Glottal squeaks (in VC sequences)

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What are glottal squeaks?

- low amplitude sustained phonation of relatively high frequency (coined by Redi & Shattuck-Hufnagel 2001)
Research questions

**QUESTIONS**
- Do squeaks co-occur with glottalisation and is this glottalisation always adjacent?
- Are squeaks found only in some individuals and are these individuals more likely to be females?
- Are squeaks sensitive to various segmental or prosodic factors?

**OTHER QUESTIONS WE’D LIKE TO KNOW THE ANSWERS TO AT SOME POINT**
- What are they articulatorily?
- Do they have a linguistic function?
  - frequency of occurrence
  - duration
  - $f_0$
  - shape
Data (VC sequences)

Aberystwyth English data (Hejná 2015)
- 12 females, 6 males (22-91 years)
- CVPV, CVP, CVF words (*matter, mat, mass*)
- CVCVP, CVCVF words (*gullet, Wallace*)
- 10,006 tokens

Manchester English data (Hejná & Scanlon 2015)
- 3 females, 2 males (20-22 years)
- CVPV, CVP, CVF words (*matter, mat, mass*)
- 410 tokens
Squeaks & glottalisation

- Squeaks are found adjacent to glottalisation in the majority of cases (Redi & Shattuck-Hufnagel 2001).

- Very infrequent – 1% of all the glottalised tokens (R&S-H 2001).

- In our datasets: 50 cases of squeaks in total, all co-occur with glottalisation.
Squeaks & glottalisation

- glottalisation always precedes squeaks
- but sometimes a short period of absence of phonatory activity is found
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- But sometimes a short period of absence of phonatory activity is found.
Consonantal effects

- Frequency of occurrence conditioned seemingly by manner of articulation: squeaks only found in plosive environments

- BUT glottalisation is much less frequent in fricative environments

- place of articulation does not affect
  - frequency of occurrence of squeaks
  - their duration
  - or their $f_0$
Consonantal effects

- Could squeaks occur due to a sequence of laryngeal constriction/tensing and laxing?
- Squeaks are most frequent with post-aspirated/affricated releases in both accents.
- Are they more likely to occur with affricated rather than post-aspirated release?
- /t/ heavily affricated.
- Doesn’t matter whether /t/, /k/, or /p/.

<table>
<thead>
<tr>
<th>Type of release</th>
<th>Glottal squeaks (count)</th>
</tr>
</thead>
<tbody>
<tr>
<td>none</td>
<td>5</td>
</tr>
<tr>
<td>post</td>
<td>35</td>
</tr>
<tr>
<td>unpost</td>
<td>10</td>
</tr>
</tbody>
</table>
Vocalic effects

- within the Manchester data, it seems that high vowels are associated with more squeaks

![Graph showing vowel and squeaks (Manchester)]
Individual effects

- Frequency of occurrence is individual-dependent:
  - Aberystwyth: 1 speaker responsible for 96% of cases
  - Correlation with who glottalises most
  - Is this really about individual squeaking, then?

- Manchester: 1 speaker responsible for 53%
  - Laryngeal allophony: foot-final glottalisation with plosives (pat)
  - All speakers glottalise to the same extent in this environment
  - And yet not all squeak to the same extent
  - Individual-dependent in the Manchester dataset at least
Sex

- Females are the primary squeakers (S&R-H 2001)

- Aberystwyth data
  - only females squeak
  - BUT females glottalise more as well

- Manchester data:
  - 3 of 3 females squeak
  - 1 of 2 males squeaks (2 cases of squeaks)
Individual effects

- Duration also individual at first sight (14.8-85.4ms)
  - But ABE37 is the only one with phonologically long vowels (associated with longer squeaks)

- $f_0$ individual (205-418Hz)
  - but this is to be expected
Types of squeaks

- there are three types of squeaks regarding the shape of the sound wave
- these seem to form a continuum

sinusoidal

complex

complex > sinusoidal
Types of squeaks

- complex squeaks most frequent

![Bar chart showing squeak types by wave complexity](chart.png)
Are they the same as whistles?

- Whistles seem to be much higher amplitude sounds.
- A lot of friction involved.
- Very high intensity energy in the lower frequencies → quasi-sinusoidal tone amidst high intensity noisy airflow.
Do they have a linguistic function?

- they don't seem to

- the main conditioning factor is presence of glottalisation:
  - Squeaking implies glottalisation
  - BUT glottalisation does not imply squeaking.

- very low amplitude sounds → doubtful whether listeners would pick up on them

- We could argue that the lack of conditioning effects corroborates this
What may squeaks be articulatorily?

- result of intrinsically tense vocal fold state associated with thyroarytenoid (TA) muscle recruitment (Esling, Zeroual & Crevier-Buchman)

- this is required for epilaryngeal constriction and vocal-ventricular fold contact (VVFC) needed to produce glottalisation (Moisik, Esling, Crevier-Buchman, Amelot & Halimi)

- squeaks might occasionally occur during constriction disengagement: at the point when VVFC suddenly releases but the TAs have not yet fully relaxed

- doesn’t explain why females squeak more → less vocal fold inertia leading to greater proness to vibration?
Taking a swim in pre-aspiration...

(The lass next door is very buxom indeed.)

(squeak in lass)

Rhosgadfan (female)
THE SQUAWKIE
Thespis (to Cinema). “Great Hollywood! Is that thing our child?”

Many thanks to James Scobbie for his glottal whistles.
References


