/l/-Darkening in Tyneside English: Phonological Predictors, Ongoing Change, and Categoricity

Scarlett L. Hart

Linguistics, 2024

Abstract:

Tyneside English has historically been described as lacking allophony between clear and dark /l/ (Wells 1983). While some more recent studies dispute this, they lack the speaker sample size and diversity to say this with certainty (Turton 2017; Carter & Local 2007; Kirkham et al 2020). In this paper, I investigate the phonological and social predictors of /l/-darkening in Tyneside English, and seek to establish whether a categorical distinction between onset and coda /l/ exists in this variety. I run a wordlist reading experiment with 15 female speakers of Tyneside English aged 18 to 86. F2-F1 distance at the midpoint of each lateral is measured and used as an acoustic proxy for degree of /l/-darkening, and a linear regression with $p \leq 0.05$ is used to determine significance. Using Turton's (2017) empirical diagnostics for categoricity, my results clearly indicate the existence of a categorical distinction between clear and dark /l/ in Tyneside English. However, I also find evidence of co-existing gradient effects on /l/-darkening, such as rime duration and adjacent vowel quality. Finally, I find a strong linear correlation between speaker age and /l/-darkness, with older speakers having lighter /l/s, suggesting a possible ongoing change. Due to the small scale of this study, future research utilising conversational data is required to verify and build upon these findings.

Keywords: phonology, phonetics, sociolinguistics, Tyneside English, /l/-darkening, categoricity, language change

Supervisor(s): Dr Rory Turnbull

/l/-Darkening in Tyneside English: Phonological Predictors, Ongoing Change, and Categoricity

Scarlett L. Hart

1. Introduction

The phoneme /l/ in English is traditionally analysed as having two distinct allophones: a "clear" or "light" unvelarised variant [l] used in the onset, and a "dark" velarised variant [ɫ] used in the coda (Chomsky & Halle 1968). Tyneside English has historically been described as lacking this allophonic variation (Beal et al 2012:22), with Wells (1982:374) characterising its /l/ as "clear in all positions". More recently, articulatory and acoustic studies on /l/ in Tyneside English have in fact found differing degrees of velarisation between onset /l/ and coda /l/, though still to a lesser extent than other British English varieties (Carter & Local 2007; Turton 2017; Kirkham et al 2020). However, methodological limitations, such as small non-diverse samples and low token counts, impact the reliability and generalisability of these results.

In this study, I seek to establish whether /l/-darkening is present in Tyneside English and, if so, how categorical this process is. I also ask how this /l/-darkening is affected by phonological and social factors. I find strong evidence of /l/-darkening in my sample of Tynesiders, with signs of both categorical and gradient effects. I also identify /l/ as a likely site of ongoing phonological change in Tyneside using apparent-time data. Additionally, I find several significant phonological predictors of /l/-darkening, including the quality of the adjacent vowel and duration of the rime.

I begin with an overview of features and models of /l/-darkening. I review prior literature on /l/-darkening in Tyneside English, focussing on phonological predictors and empirical markers of categoricity. After presenting my research questions and hypotheses, I explain the details of my methodology. I then present my results and discuss their implications. I finally conclude with my overall findings and propose how further research could build upon them.

2. Literature Review

2.1 Features and Distribution of /l/-Darkening

/l/-Darkening is the name given to the allophonic process in English by which laterals become velarised, usually in non-prevocalic positions (Polgárdi 2020:1). Articulatorily, "clear" or "light", i.e. unvelarised, laterals are marked by near simultaneous tongue-tip and dorsum gestures (Kirkham et al 2020:1), while "dark", i.e. velarised, laterals are characterised by a delayed or retracted tongue tip gesture (Turton 2017:1). Acoustically, clearer /l/s tend to have a lower F1 and higher F2, while darker /l/s have a higher F1 and lower F2 (Kirkham et al 2020:2). This makes F2-F1 distance an effective acoustic proxy for measuring this articulatory process.

Traditionally, /l/-darkening has been described as a simple allophonic process, by which a clear [l] becomes velarised or "darkened" to [ɫ] in the coda of a syllable (Halle & Mohanan 1985:65):

1)   /l/→ [+back] / __.

However, this categorical distinction between light and dark /l/ has been called into question, as has the allophonic nature of the process. Based on their acoustic and articulatory data collected primarily from American English speakers, Sproat and Fujimura (1993: 291) argue for a gradient model of /l/-darkening, where light and dark /l/ are not "phonologically or phonetically distinct entities". Instead of modelling /l/-darkening as an allophonic process based on phonological context, Sproat and Fujimura attribute the differing degrees of velarisation between onset and coda laterals to purely phonetic features associated with syllable initial and final contexts (306-308). Their primary argument is that the duration of the pre-boundary rime containing a lateral determines how light or dark it is; a longer rime duration allows the dorsum more time to retract, therefore leading to a darker /l/. If true, this would negate the need for a binary light and dark allophones to describe the variation in /l/ across morphophonological contexts.

More recent literature suggests the reality of /l/-darkening is more complex. Turton (2017:25) analysed ultrasound data from speakers of 5 different varieties of British and Irish English. She found that duration was only correlated with darkness in some varieties. Furthermore, it was those varieties that failed to show signs of categorical allophony that lacked an effect of duration. This is the opposite to what Sproat and Fujimura (1993)'s findings would predict. Turton also found evidence of categoricity co-occurring with gradient effects (15-16), such as in her London speaker.

In summary, the traditional description of /l/-darkening that states a "light/clear" /l/ allophone becomes velarised into a "dark" /l/ allophone in coda position is oversimplistic. However, an approach that completely abandons any categorical or allophonic analysis of /l/-darkening in favour of an exclusively phonetically-motivated gradient process seems to be no more accurate. The data instead suggest we must move away from the false dichotomy of gradience vs. categoricity and acknowledge that in some but perhaps not all varieties, gradient phonetically driven processes may coexist alongside categorically distinct phonological elements.

2.2 /l/-Darkening in Tyneside English
As previously stated, historical descriptions of Tyneside English have described its lateral as clear in all positions (Wells 1982:374). This is in contention with more recent accounts that report some level of /l/-darkening is present (Carter & Local 2007:192-197; Turton 2017; Kirkham et al 2020).

Turton (2017) sought to determine the categoricity of clear and dark /l/ across various English varieties using three empirical diagnostics, as identified in Turton (2015):

1. Articulatory discontinuity between sets of splines
2. Articulatory consistency within these sets
3. Statistical bimodality in the quantitative data

Turton (2017) did not find the articulatory discontinuity detailed by Diagnostic 1 in her Newcastle English speaker, as she observed gradient pattern between the five phonological contexts she examined. In addition, there was high levels of variability in some intersyllabic contexts, where both clearer and darker /l/s were produced, meaning Diagnostic 2 also wasn't

fulfilled. The quantitative data did appear to have a bimodal distribution, although it narrowly fell below the level of significance. Turton describes the case for /l/-darkening categoricity in Tyneside English as "borderline" (21), though it fails to meet each of her own diagnostics. She also reports a lack of an effect of rime duration on lateral F2-F1 distance in her Newcastle speaker, a feature she previously notes as being present in varieties that do not demonstrate evidence of categorical allophony (25).

However, even among these recent studies on /l/-darkening in Tyneside English, there are major discrepancies in findings. While Turton (2017:20-25) found a "small yet distinct split" in /l/s in differing phonological contexts, Kirkham et al (2020) reported Newcastle English as one of the three varieties with the greatest initial-final lateral distances. This variability in results is inarguably a product of methodological limitations, specifically in sample size and quality. In Kirkham et al (2020:4-5), there are only 6-10 speakers per dialect. Furthermore, these speakers are exclusively between 18 and 30 years old, with three quarters having been university educated. Meanwhile, all of Carter and Local's (2007:186) 8 speakers were between the ages of 16-18. It is unquestionable that data from a young, highly educated, and likely predominantly middle-class subset of speakers will be unrepresentative of the speaker population as a whole. More problematic still is that each variety is represented by only a single speaker in Turton (2017). In summary, all the recent studies on /l/-darkening in Tyneside English have either excessively small or demographically unrepresentative samples, affecting both the reliability and generalisability of their results. These methodological limitations mean the contrast in findings of earlier and later studies of /l/-darkening in Tyneside English may either be the product of methodology or language change.

Following this, I ask: Is /l/-darkening present in Tyneside English. If so, does show signs of categoricity and/or gradience? From my reading of the literature, I hypothesise Tyneside speakers will show no to limited evidence of distinct clear and dark /l/ categories. However, the effects of gradient processes will be visible, such as the phonological predictors discussed below.

I also ask: What causes the discrepancy between earlier and more recent descriptions of /l/-darkening in Tyneside? Based off my own observations and the changes in reports of /l/-darkening in Tyneside English over time, I hypothesise that older speakers will demonstrate less of a distinction between onset and coda laterals, with both having relatively little darkening. Meanwhile, younger speakers will have a larger gap between /l/s in each context. As this change is towards Standard British English rather than away from it, I hypothesise middle class speakers will have a greater gap between onset and coda /l/ that working class speakers.

2.3 Phonological Predictors of /l/-Darkening
In addition to whether a lateral is in the onset or coda, there are other phonological predictors reported to affect /l/darkening, although there is very little literature on their effects in Tyneside English specifically.

2.3a Rime Duration

As outlined earlier, Sproat and Fujimura (1993) attempted to model /l/-darkening as solely being conditioned by rime duration. Though this has been shown to be incorrect, rime duration is still a reported predictor of /l/-darkening in some varieties, including Standard American English, London English, and Manchester English (Turton 2017:16-20). Yuan and Liebermann (2011) found in their American English speakers that duration only predicted degree of /l/-darkening in already dark /l/s, showing evidence of an interaction between gradient and categorical processes. However, Turton found no durational effect on /l/-darkening in her speaker of Tyneside English, alongside speakers of other varieties sampled that did not show clear evidence of categoricity.

In this essay, I ask: Does rime duration affect the degree of darkening in coda laterals in Tyneside English? I hypothesise there will be no correlation between rime duration and /l/-darkening, based on previous findings looking at Tyneside English in particular.

2.3b Adjacent Vowel

Strycharczuk and Scobbie (2015)'s ultrasound study of Standard Southern British English looked at how the preceding segment affected rates of /l/-darkening. They looked at two contexts: /u:l/ and /ʊl/, finding that the laterals preceding by /u:/ had a higher rate of darkening than those preceded by /ʊ/. They attribute this to backness, as /ʊ/ typically undergoes fronting before /l/ in Standard Southern British English, while /u/ does not. However, since they only collected data for two contexts, it is not possible to determine whether it is indeed backness conditioning rates of darkening, opposed to vowel length or height.

Therefore I ask: Does the quality of the adjacent vowel impact /l/-darkening? If so, is it solely backness that has an effect, or does height also play a role? I hypothesise laterals in contact with backer vowels will be darker than those in contact with front vowels.

2.3c Vowel Breaking

The final potential phonological predictor of /l/-darkening I will look at is pre-lateral vowel breaking. Hayes (2000:7) describes this process as where high or front vowels are turned into centring diphthongs preceding a dark /l/, gaining a schwa off-glide. Hayes argues that the velarisation of the dark /l/ originally caused this breaking through vowel assimilation, but that vowel breaking now serves as a "proxy" for categorical /l/-darkening, predicting a negative correlation between the two. However, Hayes (2000) did not control the phonetic quality of the laterals in his stimuli, instead controlling for the quality of the preceding vowel, making his data unable to prove whether there is indeed a trading relation between /l/-darkening and vowel breaking present. Stimuli were also not controlled for other possible gradient predictors of /l/-darkening, such as duration. Additionally, as Turton (2017:2) remarks, the design of Hayes's (2000) experiment lends itself to producing data in favour of a categorical approach to /l/-darkening. By nature, a well-formedness task produces scalar results, making it difficult to disentangle variability on the individual and community level, causing a "probable overestimation of categorical variation in the production of individuals". It should also be noted that Hayes sampled American English speakers, half of whom were linguists, meaning his findings have limited application to your typical speaker of Tyneside English.

Based on this, I ask: Is there a correlation between the rate of /l/-darkening and breaking in the preceding vowel? If so, does the darkness of the lateral positively or negatively predict the diphthongisation of the preceding vowel? As Hayes (2000) does not provide sufficient evidence of a trading relation between /l/-darkening and vowel breaking, I hypothesise that the relationship between the two processes will be phonetically motivated, with a positive correlation between diphthongised high/front vowels and greater degrees of /l/-darkening.

3. Methodology

3.1 Participants

I collected data from 15 participants, all of whom were raised in Tyneside and had never lived outside of Tyneside for any longer than three years. Demographic data was collected via an online questionnaire, such as age, self-reported socioeconomic class, highest level of education, and part of Tyneside where participants were raised. The county where each participant's parents came from was also recorded, since parental accent has been shown to have an effect on an individual's own variety (Floccia et al 2012: 1), although this effect is small compared to the influence of peer language use. All data was anonymised and participants were randomly assigned a pseudonym.

I recruited an equal number of participants from three age groups: 18-25s, 40-55s, and over 65s, with a total of 5 participants per group. Details of each group can be found below.

	18-25s	**40-55s**	**>65s**
Age	19	42	65
	19	47	68
	20	48	73
	20	51	84
	21	54	86
Socioeconomic Class	LMC	LMC	UWC
	LMC	UWC	UWC
	UMC	LWC	LMC
	UWC	UWC	UWC
	LWC	UWC	LMC
Education	College	Postgraduate	Secondary School
	College	College	College
	Undergraduate	College	Secondary School
	Undergraduate	College	College
	Undergraduate	College	Undergraduate

Table 1: Cohort Demographics

Practical limitations led me to choose to work with a smaller sample size, in order to ensure I had sufficient time to collect, code and analyse my data. Due to my limited timescale and speaker sex/gender being previously linked to liquid velarisation in Tyneside English (Carter & Local 2007:190), I chose to exclusively include women in my sample to ensure a sufficient number of speakers per condition.

3.2 Data Collection

The participants recorded a wordlist consisting of 48 tokens and 50 filler words. The slideshow began with an ethics briefing, data protection information, and detailed instructions on how to complete the experiment. Each subsequent slide displayed a single word in large font, to ensure legibility. I also opted not to use an automatic timer in order to give participants enough time for each word regardless of reading speed.

All 48 tokens were monosyllabic and monomorphemic words without consonant clusters. The morphological complexity of tokens was controlled for as /l/-darkening has been demonstrated to be morphsyntactically sensitive in multiple varieties (Lee-Kim et al. 2013; Turton 2017: 13-25).

Table 2 shows the stimulus words used. Half had /l/ in the onset and the other half had /l/ in the coda. Stimuli contained one of three corner vowels: high front /i/, high back /u/, and low /a/ or /ɑ/, resulting in 8 tokens for each condition. There were insufficient possible tokens with /a/ in the nucleus, therefore I chose to include words with /ɑ/ as their vowel. The difference in backing and length between these two vowels did not have an impact on /l/-darkening across my data. I chose /a, i, u/ as my vowels to test both the effects of vowel backness and height.

		/l/ in onset	/l/ in coda
/i/		leek, leave, leap, leaf, lease, lean, lea, leash	keel, teal, peel, feel, seal, meal, real, veal
/u/		Luke, loot, loop, Louvre, loose, loom, lose, lude	cool, tool, pool, fool, ghoul, mule, rule, duel
/a~ɑ/		lack, lad, lap, laugh, lass, lamb, lark, lax	gal, dahl, pal, farl, Sal, Val, Carl, gnarl

Table 2: Tokens

The filler tokens were also monosyllables, however they did not include laterals. Tokens and fillers were listed in a pseudorandom order that was consistent between speakers.

Participants were instructed to complete the wordlist task alone in a quiet room. However, this was not possible for four of the five participants in the 65+ age group, who requested assistance for technical reasons. I helped one participant complete the task in her own home and a further three participants in a private room in a local library. For all participants, audio was recorded using a mobile phone.

3.3 Data Analysis

In order to measure the degree of /l/-darkening, the F1 and F2 values of each lateral midpoint were manually extracted using Praat and F2-F1 distance was calculated. F2-F1 distance was chosen as a proxy for the degree of lateral velarisation for two main reasons. Firstly, as an acoustic measure, F2-F1 is objective. Secondly, F2-F1 distance allows for effective comparison across speakers, due to taking into account interspeaker variation in fundamental frequency.

For each token with a coda /l/, the duration of the rime was also measured and the vowel was coded auditorily for diphthongisation. Auditory coding was completed twice in order to ensure accuracy.

Items of the wordlist that were misread (n=3) were excluded, as was the data from one speaker not detailed in Table #. I made this decision due to this individual displaying features of Wearside English in their vowel system that differ from those found in Tyneside English (Beal et al 2012:33). These included consistently closing diphthongal FLEECE and GOOSE vowels, [ɪ͡i] and [ə͡u], and categorical vowel breaking of /u/ before /l/, two features that could have skewed my results for the predictors of rime duration, vowel breaking, and adjacent vowel quality.

I used the Language Variation Suite to calculate my regressions, with F2-F1 as my dependent variable. The significance level was set at p<=0.05. My first regression includes all tokens in order to examine the effects of predictors that impact both onset and coda laterals. My second regression includes only coda tokens to test the impact of rime duration and vowel breaking, which exclusively affect coda laterals. The data for all predictors was included in both regressions, although tokens containing /a~ɑ/ in the nucleus were excluded from the second regression for two reasons. Firstly, I found the monosyllables with /a~ɑ/ to categorically forbid vowel breaking. Secondly, this predictor level contains words with either /a/ and /ɑ:/ - two vowels which differ both in length and backness, meaning I would be unable to separate the effects of rime duration and vowel quality.

4. Results
In this section I present my quantitative results and outcomes of my regressions.

4.1 Distributions
Table 3 shows the mean midpoint F2-F1 distance for onset and coda /l/s according to adjacent vowel and speaker cohort. For all three cohorts, onset /l/s consistently have larger F2-F1 distances, and are therefore lighter, than coda /l/s. Regardless of age, laterals adjacent to low vowels /a~ɑ/ are darker than those adjacent to high vowels /i, u/, with /i/ favouring the lightest /l/s.

F2-F1		younger (18-25)	middle-aged (40-55)	older (65+)
/a~ɑ/	onset	760	1040	1226
	coda	551	669	698
/i/	onset	1403	1418	1701
	coda	611	956	1233
/u/	onset	1346	1337	1565
	coda	556	907	1100

Table 3: Onset and Coda F2-F1 by Age and Adjacent vowel

Figure 2 displays the F2-F1 distances in Hz for /l/ in the coda and /l/ in the onset. In my data as a whole, the mean onset /l/ F2-F1 was 1311Hz while the mean coda /l/ F2-F1 was 809Hz. Using F2-F1 distance as a proxy for /l/-darkening, this makes the average onset /l/ 1.62x lighter than

the average coda /l/, demonstrating a significant difference in darkening between the two contexts. As can be seen from the box plots below, there is no overlap in the interquartile ranges of F2-F1 distance for /l/ in onset vs. in the coda, also suggesting they belong to two different categories.
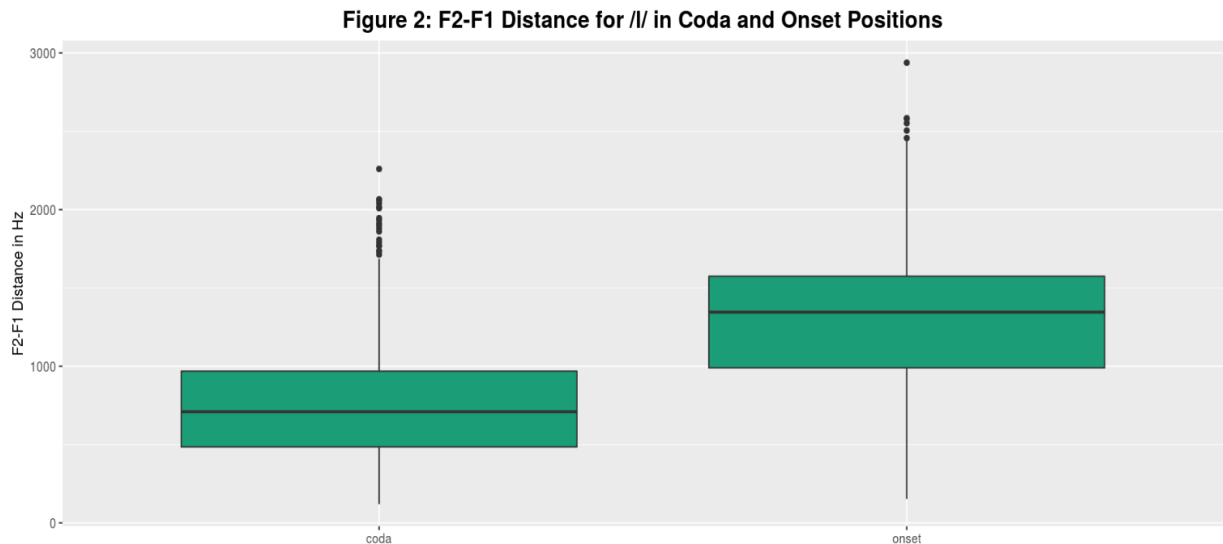

Figure 2: F2-F1 Distance for /l/ in Coda and Onset Positions

Figure 3 shows /l/ midpoint F2-F1 plotted against speaker age. There is a positive correlation between greater F2-F1 distance and age for both onset and coda /l/; The older a speaker is the lighter their laterals will typically be. Interestingly, the difference in darkness between onset and coda /l/ appears to remain fairly constant regardless of age, even if the degree of darkening in each position changes with age. Only one speaker, pseudonym Danielle (marked with D on Figure 3) does not display a sizeable gap in F2-F1 distance between onset and coda /l/, however the exclusion/inclusion of her data points did not affect significance in the regressions calculated below.
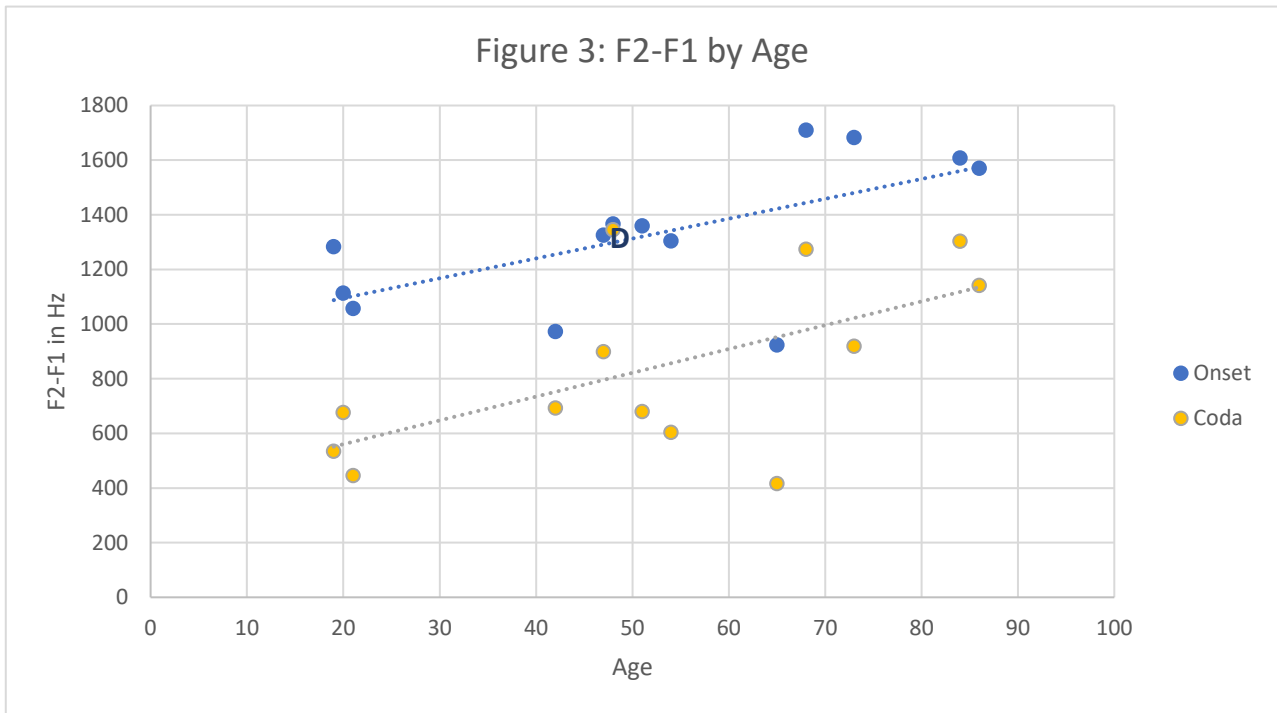
Figure 3: F2-F1 by Age

Figure 4 displays the mean midpoint F2-F1 distance for coda laterals depending on whether the preceding vowel is diphthongised, i.e. broken. The average F2-F1 distance for /l/s after unbroken vowels is 873Hz, compared to 659Hz for /l/s after broken vowels.
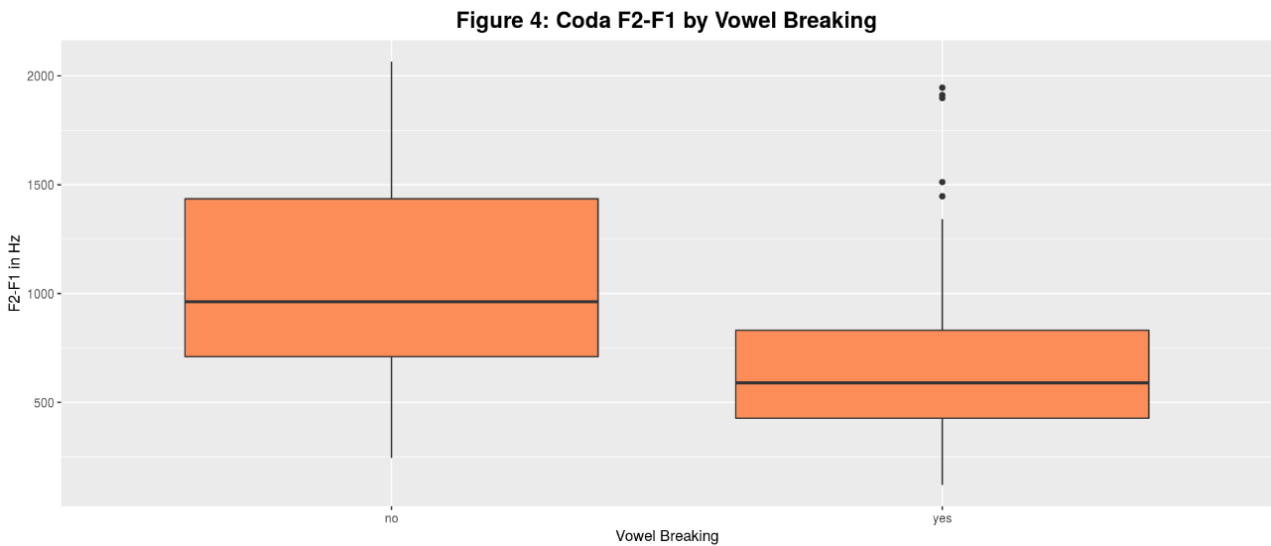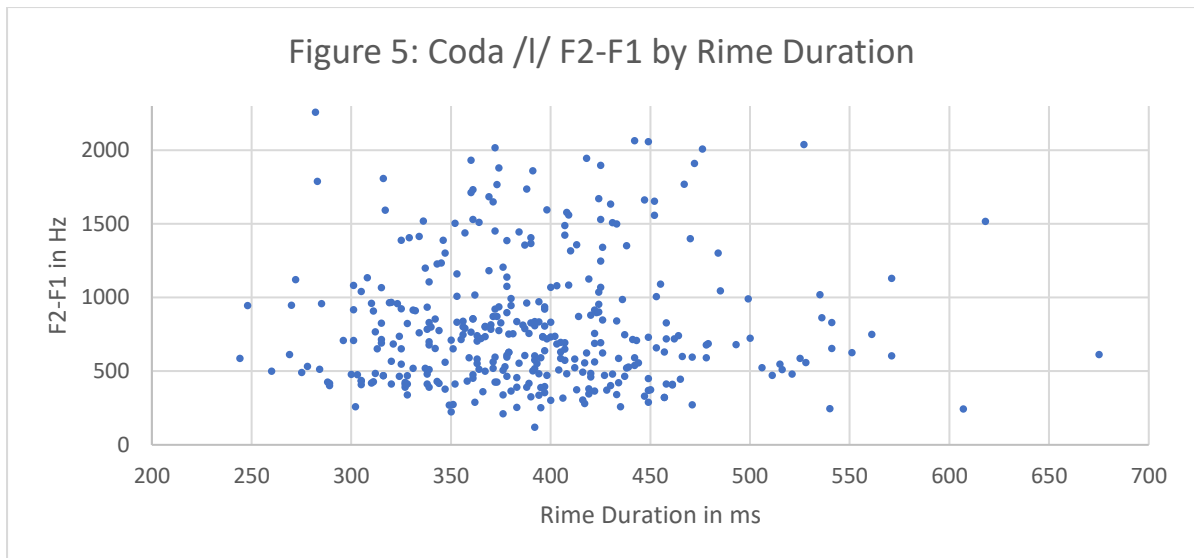
Figure 4: Coda F2-F1 by Vowel Breaking

Figure 5 shows coda /l/ F2-F1 distance plotted against rime duration, where no clear trendline is visible.

Figure 5: Coda /l/ F2-F1 by Rime Duration

4.2 Regressions

Here I present my regressions calculated using the Language Variation Suite, with a significance level of p<=0.05. I opted to run two regression as some predictors are only relevant for coda tokens, while others affect /l/s in both the onset and coda. For data validity, both regressions included all predictors.

Table 4 shows the results of my regression for tokens in both the onset and coda, in reference to the predictor level of Vowel_a. As expected, whether a lateral is in the onset or coda is a significant predictor of /l/-darkening, as is the quality of the adjacent vowel; High vowels are correlated with lighter /l/s compared to the low vowels /a, ɑ/, where /i/ is associated with lighter /l/s than /u/. Speaker age is another highly significant predictor, though self-identified socioeconomic class does not show an effect. Although vowel breaking appears to be a highly significant predictor in the onset and coda regression, this is because vowels are categorically unbroken in /l/ onset tokens, which are far lighter on average.

	Estimate	Std. Error	df	t value	Pr(>|t|)
(Intercept)	376.763	292.464	16.300	1.288	0.215613
Vowel_i	360.887	38.172	338.500	9.454	**≤0.0001**
Vowel_u	273.757	36.790	338.200	7.441	**≤0.0001**
Age	7.168	2.990	12.300	2.397	**≤0.0001**
Class	-76.178	87.559	-12.000	-0.870	0.401431
Onset.Coda	502.072	23.849	714.300	21.052	**≤0.0001**
Rime.Duration	-120.270	297.237	324.900	-0.405	0.686018
Breaking_no	154.879	39.434	343.900	3.927	**≤0.0001**

Table 4: Onset and Coda Regression

Table 5 contains the results of my second regression, looking at predictors exclusively relevant to coda laterals. Rime duration is significantly correlated with lower F2-F1 distance, i.e. with

darker laterals. Conversely the impact of vowel breaking on the darkness of the following lateral is insignificant. Another separate regression was also run for vowel breaking excluding /a~ɑ/ as this condition was categorically unbroken in my dataset, however in this regression vowel breaking still showed no significance.

|	Estimate	Std. Error	df	t value	Pr(>|t|)
(Intercept)	658.889	350.512	15.910	1.880	0.07858
Rime.Duration	-920.262	425.422	227.550	-2.163	**0.03157**
Breaking_yes	-56.269	40.249	224.030	-1.398	0.16348

Table 5: Coda Regression

5. Discussion

5.1 Categoricity in Tyneside English Laterals

In section 2.2 I asked whether /l/-darkening in Tyneside English demonstrates categoricity or gradience. Based on Carter & Local (2007), Turton (2017), and Kirkham et al (2020), I hypothesised that Tyneside speakers would show few to no signs of a categorical distinction between clear and dark /l/. To establish categoricity, I will use Turton's (2015) three empirical diagnostics.

The first of Turton's diagnostics is articulatory discontinuity between sets. As I have no articulatory data, I use my acoustic measure of F2-F1 distance as a proxy for velarisation (Kirkham 2017). Looking at the interquartile ranges displayed in Figure 2, there is no overlap in F2-F1 distance of onset and coda /l/s. This distinction between sets is held regardless of speaker age, as can be seen in Figure 3. Additionally, the statistical effect of onset vs. coda position is also shown to be highly significant in Table 4, with p≤0.0001. This provides strong evidence of an articulatory disconnect between clear onset /l/ and dark coda /l/ in Tyneside English.

My results indicate that /l/ in Tyneside English also fulfils the second of Turton's empirical diagnostics: articulatory consistency between sets. The standard error of the onset-coda predictor in my dataset is only 23.8Hz (Table 4), meaning the acoustic data suggests consistent articulation in onset and coda laterals. Figure 2 also shows that while the ranges in F2-F1 distance for onset and coda /l/ are wide, this can attributed to a small number of anomalous tokens, with the interquartile ranges being far narrower.

Figure 6: Frequency Distribution of F2-F1 Distance
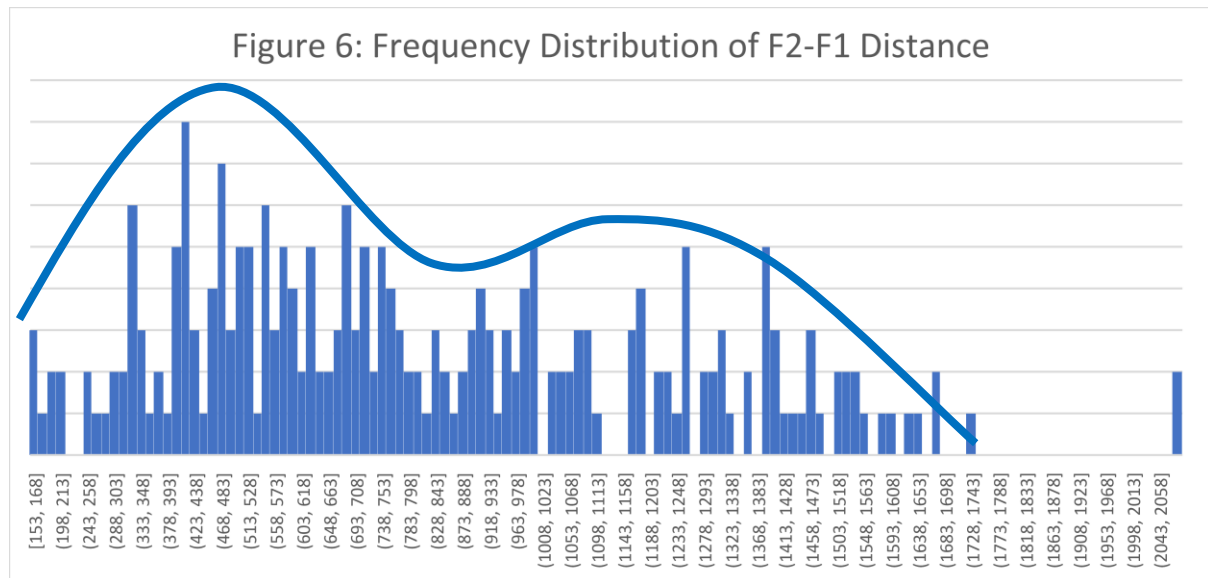
The last of Turton's empirical diagnostics for categoricity is statistical bimodality. This is a distribution with more than one peak. Figure 6 shows the frequency distribution of /l/ F2-F1 distance. There appears to be a bimodal distribution, though my dataset is not large enough to make this completely clear.

A potential limitation of my methodology is that I only looked at /l/s in simplex onsets and codas of monosyllables due to limited time. A result of this may be that my methods produce data that lend itself to a categorical analysis. This is because I lack any ambisyllabic tokens, such as "melon" or "below", which may potentially have had intermediate /l/-darkening.

Regardless of this, the data above are in support of a categorical distinction between onset and coda /l/ in Tyneside English. My speakers inarguably demonstrate signs of articulatory discontinuity and consistency between onset [l] and coda [ɫ], and my data indicate a bimodal distribution of lateral F2-F1 distance. Furthermore, the fact that the difference between the mean F2-F1 of onset and coda /l/ remains constant, regardless of age, demonstrates the preservation of distinct categories, despite an overall change in darkness. These findings counter those of Turton (2017) and align more closely with Kirkham et al (2020), who found a significant gap in acoustic signifiers of velarisation between onset and coda /l/s in their Tyneside speakers.

5.2 Phonological Predictors of /l/-Darkening
In this section, I discuss the effects of the potential phonological predictors of /l/-darkening in Tyneside English I looked at: rime duration, adjacent vowel, and vowel breaking.

As Turton (2017) found no effect of rime duration in her Newcastle speaker, I hypothesised that rime duration would also not be correlated with /l/-darkening in my speakers of Tyneside English. Although the relationship between rime duration and /l/-darkening is not immediately clear in Figure 5, Table 5 shows a weak but significant correlation. In my dataset, longer rimes are associated with lower F2-F1 distances and therefore darker /l/s. The mechanism proposed by Sproat and Fujimura (1993) likely explains this, where rimes with longer durations permit more /l/-darkening by allowing more time for the velum to be raised. This evidence of rime duration acting as a gradient predictor of /l/-darkening demonstrates that the categorical and allophonic effects discussed above co-exist alongside gradient, phonetically-motivated effects.

I hypothesised, based off Strycharczuk and Scobbie (2015), that laterals in contact with back vowels would be darker than those in contact with front vowels. However, as noted in Section 2.3, Strycharczuk and Scobbie's experimental design meant they were unable to contrast the impact of backness with the impact of height. I found evidence of gradient effects of vowel quality of lateral midpoint F2-F1 distance in my speakers of Tyneside English. Table 4 shows /l/ in contact with /u/ tended to be darker than those in contact with /i/ by 87Hz, leading me to accept my hypothesis. However, the average /l/ adjacent to /a~ɑ/ had a F2-F1 distance 354Hz lower than other laterals in my dataset. This leads me to conclude that while vowel backness is a positive predictor of /l/-darkening, vowel height plays a greater role in the darkening of an adjacent lateral. The gradient effects of vowel backness can almost certainly be attributed to phonetically motivated processes, the tongue is in closer proximity to the velum in the articulation of back vowels like /u/ compared to front vowels like /i/. However, a phonetic motivation for the darker /l/s seen with low vowels is not as clear. Although there is a greater distance for the tongue tip to move to reach the alveolar ridge, there is no obvious mechanism to explain greater tongue backing. Therefore it appears that the effects of adjacent vowels on /l/-darkening are only partially phonetically motivated.

The final phonological predictor of /l/-darkening I looked at was vowel breaking. I hypothesised that vowel breaking would be phonetically motivated by /l/-darkening in Tyneside English, predicting a positive correlation. Conversely, Hayes (2000:7) argued that there is a trading relation between the two processes in American English, where a broken vowel is perceived as a proxy for a dark /l/. If this were also the case in Tyneside English, we would instead predict a negative correlation between the two. As can be seen in Figure 4, the average /l/ after a broken vowel had a lower F2-F1 and was therefore darker than the average /l/ after an unbroken vowel. However, this difference failed to be significant (Table 5), meaning there is insufficient evidence to accept my hypothesis. My data suggest there is no link between vowel breaking and /l/-darkening across my speaker sample. Vowel breaking may still indeed be motivated by assimilation with dark /l/s in Tyneside English, though further research is needed to establish this. Although I did not find a correlation between vowel breaking and /l/-darkening, there was a significant correlation between vowel breaking and rime duration in my data. This initially appears to suggest that long rimes, rather than dark /l/s, phonetically motivate diphthongisation. However, it is more likely that diphthongised vowels themselves are simply longer in duration than their monophthongal counterparts.

In summary, my data demonstrate the inaccuracy in the binary model of gradience and categoricity presented in Hayes (2000) and Sproat & Fujimura (1993). My results provide

evidence of gradient, phonetically-motivated processes that impact /l/-darkening, including the quality of the adjacent vowel and duration of the rime within which it is contained, that co-exist alongside a clear categorical distinction between light and dark /l/ in Tyneside English.

5.3 Effects of Speaker Age and Class

Earlier I asked why earlier descriptions of Tyneside English report an absence of /l/-darkening, in contrast recent studies mostly on younger Tynesiders. I hypothesised this was due to language change, with age influencing the difference in /l/-darkening between the onset and coda.

Table 3 and Figure 3 show the effect of age on onset and coda F2-F1 distance. It is clear that not only do older adults have /l/s with consistently greater F2-F1 distances that are therefore lighter, they also have a greater gap between the F2-F1 distance/darkening of onset and coda /l/s compared to younger speakers. This effect holds regardless of the adjacent vowel, and despite older speakers having longer rime durations on average.

Moreover, the wordlist used may have actually minimised the apparent differences between younger and older speakers, by causing participants to use more careful speech than they would in spontaneous conversation. This may also explain why there is no observable significant difference in /l/-darkening between working and middle class Tynesiders in my data.

These apparent-time data provide strong evidence on an ongoing change in Tyneside, with age being a highly significant predictor of onset-coda /l/-darkening. Although the apparent-time method falsely assumes post-adolescent linguistic stability, in this case this would minimise evidence of change rather than accentuate it (Pichler et al 2018). Therefore I accept my hypothesis that the gap between lighter onset /l/s and darker coda /l/s is widening in younger speakers of Tyneside English. I reject my hypothesis that middle class speakers would participate more in this change compared to working class speakers, though acknowledge this result may be a product of my experimental design.

6. Conclusion

In this essay I explored the process of /l/-darkening in Tyneside English. I also sought to establish whether there is evidence of a categorical distinction between onset and coda /l/ in Tyneside English. I asked if phonological predictors, such as rime duration and adjacent vowel quality, could have a gradient effect on lateral velarisation. Finally, I investigated the impact of the social predictors of age and class to determine whether there are signs of ongoing language change.

I collected wordlist data from 15 female speakers of Tyneside English between the ages of 19 and 86. Acoustic analysis was used to measure the F2-F1 distance at the midpoint of each lateral and the duration of each lateral-containing rime. F2-F1 distance was taken as an acoustic measure of /l/-darkening. My results suggest that current speakers of Tyneside English do in fact show signs of categoricity in /l/, using Turton's (2017) diagnostics. Looking at my sample, there is discontinuity between onset and coda /l/s and consistency within each set. There also appears to be statistical bimodality in the data, although this is less conclusive.

Alongside this categoricity, my findings demonstrate gradient effects impacting /l/-darkening in Tyneside English. Longer rime durations were correlated with /l/-darkening, exerting a gradient effect layered atop the categorically distinct clear and dark /l/. This provides further evidence against Sproat and Fujimura's (1992) exclusively gradient and phonetically motivated model of /l/-darkening. Conversely, there was no correlation between /l/-darkening and vowel breaking. This is not what would be expected from Hayes (2000), who argues vowel breaking is triggered by dark /l/s. Instead, I found longer rimes were more likely to contain a broken vowel. On the surface this seems to suggest that breaking is triggered by longer durations. However, more likely is that diphthongisation itself simply elongates the rime it occurs in. The final phonological predictor of /l/ darkening I examined was the quality of the adjacent vowel. Looking at the vowels /a, i, u/, /a/ favoured the darkest /l/s and /i/ the lightest. This suggests that backer and lower vowels are associated with greater /l/-darkening, exerting gradient effects that can partially be explained by phonetic motivators.

As well as phonological predictors, I also looked at two potential social predictors: age and socioeconomic class. Although class failed to have any significant effect, the impact of age on /l/-darkening in my female speakers from Tyneside was staggering. While all but one speaker had a clear divide in /l/-darkening between onsets and codas, this divide was significantly wider in younger speakers than older speakers. This apparent-time data suggests an ongoing change in Tyneside English, wherein the two categories of /l/ are diverging. While earlier descriptions of Tyneside English, such as that of Wells (1982:374), characterise /l/ as consistently light in all positions, more recent studies, such as those referenced in Section 2 report differences between onset and coda laterals. Rather than these earlier studies being inaccurate, my findings posit that the discrepancies in the literature may well be explained by a previously unidentified language change.

Future research is needed to verify my findings. Due to the limited timescale of my data collection an analysis, my sample consisted of only fifteen female speakers and, in addition, my data came exclusively from a wordlist that contained only monosyllables. A follow-up study with a larger sample of both male and female Tynesiders across all age groups could determine whether the trends observed in my speakers hold for the population as a whole. A more prolonged future study should also collect tokens from more naturalistic interview-style data. Additional phonological contexts should also be examined, such as ambisyllabic /l/ or /l/ contained in clusters e.g. in "ye**ll**ow", "fe**l**t", "s**l**eep". Finally, as well expanding our knowledge on /l/-darkening in Tyneside, future research should also focus on other varieties from the North of England previously described as lacking a light/dark /l/ contrast, in order to determine whether this language change is exclusive to Tyneside or whether it extends to other northern varieties.

7. List of References

Beal, J., L. Burbano-Elizondo & C. Llamas. 2012. *Urban North-Eastern English*. Edinburgh University Press.

Carter, P. & J. Local. 2007. 'F2 variation in Newcastle and Leeds English liquid systems', Journal of the International Phonetic Association, 37(2), pp. 183–199.

Chomsky, N. & M. Halle. 1968. *The Sound Pattern of English*. New York: Harper & Row.

Floccia, C., Delle Luche, C., Durrant, S., Butler, J. & J. Goslin. 2012. 'Parent or community: Where do 20-month-olds exposed to two accents acquire their representation of words?', *Cognition*, 124(1), pp. 95–100.

Halle, M. & K.P. Mohanan. 1985. 'Segmental phonology of Modern English', Linguistic inquiry, 16(1), pp. 57–116.

Hayes, B. 2000. 'Gradient well-formedness in Optimality Theory'. In: Dekkers, J., Leeuw, F.V.D. and J.V.D. Weijer. (eds.). *Optimality Theory: Phonology, Syntax, and Acquisition* (p. 88–120). Oxford: Oxford University Press

Kirkham, S. 2017. 'Ethnicity and phonetic variation in Sheffield English liquids,' Journal of the International Phonetic Association. 47(1), 17–35

Kirkham, S., Turton, D. & A. Leemann. 2020. 'A typology of laterals in twelve English dialects', The Journal of the Acoustical Society of America, 148(1), 72–76

Lee-Kim, S.-I., Davidson, L. and S. Hwang. 2013. 'Morphological effects on the darkness of English intervocalic /l/'. Laboratory Phonology, 4(2), 475–511

Polgárdi, K. 2020. 'Darkening and vocalisation of /l/ in English: An Element Theory account'. English Language & Linguistics, 24(4), 745-768.

Sproat, R., & O. Fujimura. 1993. 'Allophonic variation in English /l/ and its implications for phonetic implementation'. Journal of Phonetics, 21, 291–311.

Strycharczuk, P. & J. M. Scobbie. 2015. 'Velocity measures in ultrasound data. Gestural timing of post-vocalic /l/ in English', in Proceedings of the 18th International Congress of Phonetic Sciences, Paper 0309

Strycharczuk, P. & J.M. Scobbie. 2020. 'Gestural delay and gestural reduction. Articulatory variation in /l/-vocalisation in Southern British English'. In: Przewozny, A., Viollain, C. & Navarro, S. (eds). *The Corpus Phonology of English: Multifocal Analyses of Variation*. Edinburgh: Edinburgh University Press, pp. 9-29

Turton, D. 2015. 'Determining categoricity in English /l/-darkening: A principal component analysis of ultrasound spline data'. Proceedings of the XVII International Congress of Phonetic Sciences International Conference of Phonetic Science 2015, Glasgow

Turton, D. 2017. 'Categorical or gradient? An ultrasound investigation of /l/-darkening and vocalization in varieties of English', Laboratory phonology, 8(1)

Wells, J.C. 1982. *Accents of English*. Cambridge University Press.

Yuan, J. & M. Liberman. 2011. '/l/ variation in American English: A corpus approach'. Journal of Speech Sciences, 1(2), 35–46