Laryngeal allophonies: English pre-aspiration and glottalisation

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Manchester English well-known for glottalisation
we found pre-aspiration in the variety
glottalisation is an adducting laryngeal gesture
pre-aspiration is an abducting one

What is the relationship between the two?

‘CVP (bat), ‘CVPV(C) (batter)
‘CVF (mass)
- period of voiceless (primarily) glottal friction
Pre-aspiration period of voiceless (primarily) glottal friction.
Glottalisation

irregularity in the glottal pulses

sudden drop in $f_0$
Glottalisation

Irregularity in the glottal pulses

Sudden drop in $f_0$
Glottalisation
Speakers

- 3 females & 2 males
- 20-22 years
- parents also from Manchester
words embedded in *That’s the word X*.

- **plosive context:** *pat, patter*
  - 36-72 tokens per speaker
  - 305 tokens in total

- **fricative context:** *mass*
  - 15-31 tokens per speaker
  - 105 tokens in total
/æ/, /ɪ/, /ɔ/, /ʊ/ combined with

/p/, /t/, /k/

/f/, /θ/, /s/, /ʃ/
Results: plosives

- word-medially pre-aspirated
  batter  \([\text{pa}^\text{th}^\text{θ}]\)

- word-finally (pre)glottalised
  bat  \([\text{pa}^\text{ʔt}] \sim [\text{pa}^\text{ʔ}]\)

- other aspects no effect
  - vowel backness
  - vowel height
  - place of articulation of the plosive
Results: fricatives

- **Fricatives**
  - pre-aspiration obligatory
  - glottalisation co-occurs with pre-aspiration
  - *mass* [maʰs] ~ [maʰs]

- glottalisation more frequent with low vowels
  - significant for /a/ vs /i/
  - not significant for /o/ vs /u/

- *mass - matt* allophony:
  - fricatives pre-aspirated
  - plosives glottalised
Results: fricatives

pre-aspiration obligatory

mass [maʔ][hs] ~ [mahs]

glottalisation more frequent with low vowels

significant for /a/ vs /ɪ/

not significant for /ɒ/ vs /ʊ/

mass - matt allophony:

fricatives pre-aspirated

plosives glottalised
Glottalling

- can happen with a glottal adducting or abducting gesture
- suggesting a relationship between pre-aspiration and glottalisation
But how widespread are these allophonic patterns?

ABERYSTWYTH ENGLISH

- One speaker shows the same pattern in the plosive environment.
- Glottalisation most frequently vowel-final.
- Pre-aspiration in fricatives above 90%.
- Always co-occurring with glottalisation if the latter is present.
- Glottalisation place is variable.
But how widespread are these allophonies?

Pilot student project focusing on phonetic realisations of /t/ 

- What is the phonetic realisation?
- What are the allophonic patterns related to /t/?

- How many allophonic patterns are there?
  - Are these region specific?
  - Style specific?
  - Gender specific?

- Do these form dialectological continua?

With Lauren Bramley, Sadie Maher & Siobhan Paterson
Data

- 6 regions:
  - Bangor, Aberystwyth, Bridgend; Manchester, Birmingham, Kent

- 6 speakers:
  - all females
  - 20-22 years old
  - parents from the same area (excepting Bridgend)
6 regions:
- Bangor, Aberystwyth, Bridgend
- Manchester, Birmingham, Kent

6 speakers:
- all females
- 20-22 years old
- parents from the same area (excepting Bridgend)
words in isolation

- word-initial /t/:  
  - tat  
  - 8 x 6 (48)

- word-medial /t/:  
  - tatter  
  - 13 x 6 (78)

- word-final /t/:  
  - tat  
  - 11 x 6 (66)

- exploratory analysis (192 tokens in total)
Post-aspiration
Spirantisation
Spirantisation

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<thead>
<tr>
<th>f</th>
<th>a</th>
<th>k</th>
<th>t</th>
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<tr>
<td>br</td>
<td>pre</td>
<td>clo</td>
<td>post</td>
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Glottalling
Glottal reinforcement
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<th>Bridgend</th>
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<tbody>
<tr>
<td><em>tat</em></td>
<td>$[t^{s(h)}a^{(h)}t^{s(h)}]$</td>
<td>$[t^{sh}a^{h}t^{s(h)}]$</td>
<td>$[t^{sh}a^{(h)?t^{s(h)}}]$</td>
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<tr>
<td><em>tatter</em></td>
<td>$[t^{s(h)}a^{h}t^{s}\emptyset]$</td>
<td>$[t^{sh}a^{h}t^{s(h)}\emptyset]$</td>
<td>$[t^{sh}a^{(?h)}t^{s}\emptyset]$</td>
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<td>$[t^{sh}a^{?}]$</td>
<td>$[t^{sh}a^{?t^{s}}]$</td>
</tr>
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<td><em>tatter</em></td>
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<td>a. $[t^{sh}a^{?}\emptyset]$</td>
<td>b. $[t^{sh}a^{(h)}t^{(sh)}\emptyset]$</td>
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### Allophonies?

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<tr>
<td><em>tat</em></td>
<td>[tʰətˢ]</td>
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<td><em>tatter</em></td>
<td>[tʰə hʊtʰə]</td>
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<td>b. [tʰətʰə]</td>
</tr>
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What motivates the allophonic patterns?

- connection between the pre-release and post-release gestures?
- pre-aspiration and post-aspiration perceptually confusabale in Andalusian Spanish (Ruch & Harrington 2014)
Further questions: motivations

- connection between the pre-release and post-release gestures?
- not borne out by preliminary informal analyses
Affrication & pre-aspiration

foot-medially

Pre-aspiration

Affrication

word-medial

place

pre-aspiration

Aberystwyth, Bangor, Birmingham, Bridgend, Kent, Manchester

affrication

Aberystwyth, Bangor, Birmingham, Bridgend, Kent, Manchester
Affrication & pre-aspiration

Pre-aspiration

Affrication

word-final

place

Aberystwyth  Bangor  Birmingham  Bridgend  Kent  Manchester

pre-aspiration

place

Aberystwyth  Bangor  Birmingham  Bridgend  Kent  Manchester
Affrication & glottal reinforcement
foot-medially

Glottal reinforcement

Affrication

word-medial

reinforcement

place

word-medial

affrication

yes

no
Affrication & glottal reinforcement

Glottal reinforcement

Affrication
Further questions: motivations

- pre-aspiration and affrication can co-occur
- glottalisation and affrication can also co-occur
HYPOTHESES

- breathiness as a precursor to pre-aspiration
- post-aspiration as a precursor to (local) breathiness
- utterance-final glottalisation as a precursor to segmental glottalisation

If this is the case, we should never get the type of allophony where
- pre-aspiration = foot-final
- glottalisation = foot-medial
Is breathiness a precursor to pre-aspiration?

- Breathiness in Italian VP sequences (Gobl & Ní Chasaide 1988)
- Pre-aspiration found recently (e.g. Stevens & Hajek 2007)

- Pre-aspiration found in languages with post-aspiration

- Pre-aspiration present → Breathiness present
- Breathiness present ≠ Pre-aspiration present
Aberystwyth English: pre-aspiration implies breathiness

DATA

- ‘CVP, ‘CVPV  
  matt  matter
- ‘CVF  
  mass
- ‘CVCVP, ‘CVCVF  
  gullet  Wallace

- 2x in a carrier sentence Say X once.
- 1x in isolation

- Almost 10,000 tokens
Aberystwyth English: pre-aspiration implies breathiness

SPEAKERS

- 12 females & 6 males
- born & raised in Aberystwyth
- L1 Welsh speakers
- 22-91 years
- non-smokers
STRESSED SYLLABLES

The top row shows the stressed context (‘CV(CV)’) and the bottom row shows the unstressed context (‘CVCVC’); the figures on the left show the frequency of occurrence (%) of pre-aspiration across the two manners of articulation (fricatives vs plosives) and the figures on the right show the frequency of occurrence (%) of breathiness across these two contexts.

On the other hand, pre-aspiration and breathiness durations agree in being longer in stressed than unstressed syllables (p < 0.0001). Unlike pre-aspiration, however, breathiness is longer in duration with fricatives than with plosives (p < 0.05). These tendencies are demonstrated in Figure 3.26.
Aberystwyth English: pre-aspiration implies breathiness

UNSTRESSED SYLLABLES

Figure 3.25. Pre-aspiration and breathiness occurrence by manner of articulation and stress
Inconclusive coda

- What relationships between pre-aspiration and glottalisation exist in English accents?

- Do these relationships change in different styles?

- Do we get the same relationships in older speakers?

- How old is English pre-aspiration?

- Is it as old as glottalisation?

- Do both serve to cue phonetic voicelessness?
Thank you for listening!
References


- Hejná, M.; Scanlon, J. 2015. “New laryngeal allophony in Manchester English”. *18th ICPHs, Glasgow*.


**Aberystwyth English:**

**pre-aspiration implies breathiness**

### STRESSED SYLLABLES

### PLOSIVES

Each column represents one speaker (e.g. ABE12, as indicated at the bottom); the number at the top stands for the number of tokens available for the analyses for each speaker (e.g. 591 for ABE12); the figure itself shows the percentage of pre-aspiration occurring on its own, breathiness occurring on its own, neither occurring, or the two co-occurring within each speaker.

Breathiness is however obligatory in fricatives in stressed syllables ([masallax](#)) and in both fricatives and plosives in unstressed syllables ([Walla]x, [gulle]t). It follows that when pre-aspiration is found with fricatives in stressed syllables or in unstressed syllables, it always co-occurs with breathiness since the latter is obligatory in these environments. This is further illustrated in Figures 3.28 and 3.29.

For each speaker, the total number of tokens is provided at the top of the appropriate column. The y-axis of the graphs represents percentages (100% = 1.0, 20% = 0.2, etc.).
Aberystwyth English: pre-aspiration implies breathiness

STRESSED SYLLABLES

FRICATIVES

Figure 3.28. Breathiness and pre-aspiration occurrence in fricatives by speaker. Each column represents one speaker (e.g. ABE11, as indicated at the bottom); the number at the top stands for the number of tokens available for the analyses (e.g. 33 for ABE11); the figure itself shows the percentage of pre-aspiration occurring on its own, breathiness occurring on its own, neither occurring, or the two occurring within each speaker.
Irrespective of gender or age, there is a strong tendency for the two to co-occur, although for most speakers breathiness is more frequent than pre-aspiration, especially in the oldest generation. This supports the suggestion that breathiness is a precursor to pre-aspiration, but data from more speakers need to be analysed.

Bigger differences between pre-aspiration and breathiness are found in how their frequency of occurrence is conditioned segmentally and prosodically. They are both more frequent in /ɪ/ followed by a word-final rather than a word-medial plosive. This prosodic conditioning is however significant on its own for breathiness, whilst it is not for pre-aspiration. For pre-aspiration, on the other hand, the conditioning by the vowel type is on the whole significant, which is not the case for breathiness. The two therefore overlap in terms of their linguistic conditioning, but whilst breathiness is more sensitive to prosodic factors, pre-aspiration is more strongly affected by the segmental factors. The two show a trading pattern regarding the place of articulation of the post-tonic plosive: breathiness becomes more frequent the more posterior the plosive is, and the opposite is true for pre-aspiration.

Figure 7.6. (Biological) age and pre-aspiration and breathiness occurrence (raw frequency count)