 women and 1 man
  - all between 20–40 years old
  - all speakers from the Tila dialect

Task

- The task was reading-based
  - Makes it possible to control for other factors that influence prosody
  - Sentences with two overt arguments are rare in corpora
Sentences with significant disfluencies or extreme background noise, were thrown out.

Sentences were aligned with the help of the ProsodyLab-Aligner (Gorman, et al. 2011) and a troop of McGill undergraduates.
Experimental materials

4 conditions (2 x 2) x 11 items = 44 target sentences

There were two variables:
- Word order (VOS/VSO)
  - VOS = NP object
  - VSO = DP object
- Presence/absence of nominal modifiers
Experimental materials

Because of certain constraints, some of the sentences are amusing…

- Target sentences are “sonorant-rich”
  (Mayan phoneme inventories do not lend themselves easily to this task)
- They include adverbial material in final position
- Head nouns and modifiers are bi- and trisyllabic

(20) Tyi ibä’ñä chámeñ lukum jiñi jujp’embä ñeñe’ tyi abälel.  
ASP fear dead snake DET fat baby PREP night  
‘The fat baby feared the dead snake at night.’

(21) Tyi ich’ili k’umbä bu’ul jiñi p’ump’uñ uma’ tyi k’iñijel.  
ASP fry soft beans DET poor mute PREP party  
‘The poor mute fried soft beans at the party.’
Acoustic cues

Cross-linguistic cues to the presence of a prosodic boundary

- **Phrase-final lengthening**
- **Distribution of pauses**

See Clemens and Coon (to appear)

In other Mayan languages (see Bennett to appear)...

- **Phrase-final H% tones**
- **Final devoicing**
  For Ch’ol, phrase/word-final devoicing is more accurately described as ‘tense voice’ (Lesure and Clemens to appear)
- **Final aspiration**
<table>
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</table>

- Is there a boundary between subject and object in VOS?
- Is there a boundary between object and subject in VSO?
The difference in duration between the unmodified VOS object and VSO subject is significant (Paired T-Test; \( p < 0.005 \))

- Effect size is below the perceptibility threshold (Stevens 2000)
- Phrase-final lengthening may be a mechanical effect of prosodic planning (Myers and Hansen 2007)
- No durational differences among modified postverbal arguments

(22) Duration of the immediately post-verbal argument

<table>
<thead>
<tr>
<th></th>
<th>UNMODIFIED</th>
<th>MODIFIED</th>
</tr>
</thead>
<tbody>
<tr>
<td>VOS</td>
<td>52 ms</td>
<td>49 ms</td>
</tr>
<tr>
<td>VSO</td>
<td>48 ms</td>
<td>48 ms</td>
</tr>
</tbody>
</table>

The NP object in unmodified VOS clauses is significantly longer than the DP subject in VSO clauses. This is consistent with the raising analyses.
Introduction
Syntactic analyses
Syntax–prosody mapping
Prosodic Studies
Discussion

Ch’ol
Niuean
Prosodic category of the verb

Prosodic category of the verb

VOS

PLAY

Pitch (Hz)

0

350

300

250

200

150

100

50

0

2.602125

0

Time (s)

2.602

NO H%

H%

H%

L%

tyi’julu

balum

aj

More

#

tyi

matye’el

PFV=shoot

jaguar

CLF

More

PREP

jungle

‘More shot a/the jaguar in the jungle’
"Ana burned this corn three days ago."

Pitch (Hz)

Time (s)

tyi’pulu    aj    Ana    ili    ixim    tyi    yuxk’iñi

PFV=burn    CLF    Ana    DEM    corn    PREP    3.days.ago

'Ana burned this corn three days ago.'
Time-normalized pitch contour on first argument

Sentence type
- VSO
- VOS

Pitch (z-scores over ERB)

1 2 3 4 5 6 7 8 9 10 11 12 13
Taking Stock

- Prosodic study with the following results:
  - The H% between the object and subject in VOS clauses is higher than the H% between the subject and object in VSO clauses
  - The post-verbal argument is longer in VOS clauses than in VSO clauses
- The prosodic data fits the raising analyses better than the right-side specifier analyses.
  - Raising: \((V O)(S)✓\)
  - Raising: \((V)(S O)✓\)
  - Right-side specifier: \((V O S)✗\)
  - Right-side specifier: \((V S)(O)✗\)
Can we use prosodic data to differentiate between raising analyses?
Niuean
Methodology

Participants

- Data from this study come from **five native-speakers of Niuean:**
  - Niuean-English bilinguals
  - Recorded in Auckland, NZ
  - 4 women; 1 man

Task

- Two reading-based sessions
  - Mixture of VSO and VOS in each session
  - VSO/VOS pairs not recorded in the same session
- They were asked to read each sentence 2 times, or until they got a “natural-sounding” version (as determined by the participant)
Experimental materials

Three variables

- Word order (VOS/VSO)
  - VOS = NP object
  - VSO = DP object
- Presence/absence of modifier on the object
- Object type: absolutive, middle, and instrumental

12 Conditions (2 x 2 x 3) x 5 items = 60 target sentences
Experimental materials

- Target sentences are “sonorant-rich”
- They include adverbial material in final position

(23) Na tō [SUB he magafaoa] [OBJ e talo (mo e tau fiti)] he māla.
PST plant ERG family ABS taro COM ABS PL flower LOC farm
‘The family planted taro and flowers on the farm.’

(24) Na tō [OBJ talo (mo e tau fiti)] [SUB e magafaoa] he māla.
PST plant taro COM ABS PL flower ABS family LOC farm
‘The family planted taro and flowers on the farm.’
Intonation

Niuean sentences contain a series of **H*L- tunes

- **H* on most prominent syllable of rightmost prosodic-ω of the phrase.
- Pitch falls immediately thereafter.
‘The youth listened to the songs on the radio.’
**Introduction**

**Syntactic analyses**

**Syntax–prosody mapping**

**Prosodic Studies**

**Discussion**

**Ch’ol**

**Niuean**

Prosodic category of the verb

### VOS PLAY

<table>
<thead>
<tr>
<th>Pitch (Hz)</th>
<th>Time (s)</th>
</tr>
</thead>
<tbody>
<tr>
<td>0</td>
<td>0.000</td>
</tr>
<tr>
<td>500</td>
<td>3.372</td>
</tr>
</tbody>
</table>

The youth listened to the songs on the radio.

<table>
<thead>
<tr>
<th>ne</th>
<th>fa</th>
<th>no</th>
<th>ŋo</th>
<th>‘no</th>
<th>ŋo</th>
<th>lo</th>
<th>‘lo</th>
<th>ŋo</th>
<th>e</th>
<th>‘fwa</th>
<th>ta</th>
<th>he</th>
<th>le</th>
<th>ti</th>
<th>o:</th>
</tr>
</thead>
<tbody>
<tr>
<td>ne</td>
<td>fanogonogo</td>
<td>lologo</td>
<td>e</td>
<td>fuata</td>
<td>he</td>
<td>le</td>
<td>tiō</td>
<td>OBL radio</td>
<td></td>
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</tbody>
</table>

<table>
<thead>
<tr>
<th>PST listen</th>
<th>song</th>
<th>ABS youth</th>
</tr>
</thead>
<tbody>
<tr>
<td>‘The youth listened to the songs on the radio.’</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
Max Pitch Across Conditions

- Max pitch associated with the verb is higher in the VS condition than it is in the PNI condition by approx. 23 Hz (Paired T-Test; p < 0.0001).
- Max pitch value on the constituent immediately following the verb is lower in the VS than in the PNI condition by approx. 13 Hz (Paired T-Test; p < 0.0001).
Conclusions

The VS verb is at the right-edge of a ϕ-phrase; the PNI verb is not.
  - There is a H* on VS verbs, but not PNI verbs.
  - The VS verb—not the PNI verb—is not at the right-edge of a ϕ-phrase.

The incorporated element in PNI clauses is at the right-edge of an earlier ϕ-phrase than the subject in VS clauses.
  - Max F₀ decreases with each ϕ-phrase.
  - Max F₀ on the subject in VS clauses is lower than the max F₀ on the incorporated element in PNI clauses.
Duration data

- The VSO verb is approx. 5 ms longer than the VOS verb
  - This is a statistically significant finding (Paired T-Test; p < 0.0005)

- The VSO verb is at the right-edge of a ϕ-phrase; the VOS verb is not.
  - Items at a phrase-edge tend to be longer
  - The duration of the VSO verb is longer than the duration of the VOS verb
Taking stock

Data from duration and intonation support an analysis where . . .

- The verb and the object form a constituent in VOS clauses
  - (V (O)) (S)
- The verb comprises a unique ϕ-phrase in VSO
  - (V) (S) (O)

These findings are compatible with VP-raising (Coon 2010; Massam 2001) and V₀-raising (Clemens 2014; Clemens and Coon 2016).
Prosodic category of the verb
V⁰- and VP-Raising: Syntax-prosody mapping for VOS

(25)

(26)

Clemens
Prosody and head movement
V⁰- and VP-Raising: Syntax-prosody mapping for VSO

(27)

(28)
The VSO verb

Is the verb in VSO clauses a $\varphi$-phrase or a prosodic-$\omega$?

- For Ch’ol it is unclear (contradictory results for duration and pitch)
  - No phrase final-lengthening
  - Has the intonational contour of a $\varphi$-phrase

- For Niuean, it is clearly a $\varphi$-phrase
  - Phrase-final lengthening
  - Has the intonational contour of a $\varphi$-phrase
Different eurythmic constraints could be at play

- **STRONG START** (Werle 2009, Selkirk 2011)
  - A preference for prosodic constituents whose first subconstituent is not lower-ranked than the one that immediately follows it.

- **EQUAL SISTERS** (Myrberg 2010, 2013; Bennett et al. 2016)
  - A preference for prosodic constituents that have matching subcomponents

(29) and (30)
Common assumption: head movement results in the formation of a complex head . . .

If the verb or verbal complex does not surface as a single *prosodic* word, head movement has not taken place.
Complex heads vs. complex words

(32) From X₀ to ω

a. \[[X₀ X₀ X₀ X₀]X₀ \rightarrow (ω (ω ω)ω)ω\]

b. \[[X₀ X₀ X₀]X₀ \rightarrow ω\]

c. \[[X₀ X₀ X₀ X₀]X₀ \rightarrow (ω)ω (ω)ω (ω)ω\]

- Mapping (a) is common.
- Mapping (b) is uncontroversial.
- Mapping (c) is also expected: just as there are minimal size restrictions on prosodic-ωs, languages are known to display maximal size restrictions (DeLacy 2008; Ketner 2006; Itô and Mester 2007).
Discussion
What now?

- Analyze more prosodic data to assess the status of constraints like \textsc{Equal Sist}ers and \textsc{Strong Start} and any minimal or maximal size restrictions on prosodic-\(\omega\)s
- Return to syntactic arguments for differentiating between \(X^0\)- and \(XP\)-raising in these languages
Prosodic constituency can be helpful in diagnosing syntactic constituency

- The prosodic facts are consistent with the raising accounts

However, there can be a many-to-one correlation between syntax and prosody (and in other cases a one-to-many correlation)

- The prosodic facts are insufficient to distinguish between the raising accounts (at least for now)

We can address this problem by...

- Using a variety of methodologies in search of converging evidence, e.g. syntactic and prosodic arguments
- Collecting and analyzing more prosodic data in order to get a better grasp on the prosodic systems of individual languages
Wokox awäläl and Fakaauē lahi!

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