

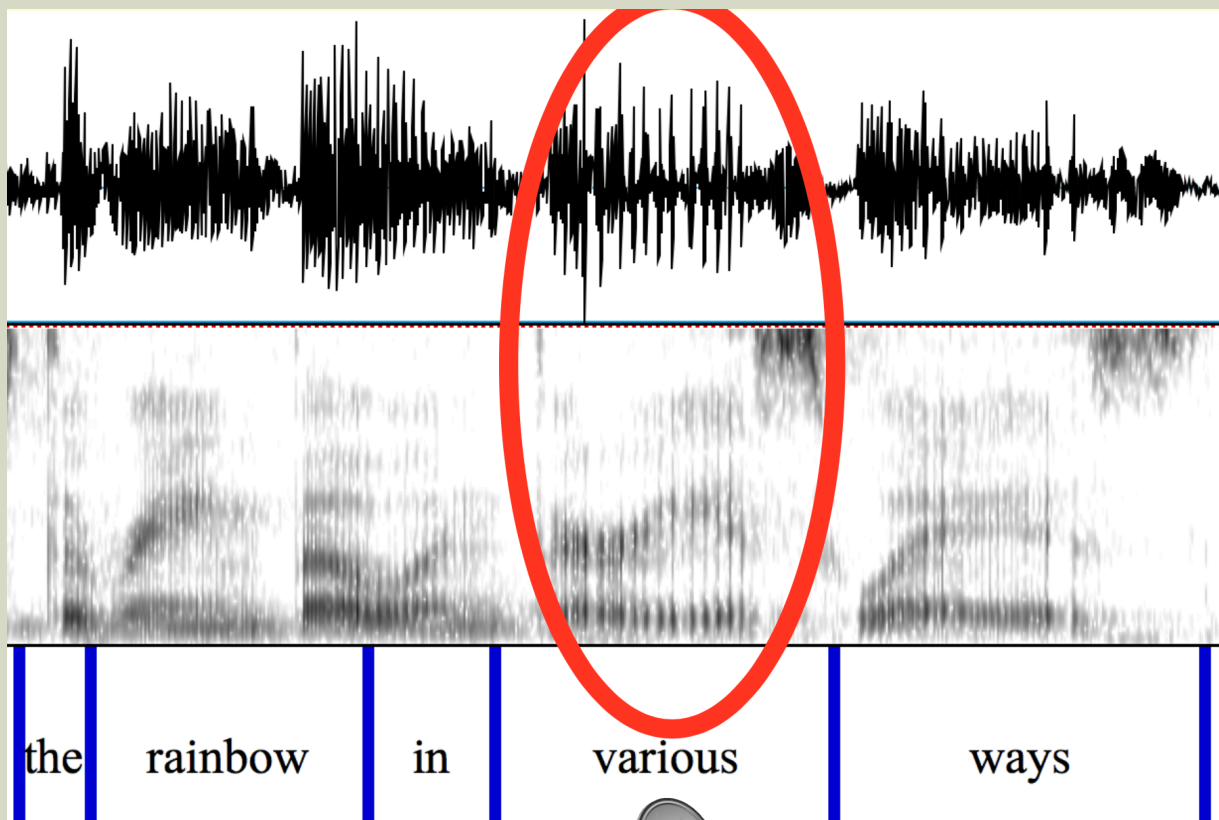
CREAKY VOICE BEYOND BINARY GENDER

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BACKGROUND

- Creaky voice is a **non-modal phonation** characterized by:
 - Lower f_0
 - More irregular f_0
 - Multiple pulses
 - Added noise



BACKGROUND

- 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

BACKGROUND

- 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

BACKGROUND

- **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?

BACKGROUND

- 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)

MOTIVATION

- 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

GUIDING QUESTIONS

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)

	Identify as women	Identify as men	Identify as neither
Assigned Female at birth	Cis women	Trans men not on T	AFAB non-binary not on T
Assigned Female at birth, taking testosterone	N/A	Trans men on T	AFAB non-binary on T
Assigned Male at birth	Trans women	Cis men	AMAB non-binary

SPEAKERS

- (Mostly) equally distributed across our groups:

	Women	Men	Non-binary
AFAB	6	2	6
AFAB+T	N/A	6	6
AMAB	6	6	5

TASK

- 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

TASK

- 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**

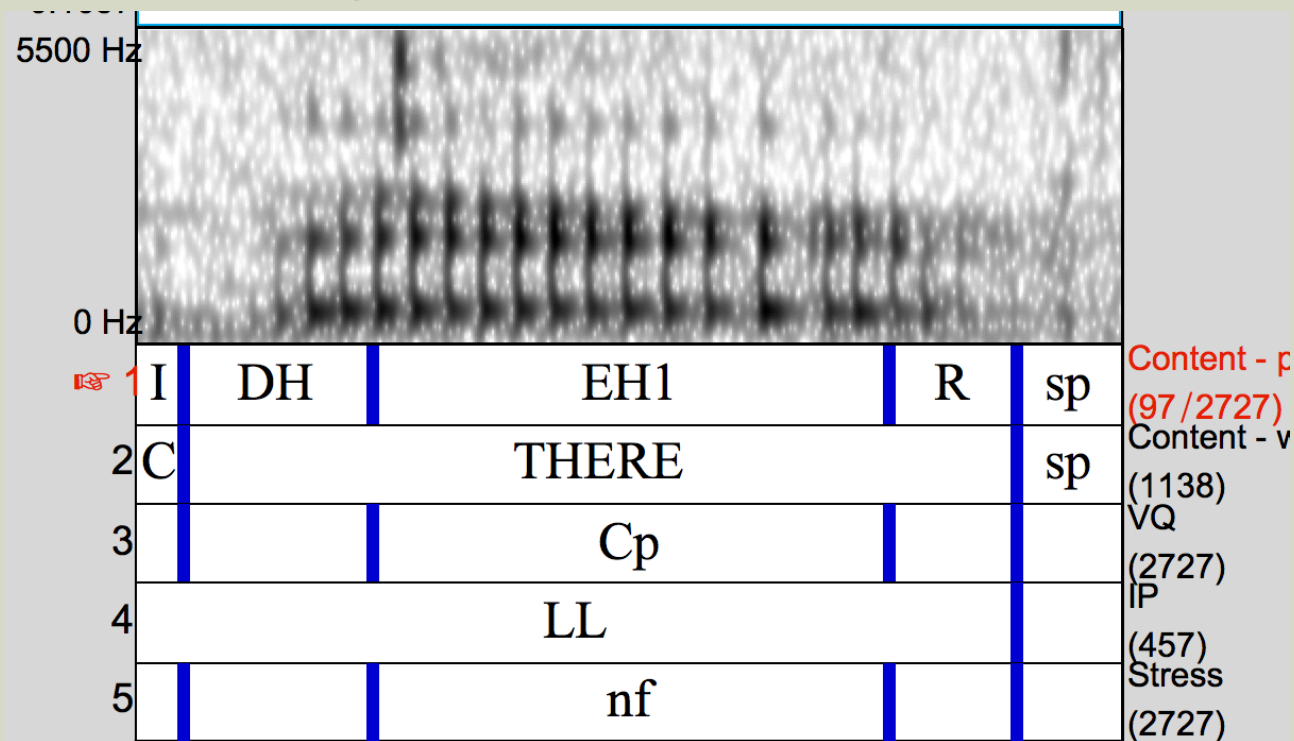
- RAs transcribed all speech orthographically
- Segmented semi-automatically using Forced Alignment and Vowel Extraction (FAVE) suite (Rosenfelder et al. 2011)
- RAs hand-corrected FAVE errors
- Provided phonemic transcription incl. lexical stress

■ **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%

CODING

- 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**

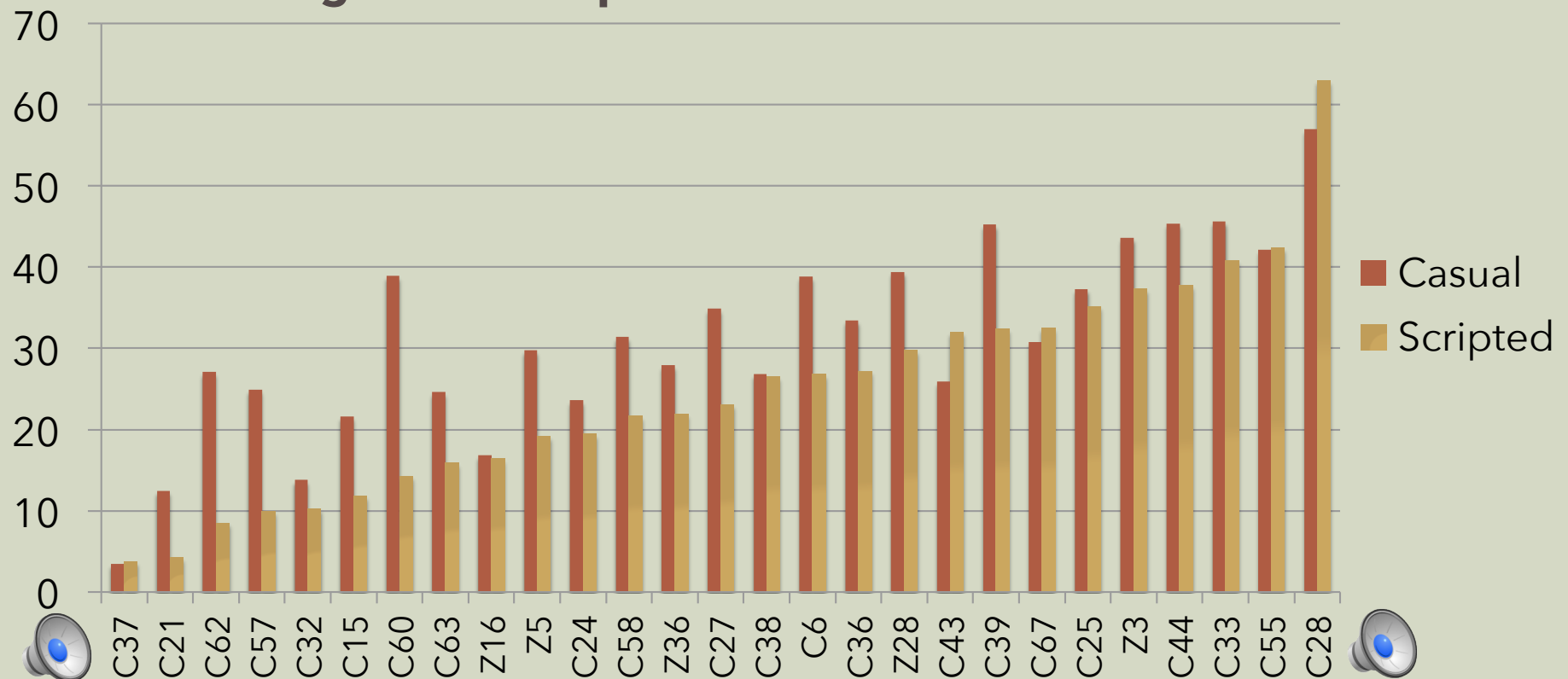


CODING

- **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

DEPENDENT VARIABLE

- 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:

	Women	Men	Non-binary
AFAB	38%	34%	25%
AFAB+T	N/A	22%	30%
AMAB	29%	24%	30%

RESULTS: PERCENT CREAK

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

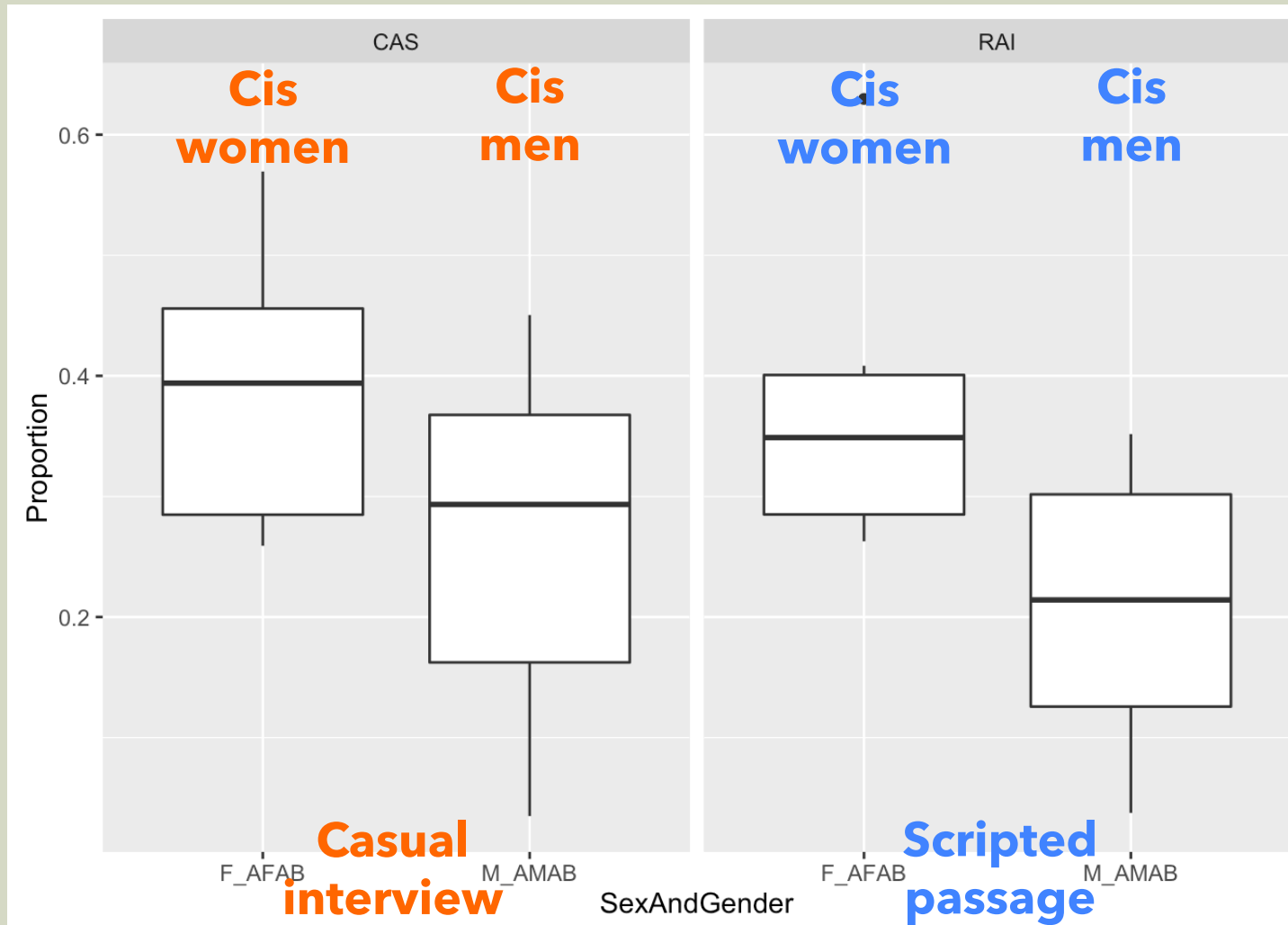
	Women	Men	Non-binary
AFAB	38%	34%	25%
AFAB+T	N/A	22%	30%
AMAB	29%	24%	30%

RESULTS: PERCENT CREAK

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

	Women	Men	Non-binary
AFAB	38%		
AFAB+T			
AMAB		24%	

RESULTS: PERCENT CREAK

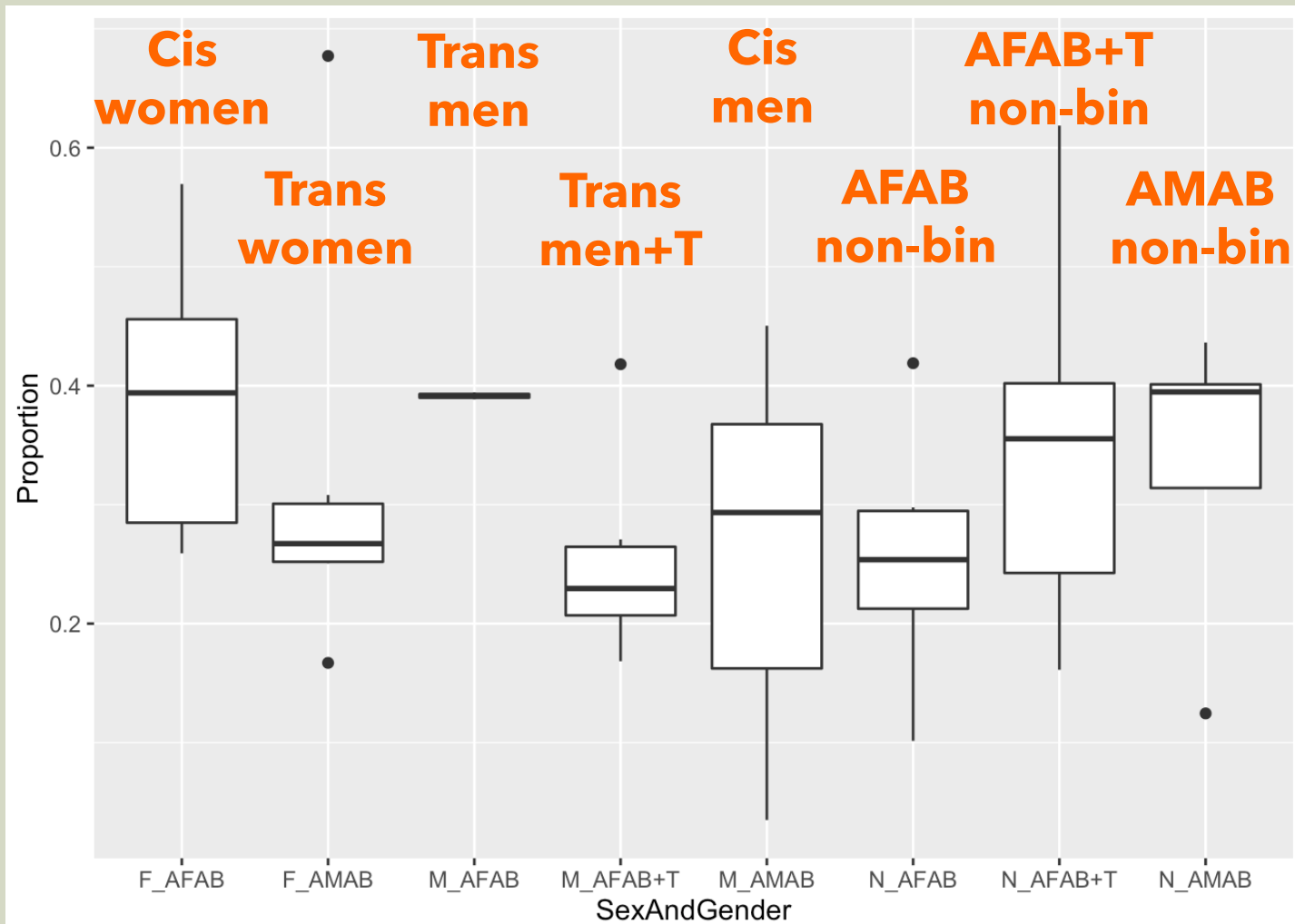


RESULTS: PERCENT CREAK

- However, an ANOVA of the **full sample** found **no significant variation** by sex, gender, or their interaction
- Motivates further analysis

	Women	Men	Non-binary
AFAB	38%	34%	25%
AFAB+T	N/A	22%	30%
AMAB	29%	24%	30%

RESULTS: PERCENT CREAK



MIXED-EFFECTS MODEL

- 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

MODEL RESULTS

- **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

RETURNING TO OUR QUESTIONS

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 ($p = 0.03$)

	Women	Men	Non-binary
AFAB	38%		
AFAB+T			
AMAB		24%	

RETURNING TO OUR QUESTIONS

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

	Women	Men	Non-binary
AFAB	38%	34%	
AFAB+T	N/A	22%	
AMAB	29%	24%	

RETURNING TO OUR QUESTIONS

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

	Women	Men	Non-binary
AFAB	38%	34%	25%
AFAB+T	N/A	22%	30%
AMAB	29%	24%	30%

RETURNING TO OUR QUESTIONS

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?

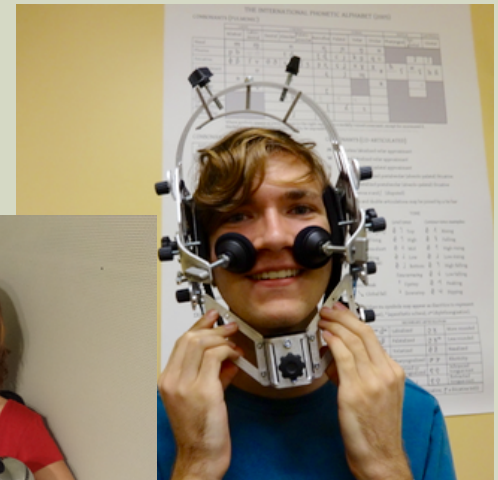
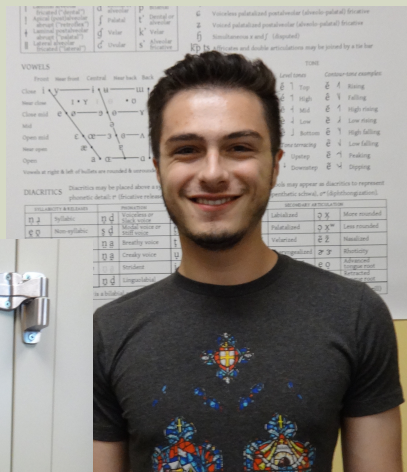
RETURNING TO OUR QUESTIONS

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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