CREAKY VOICE BEYOND BINARY GENDER

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Creaky voice is a non-modal phonation characterized by:

- Lower f0
- More irregular f0
- Multiple pulses
- Added noise
Creak has historically been associated in English with:

- **Men** in the UK (Esling 1978; Henton & Bladon 1988; Stuart-Smith 1999)

- **(Young urban) women** in the US (Szakay 2010; Podesva 2013; Yuasa 2010; Lefkowitz 2007)

This previous work:

- Treats gender as a **binary** (women/femininity vs. men/masculinity)
- Finds that creak use varies along this binary
But what explains this broad demographic patterning?

“Woman” and “man” are complex categories that are:
- Intersectional
- Locally realized rather than globally fixed
- Influenced by various factors related to sex, gender, and sexuality
What about “woman” (or “man”) motivates the use of linguistic resources? Is it:

- ...sex assignment at birth?
- ...physiology?
- ...early gender socialization as a girl?
- ...current identity as a woman?
- ...current identity as not-a-man?
- ...some combination of the above?
- ...something else?
Some recent work has suggested a more nuanced relationship between creak and sex/gender

- Cholas (Mendoza-Denton 2007, 2011)
- Men who are (perceived as) gay/queer (Podesva 2007; Zimman 2013)
- Trans men (Zimman 2012)
Our study: beyond binary gender

More diverse sample, explicitly including:
- Transgender individuals
- Those of nonbinary gender

More complex analysis, expanding sex/gender variable:
- Current gender identity
- Socialization / sex assignment at birth
- Laryngeal physiology: exposure to testosterone
1. What will a more diverse sample tell us about:
   a. The cis men and women traditionally described through focus on the gender binary?
   b. Speakers from outside the binary, who are by and large excluded from quantitative analysis?

2. What will a more diverse sample tell us about:
   a. Our reliance on the gender binary in sociolinguistic sampling and analysis?
   b. Our reliance on the gender binary when investigating variables we believe to be relevant to sex and gender identification?
SPEAKERS

- Data come from a large corpus of recordings
  - 98 native speakers of American English
  - Aged 18-35
  - Recorded at Reed College Lab of Linguistics (LoL) in Portland, OR
  - Collected in 2013-2014
  - Publicly available on Dataverse

- Dataset focuses on 43 speakers who provided detailed information about sex/gender
**SPEAKERS**

- **Stratified across:**
  - **Current gender identity** (women, men, non-binary)
  - **Sex assignment at birth** (female, male)
  - **Exposure to testosterone** (which affects larynx size)

<table>
<thead>
<tr>
<th></th>
<th>Identify as women</th>
<th>Identify as men</th>
<th>Identify as neither</th>
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<tbody>
<tr>
<td><strong>Assigned Female at birth</strong></td>
<td>Cis women</td>
<td>Trans men not on T</td>
<td>AFAB non-binary not on T</td>
</tr>
<tr>
<td><strong>Assigned Female at birth, taking testosterone</strong></td>
<td>N/A</td>
<td>Trans men on T</td>
<td>AFAB non-binary on T</td>
</tr>
<tr>
<td><strong>Assigned Male at birth</strong></td>
<td>Trans women</td>
<td>Cis men</td>
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- (Mostly) equally distributed across our groups:

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<tr>
<td>AFAB</td>
<td>6</td>
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<tr>
<td>AFAB+T</td>
<td>N/A</td>
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<td>AMAB</td>
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<td>5</td>
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In the overall corpus, each speaker participated in:
- Casual interview about childhood
- Reading of a wordlist
- Reading of the Rainbow Passage
- Acting out a story with dialog, strapped to the EGG
- Attitudinal perception of voices
- Interview addressing gender and voice
We examined recordings of the following:

- **Casual interview** about childhood (5-min excerpt)
- Reading of a wordlist
- **Reading of the Rainbow Passage**
- Acting out a story with dialog, strapped to the EGG
- Attitudinal perception of voices
- Interview addressing gender and voice
TRANSCRIPTION

- **Segmental**
  - RAs transcribed all speech orthographically
  - Segmented semi-automatically using Forced Alignment and Vowel Extraction (FAVE) suite (Rosenfelder et al. 2011)
  - RAs hand-corrected FAVE errors
  - Provided phonemic transcription incl. lexical stress

- **Intonational**
  - ToBI-based transcription (Veilleux et al. 2006; Beckman & Ayers Elam 1997)
  - Prominence location
  - IP boundary tone type and location, e.g. L-L%, H-H%
Two RAs **auditorily coded** each vowel for voice quality: creaky, modal, other (e.g. breathy, falsetto).

Mean inter-rater reliability: 86%.

A third rater resolved discrepancies.

Total dataset: **34,510 vowels**
- **Auditory coding** rather than purely acoustic coding
- Follows bulk of work examining creak and gender in English (Podesva & Lee 2010; Podesva 2013; Yuasa 2010; etc.)

- Further validated by related work (Khan et al. 2015)
  - 14 trained linguistics students rated relative creak IP-finally
  - Crosslinguistically common acoustic cues of creak (e.g. H1-H2) were *not* correlated with students’ creakiness ratings
  - Discourages reliance on individual cues for this type of analysis
Creakiness of a recording was quantified as the number of Vs coded as creaky as a % of all Vs: **percent creak**

**Wide range across speakers** in use of creak
RESULTS: PERCENT CREAK

- Percent creak for each sex/gender group:

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### RESULTS: PERCENT CREAK

- Highest percent creak: **cis women (38%)**
- Lowest percent creak: **trans men on testosterone (22%)**

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- **ANOVA** comparing the *cisgender individuals* only:
- Cis women have a significantly **higher percent creak** than cis men (p = 0.01)

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RESULTS: PERCENT CREAK

[Box plots showing proportion of creak for Cis women and men in Casual interview and Scripted passage for SexAndGender F_AFAB and M_AMAB]
However, an ANOVA of the full sample found no significant variation by sex, gender, or their interaction. Motivates further analysis.

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RESULTS: PERCENT CREAK

[Categorical data representation with box plots for different groups such as Cis women, Trans men, Cis men, Trans women, Trans men+T, AFAB+T non-bin, AMAB non-bin, with respective sex and gender categories.]
A mixed-effects logistic regression model was fit to the full dataset of 34,510 vowels

**Prosodic factors**
- Lexical stress
- Pitch accent placement
- Position in the IP
- Boundary tone type

**Social factors**
- Sex/gender: 8 levels
- Speech style: casual vs. reading

**Random effects**
- Speaker
- Word
Significant predictors of creak ($p < 0.01$):
- All prosodic factors, as expected
- Speech style: casual speech is creakier than scripted reading

Nonsignificant predictors of creak ($0.03 < p < 0.78$)
- Sex/gender
1. What will a more diverse sample tell us about:
   a. The **cis men and women** traditionally described through focus on the gender binary?

→ Cis women were indeed more likely to produce creaky vowels than cis men (p = 0.03)

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1. What will a more diverse sample tell us about:
   b. Speakers from outside the binary, who are by and large excluded from quantitative analysis?

   → Trans speakers not on T pattern more with others of the same assigned sex than with their cis counterparts
   → Trans men on T use the lowest percent creak in the sample, patterning with cis men

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1. What will a more diverse sample tell us about:
   b. Speakers from **outside the binary**, who are by and large excluded from quantitative analysis?

→ Non-binary speakers don’t obviously pattern in any meaningful way

→ However, **none of these differences emerge as significant** in our model

**Overall, sex/gender does NOT predict creak here**

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2. What will a more diverse sample tell us about:
   a. Our reliance on the gender binary in sociolinguistic sampling and analysis?
   → It’s a practical necessity, and the binary pattern is well-established.

   → But what does it mean that, as researchers, we assume the gendered world is binary?
Returning to our Questions

2. What will a more diverse sample tell us about:
   b. Our reliance on the gender binary when investigating variables we believe to be relevant to sex and gender identification?

→ We can do better!
ACKNOWLEDGMENTS

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- Many thanks to our participants, our hardworking RAs, and our audience here at ADS2017!
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