



Exploration of Welsh English Pre-aspiration: How Wide-Spread is it?

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Abstract

This study investigates how widespread pre-aspiration and local breathiness are in English spoken in Wales, by speakers identifying as Welsh. While the main purpose is to establish whether the phenomenon is generally present in Welsh English, the data also enables us to explore whether pre-aspiration might be conditioned by sex/gender, age, and the ability to speak Welsh. An acoustic corpus of 45 speakers producing word-final plosives and fricatives is analysed.

Pre-aspiration and local breathiness are produced by all speakers, representing 32 towns and 16 areas included in the analyses. Pre-aspiration and breathiness are more frequent and longer in L1 and L2 Welsh speakers than those who do not speak Welsh at all. In general, no statistically significant sex and age effects emerge.

In addition, a gradient allophony between pre-aspiration and glottalisation is reported for all speakers in the plosive context: the more frequently they glottalise, the less frequent the pre-aspiration. In fricatives, most speakers do not glottalise. Regarding those who do, 1. some display no relationship between pre-aspiration and glottalisation, and 2. a minority display either an indication of gradient allophony between the two, or 3. a positive correlation.

Index Terms: pre-aspiration, local breathiness, glottalisation, Welsh English, regional variation, allophony

1. Introduction

Pre-aspiration can be defined as a period of (primarily) glottal friction which is found in the sequences of sonorants and phonetically voiceless obstruents, leading to pronunciations such as *mat* [ma^ht̚], *match* [ma^htʃ], and *mass* [ma^hs] in Welsh English (WE). Pre-aspiration has been reported in a number of English accents since 1999 ([1] for an overview), most studies focusing on British varieties. Regarding WE, pre-aspiration has been identified in Aberystwyth (mid Wales) [2-5] and north Wales [6]. However, it is not known whether pre-aspiration is, in fact, restricted only to the two areas included in [2-6] or if it is found in WE more generally. This study therefore asks the following, primary questions.

- How widespread is English pre-aspiration in Wales?
- Are there regional differences in pre-aspiration frequency and duration?

The present study uses high-quality data from a corpus of WE collected by the author in 2012. This paper presents an analysis that enables us to directly compare pre-aspiration realisation across various regions, albeit solely within Wales. Comparisons of pre-aspiration across dialects of English has generally been done to a very limited extent ([1], [7]).

2. Beyond region

As [1, pp. 24] say in their comment on our understanding of pre-aspiration in English dialects, '[w]hile research on language-internal predictors of English pre-aspiration is somewhat dormant, the research into the social functions of English pre-aspiration has not even commenced.' A rather limited number of studies of English pre-aspiration have explored what social functions the phenomenon might have. In fact, little is known about basic regional differences. Those studies that do report any socially conditioned constraints on pre-aspiration typically do so in an exploratory and/or accidental manner, and the social aspects touched upon in the literature thus far are those of sex/gender (with female speakers contrasted with male speakers), age (established via year of birth), L1 status, and the type of profession.

In the context of Wales, having Welsh as L1, L2, or neither (e.g. not being able to speak Welsh at all) is likely to have an effect on the speaker's phonetic realisation of pre-aspiration. This hypothesis is motivated by the information available for pre-aspiration in Welsh. The phenomenon has been reported in Bethesda (north Wales) [8] and in South Wales Welsh, including Ystalyfera Welsh [9-10]. What is noteworthy is the fact that, in Bethesda Welsh at least, pre-aspiration is longer in duration in the speakers whose home language is Welsh rather than English. This raises the following questions:

- Do L1 Welsh speakers produce more and longer pre-aspiration in their English than L2 Welsh speakers and those who do not speak Welsh at all?
- Is pre-aspiration more frequent and durationally longer in areas represented by most speakers of Welsh?

The social factor most often included in pre-aspiration studies (focusing on English as well as in other languages) is that of sex/gender. In general, pre-aspiration is favoured by female speakers, although a small number of studies have not found this effect (see [1] for an overview). In this light,

- Do female speakers show more frequent and longer pre-aspiration than male speakers in WE more generally?

Age-specific differences – when identified – seem to be community-specific. [11, pp. 66-67] report the presence of pre-aspiration in Tyneside English in apparent time: pre-aspiration is more frequently found in 'young' as opposed to 'older' speakers. In fact, none of their 'older' speakers produce any pre-aspiration. [2] reports similar patterns in Aberystwyth English, although all the Aberystwyth English speakers pre-aspirate to at least some extent. In contrast, [12] finds decreasing frequency of pre-aspiration in apparent (and real) time in New Zealand English. Interestingly, 'professional' speakers pre-aspirate more frequently than 'non-professional' speakers in the New Zealand English study, and this difference is greater in the

male than the female data. Similarly, a decrease of pre-aspiration (in frequency and duration) is also reported by [13], who inspects 12 speakers of Hebrides English, all bilingual English-Scottish Gaelic speakers. The present study therefore also explores the following:

- Do younger speakers exhibit more frequent and longer pre-aspiration than older speakers in WE more generally?

Finally, [14] identify an allophonic relationship between pre-aspiration and (pre-)glottalisation in their Manchester English speakers, who were in their 20s. In foot-final environments, plosives are realised with (pre-)glottalisation (e.g. *mat* [ma^ʔt] ~ [ma^ʔ?]), while fricatives are pre-aspirated (e.g. *mass* [ma^hs]), and foot-medial plosives are also pre-aspirated (e.g. *matter* [ma^ht^sə]), at least in their word-list data. A similar allophony was identified by [2] in one of the Aberystwyth English speakers (also in her 20s). Because extremely little is known about this allophony, this study finally also aims to shed some light on the following question:

- How widespread is the laryngeal allophony reported by [14] in WE?

3. Methodology

3.1. Pre-aspiration

Pre-aspiration is defined here as a period of (primarily) glottal friction which is voiceless and which is found in sequences of (vocalic or consonantal) sonorants and phonetically voiceless obstruents. This means that the narrow definition of pre-aspiration is adopted. However, voiceless pre-aspiration is often accompanied with an interval of voiced glottal friction (or slack voice), also referred to as local breathiness. Both pre-aspiration and breathiness are quantified in this study using Praat [15].

Pre-aspiration was identified by the presence of glottal friction in the spectrogram and the lack of voicing in the spectrogram and the waveform. Local breathiness was identified on the basis of the presence of friction in the spectrogram and/or the simplification of the waveform. See Figure 1.

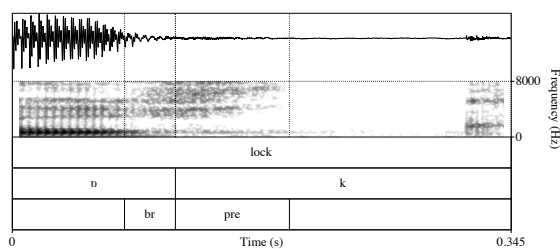


Figure 1: Identification and segmentation of local breathiness ('br') and pre-aspiration ('pre').

3.2. (Pre-)glottalisation

Glottalisation was identified in line with [14]: either as a sudden drop in f0, or an interval of aperiodic phonation which still shows (irregular) pulsing (see Figure 2). Only cases where glottalisation was found towards the end of the vowel or throughout the entire vowel were counted as glottalised.

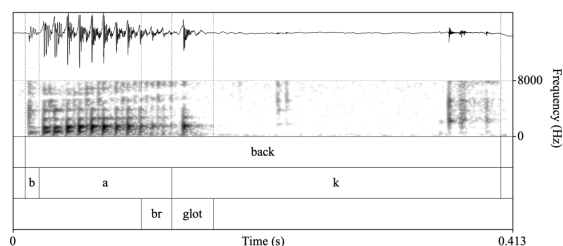


Figure 2: Identification of glottalisation ('glot').

3.3. Speakers

45 speakers are included in this study. All speakers were raised in Wales. Other aspects of their social background vary and were not aimed to be balanced during the data collection.

Table 1: Social characteristics of the speakers.

Area	%W	F/M	W/E
Gwynedd	65.4	4/0	4/0
Isle of Anglesey	57.2	1/1	2/0
Ceredigion	47.3	8/7	15/0
Carmarthenshire	43.9	1/4	5/0
Denbighshire	24.6	1/0	0/1
Pembrokeshire	19.2	1/0	1/0
Powys	18.6	3/1	3/1
Neath Port Talbot	15.3	0/1	1/0
Flintshire	13.2	0/1	1/0
Wrexham	12.9	1/0	1/0
Rhondda Cynon Taf	12.3	0/2	2/0
Swansea	11.4	1/0	1/0
Caerphilly	11.2	1/0	0/1
Cardiff	11.1	1/2	0/3
Bridgend	9.7	1/1	1/1
Blaenau Gwent	7.8	1/0	1/0

Table 1 summarises the number of speakers per local authority area (22 principle areas, Local Government (Wales) Act 1994), ranged from those with the highest proportion of Welsh speakers to the lowest (%W; [16]). Of the 22 areas, 16 are represented in the corpus (excluding Conwy, Merthyr Tydfil, Monmouthshire, Torfaen, Newport, Vale of Glamorgan). Table 1 also provides information related to the speakers' sex/gender (F = female, M = male) and their L1 (W = Welsh, E = English). Regarding age, the speakers analysed here were born between 1922 and 1993.

As apparent, the four social factors (region, L1, sex/gender, age) are not balanced within the dataset. However, at present it is not known whether pre-aspiration is found in English beyond North Wales and Aberystwyth. The dataset is sufficiently rich to enable us to answer the main question and suggest whether various social factors might play any role at all.

3.4. Data

The speakers were recorded reading a list of words in isolation. H4 Zoom Handy recorder was used together with an AKG C520 head-mounted microphone. The list of words contained lexical items of interest to various research questions, and only a subset is analysed in this paper. The analyses are limited to fortis obstruents in 'CVC structure words, where the obstruent

potentially inducing pre-aspiration is always final. An overview of the segmental properties of the words is provided in Table 2.

Table 2: Words by segmental properties.

Vowel	/p/	/t/	/k/	/s/
/a/	cap	mat	back	lass
	map	cat	lack	mass
	sap	mat	mac	
/ɛ/	rep	let	neck	guess
		pet		less
/ɪ/	lip	lit	Nick	miss
/ɒ/	lop	lot	lock	loss
/ʌ/	sup	but	luck	bus
		hut		fuss
/ʊ/		foot	cook	
		put	look	
		soot	took	
/ɑ:/	carp	art	lark	
	harp	heart		
/i:/	leap	beat	leak	lease
		meet	leek	
/ɜ:/	burp		lurk	verse
/o:/	dorp	taught	auk	
	thorp	wrought		
/u:/	loop	lute	Luke	loose
/aɪ/	ripe	light	like	lice
/aʊ/		lout		louse
/əʊ/	lope	mote	oak	
/eɪ/	hape	late	fake	face

Each participant read each of the words once, giving 75 words in total per speaker. However, some participants produced postvocalic /r/ (*heart* /ha:rt/) and/or mispronounced a word on occasion. Thus, the corpus yielded 45*71-75 words in total (3306 tokens).

3.5. Statistical analyses

The statistical analyses were conducted through Mixed Effects Models, using the *lmer* [17], the *lmerTest* [18], and the *effects* packages [19]. The models were built in a step-up fashion, comparing model fits through anova tests in order to establish the best fit. The factors of relevance here, and their levels, are explained in 3.3. These were used as fixed effects, together with town of origin, not introduced above. Town of origin had 32 levels, and reflects the town in which the speaker was raised. Lexeme and speaker were used as random effects.

4. Results

4.1. Presence of pre-aspiration and local breathiness

Pre-aspiration occurs in 63% of the plosive tokens and 32% of the fricative tokens. It is found in all of the speakers analysed, and thus also in all 32 towns and 16 areas. Principal area does not improve model fit (with Aberystwyth taken as the reference level) ($\chi^2(15) = 21.823$, $p > 0.1$). While the number of Welsh speakers per area shows no effect ($\chi^2(1) = 0.1294$, $p > 0.7$), the ability to speak Welsh does: L1 and L2 speakers produce more pre-aspiration than speakers who do not speak Welsh at all ($\chi^2(2) = 18.769$, $p < 0.0001$), as shown in Figure 3.

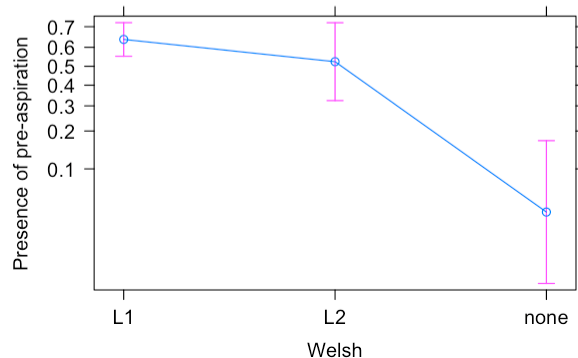


Figure 3: Ability to speak Welsh and presence of pre-aspiration.

Adding sex verges on improving the model fit ($\chi^2(1) = 3.5904$, $p = 0.06$), with female speakers associated with more frequent pre-aspiration application than male speakers. Age does not improve model fit ($\chi^2(1) = 0.0281$, $p > 0.8$).

Local breathiness approaches near obligatory application, with 98% of the fricative contexts and 85% of the plosive contexts being associated with breathiness. For these reasons, it was not possible to successfully build meaningful models. Visual inspection reveals the following patterns. Breathiness is present in all speakers and areas. Areas with high numbers of Welsh speakers are associated with more frequent breathiness application – the areas with the least breathiness are Cardiff, Caerphilly, Denbighshire, and Flintshire. L1 Welsh speakers show more breathiness than L2 speakers, who in turn show more breathiness than those who do not speak Welsh at all. Older speakers produce more instances of local breathiness. Female speakers exhibit slightly more frequent local breathiness than male speakers.

4.2. Duration of pre-aspiration and local breathiness

First of all, the raw durations of pre-aspiration and those normalised as a percentage of the overall word duration were visually contrasted. Since no differences were found, raw values are used in the analyses that follow. The durational measures include zero values in line with most pre-aspiration studies (however, see [5]).

Excluding area from the model results in a better fit ($\chi^2(15) = 25.257$, $p < 0.05$; the same is the case for town of origin). While the percentage of Welsh speakers in area does not contribute significantly ($\chi^2(1) = 0.6147$, $p > 0.2$), the ability to speak Welsh does ($\chi^2(2) = 6.0568$, $p < 0.05$): L1 and L2 Welsh speakers produce longer pre-aspiration than speakers with no Welsh (Figure 4). Neither sex ($\chi^2(1) = 0.08826$, $p > 0.1$): nor year ($\chi^2(1) = 2.0965$, $p > 0.1$) improve model fit.

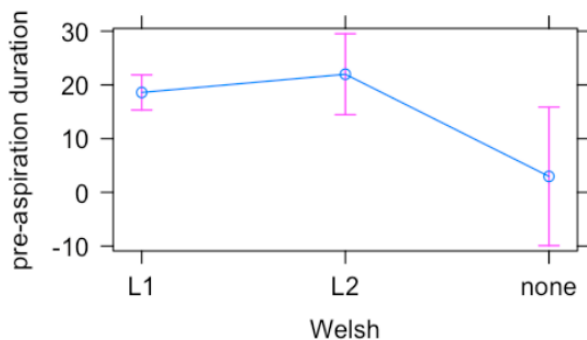


Figure 4: Ability to speak Welsh and pre-aspiration duration.

We find very similar patterns when inspecting breathiness duration. Area does not improve model fit ($\chi^2(15) = 18.062$, $p > 0.2$), although the town of origin does ($\chi^2(31) = 76.632$, $p < 0.0001$). With 33 levels per town of origin, inter-level comparisons are not reported here. Number of Welsh speakers per area is not a significant variable ($\chi^2(1) = 0$, $p > 0.9$), but the ability to speak Welsh is ($\chi^2(2) = 12.09$, $p < 0.01$): L1 and L2 Welsh speakers produce longer local breathiness than speakers with no Welsh. Neither age ($\chi^2(1) = 1.8008$, $p > 0.1$) nor sex ($\chi^2(1) = 0.6446$, $p > 0.4$) improve model fit.

4.3. Pre-aspiration and glottalisation

Glottalisation is found in 19% of the data. More specifically, 21% of the plosive tokens and 7% of the fricative tokens show glottalisation. 28 out of the 45 speakers show no glottalisation, or practically none. The remaining speakers all produce more glottalisation in the plosive than the fricative context. 3 speakers produce glottalisation obligatorily in plosives (2 from Cardiff; 1 from Ruthin).

All 45 speakers show a gradient allophony between pre-aspiration and glottalisation in the plosive context: the more frequent the glottalisation, the less frequent the pre-aspiration (Figure 5). 1 speaker shows the same allophony in the fricative context. 3 speakers show an indication of this allophony in fricatives as well, but neither glottalisation nor pre-aspiration is frequent enough to enable a reliable assessment.

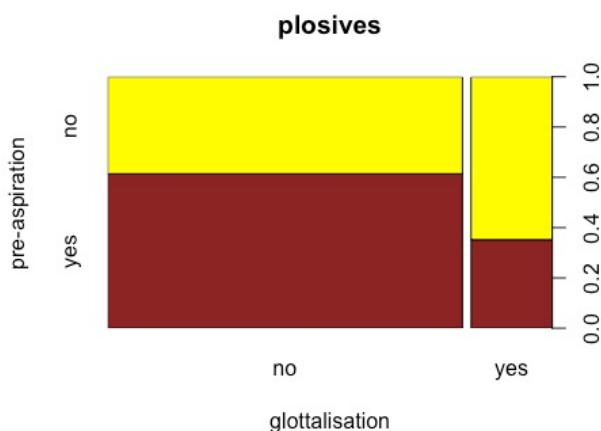


Figure 5: Gradient laryngeal allophony in plosives.

1 speaker exhibits the opposite of allophony in the fricative context: the more frequent the pre-aspiration, the more frequent the glottalisation. 3 speakers indicate the same tendency, but in their case the frequency of glottalisation is too low for a reliable assessment. For 1 speaker, glottalisation categorically blocks pre-aspiration in fricatives. 30 speakers, however, show no glottalisation in fricatives. Finally, 8 speakers display no relationship between pre-aspiration and glottalisation in the fricative context (1 of these pre-aspirates 100% of the times in this environment).

5. Conclusion

First and foremost, the results show that pre-aspiration is a phenomenon found in all 45 speakers, as is local breathiness. We can conclude it is indeed a general feature of WE. In the data analysed here, no area-specific differences are found. The number of Welsh speakers reported by area does not condition pre-aspiration; however, speakers with no Welsh pre-aspirate less frequently and with shorter durations. These patterns also generally hold for local breathiness. While not confirmed by the statistical analyses, the visual inspection of the data further reveals that L1 Welsh speakers produce more frequent pre-aspiration and breathiness than L2 Welsh speakers. I propose that, in WE, pre-aspiration may serve primarily as a cue to Welshness regarding its potential social functions, and the ‘Cymro Cymraeg’ category of Welshness in particular (i.e. ‘Welsh-speaking Welshman’).

The presence of gradient allophony between pre-aspiration and glottalisation is also reported as a general feature of WE here. This laryngeal allophony is a linguistic feature that might enable a speaker to use both more local, Welsh features (pre-aspiration produced with specific durations and frequencies), in combination with more supralocal features (glottalisation). When the two phenomena co-occur in a single token, the speakers either produce pre-aspiration and glottalisation consecutively, or simultaneously through local whispery creak.

Finally, sex and age exhibit no statistically significant effects; nevertheless, there is a tendency for females to produce more frequent pre-aspiration and for older speakers to produce more frequent local breathiness.

6. Acknowledgements

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