Syntax-prosody mismatches in Irish and English verb-initial structures

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Introduction

- Syntax-prosody interface: concerned with the mapping of syntactic to prosodic structure
- To what extent can prosody be used as a test for syntactic constituent structure?

Introduction

- Between-language comparison is complicated by several factors:

1. Language-specific syntactic differences
2. Language-specific prosodic/eurhythmic preferences
3. Language-specific intonational tunes

Introduction

- In this talk: I discuss experimental work that compares two languages, (Connemara) Irish and (North American) English

Introduction

- Main idea: control for factor 1 (language-specific syntactic differences) to better assess the roles of factor 2 and (to some extent) factor 3
  - Compare the prosody of VSO (basic transitive) sentences in Irish with VOO (ditransitive/double object constructions) in English.

Introduction

- Three types of prosodic cues were examined:
  - Duration
  - Location and likelihood of prosodic pauses
  - F0 contours (pitch tracks) and overall pitch patterns

Introduction

- Main findings:
  - Speakers of the two languages behave remarkably similarly on all three prosodic measures in the two structures examined
  - … but not in the way that we might expect given our assumptions about the underlying syntactic structure, giving rise to apparent syntax-prosody mismatches.

Introduction

- This suggests that we may need to re-evaluate how mismatches are integrated into our theory of syntax-prosody mapping, and ask the following questions:
  - How do we diagnose when we have a mismatch, and when should we use prosodic evidence to revise our assumptions about the underlying syntactic structure?
  - What types of prosodic patterns are indicative of a universal pattern, and which are language-specific?

Experiments: Design

Experimental design

- 4 production experiments:
  - Experiments 1 & 2: Connemara Irish
  - Experiments 3 & 4: North American English

Experimental design

- Experiments looked a comparable syntactic structures: VSO (basic transitive) sentences in Irish and VOO (double object) constructions in English.

Syntax: Irish

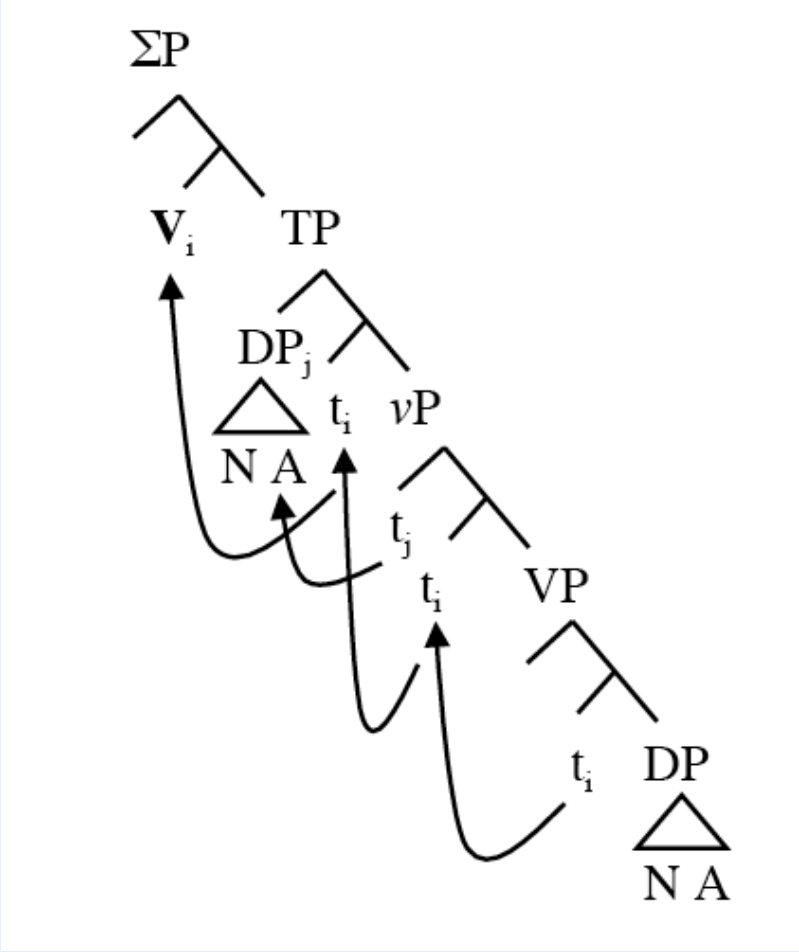
- Basic word order in Irish is VSO:

Leanann Liam Ó Móráin Niall Ó Mearlaigh.
follows Liam Ó Móráin Niall Ó Mearlaigh
‘Liam O’Moran follows Niall O’Marley.’

Syntax: Irish

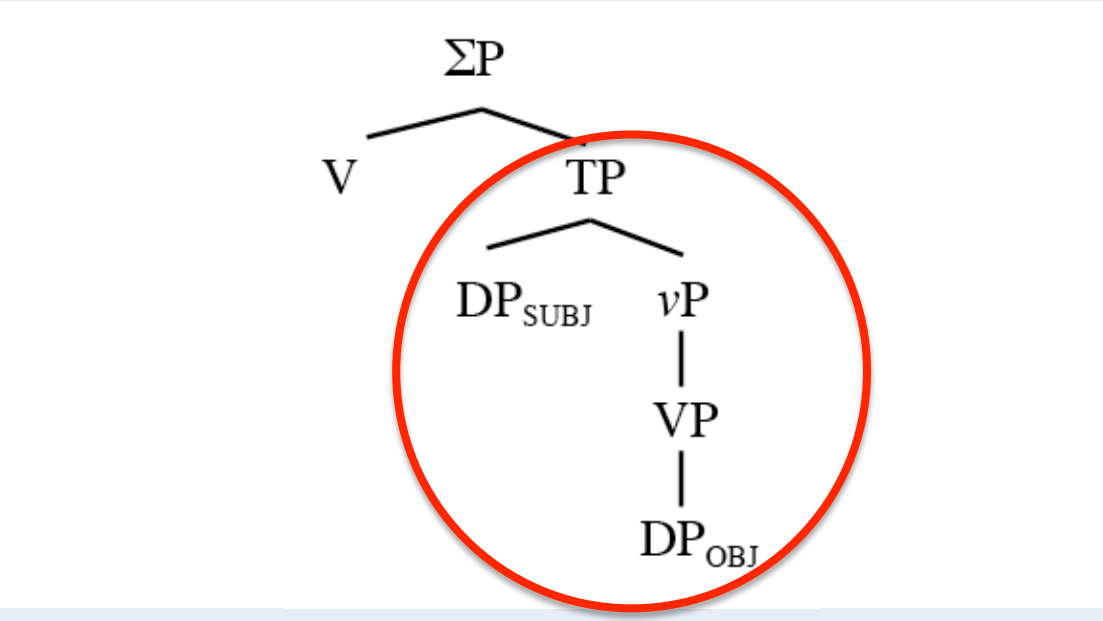
- Evidence from syntactic constituency tests suggest that subject and object form a constituent in Irish, to the exclusion of the verb (McCloskey 1996, 2011).
  - Follow McCloskey (2011) in the assumption that V moves to ΣP through head movement, S moves to Spec,TP, and O remains in VP.

Structure of an Irish transitive (VSO) sentence (McCloskey 1996, 2011)



Syntax: Irish

- Crucially: S and O form a constituent to the exclusion of V, ignoring category labels.

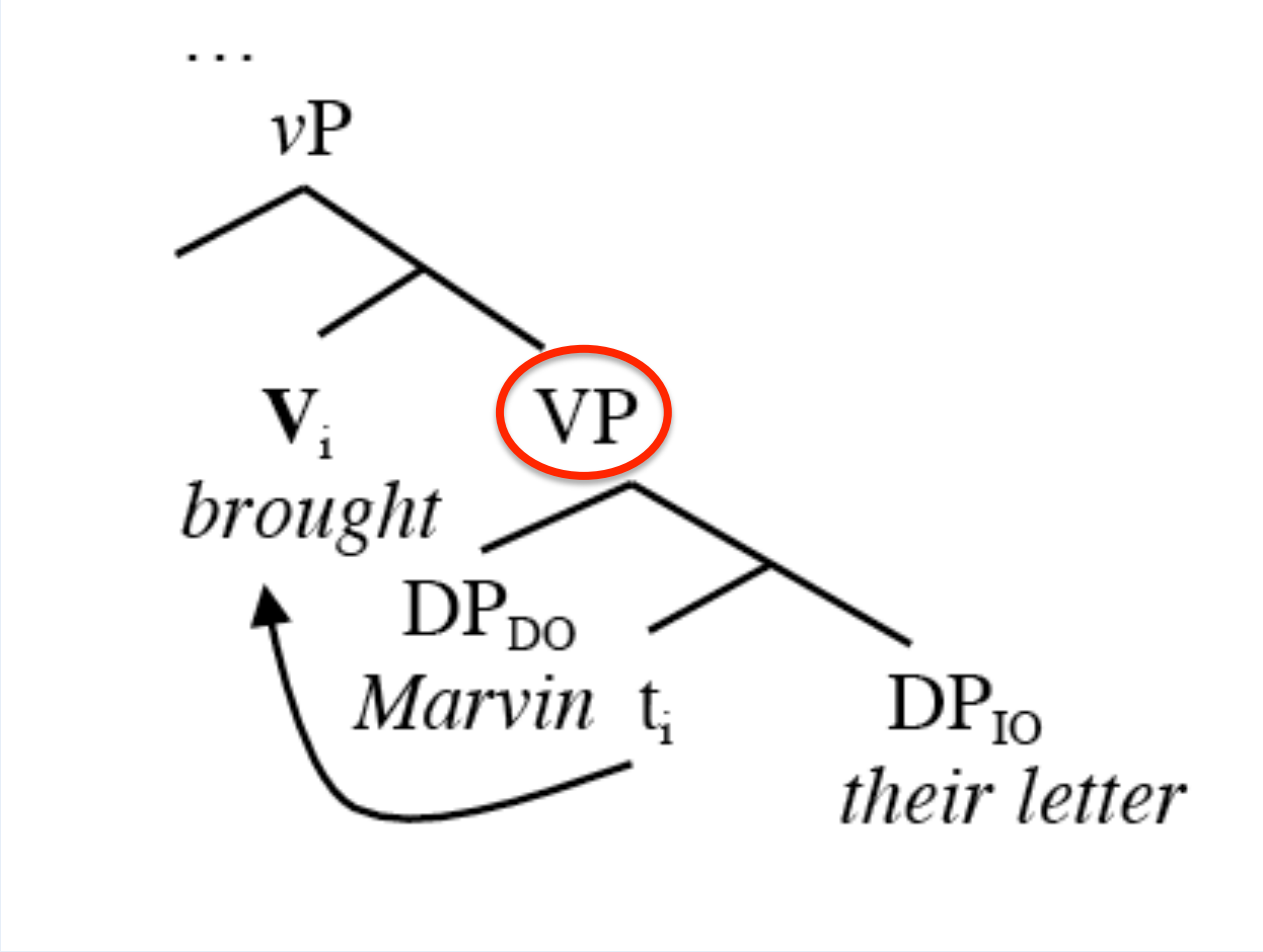


Syntax: English

- (Arguably) comparable structures in English: VOO (double object constructions)
  - Assumption: pronominal subjects are prosodic clitics.

He brought Marvin their letter.

Syntax: English

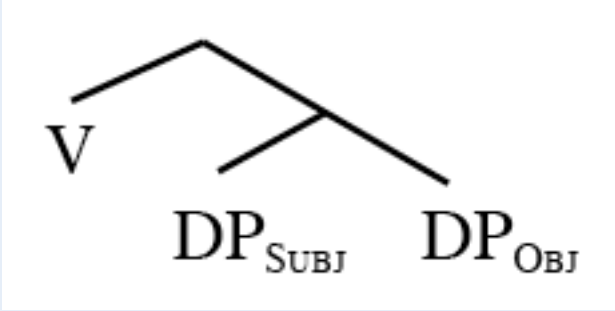


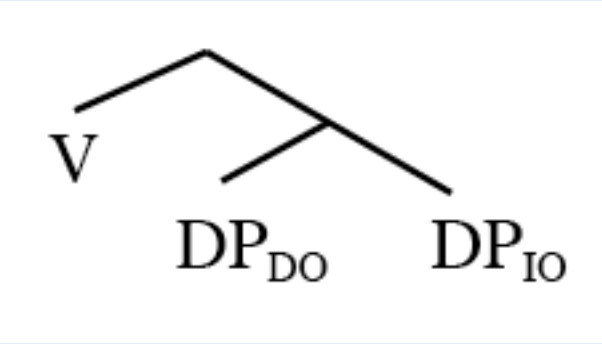
Syntax: English

- Larson (1988) analysis: “The situation posited here for VP in English is analogous to the situation widely assumed for S in VSO languages” (Larson 1988: 344; also Dowty 1982, Jacobson 1987)

Syntax: Comparison

- In both languages: post-verbal arguments appear to form a constituent to the exclusion of the verb.





Experiments: Methods and Materials

Materials and design

- 4 experiments: VSO structures (Irish) and VOO structures (English)

	Names	Branching DPs
Connemara Irish	**Experiment 1**	**Experiment 2**
N.A. English	**Experiment 3**	**Experiment 4**

Materials and design

- Each experiment: 2x2 design varying subject/ object complexity

	Branching object (B)	Non-branching object (N)
Branching subject (B)	**BB**	**BN**
Non-branching subject (N)	**NB**	**NN**

Sample materials: Experiment 1 (Irish names)

‘Liam (O’Moran) follows Niall (O’Marley).’

Condition	V	S		O	
		N1	N2	N3	N4
BB	Leanann	Liam	Ó Móráin	Niall	Ó Mearlaigh
BN	Leanann	Liam	Ó Móráin	Niall	
NB	Leanann	Liam		Niall	Ó Mearlaigh
NN	Leanann	Liam		Niall	

Sample materials: Experiment 2 (Irish DPs)

‘Neasa/nice children pick (ripe) apples’

Condition	V	S		O	
		N1	A2	N3	A4
BB	Piocann pick.pres	páistí children	deasa nice	úlla apples	aibí ripe
BN	Piocann	páistí	deasa	úlla	
NB	Piocann	Neasa		úlla	áibí
NN	Piocann	Neasa		úlla	

Methods: Irish experiments

- Experiment 1 (Irish names):
  - Recorded at Trinity College Dublin in a sound-attenuated booth
  - 6 bilingual native speakers of Connemara Irish, living in Dublin at the time of recording
  - 3 male, 3 female (ages 19-46)
  - 4 conditions x 6 items x 4-5 repetitions of the experiment
- Experiment 2(Irish DPs):
  - Recorded in Carraroe, Ireland in a classroom at the Acadamh na hOllscolaíochta Gaeilge and in Dublin at Trinity College Dublin
  - Part of a larger experiment
  - Analysis for 8 speakers out of 12 recorded (7 female, 1 male); ages 22-60
  - 4 conditions x 12 items

Sample materials: Experiment 3 (English names)

- Context: Sarah Thompson, the head of the department, is responsible for providing each professor with a research assistant.

Condition	V	O		O	
		N1	N2	N3	N4
BB	She allotted	Mary	MacEwan	Lauren	O'Hara
BN	She allotted	Mary	MacEwan	Lauren	
NB	She allotted	Mary		Lauren	O'Hara
NN	She allotted	Mary		Lauren	

Sample materials: Experiment 4 (English DPs)

Condition	V	O		O	
		N1	N2	N3	N4
BB	He brought	Marvin's	sister	Mandy's	letter
BN	He brought	Marvin's	sister	their letter	
NB	He brought	Marvin		Mandy's	letter
NN	He brought	Marvin		their letter	

Methods: English experiments

- Both experiments were recorded in McGill prosody lab
  - Experiment 3: 18 participants x 4 conditions x 8 items
  - Experiment 4: 16 participants x 4 conditions x 8 items

Methods

- Experiment 3 (English names): items presented with a neutral context
- Experiments 1, 2, and 4 (Irish names, Irish DPs, English DPs): items presented with no context
- Data were excluded for the following reasons:
  - Technical problems with the recording
  - An obvious disfluency
  - Obvious perceived emphasis on a particular word

Analysis: All experiments

- Data were aligned using the prosodylab-aligner (Gorman et al. 2011) and analysed used Praat (Boersma & Weenink 2013) and R.

Background: Boundary Strength

Boundary Strength

- Relative boundary strength: theory that some prosodic boundaries are stronger than others.
  - To some extent this correlates with prosodic categories (PWd, Phonological Phrase, Intonational Phrase)
  - But also applies to differences within categories (Ladd 1986, 1988; Kubozono 1989, 1992; Féry & Truckenbrodt 2005; Wagner 2005, 2010)

Background: Boundary Strength

- **Durational effects** (including lengthening as well as pauses) are used to disambiguate syntactic structures (Lehiste 1973, and others).
- **Pre-boundary lengthening:** increased duration of segments/words before a prosodic boundary.
- **Relation to boundary strength:** durational effects increase with boundary strength (Price et al. 1991, Wightman et al. 1992, Wagner 2005).

Background: Durational effects

- Example (Lehiste 1973): Boundary rank (| vs. ||) is determined by **depth of embedding**.
- Duration is longest before the strongest boundary.

1) [[Steve or Sam] and Bob] will come.

Steve | or Sam || and Bob

2) [Steve or [Sam and Bob]] will come.

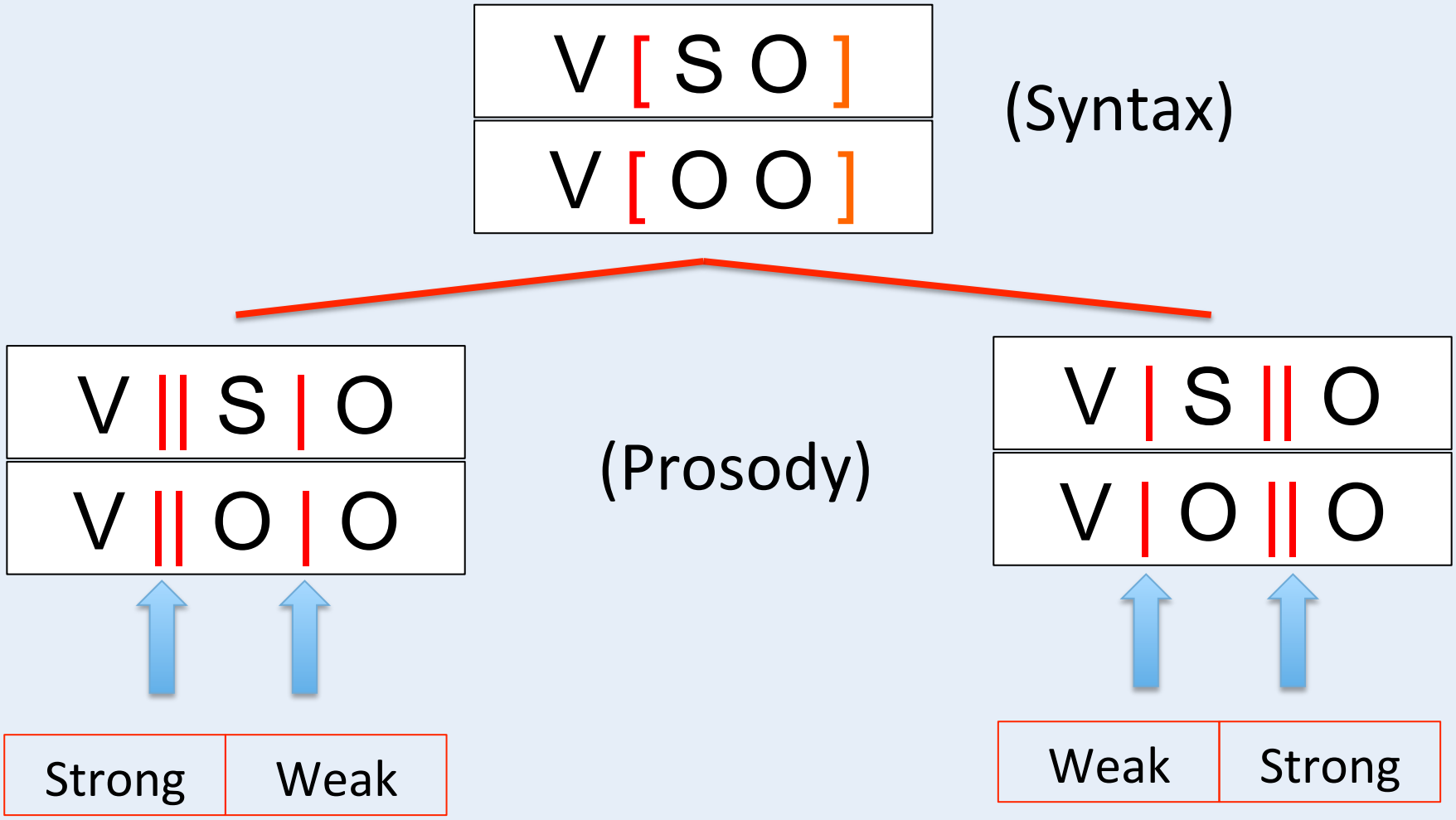
Steve || or Sam | and Bob

- Boundary strength by rank: pipes (| vs. ||)
- Pre-boundary lengthening: a vs. a (longest)

Predictions

- Predictions: duration and pauses
  - Words should have a relatively longer duration before a relatively strong prosodic boundary
  - Pauses should be more likely at a relatively strong prosodic boundary

Predictions: Boundary strength



Experiments: Results

Prosodic boundaries

- Three cues to prosodic boundaries will be considered in this talk:
  - Location and likelihood of prosodic pauses
  - Relative duration (pre-boundary lengthening)
  - Pitch contours and presence of tonal cues at prosodic boundaries

A note on presentation

- For ease of presentation, results are presented as branching/ non-branching conditions:

Condition	V	O		O	
		N1	N2	N3	N4
BB	She allotted	Mary	MacEwan	Lauren	O'Hara
BN	She allotted	Mary	MacEwan	Lauren	
NB	She allotted	Mary		Lauren	O'Hara
NN	She allotted	Mary		Lauren	

A note on presentation

- Resulting in a comparison of two conditions:

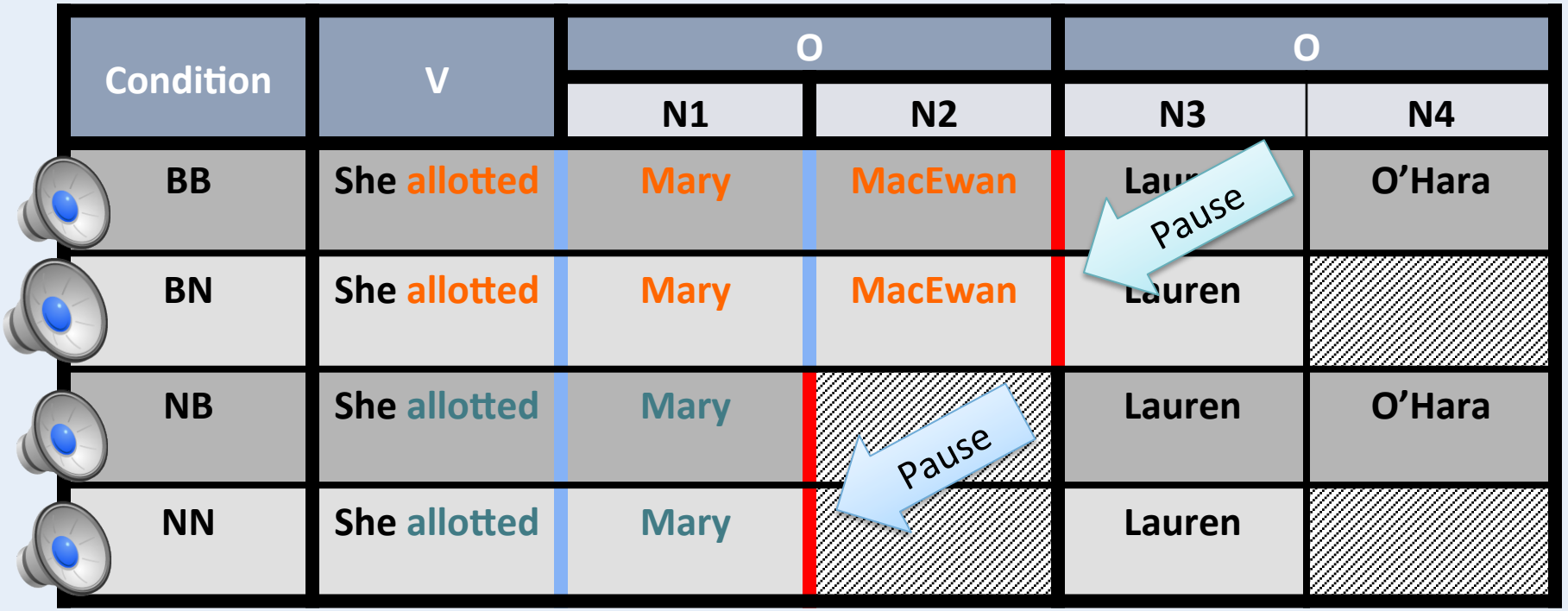
Condition	V	O		O	
		N1	N2	N3	N4
Branching subject	She allotted	Mary	MacEwan	Lauren	(O'Hara)
Non-branching subject	She allotted	Mary		Lauren	(O'Hara)

1. Results: Pauses

- Measurements:
  - Pauses automatically identified by prosodylab-aligner (Gorman et al. 2011)
  - Measurement of duration of pause following words of interest

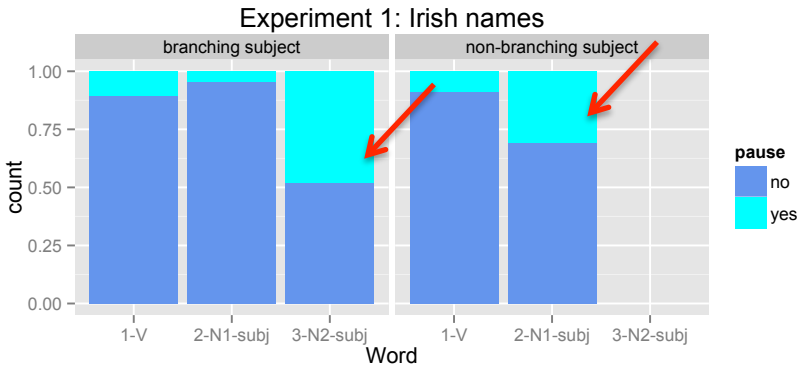
Pauses are more common following the first argument

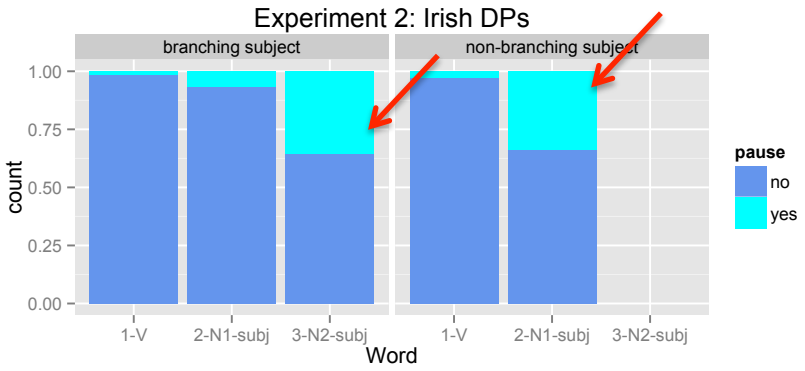
- Example: experiment 3 (English names)

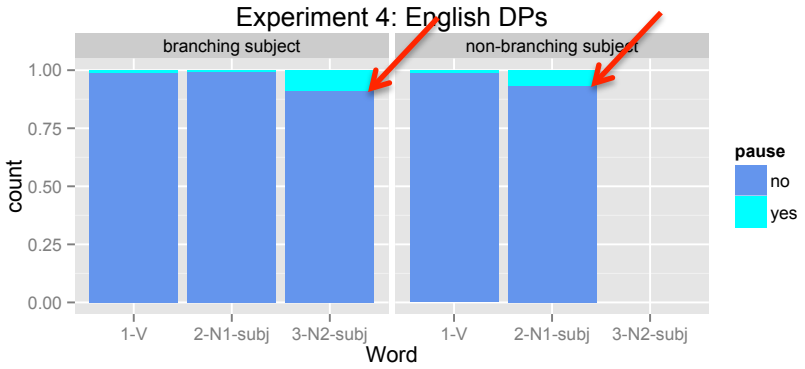


Pauses

V | N1 (N2) | N3 (N4)





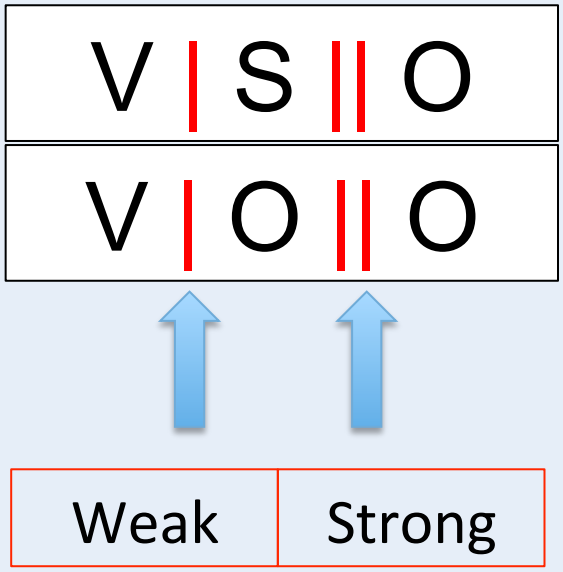


Results: Pauses

- Pauses are more common following the first post-verbal argument than following the verb
  - Particularly true of Irish, where pauses are more frequent
  - Also observed in Bennett (2008) for Irish (natural storytelling speech in Donegal Irish)

Results: Pauses

- Implication: there is a stronger prosodic boundary following the first post-verbal argument than following the verb:



2. Results: Duration

- Prediction: We should see pre-boundary lengthening before a strong prosodic boundary
- Duration (roughly) normalized by dividing raw word duration by number of phonemes

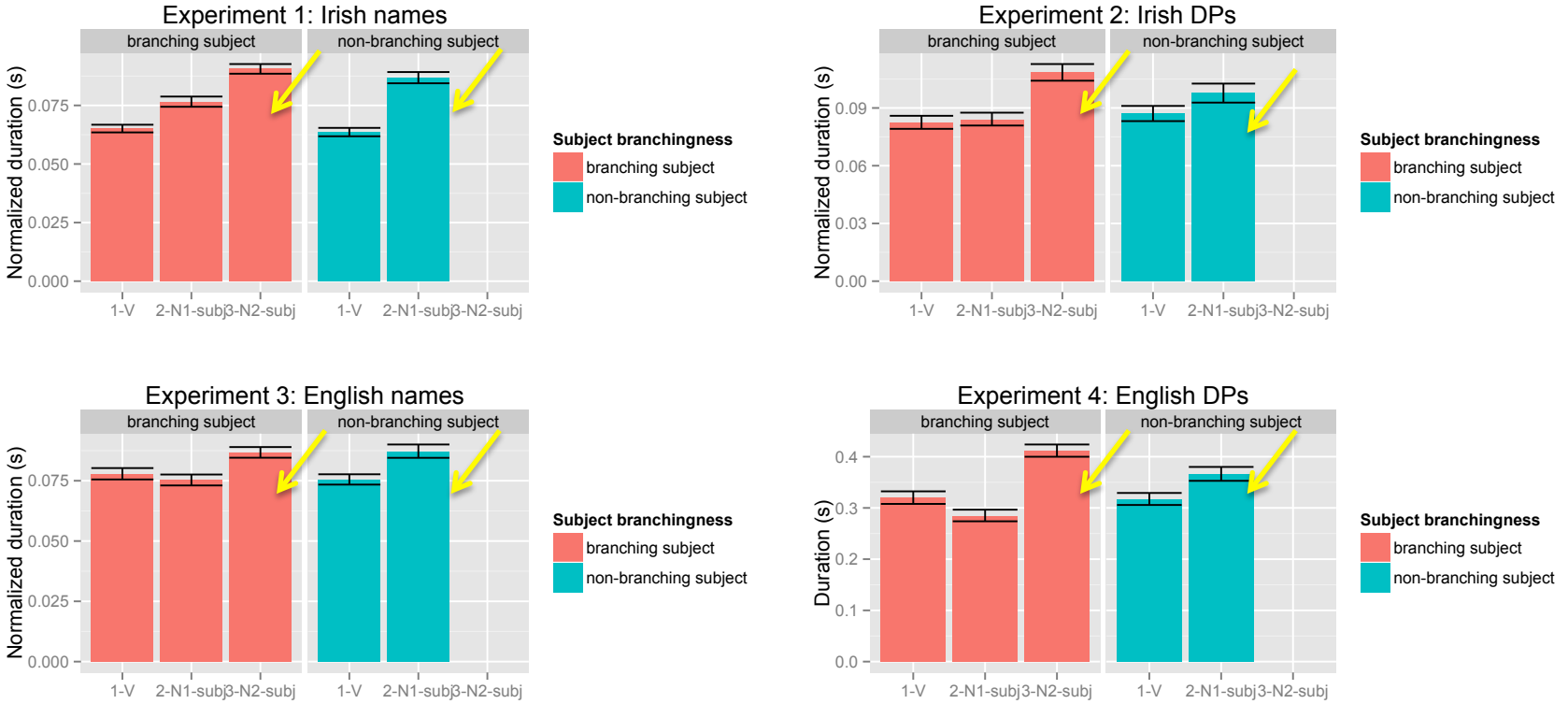
B. Duration of V vs. S/DO

- Example: experiment 3 (English names):

Condition	V	O		O	
		N1	N2	N3	N4
BB	She allotted	Mary	MacEwan	Lauren	O'Hara
BN	She allotted	Mary	MacEwan	Lauren	
NB	She allotted	Mary		Lauren	O'Hara
NN	She allotted	Mary		Lauren	

Duration: lengthening on right edge of first argument

V | N1 (N2) | N3 (N4)



Results: duration

- Results are similar for both languages in all four experiments:
  - Lengthening at the right edge of the subject (Irish) or first object (English)
  - The verb is not lengthened relative to the subject

3. Results: F0

- While F0 analysis is ongoing, speakers seem to employ similar techniques to achieve a "neutral" pronunciation of these types of sentences.

Results: F0

- Specifically:
  - Rise in F0 on the verb (“LH” accent)
  - Fall in F0 on the rightmost word of each argument (“HL” accent)
  - (Optional) rise in F0 on the leftmost word of the first argument (“LH” accent)

Results: F0

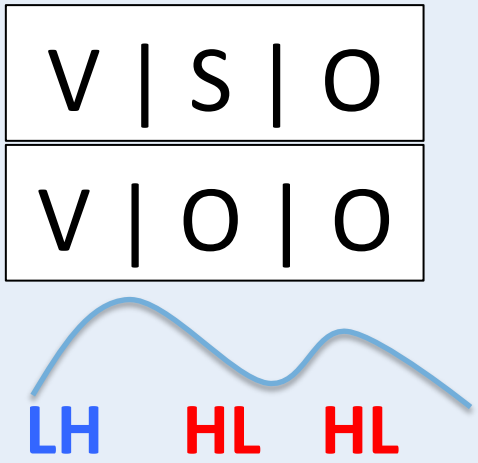
- These are comparable to the patterns described for neutral (all new) sentences Connemara Irish in Elfner (2012), where LH and HL accents provide evidence for prosodic "bracketing":
  - LH indicate the left edge of a (non-minimal) prosodic phrase
  - HL indicates the right edge of a prosodic phrase

Results: F0

- To illustrate:
  - Sample pitch tracks from each language
  - Chart showing mean difference in F0 values (rise in F0 vs. fall in F0) by word in two of four experiments (experiments 1 and 3).

Sample pitch tracks

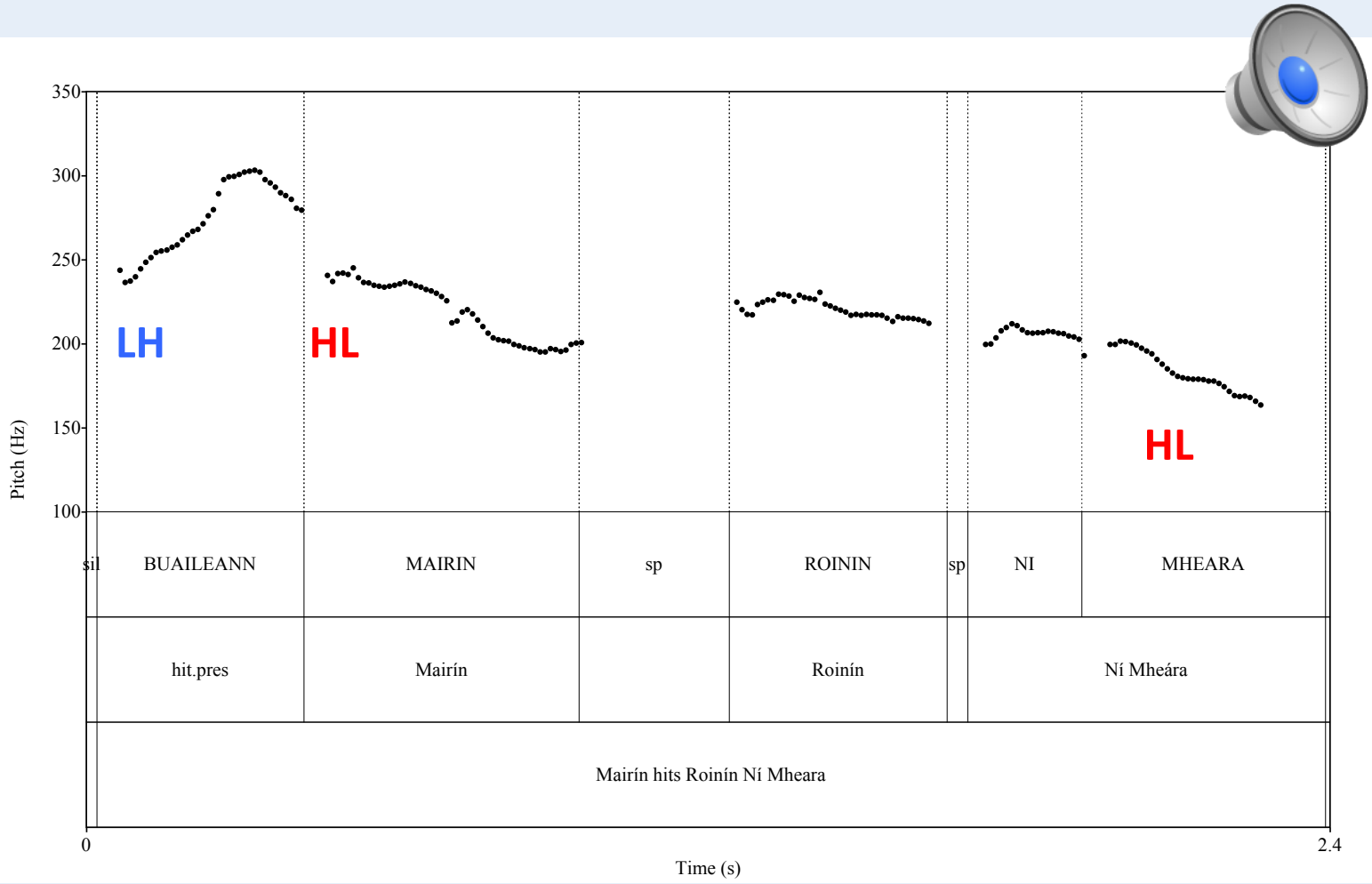
- Common pattern: rise-fall-fall



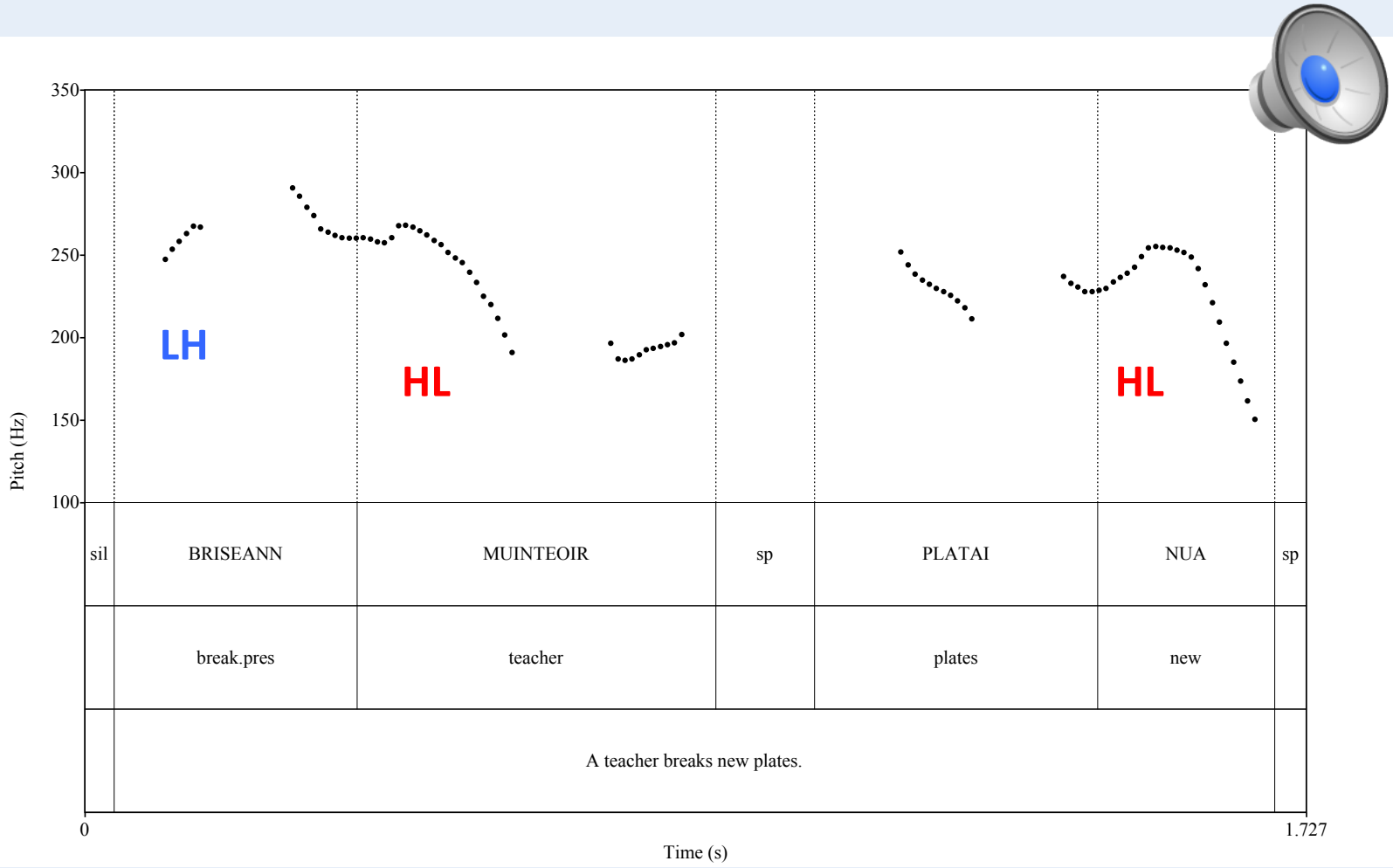
Sample pitch tracks

- Note: not all participants exhibited these patterns (particularly in English), but a subset of speakers in each language and in each experiment employ this pattern.
- This suggests that this is a possible pattern in both languages.

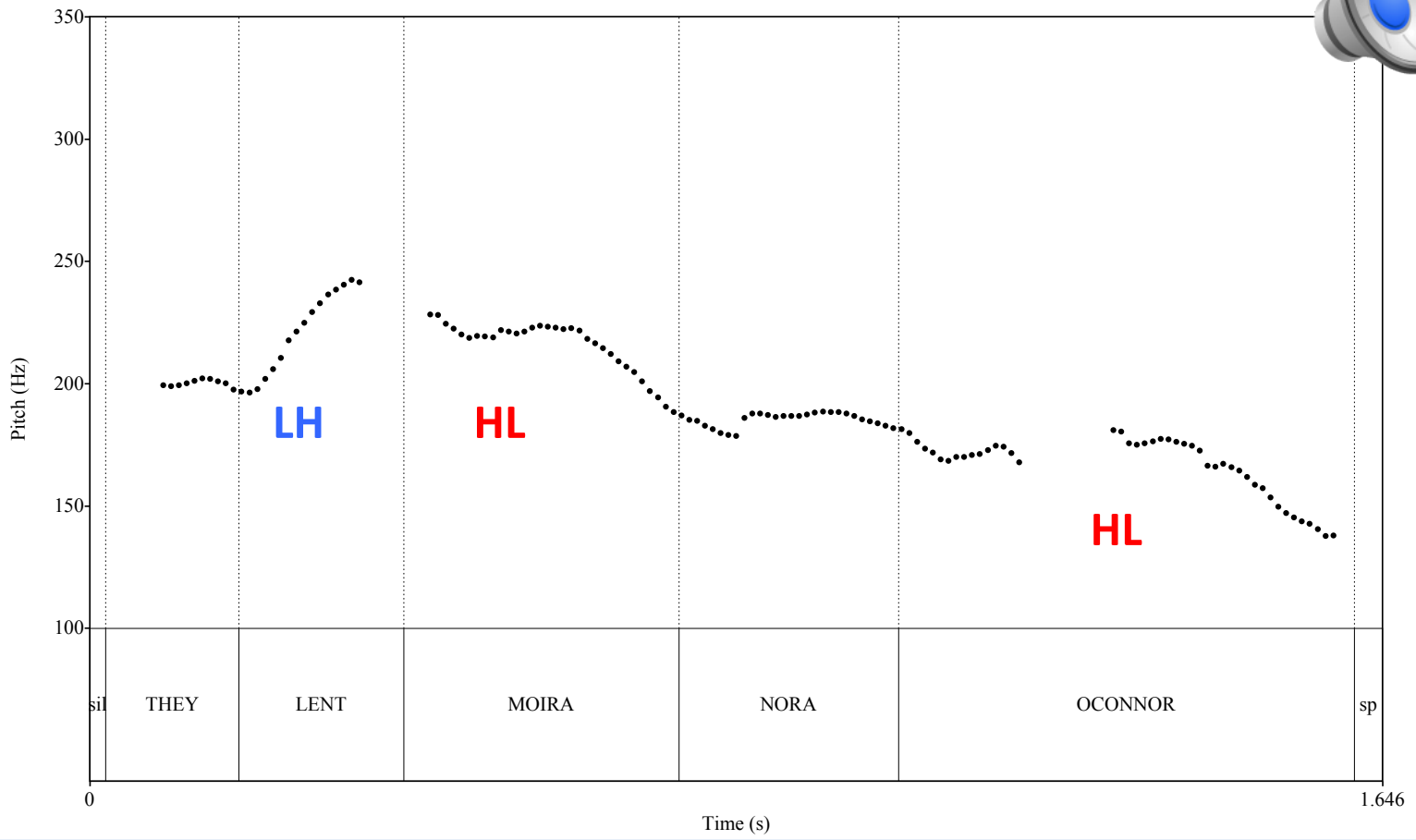
Experiment 1 (Irish names)



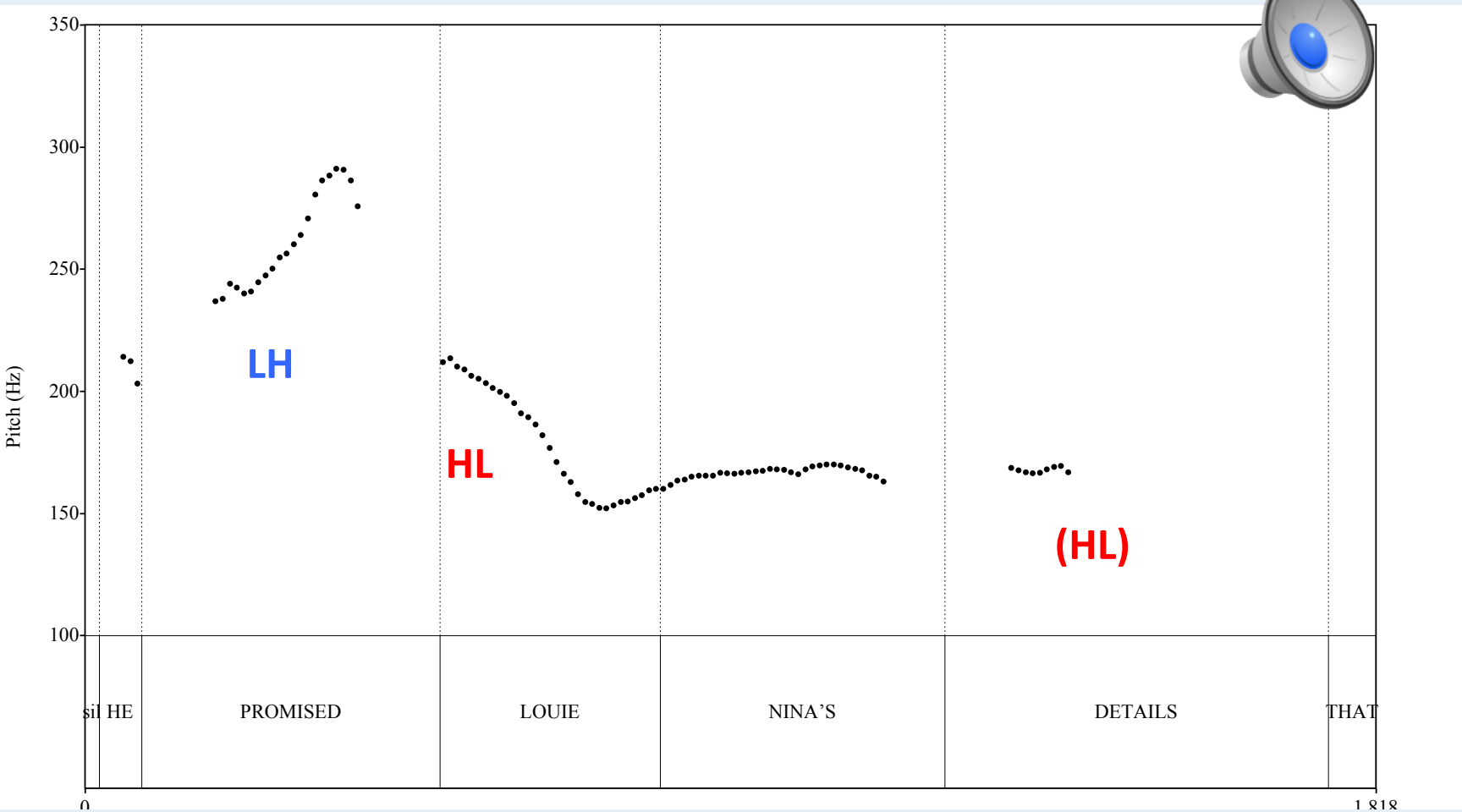
Experiment 2 (Irish DP)



Experiment 3 (English names)



Experiment 4 (English DPs)



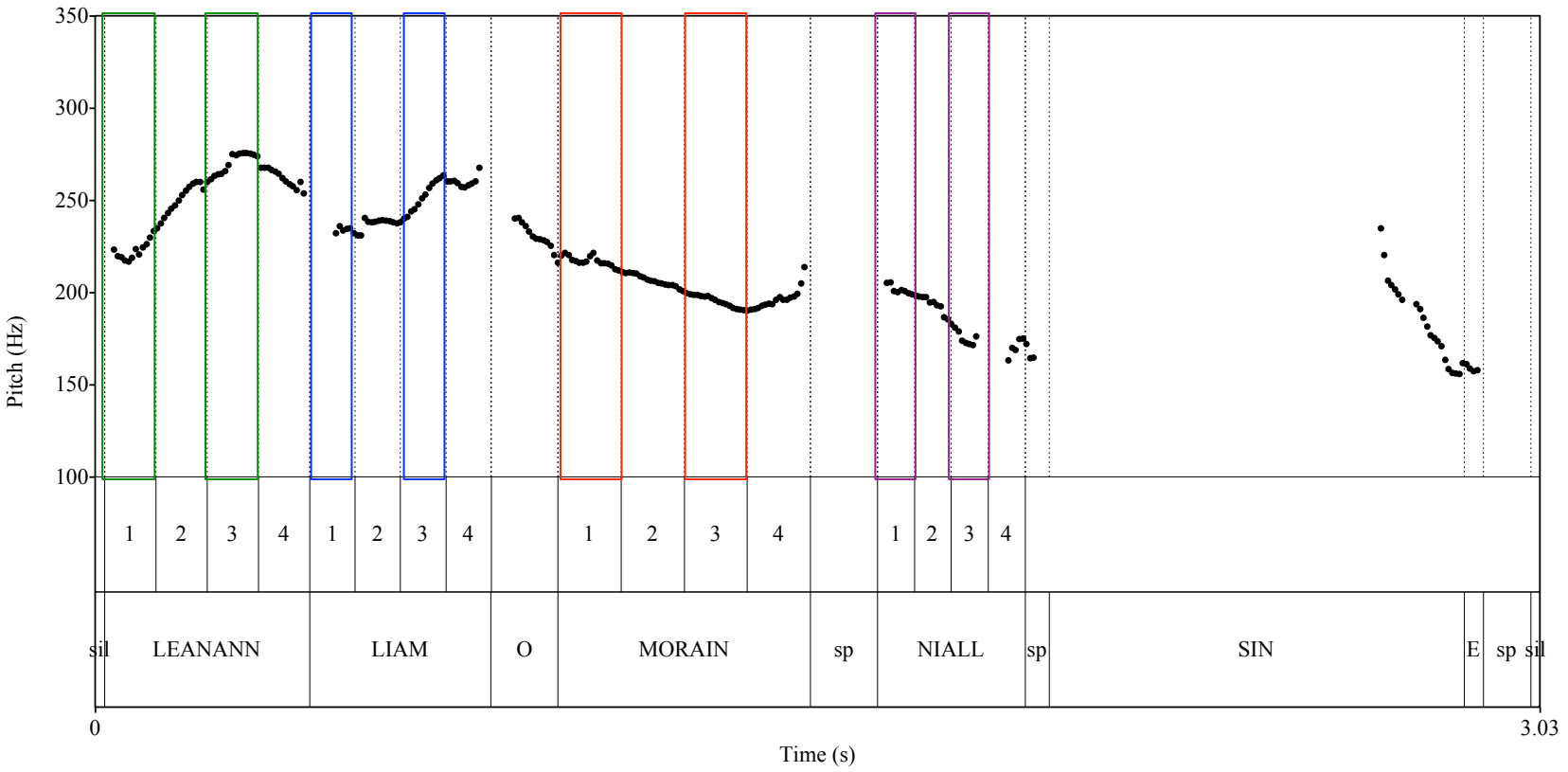
Quantitative analysis: F0 rises/falls

- Method:
  - Measurements for mean F0 values in third quadrant and first quadrant of the target word

Third-first = mean 3rd quadrant – mean 1st quadrant

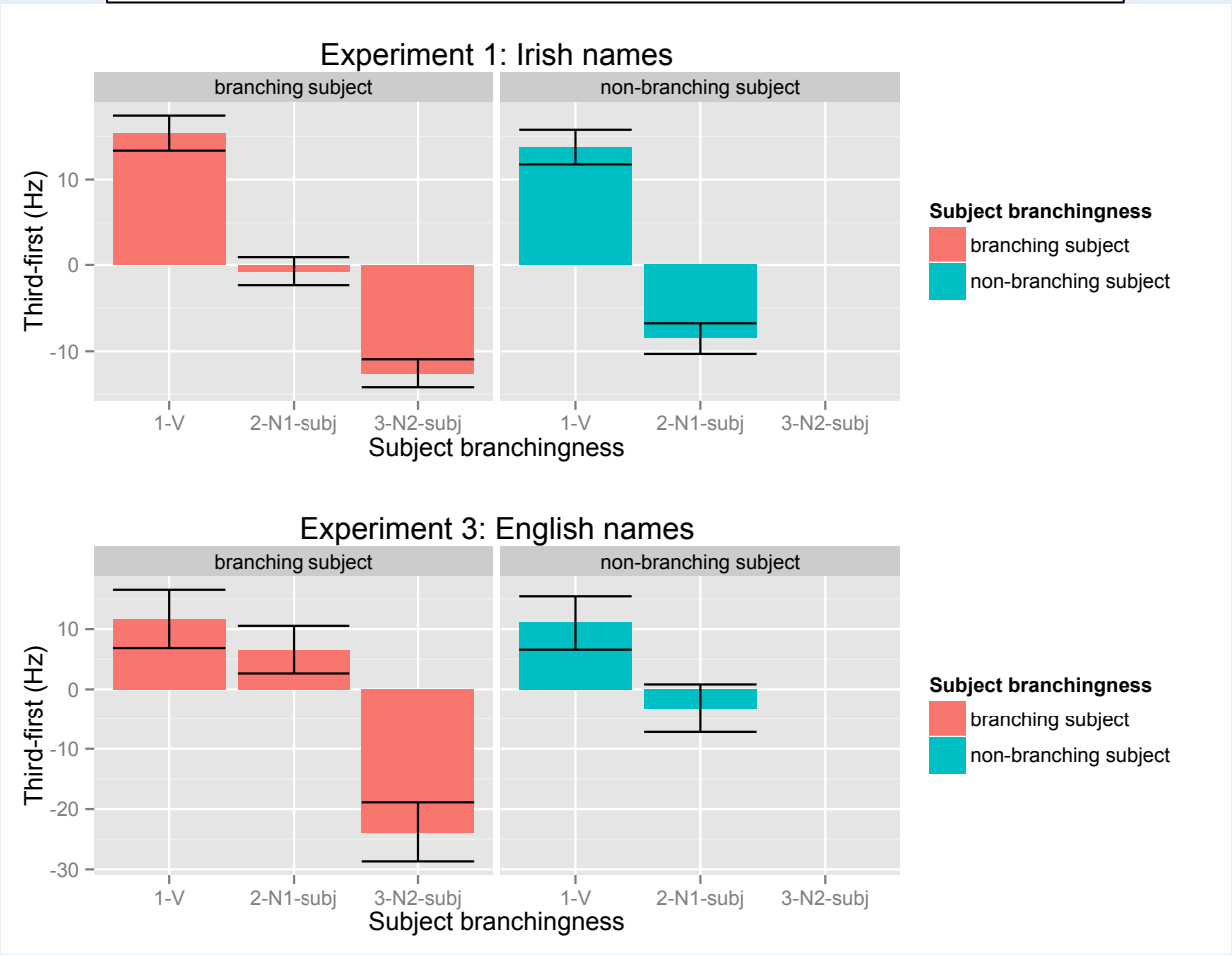
Third-first	pitch accent type
>0 Hz	LH (‘rise’)
< 0 Hz	HL (‘fall’)

Illustration: Third-first



Mean third-first

V | N1 (N2) | N3 (N4)



Summary: F0

- While more detailed analysis is necessary, it is intriguing that speakers from both languages have the option of employing a similar pitch contour:
  - Rises (LH) on the verb
  - Falls (HL) on the rightmost word of subject (and object)

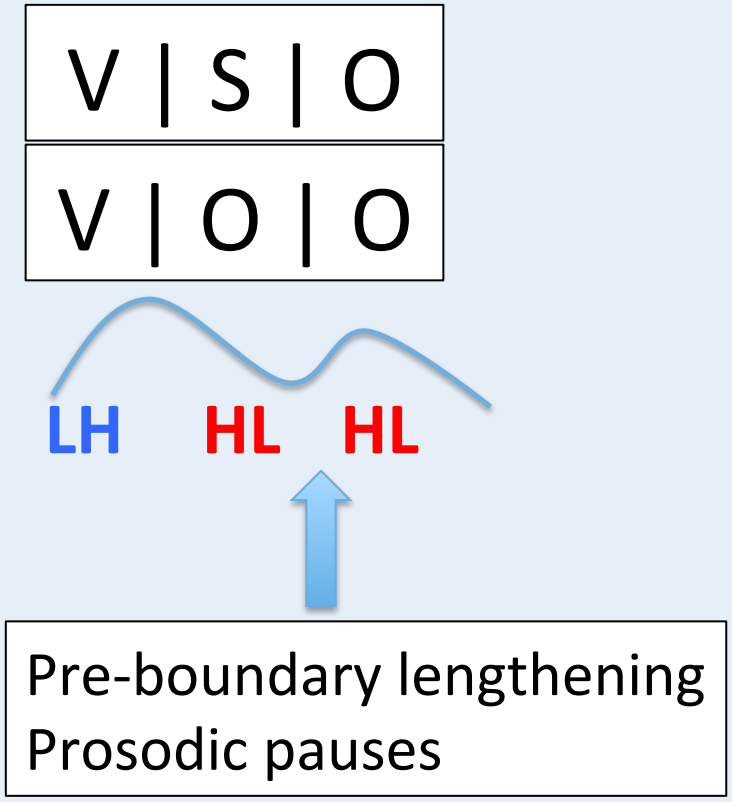
Discussion

Summary

- Participants in all four experiments behaved similarly:
  - Pre-boundary lengthening is observed on the post-verbal argument (subject/first object) but not on the verb
  - Pauses are more common following the post-verbal argument (especially in Irish) and rarely occur following the verb
  - (Optional) rise-fall-fall pitch contour involving rise (LH) on verb and falls (HL) on right edge of each post-verbal argument

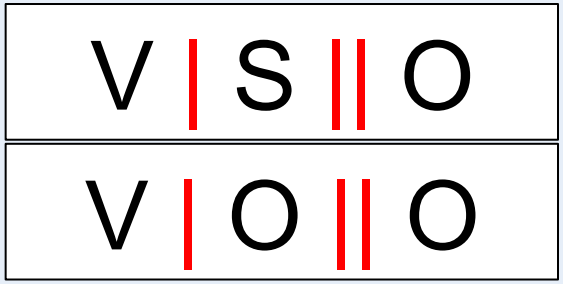
Summary

- Schematically:



Analysis: Prosodic boundary strength

- These results suggest that prosodic boundary following the first post-verbal argument is stronger than the boundary following the verb:



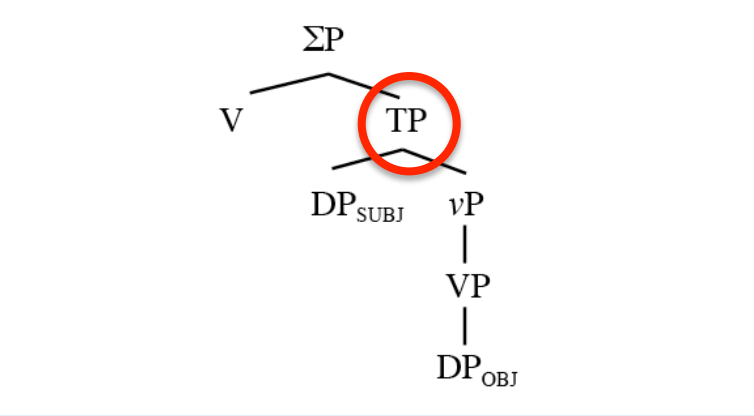
A mismatch?

- What does this tell us about the underlying syntactic structure?
- To what extent can we (or should we) use prosody/boundary strength as a test for constituency?

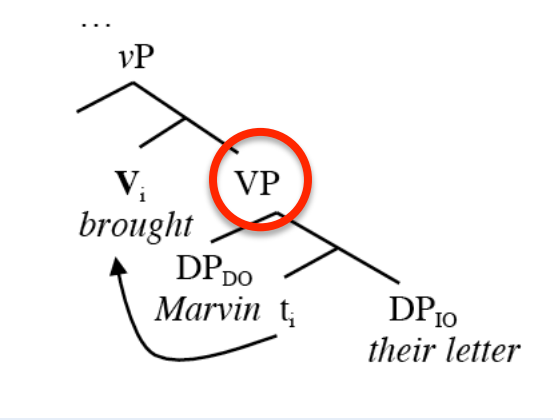
A mismatch?

- For both structures, the two post-verbal arguments were predicted to form a constituent to the exclusion of the verb:

Irish VSO



English VOO

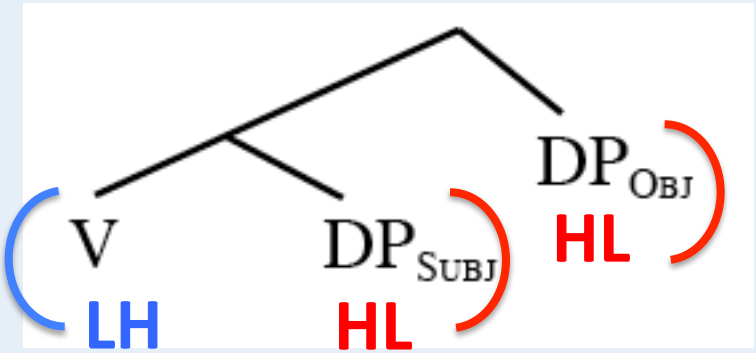


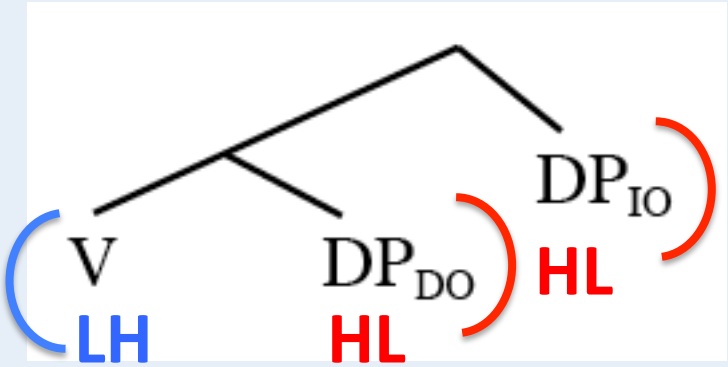
A mismatch?

- Based on boundary strength alone, it is therefore surprising that there is a stronger prosodic boundary between the two post-verbal arguments than following the verb.
- But how do we know when the prosodic parse is truly a mismatch with the syntactic structure?

A mismatch?

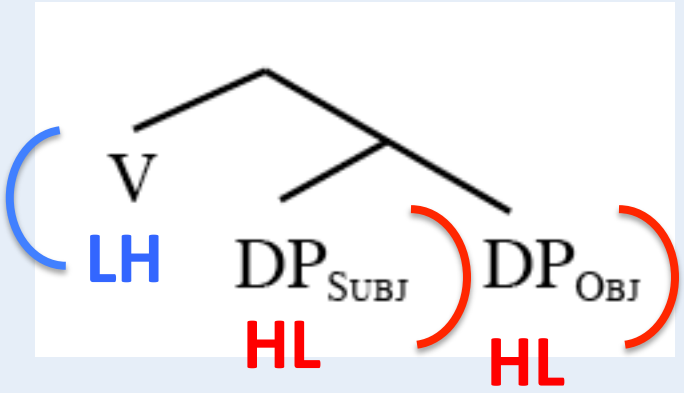
- HYPOTHESIS A: V forms a constituent with the first argument, an apparent mismatch with the syntax:

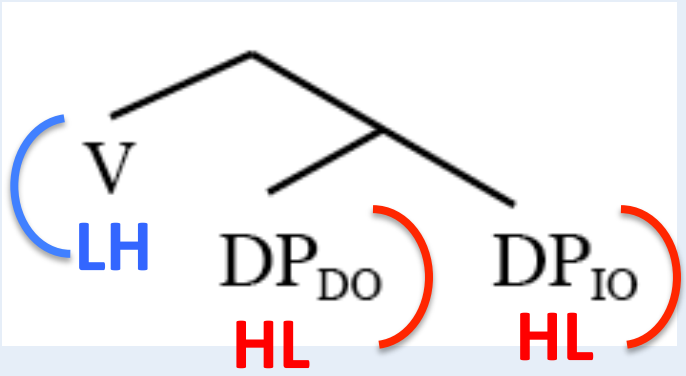




A mismatch?

HYPOTHESIS B: Only the right edges of **phrases** are marked by lengthening and pauses (there is no right phrase edge following V because V is not phrasal): preserves syntactic assumptions





A mismatch?

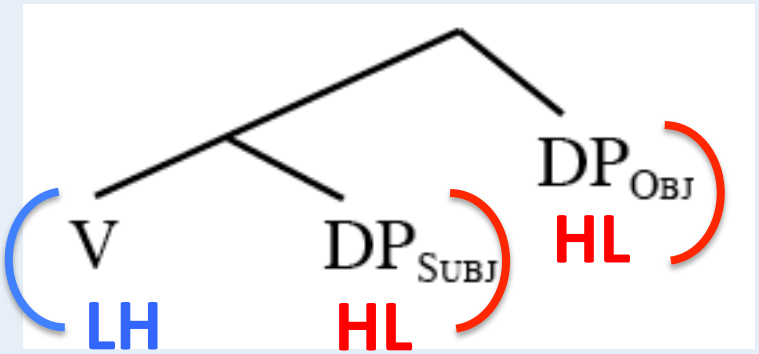
- How can we decide between these two possible accounts?
- And how do we know whether this confirms our hypotheses about the underlying structure, or goes against them?
  - Whether or not a prosodic parse is a mismatch depends on our syntactic assumptions…

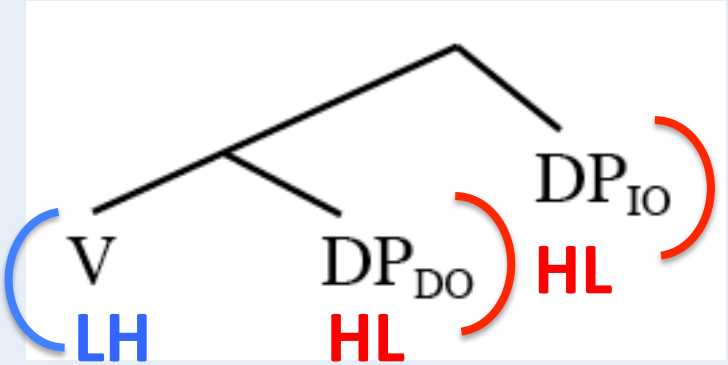
A mismatch?

- However: If we need to derive the mismatch from the syntax using edge-marking, can (or should) we just derive this from the syntax itself?
  - i.e. Can we use the prosodic evidence as an indication that the syntactic story is more complicated/different than it seems?
  - Are apparent mismatches a sign that we should revise our syntactic assumptions?

Implication

- Implication: VSO/VOO structures are underlyingly [VS]O/[VO]O:





- The pressure would then be on the syntactic component to derive these structures…
- (to be discussed in Michael Wagner's talk…)

Conclusion

- The prosodic similarity between the Irish and English structures suggests that there is an important role for structure, even in the case of apparent mismatches.
  - While further typological research is needed, it seems unlikely that this is due to coincidence, and hence unlikely to be due to language-specific factors.
  - … it seems that Tagalog may also show some of these patterns, at least in terms of pitch patterns (Norvin Richards' and Joey Sabbagh's talks tomorrow…)

Conclusion

- However, this raises the question of how much we want to rely on prosody/boundary strength as a test for constituency– a theoretical question without a clear answer.
  - … But maybe we'll know more at the end of the workshop!

Thank you!

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