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Declarative and Interrogative Intonation in Derry City English

An argument for a register tier

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northern Irish English (nIE) and Derry

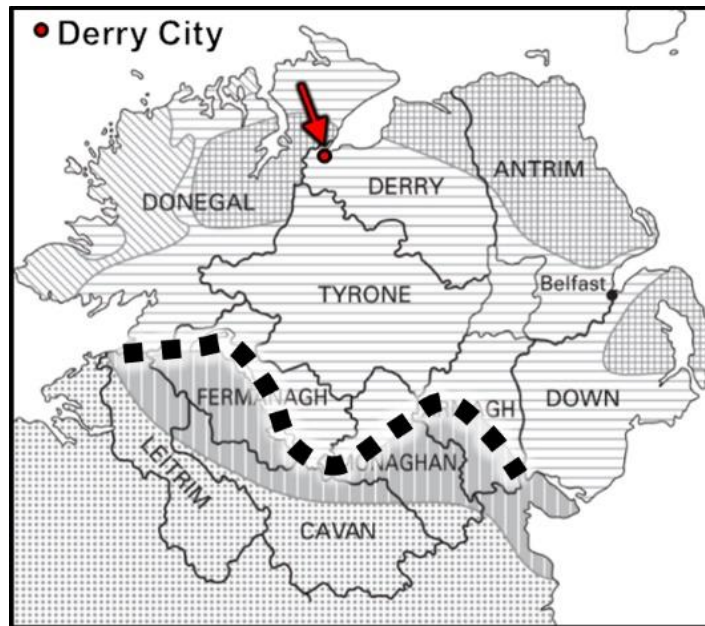
Background

Derry City

- 2nd largest urban area in NI [1]
- DCE intonation less documented [2]

nIE and Intonation

- Prevalence of nuclear rises across sentence modes [3]
- Jarman and Cruttenden (1976) [2]
- McElholm (1986) [3]



AM Analysis and nE Intonation

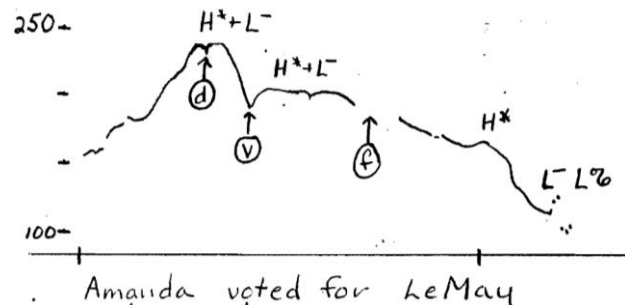
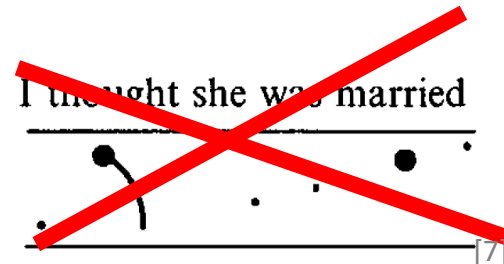
AM pitch contour analysis & K-Max

AM Fundamentals^[4,5,6]

- Sequence of Low and High phonological primitives.
- Pitch accents (PAs) edge tones.
- PA associated with lexically stressed syllable though *starred tone*.
- Implemented in the pitch contour.

L H L H H L L

%L H* L H* H* L L%



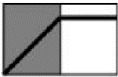

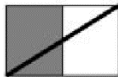

[4]

AM Analysis and nE Intonation

AM pitch contour analysis & K-Max

AM studies of nE

- **Belfast:** Lowry^[8-10], IViE^[9-14], Sullivan^[14-16]
- **Donegal:** TCD Speech & PhLab ^[17-18]
- even more L*H!
- L*H % is the unmarked nuclear form.
- L*H % 83% of all nuclear contours ^[11]
- L*H H% 5.6% YNQs ...
- ... 16.9% DECQs

Schematic representation				
Impressionistic description	rise-plateau	rise-plateau-slump	high rise	fall
IViE labelling	L*H %	L*H L%	L*H H%	L*H %

[10]

Phonological & paralinguistic use of pitch

Background

The Problem (for me) in AM

- Phonological Contrasts:
 - $H^*L\%$ | $L^*H\%$ | $L^*H H\%$
- Paralinguistic scaling effects:
 - Ohala: frequency code ^[19]
 - Gussenhoven: biological codes ^[20, 5]
- Haan's PhD Thesis on Dutch Q forms ^[21]
 - ***Paralinguistic pitch raising in Q forms inversely proportional to semantic and Grammatical content.***



AM phonology and northern Irish English

Background

Current study

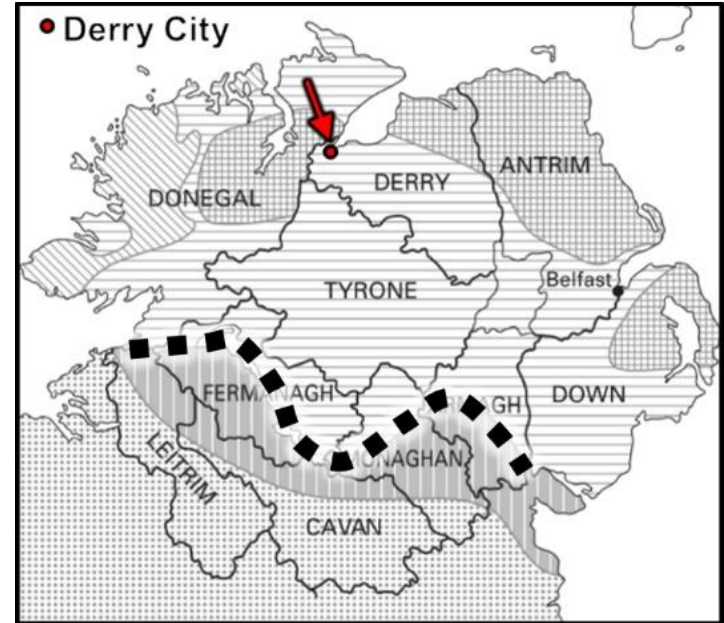
Phonological and Phonetic Analysis of Intonation of Sentence Modes in Derry City English.

Descriptive

- What are the phonological and phonetic characteristics of nuclear pitch contours in DCE across sentence modes?

Theoretical

- Does a register tier provide a plausible phonological explanation for variation across sentence modes in DCE? [22,23]



Stimuli and Target Utterances

Materials

- 4 sentence modes x 3 Variants x 5 reps

DEC	I valued the vases.
	I live in the valley.
	I've hidden the valuables
YNQ	Have you valued the vases?
	Do you live in the valley?
	Have you hidden the valuables?
WHQ	Who valued the vases?
	Why do you live in the valley?
	Where have you hidden the valuables?
DCQ	You valued the vases?
	You live in the valley?
	You've hidden the valuables?

- Embedded in short dialogues

Talking about work...

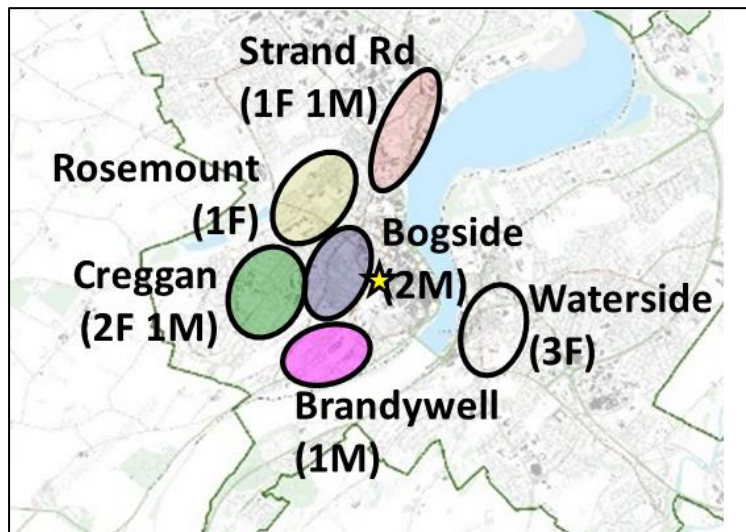
A: I think everything's ready for the auction.

B: Have you valued the vases?

Set A.1.1

Speakers and Recording

Materials



- 11 Derry City English Speakers
- 6 Female, 5 male, 35-60 y/o ($\bar{x}=40$ s.d.=9.9)



- Verbal Arts Centre studio
- Pairs (friends, family, co-workers)
- Largely self-directed

Sentence Mode Corpus

Materials

Final corpus for sentence mode

	11 speakers
×	12 target phrases
×	5 repetitions
<hr/>	
	660 utterances
-	21 errors
<hr/>	
	639 valid utterances

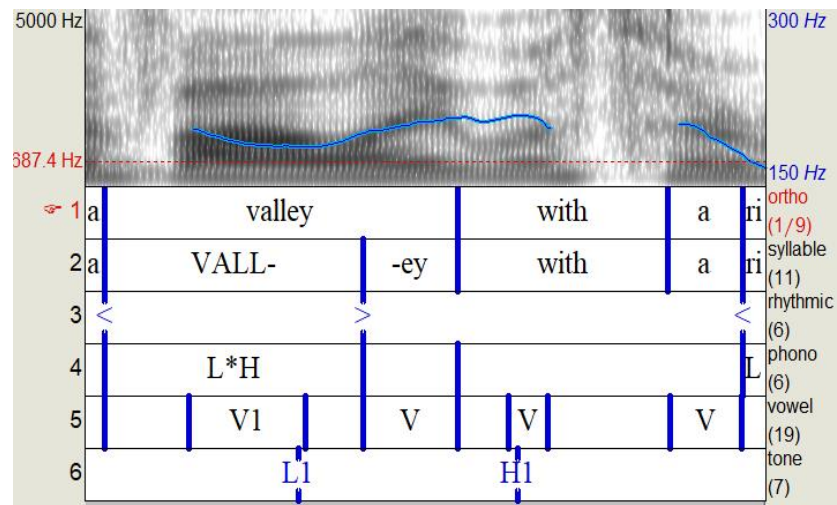


Materials and Methods

Annotation and analysis

Annotation and analysis

- Praat for annotation^[24]
- IViE labelling^[25]
- PA judgments by researcher...
- ...with another trained phonetician
- Ts marked at f_0 extrema (ST re 1 Hz)
- Time: onset of vowel in stressed syllable to tonal target (ms)



Materials and Methods

Annotation and analysis

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- Ts marked at f_0 extrema (ST re 1 Hz)
- Time: onset of vowel in stressed syllable to tonal target (ms)

#	Parameters	Abbr.	Measurement
1.	f_0 of L-target	L_F0	ST re 1 Hz
2.	f_0 of H-target	H_F0	ST re 1 Hz
3.	Excursion size	Exc.	H_F0 -L_F0
4.	Time of L-target	L_T	ms
5.	Time of H-target	H_T	ms
6.	Slope	Slope	ST/sec

Phonological Labelling

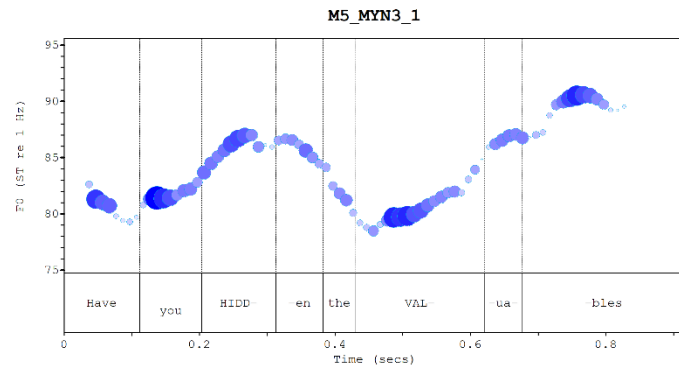
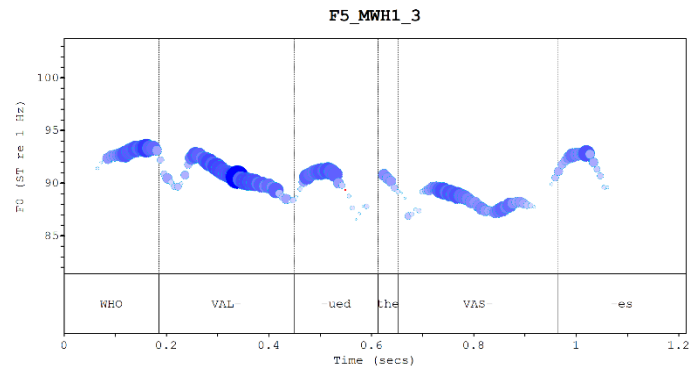
Annotation and analysis

— Sometimes clear apparent distinction between contour type:

- **L*H %**
- **L*H H%**

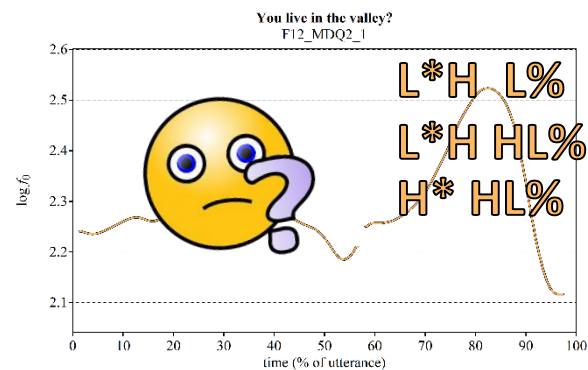
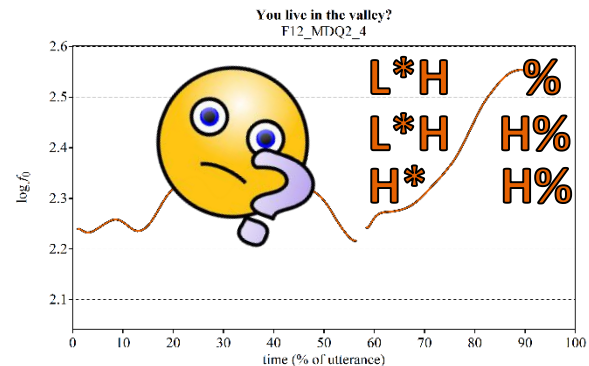
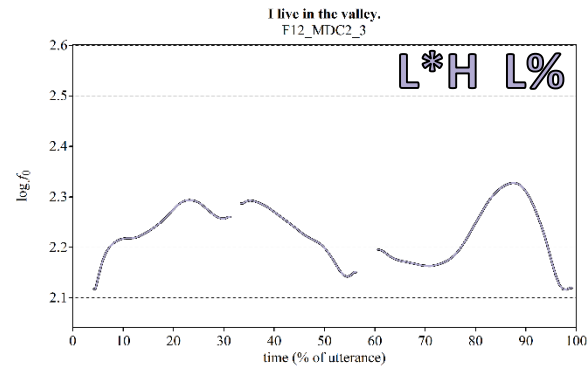
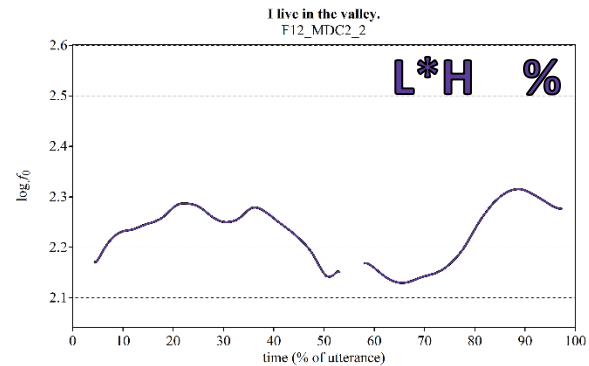
— But...

...not really so clear cut.



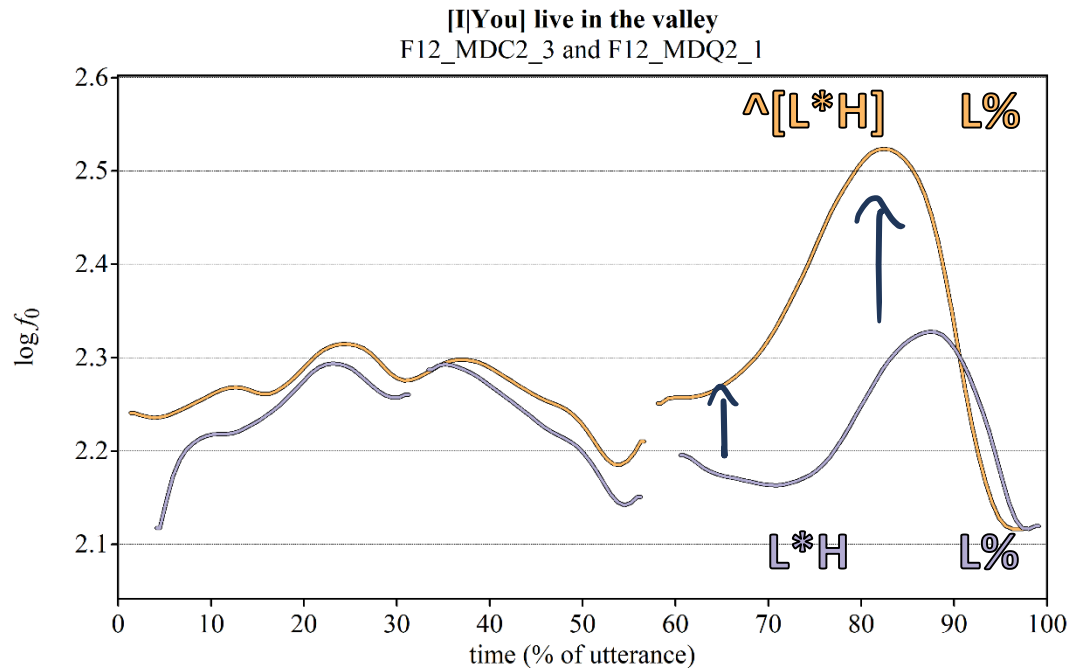
Labelling Issues

Annotation and analysis



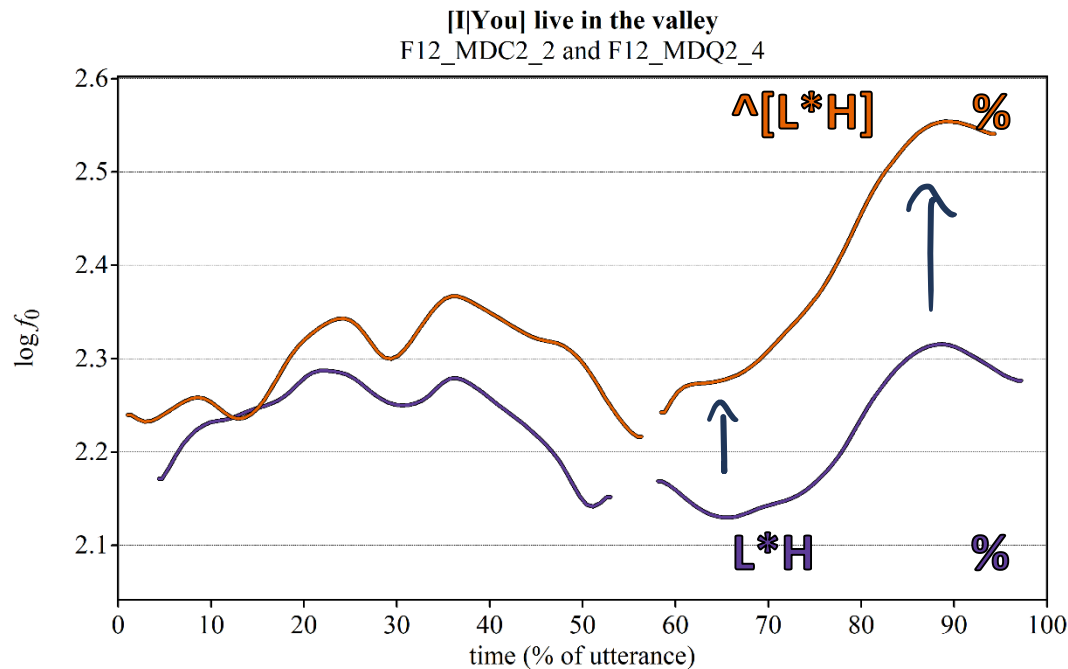
Labelling Register

Annotation and analysis



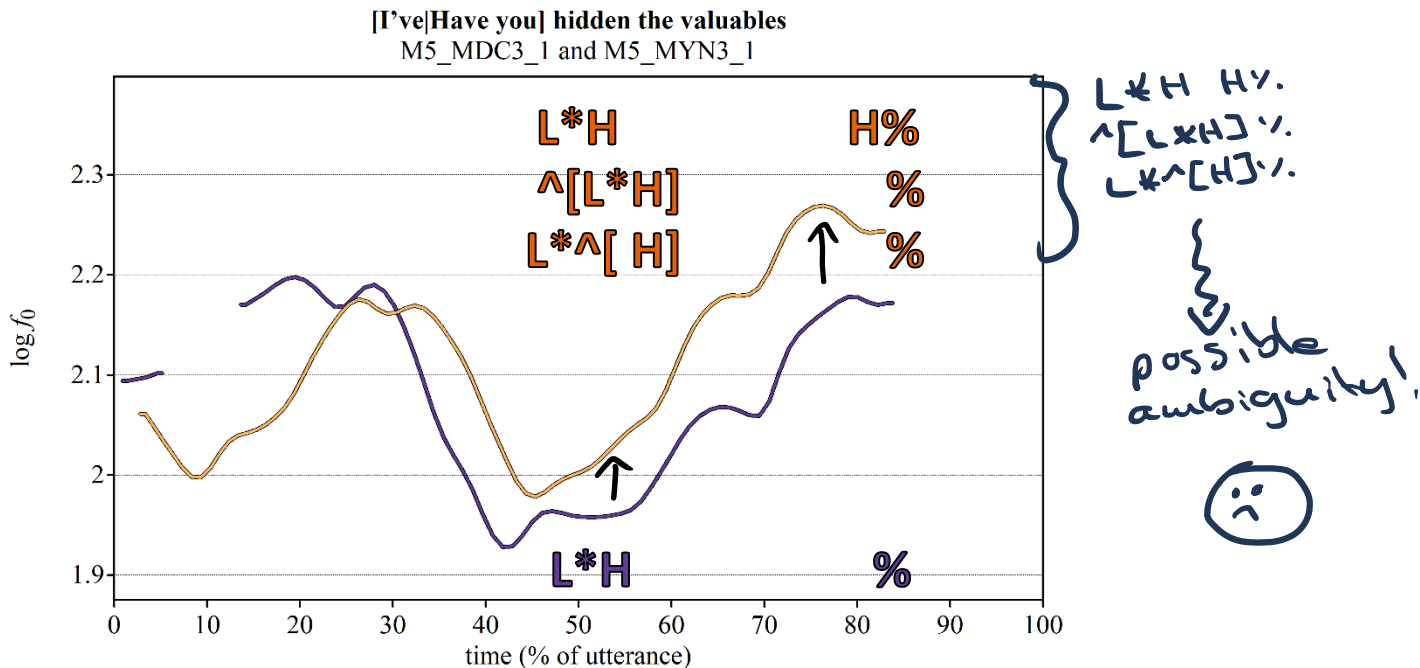
Labelling Register

Annotation and analysis



Labelling Register

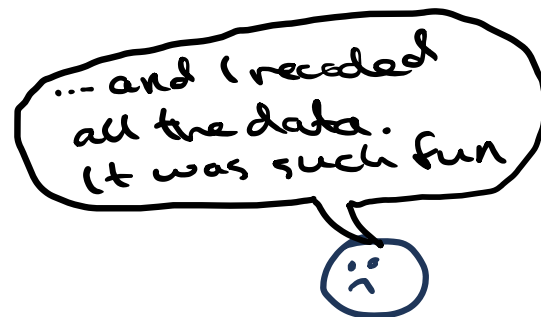
Annotation and analysis



Labelling Register

Annotation and analysis

- \wedge → high register
- [...] → scope of high register
- $\wedge[\% H^* L^* H L\%]$ utterance-wide*
- $\% H^* \wedge[L^* H L\%]$ nuclear contour**
- $\% H^* \wedge[L^* H] L\%$ pitch accent
- $\% H^* L^* \wedge[H] L\%$ tone

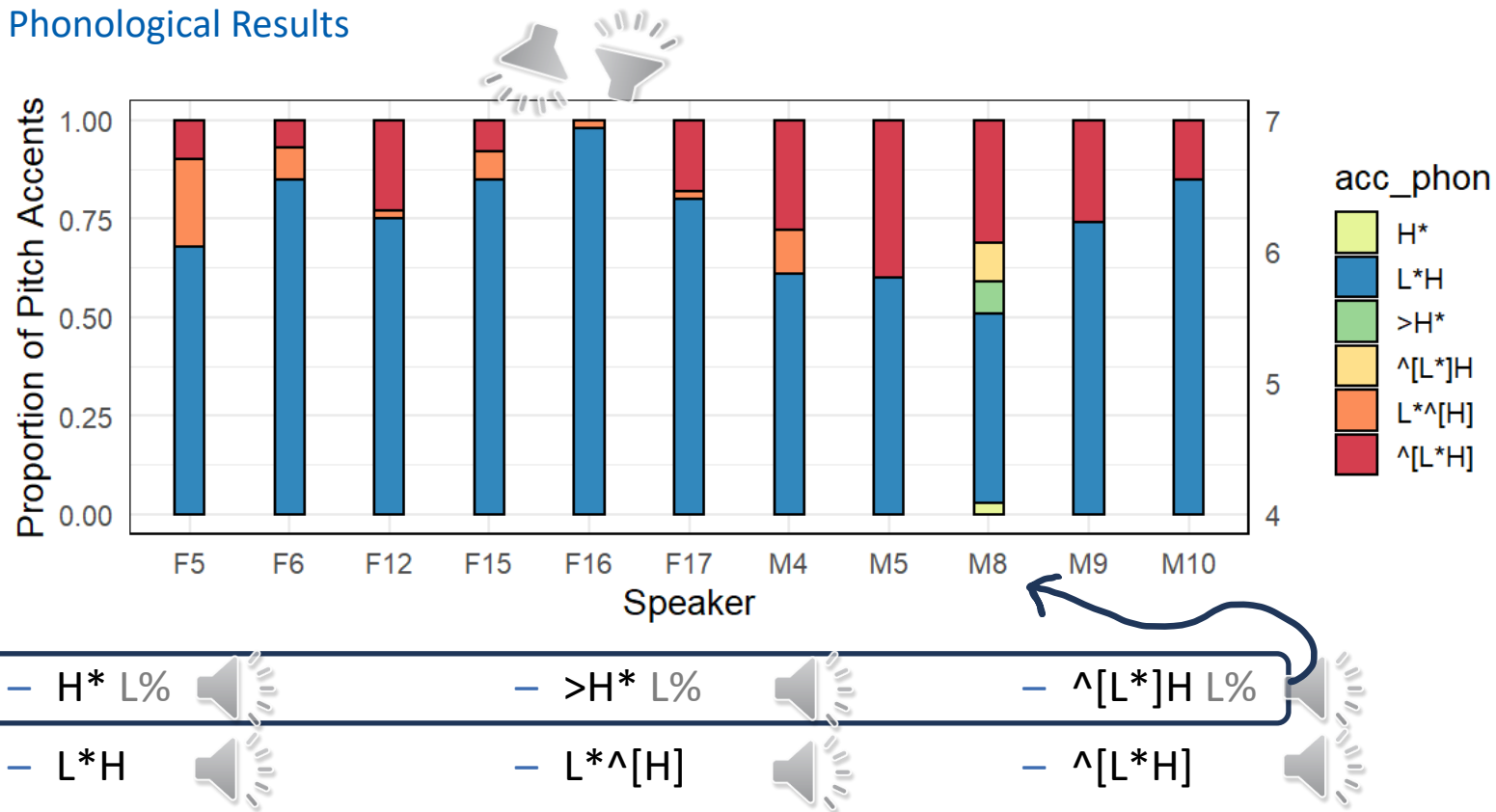


*NB: This study focuses on nuclear contours only.

**Hard to discriminate from $\wedge[L^* H] 0\%$, so both treated as the same here.

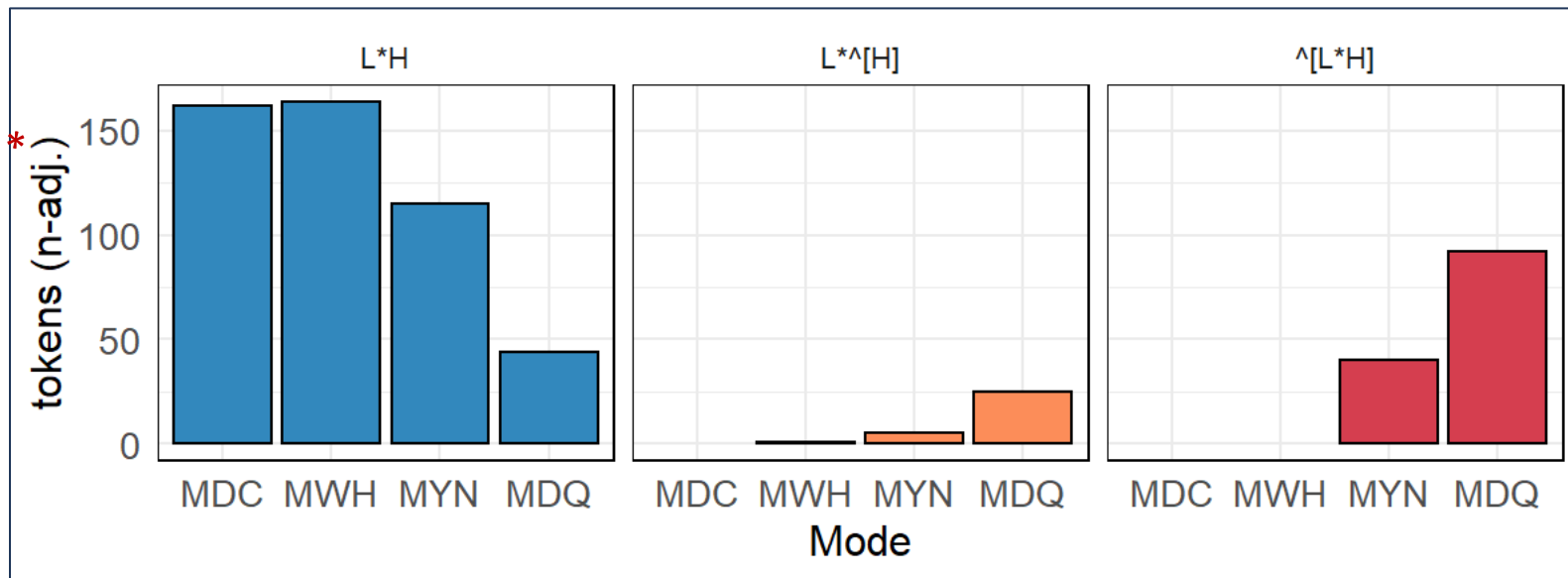
Nuclear Pitch Accent and Speaker

Phonological Results



Nuclear Pitch Accent and Sentence Mode

Phonological Results



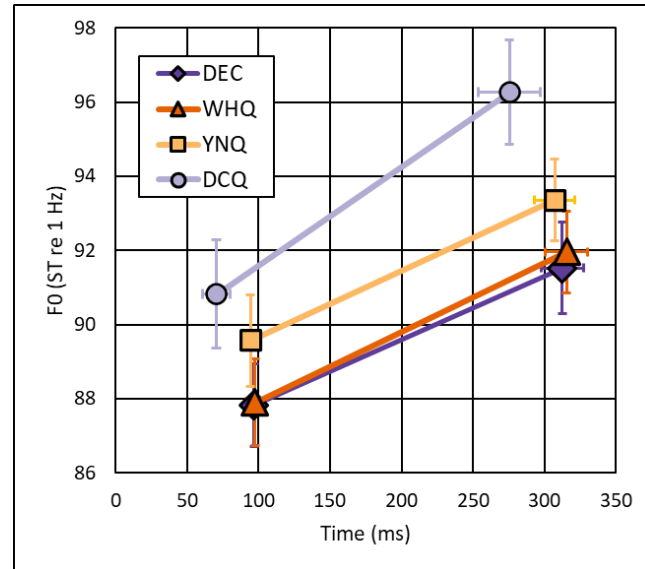
— Marginal tokens not shown: H^* ($\hat{n}=2$), $>H^*$ ($\hat{n}=5$), $^[L^*]H$ ($\hat{n}=6$)

***Projected Distribution of nuclear PA tokens after accounting for uneven distributions of speaker utterances and stimuli.**

Phonetic Parameters and Sentence Mode

Statistical analysis

- This component of the analysis is blind any phonological variation.
- DECQ parameters tend to be significantly and noticeably different from other modes.
- There is generally little difference between DEC and WHQ parameters.
- There still likely a paralinguistic component.



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Register Tier in DCE

Take Aways

- An attempt to adapt the theory to the data.
- Register tier seems to provide the best solution for an efficient description of the observations.
- Lack of standard L^*H / H^*L phonological contrast brings role of register tier to the fore.
- Recourse to register tier most likely when there is less lexical / grammatical marking of Q-forms.
- Use of register tier seems optional.



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Thank You



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The slides that time forgot...



Phonetic Parameters and Sentence Mode

Annotation and analysis

- Linear Mixed Effects Model Analysis

- R – LmerTest, etc...

`l_t ~ mode + gender + (1 + mode | speaker)`

~~`h_t ~ mode + gender + (1 + mode | speaker)`~~

`l_f0 ~ mode + gender + (1 + mode | speaker)`

`h_f0 ~ mode + gender + (1 + mode | speaker)`

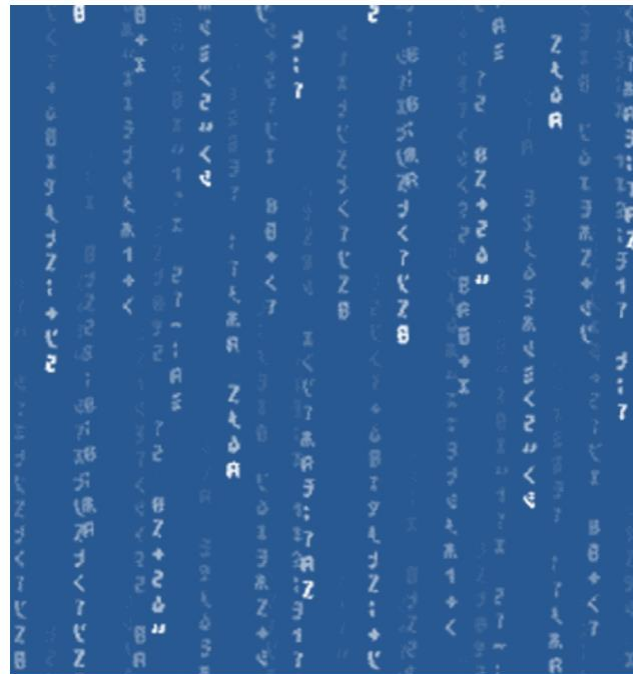
`exc ~ mode + gender + (1 + mode | speaker)`

`slope ~ mode + gender + (1 + mode | speaker)`

- Tested models + pairwise comparison of modes.

- All intercepts statistically significant ($p < 0.0001$)

- Not so with pairwise comparisons (as expected)



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Phonetic Parameters and Sentence Mode

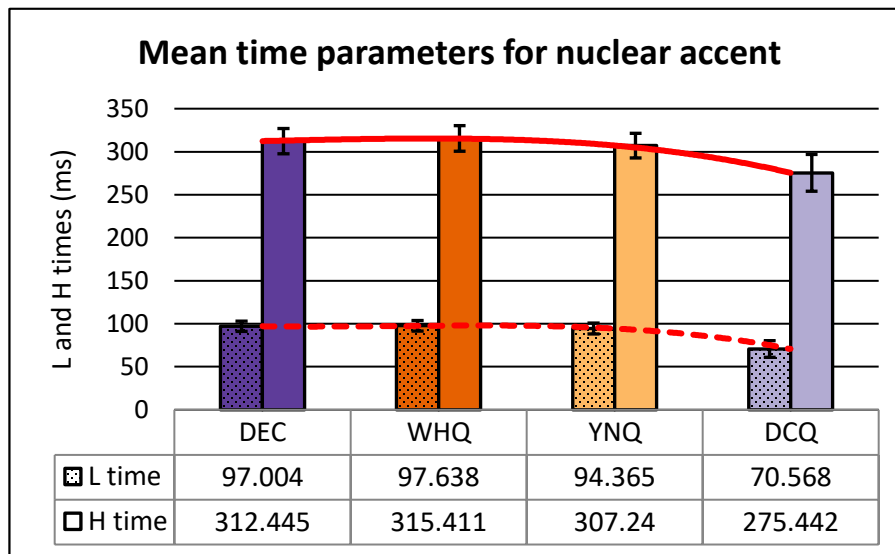
Annotation and analysis

TIME PARAMETERS

- Little variation in time for DEC, WHQ, YNQ
- DCQ timed earlier.

Statistically significant results*

- L_t pairwise comparison:
 - DEC v DCQ ($p=0.038$)
 - WHQ v DCQ ($p=0.027$)



*p.values Bonferroni adjusted by factor of 5

Phonetic Parameters and Sentence Mode

Annotation and analysis

$L f_0$ and $H f_0$

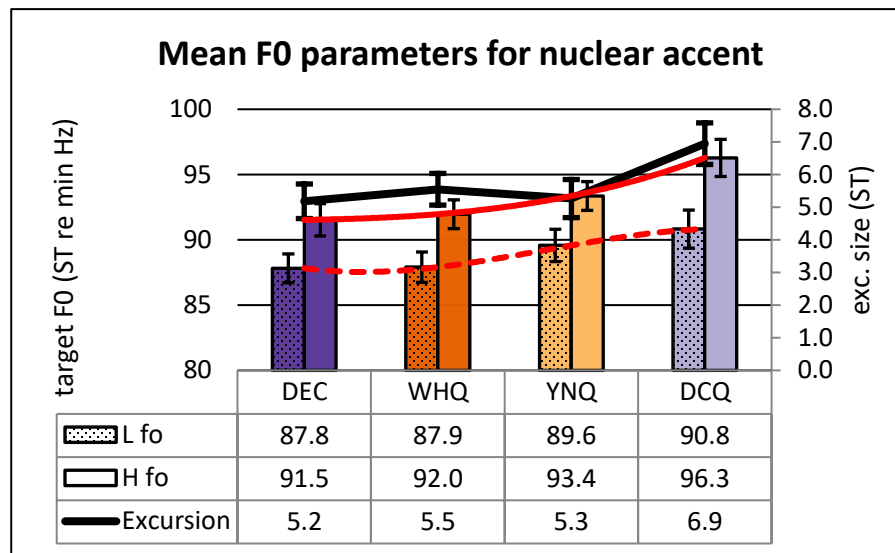
- DEC \approx WHQ
- increase: YNQ \rightarrow DCQ

Excursion Size

- Noticeable increase for DCQ

Statistically significant results*

- L_{f0} , H_{f0} :
 - All but DEC v WHQ ($p. \approx 1$)
- Excursion:
 - All v DCQ ($p. < 0.05$)

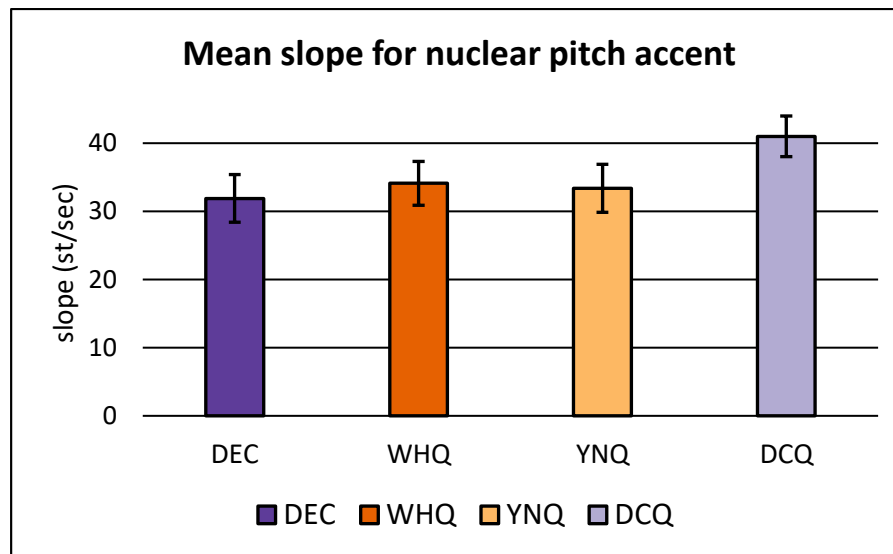


Phonetic Parameters and Sentence Mode

Annotation and analysis

COMPOSITE PARAMETER

- Slope matters for DCQ!
- Non-significant for other pairwise comparisons.



Categorization of Mode by Nuclear PA

Results and Analysis

- **Trained on Pitch accent only.**
- **41.9% Accuracy**
- **Performs better than:**
 - PA + gender
 - PA + boundary

Model 13

True Class	MDC	MDQ	MWH	MYN
	64		97	2
	17	108	26	2
	64	1	96	
MYN	48	46	68	
		Predicted Class		

Categorization of Mode by Nuclear PA

Results and Analysis

- **Trained on Pitch accent only**
- **41.9% Accuracy**
- **Performs better than:**
 - **PA + gender**
 - **PA + boundary**
- YNQ never correctly identified!
- MDC & MWH most Confused
- DCQ best identified.

Model 13

True Class	MDC	MDQ	MWH	MYN		
	39.3%		59.5%	1.2%	39.3%	60.7%
	11.1%	70.6%	17.0%	1.3%	70.6%	29.4%
	39.8%	0.6%	59.6%		59.6%	40.4%
MYN	29.6%	28.4%	42.0%			100.0%
Predicted Class					TPR	FNR

TPR: True Positive Rate
FNT: False Negative Rate

Categorization of Mode by Nuclear Contour

Results and Analysis

- **Trained on Pitch accent only**
- **41.9% Accuracy**
- **Performs better than:**
 - **PA + gender**
 - **PA + boundary**
- YNQ split between DEC and DCQ!
- **DEC never predicted as DCQ!**

		Model 13				
True Class	MDC	33.2%		33.8%	50.0%	
	MDQ	8.8%	69.7%	9.1%	50.0%	
	MWH	33.2%	0.6%	33.4%		
	MYN	24.9%	29.7%	23.7%		
		MDC	MDQ	MWH	MYN	
		Predicted Class				
		PPV	33.2%	69.7%	33.4%	
		FDR	66.8%	30.3%	66.6%	100.0%

PPV: Positive Predictive Value

FDR: False Discovery Rate

Best Model with Phonetic Parameters

Results and Analysis

PARAMETERS

- Gender
 - L_t
 - Slope
 - L_{f0}
 - H_{f0}
 - Boundary f0
 - Excursion (L to H)
 - Excursion (H to %)
- **68% accuracy**
 - **Model with phonological params performs more poorly!**

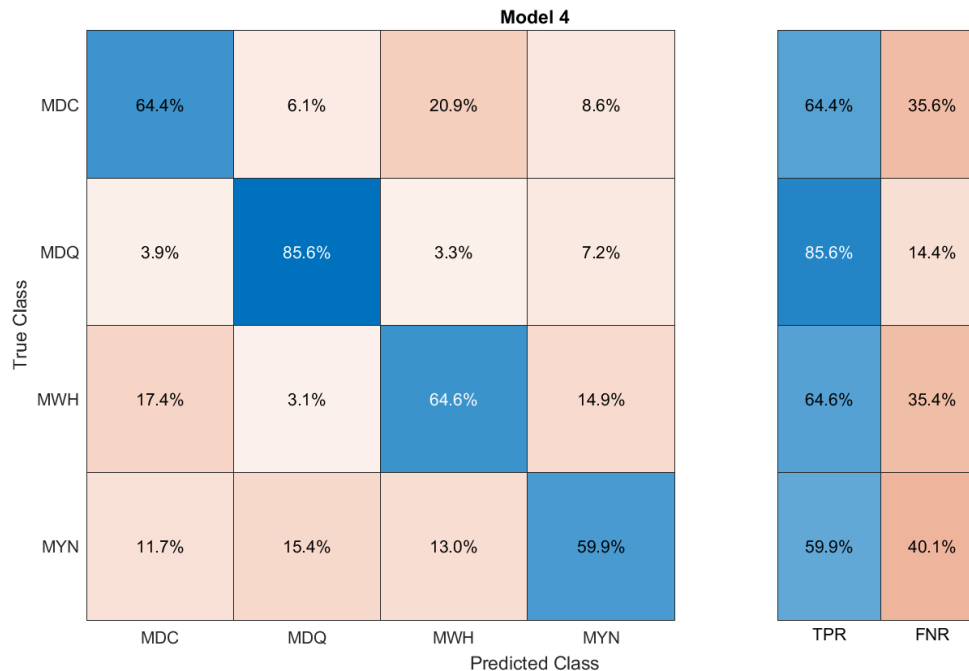
Model 4

True Class	Predicted Class				
	MDC	MDQ	MWH	MYN	
	MDC	105	10	34	14
	MDQ	6	131	5	11
	MWH	28	5	104	24
	MYN	19	25	21	97

Best Model with Phonetic Parameters

Results and Analysis

- **Noticeable improvement in true positive rates!**
- **DCQ still highest true positive rate.**



TPR: True Positive Rate
FNR: False Negative Rate

Best Model with Phonetic Parameters

Results and Analysis

- **General improvement in PPV**
- **MDQ PPV “least improved”**
- **MDC false discovery != 0, but 5.8%**

		Model 4			
True Class	MDC	66.5%	5.8%	20.7%	9.6%
	MDQ	3.8%	76.6%	3.0%	7.5%
	MWH	17.7%	2.9%	63.4%	16.4%
	MYN	12.0%	14.6%	12.8%	66.4%
		Predicted Class			
		MDC	MDQ	MWH	MYN
PPV		66.5%	76.6%	63.4%	66.4%
FDR		33.5%	23.4%	36.6%	33.6%

PPV: Positive Predictive Value

FDR: False Discovery Rate