

An ultrasound investigation of Northern English /l/s

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Introduction

Previous work

Present study

Methodology

Results

/l/-darkening

- The process whereby /l/ is realised with a delayed and/or reduced tongue-tip gesture.
 - cf. /l/-vocalisation where the tongue tip gesture is lost altogether
- Generally stated that clear/light [l] is found in onsets, e.g. *light, love*, and dark [ɫ] is found in codas, e.g. *dull, fall*.

[l]ight

du[ɫ]

/l/ variation in Northern dialects

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Can we find evidence to support or dispute this claim using ultrasound tongue imaging?

General research questions of the project

1. What determines the amount of /l/-darkening, determined by articulatory criteria, found in different morphosyntactic domains?
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2. To what extent can articulatory data help us distinguish between gradient and categorical processes?
3. What kind of articulatory variation do we find in different dialects of English? More specifically, Northern varieties.

Descriptions of Northern /l/s

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- Hull lightly velarised in all positions (Williams and Kerswill 1999:148)

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- Newcastle is the inverse pattern to Leeds and Manchester. All laterals are very light but initial /l/s are lighter (Carter and Local 2003, 2007).
- Sheffield /l/ is similar to nearby Leeds in being very dark, but there is an ethnicity effect: Pakistani speakers have very light [l]s (Kirkham 2014).

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Like other consonants, Scouse /l/ is velarised, and does not vary much according to syllable position. Before a vowel, it may be darker than the RP sound, but after a vowel it is clearer than the Southern English pharyngealised one.

Knowles (1973:256)

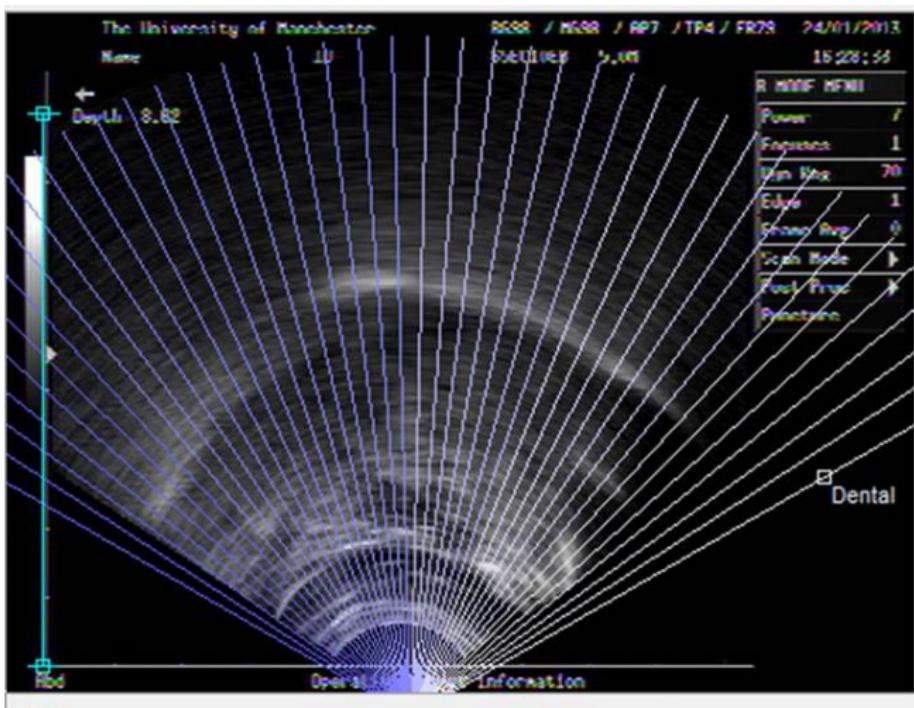
Today's research questions

Very little articulatory evidence of Northern dialects exists.

- To what extent can articulatory evidence from ultrasound support the descriptive (and acoustic) claims?
- Can we shed any light on undescribed varieties, such as Liverpool?
- To what extent is velarisation a synonym for darkening?

Today I'll be discussing data from Newcastle, Manchester, Belfast and Liverpool.

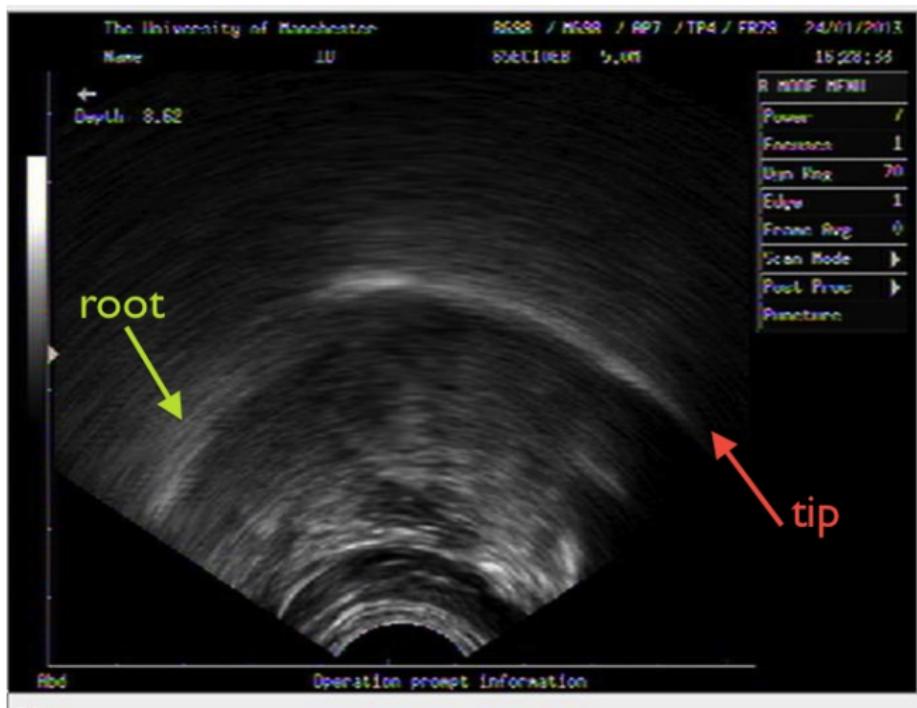
Ultrasound



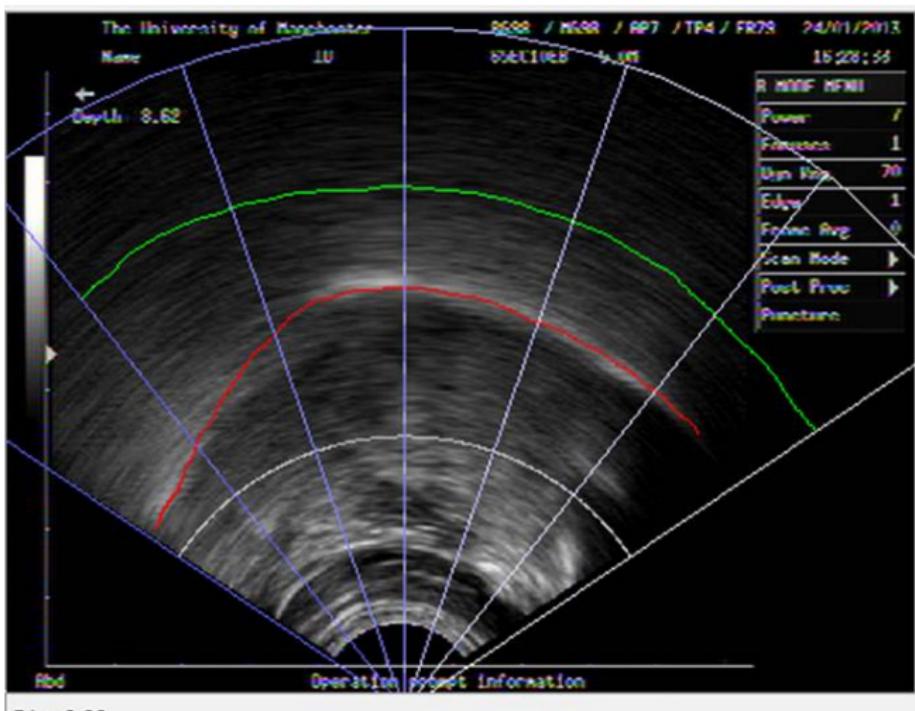
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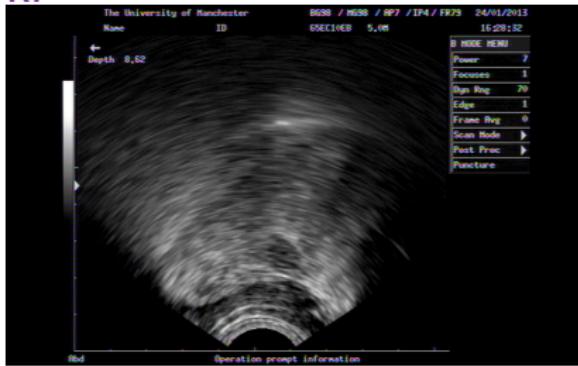


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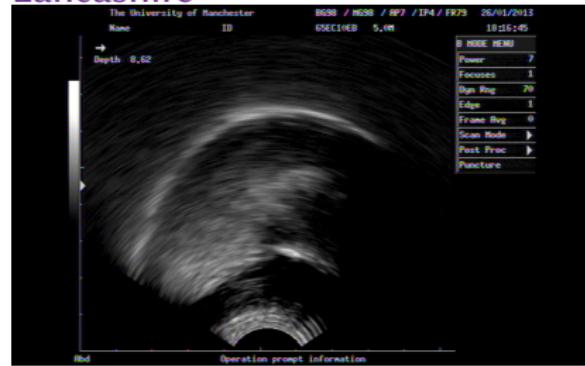


Some /l/s are darker than others...

RP



Lancashire



Methodology

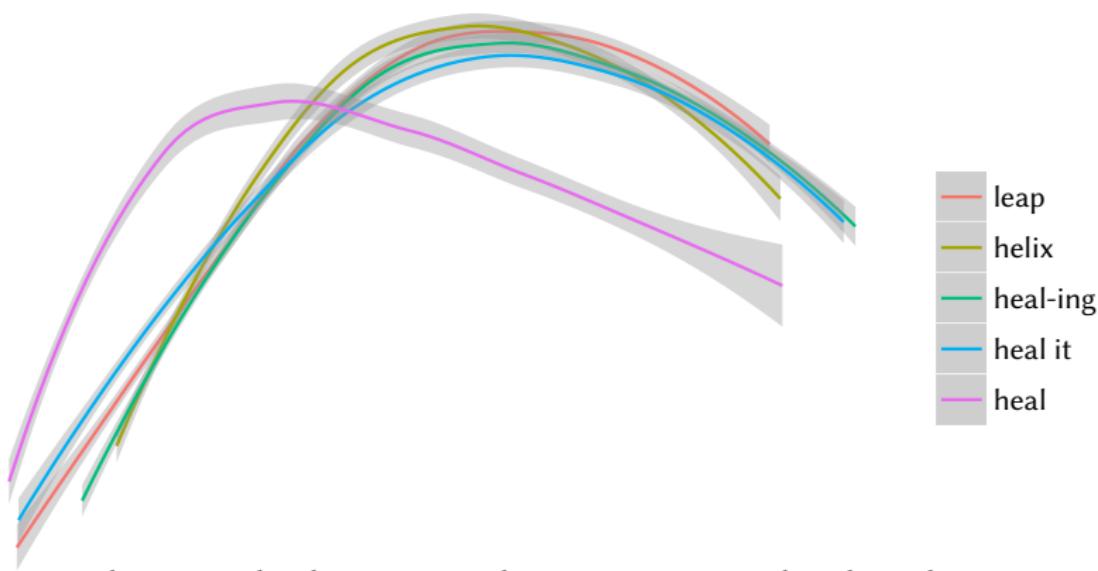
- Subjects read 5 repetitions per sentence, interspersed with distractors
- /l/s always flanked by high front vowels.
- Recorded on a Mindray DP2200 ultrasound machine (frame rate 60fps deinterlaced).
- /l/s segmented acoustically and splines hand-drawn for all frames within /l/ boundaries in Articulate Assistant Advanced (AAA; Articulate Instruments, 2010).
- Spline coordinates of midpoint plotted
- Non-overlapping confidence intervals taken as significant difference through loess smoothers (similar to SS ANOVA, see Davidson 2006).
- Acoustic measures extracted with Praat script show the F2-F1 difference at the midpoint (the smaller the value the darker the /l/).

Sentences

Speakers read 2 x 10 phonological contexts 5 times = 100 [l]s

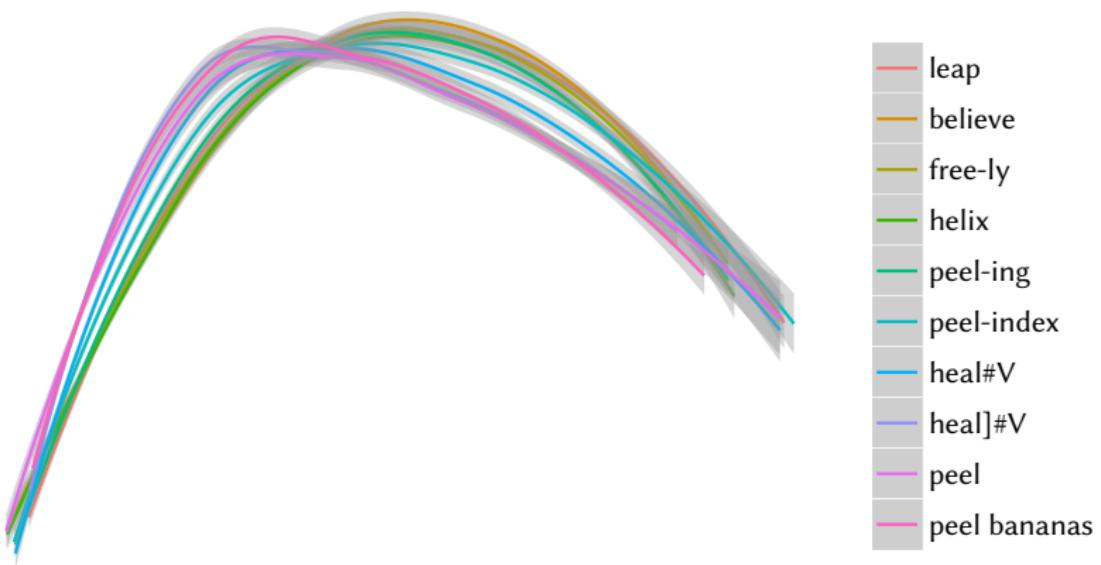
Context	Example
1. word-initial	<i>leap</i>
2. foot-initial	<i>believe</i>
3. suffix	<i>free-<i>ly</i></i>
4. foot-medial intervocalic	<i>helix</i>
5. morpheme boundary	<i>peel-ing</i>
6. internal boundary	<i>peel-instrument</i>
7. word-final internal boundary	<i>heal_{VP}</i>
8. word-final phrase boundary	<i>heal##..._{VP}</i>]
9. final	<i>peel</i>
10. word-final pre-consonantal	<i>peel bananas</i>

RP: What does a ‘standard’ /l/ distribution look like?

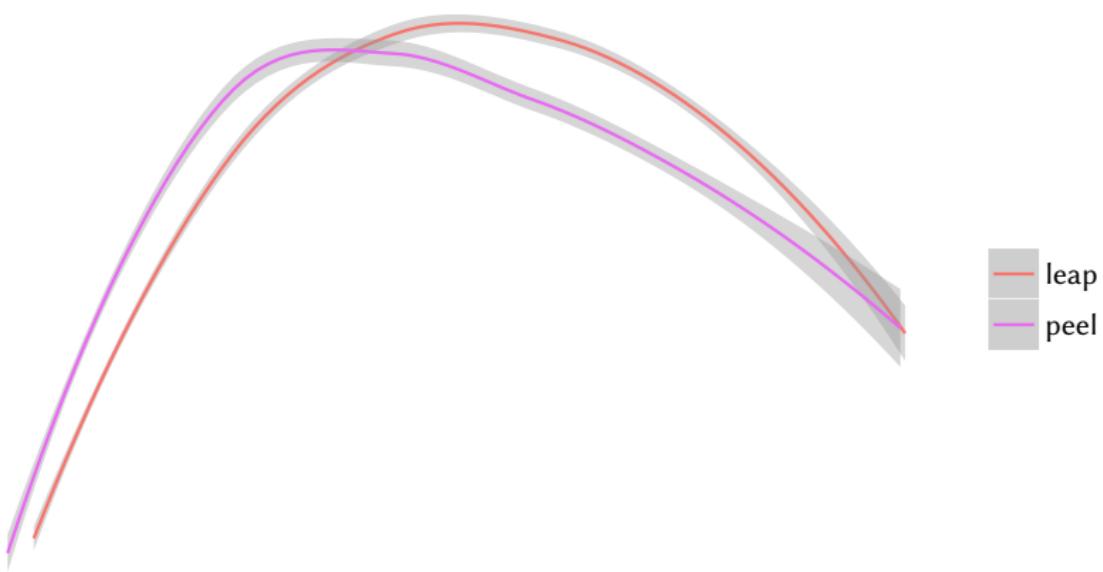


The lowered tongue body, retracted tongue root and reduced tongue tip gesture typical of dark [ɫ] is found only for the non-prevocalic /l/s.

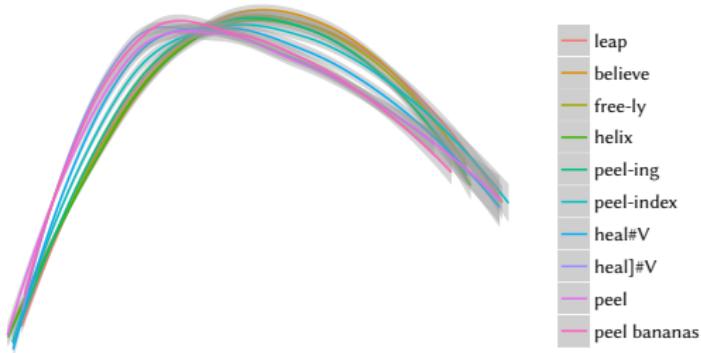
Newcastle



Newcastle

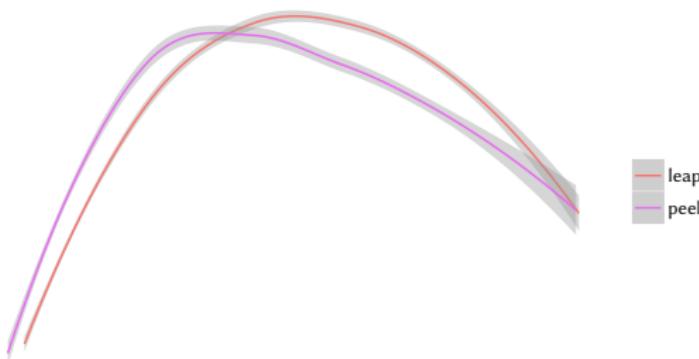


Newcastle



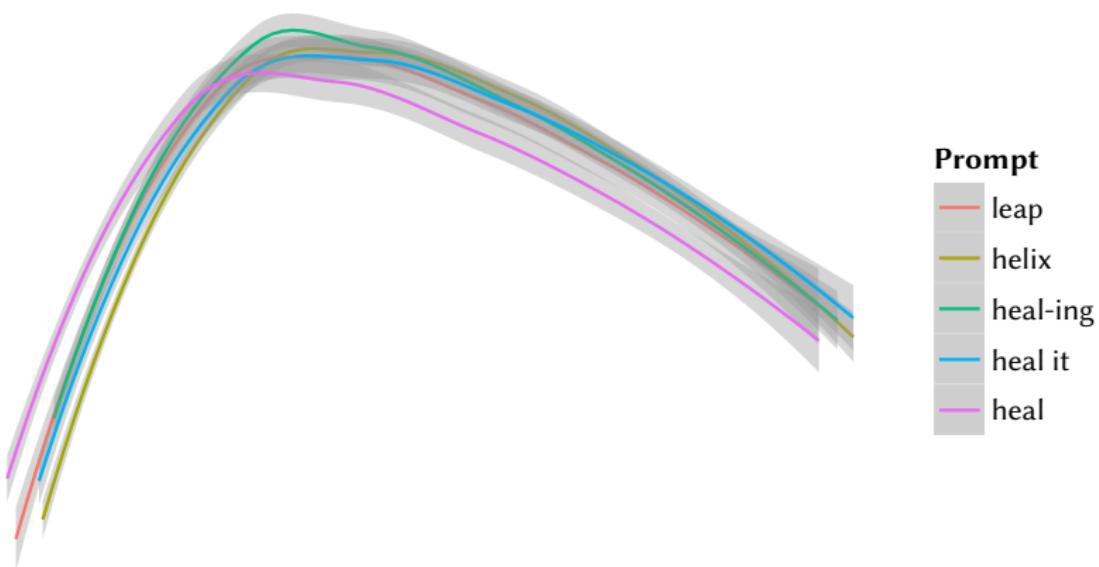
- All environments are fairly similar
- However there is a small difference between the word-final and non-word-final /l/s.

Newcastle

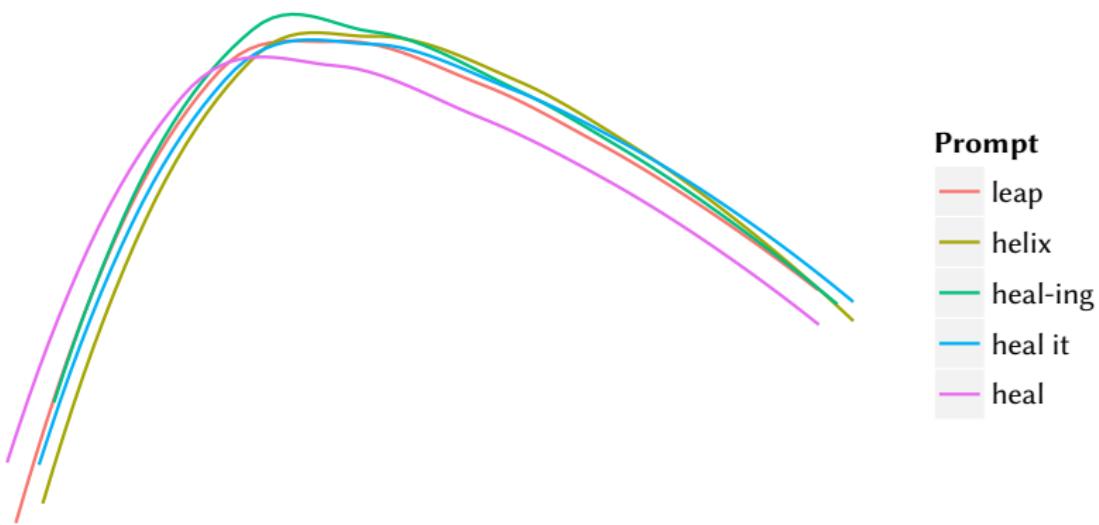


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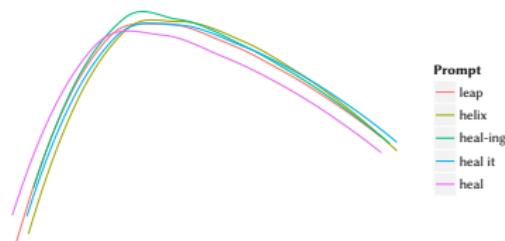
Manchester English



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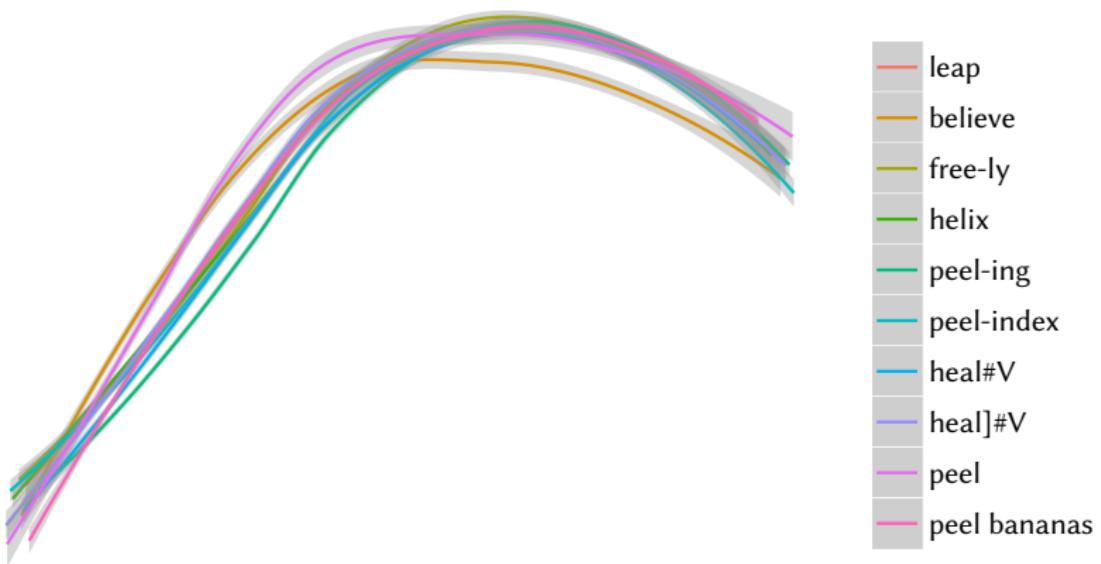


- At first glance, all environments appear the same.



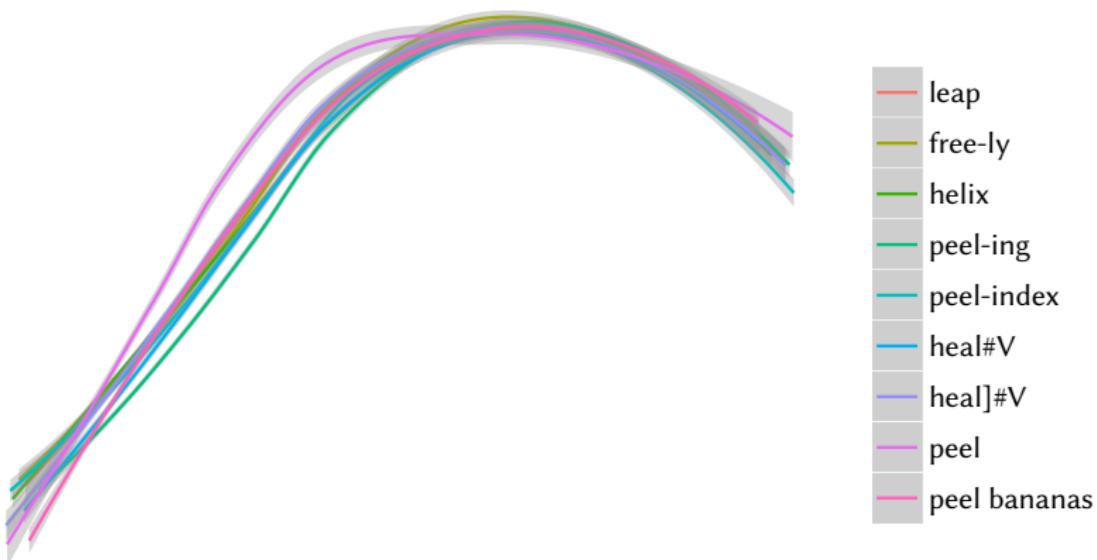
- However, differences in tongue-root backing between *heal*-type tokens and the other four environments are significantly different.

Belfast



This speaker produces word-medial foot-initial /l/s in *believe* which little to no schwa realisation, so the /l/ becomes part of a branching onset.

Belfast



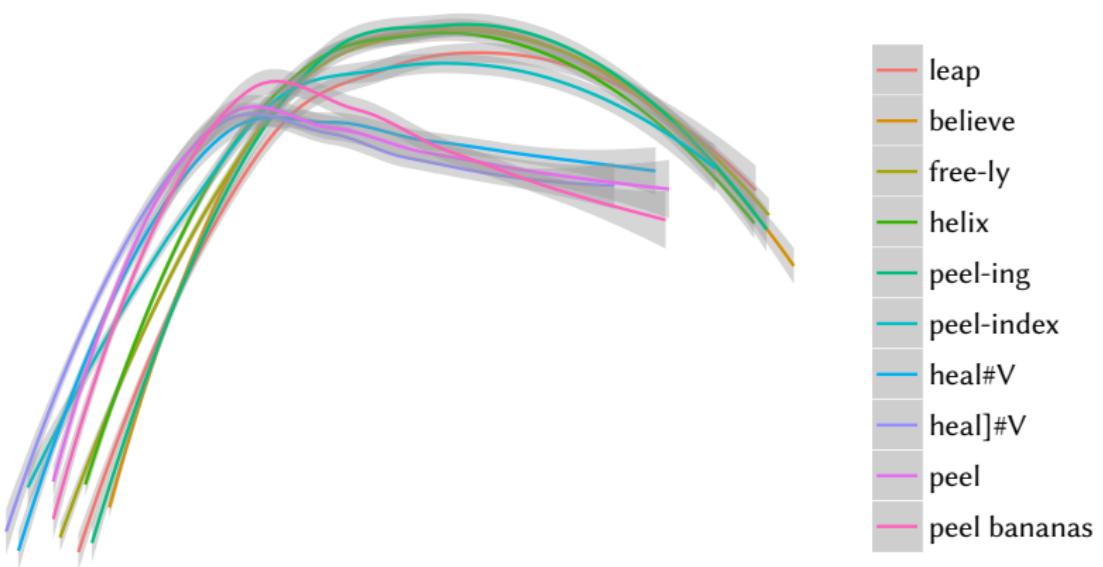
Removing this token from the picture, we can see that phrase-final tokens are slightly more retracted.

- Belfast /l/s are indeed very light, showing high tongue-tip placement, and little retraction of the tongue root.

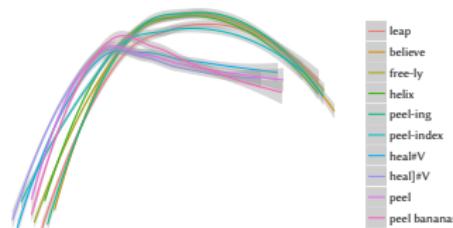


- There is no evidence of a more distinct light/dark pattern as reported for Derry.
- However, phrase-final *peel*-like tokens show significantly more retraction (note that word-final pre-consonantal *peel bananas* tokens do not).

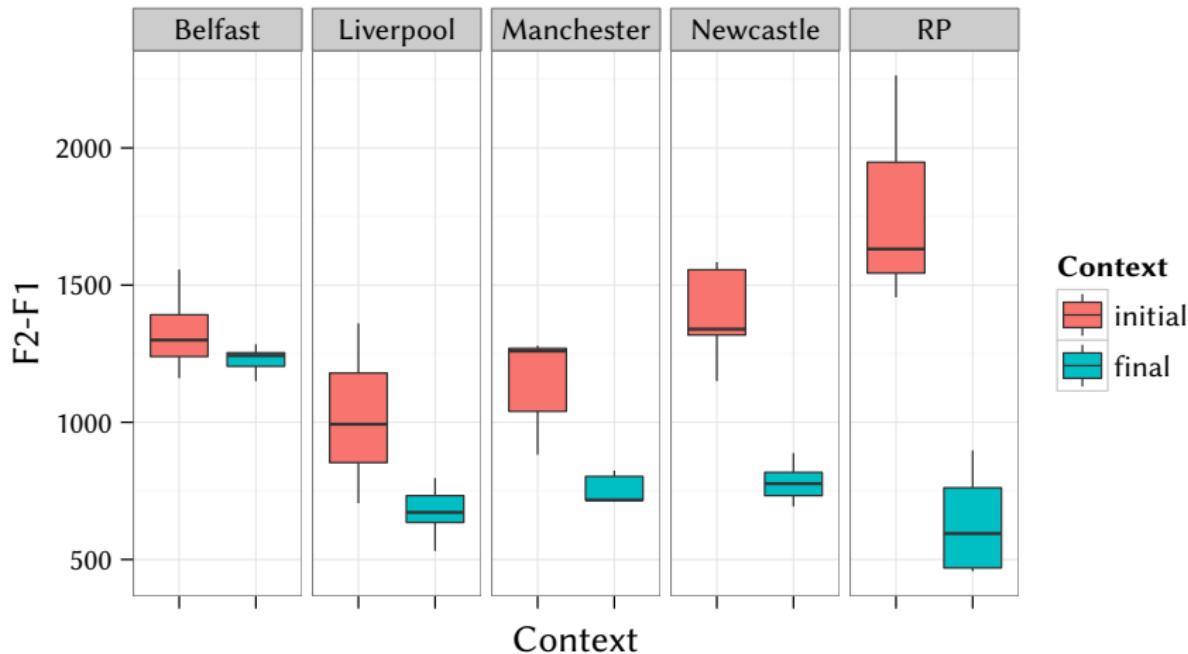
Liverpool



- The Liverpool speaker does exhibit a difference between word-final and non-word-final /l/s.
- Although the tongue root shows little variation, the tongue shapes are completely different.
 - In this respect, Liverpool varies from its Lancashire neighbours, and from the Irish influence (although Southern Irish dialects would be useful for comparison).
 - Note the obvious velarisation in the darker /l/s, corroborating Knowles's claims.



Acoustics: F2-F1



Conclusions

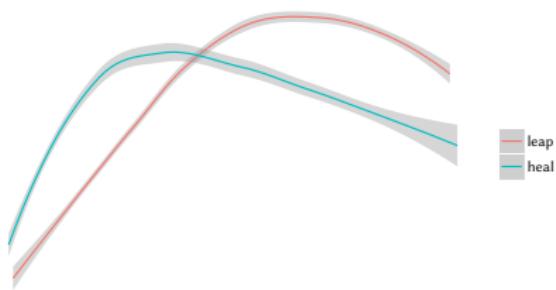
Do Northern dialects show smaller differences between their lightest and darkest /l/s?

- In comparison to RP, it seems so, but to varying extents.
 - Manchester, Liverpool and Newcastle have a small but distinct difference between initial and final position. Belfast does not.
- The extent to which a speaker has two allophonic categories is not simple.
- Articulatory similarity does not neatly map onto acoustic similarity.
- Acoustics for Manchester and Liverpool are very similar, but splines less so.
 - Perhaps investigation of formant trajectories can help shed light on different patterns.

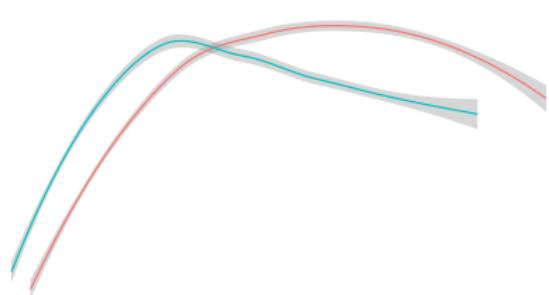
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/l/-darkening \neq /l/-velarisation (although dark [ɿ]s may be velarised)

RP



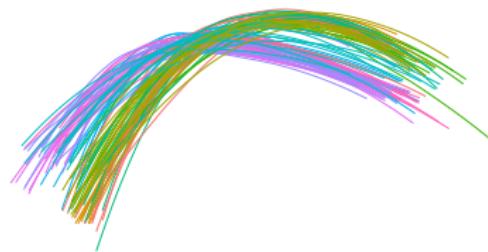
Liverpool



Conclusions

- The descriptive literature provides a useful starting point for initial research questions.
- However, auditory and even acoustic analyses can fail to identify certain aspects of articulation.
- Ultrasound tongue imaging brings a new insight to lateral variation from a dialectological perspective.

Thanks for listening!



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