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Uncovering identity in lesbian voices: an analysis of variation in vowels and creak

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Abstract. This study provides evidence of intra-community variation among lesbian speakers related to individual differences in gender presentation and workspace environment. An analysis is performed on two cues of queer identity- creaky voice and vowel formants and their variation within lesbian speech across three factors - gender presentation, queer community familiarity, and workspace type. Overall, vowel space expansion and total creak were found to correlate with a more masculine gender presentation; and different creak phrasal patterns were found to correlate with different workspace types. This variation demonstrates the need for a more nuanced investigation of indexing LGBTQ+ identities through speech.

Keywords. acoustics; phonetics; lesbian; queer; creak; vowels

1. Introduction. The relationship between identity and speech is known to be complex, as both a speaker's identity and their acoustic production are multifaceted, dynamic entities. Recent literature has shown that a speaker's gender and sexuality identities may correlate with certain acoustic variables (e.g., Munson 2011). However, few works have expanded upon how other elements of an individual speaker's identity and the conversational context play a role in this phenomenon.

In particular, individual gender presentation - that is, individual expression of gender through aspects of behavior and appearance - has only recently been studied with regards to acoustic production (Sulkin 2024). According to the Indexicality Principle as proposed by Bucholtz & Hall (2010), identity is produced through different linguistic means during discourse; production of identity can include the overt mention of identity or the use of linguistic structures associated with specific groups. Since gender and sexuality are features of identity that can be indexed through various linguistic structures, we expect that gender presentation can be indexed in queer peoples speech as well.

Lesbian speakers are ideal for studying correlations between gender presentation and speech as gender presentation and behavior-based archetypes are particularly salient within lesbian communities (e.g., Eves 2004). Some of these archetypes are briefly defined below:

- *Butch* (also called *masc*): stereotypically masculine presentation and behavior
- *Femme*: stereotypically feminine presentation and behavior
- *Chapstick*: more gender-neutral presentation and behavior, potentially leaning feminine or sporty. The term 'chapstick' is derived from lipstick lesbian, which was once used to refer to hyper feminine behavior and presentation
- *Stud*: similar to *butch*, this term refers to stereotypically masculine presentation and behavior; however, it is used exclusively by lesbians who identify as either Black or African American

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While queer speakers have often been treated as members of linguistically homogeneous communities in existing literature, there is evidence that there is plenty of intra-community variation. Levon (2011) found that lesbians with different political affiliations use high fundamental frequency (F0) to mark different parts of their identity, and Calder (2024) found that gender nonconforming drag performers have different CoG of /s/ from traditionally feminine drag performers. Based on these previous studies and the salience of gender presentation-based archetypes within the lesbian community, we expect acoustic variation to occur within the lesbian community on the basis of gender presentation and other social variables known to affect the indexation of gender and sexuality.

2. Background. This study examines the relationship between three acoustic variables - fundamental frequency (F0), creak, and vowel space expansion - and four social variables - gender presentation, workplace, environment, familiarity with the LGBTQ+ community, and conversation topic.

2.1. ACOUSTIC CORRELATES OF QUEER IDENTITY. The acoustic variables analyzed in this study are F0, creak, and vowel space expansion. F0 is considered the most salient and robust index of gender such that men reliably produce lower F0 than women and people with lower F0 tend to be perceived as more masculine (e.g., Munson 2007). This effect is partially biological, as speakers who experience male puberty will have longer and more massive vocal folds, leading to intrinsically lower F0. Nevertheless, F0 differences are at least in part socially determined; for example, speakers of different languages controlled for age, sex and body size nevertheless show significant differences in F0 (Van Bezooijen 1995; Biemans 1998; Lewis 2002). Studies that have compared the F0 of straight and lesbian women have mixed results. Moonwomon-Baird (1997), Camp (2009), Van Borsel et al. (2013), and Cuddy (2019) have all reported that lesbian women have lower F0 than straight women; however, Waksler (2001) and Barron-Lutzross (2018) have found no relationship between sexuality and F0 production.

The use of creaky voice has a more nuanced relationship with indexing gender and sexuality. Creak has competing traits of indexing both masculinity (due to frequent co-production with lower F0) and femininity (due to saliency in women's speech, as in Dallaston & Docherty (2020)). Ultimately, the actual production of creak is comparably prevalent among both men and women (Yuasa 2010; Dallaston & Docherty 2020; Becker et al. 2022); however, creaky voice is perceived as more salient in women's speech and, as a result, its use is more stigmatized among women than men (Lee 2016; Towarnicky 2022). Additionally, variation in creak is not necessarily limited to presence or absence, but rather different speakers may use different types of creak or produce creak at different points in the phrase (Keating et al. 2015; Huang 2023). When comparing the use of creaky voice across speakers of different sexualities, previous studies have found no significant differences with regards to creaky voice production (Barron-Lutzross 2018). However, it may be the case that women who use more creaky voice may be more likely to be perceived as lesbian (Barron-Lutzross 2015, 2018).

Vowel space is another acoustic cue of gender and sexuality. Previous studies find that women on average have larger vowel spaces than men, and there is evidence that a larger vowel space is linked to lower F0 (Simpson & Ericsdotter 2007). Notably, there is a mismatch between speakers' production and listeners' perception of queer voices. In a production study, both gay and lesbian speakers have been found to produce significantly more-expanded vowel spaces than heterosexual speakers (Pierrehumbert et al. 2004). However, in a perception study, male speakers

with larger vowel spaces and female speakers with smaller vowel spaces are more likely to be judged as queer (Munson et al. 2006).

2.2. SOCIAL VARIABLES AND INDIVIDUAL DIFFERENCES. Acoustic variation is known to be affected by sociocultural factors. The main social variable of interest in this study is gender presentation: each individual's expression of gender through aspects of behavior and appearance. Sulkin (2024) found that as speakers rate their gender presentation more masculine, their mean F0 decreases and proportion of creaky voice increases. The study concludes that there may be a lesbian speech stereotype (e.g. lower F0) - but it is influenced by the existence of appearance and behavior based archetypes in the community. Our primary goal is to expand on this work by investigating this variation alongside other social variables.

One such social variable is whether a speaker works in a male-dominated or female-dominated workplace. It has been found that women who work in a male-dominated field adopt more masculine speaking styles. McElhinny (1998) examined the speech of women entering the Pittsburgh police force - a male-dominated workspace - and found that female police officers adopted normative masculine behaviors and were more likely to judge the masculine styles as professional behavior.

Another social variable is familiarity with queer culture and identities. Barron-Lutzross (2018) proposed that a speaker's familiarity with the LGBTQ+ community can correlate with speech patterns. She found that regardless of sexuality, women with greater familiarity with queer culture have lower F0 and speech rates. However, this pattern was more clearly observed in straight women than in lesbian or bisexual women.

A final social variable of interest is conversation topic. Speakers naturally use different registers, speech styles, and speech characteristics depending on the topic of conversation (e.g. Rickford et al. (1994)). Additionally, previous literature suggests that when a speaker is discussing a topic that brings an aspect of their identity into focus, they tend to index that aspect more strongly. In one such study, Levon (2009) found that gay men were more likely to use higher pitch (which is typically associated with a stereotypical gay male identity) in certain contexts when discussing topics where their sexuality was salient. In the present study, conversation topic is the most dynamic of the social variables we consider and the only one to vary across each speaker's identity.

2.3. SUMMARY. Speakers use acoustic cues to index aspects of their identity including gender and sexuality. The relatively small amount of phonetic literature that includes queer women as subjects of interest provides evidence toward the relationship between acoustic variables and their indexation of identity features. For F0 production, the cues for queerness in women correspond to the cues for a more masculine presentation (lower F0). For creak production, the cues for queerness in women align with both perceptions of feminine speakers (more salient creak) and the low F0 production of masculine speakers. For vowel space expansion, the produced cues for queerness align with the productions of normative feminine speakers (larger vowel spaces), but the perceived cues for queerness align with the productions of normative masculine speakers (smaller vowel spaces).

These three acoustic cues are predicted to vary with regards to individual differences in gender presentation. To get a full view of individual differences, it is important to also look at previously examined variables such as workplace and speakers' familiarity with the LGBTQ+ community and to consider varying discourse topics, as these might variables may influence speakers' indexation of identity cues.

3. Research questions. This study aims to investigate the following research questions:

1. **How do individual differences in a lesbian speaker's gender presentation, workplace environment, familiarity with the LGBTQ+ community correlate with their F0 production, creaky voice production, and vowel space expansion?** We predict that speakers who rate themselves as more masculine will adopt features more associated with masculine speaking styles: lower F0, more creak, and smaller vowel space. Similarly, we predict speakers in a more male-dominated workplace would be also be more likely to adopt these masculine characteristics. Speakers with a higher LGBTQ+ community rating would be expected to index more variables associated with queerness in women (lower F0, more creak, and larger vowel space production).

2. **How are the above variables modulated by the topic of conversation?** We predict speakers will use more features associated with queerness in women (lower F0, more creak, and larger vowel space production) when answering a question pertaining to queerness.

4. Methods.

4.1. CORPUS. The data analyzed in this study comes from an anonymized corpus of interviews with eleven cis lesbian speakers native speakers of US English collected by Sulkin (2024) in Boston, Massachusetts, which is publicly available at `https://osf.io/fk7us/`. The corpus contains speech data from sociolinguistic interviews and read speech recorded as 48kHz, 24bit .wav files using a Zoom H4n Pro on stereo mode with a AKG C520 condenser microphone. The corpus also includes phonetic transcriptions of each word in the interview alongside F0, F1 and F2 measurements retrieved in Praat at every vowel midpoint as well as a binary creaky voice measurement for every vowel using software from Drugman et al. (2014); there are approximately 3000 vowel tokens per speaker.

Each speaker self-reported a gender presentation rating as a Likert scale value from 1 to 5, where 1 represents a hyper-feminine gender presentation and 5 represents a hyper-masculine gender presentation. Each speaker also self-reported their familiarity with LGBTQ+ culture on a 1-5 Likert, scale where 1 represents low familiarity or involvement with the queer community and 5 represents high familiarity or involvement with the queer community. Additionally, each speaker reported their workplace dominance as male-dominated or female-dominated (no speakers reported a mixed-gender workplace or field of study). Demographic information for each of the 11 speakers can be found in Table 1. The dataset attains a fairly even representation of the gender presentation scale used, as well as type of workplace.

4.2. DATA ANALYSIS. The authors annotated the corpus for phrase boundaries, and each discourse topic was coded as either 'neutral' or 'queer'. Answers to questions related directly to queerness, such as 'How would you define lesbian?' were coded as 'queer'. Answers to questions that did not contain any reference to queer identity such as 'Where did you grow up?' were coded as neutral. Answers to ambiguous questions - such as 'What kind of media do you enjoy?' - where some speakers related their answer to their queer identity but others did not - were excluded from the analysis.

Speaker	Age	Ethnicity	Gender Presentation	Label	Familiarity	Work
A	24	Asian	1	femme	4	M
B	29	White	1	femme	5	F
C	21	Asian	2	femme	3	F
D	25	Latina	2	femme	3	M
E	27	Indian/White	2	chapstick	4	M
F	22	White	3	chapstick	2	M
G	22	Latina	3	masc	5	F
H	30	White	4	masc	2	F
I	24	Asian	4	masc	4	M
J	22	White	5	butch	1	F
K	26	African American	5	stud	4	M

Table 1. Demographics of speakers in dataset

To evaluate F0 and the general use of creak, linear mixed effect regression models were calculated in R using the lme4 package (R Core Team 2021; Bates et al. 2015). To measure the presence of creaky voice at various points of each speaker's phrase, each vowel was coded into 10 bins (such that the first bin contains all vowels in the first 10% of the phrase, etc.) based on its position within the annotated phrase boundaries. To evaluate vowels, all /i/, /u/, and /a/ tokens were normalized across speaker.

When analyzing measures from the entire token set - such as overall F0 and creak use - gender presentation is coded as a continuous variable. However, in the analysis for subset measures - such as question type and creak use in phrase - gender presentation is coded as a binary discrete variable with speakers who rated themselves as 'femme' or 'chapstick' grouped together in a 'feminine' bin and speakers who rated themselves as 'masc,' 'butch' or 'stud' grouped together in a 'masculine' bin. The use of two macro variables rather than a five point scale for these measures was chosen both to mitigate the smaller number of tokens in each category and to make data presentation clearer for phenomena with many additional independent variables.

5. Results.

5.1. F0. As in Sulkin (2024), F0 correlates strongly with gender presentation such that speakers who rate themselves as more masculine tend to have lower F0s. Speaker F0 plotted by self-reported gender presentation can be found in Figure 1.

A linear model (Table 2) was run to analyze each vowel's F0, with question type and speaker label as fixed effects. As there were no effects of workplace or LGBTQ+ community familiarity on F0, they were not included in the final model. However, there was an effect of conversation topic, such that speakers had lower F0 when discussing queer topics compared to neutral topics. Additionally, there was an interaction between conversation topic and gender presentation such that the decrease in F0 during queer-focused questions more pronounced for more masculine speakers. Interestingly, more masculine speakers had higher F0 answering neutral questions.

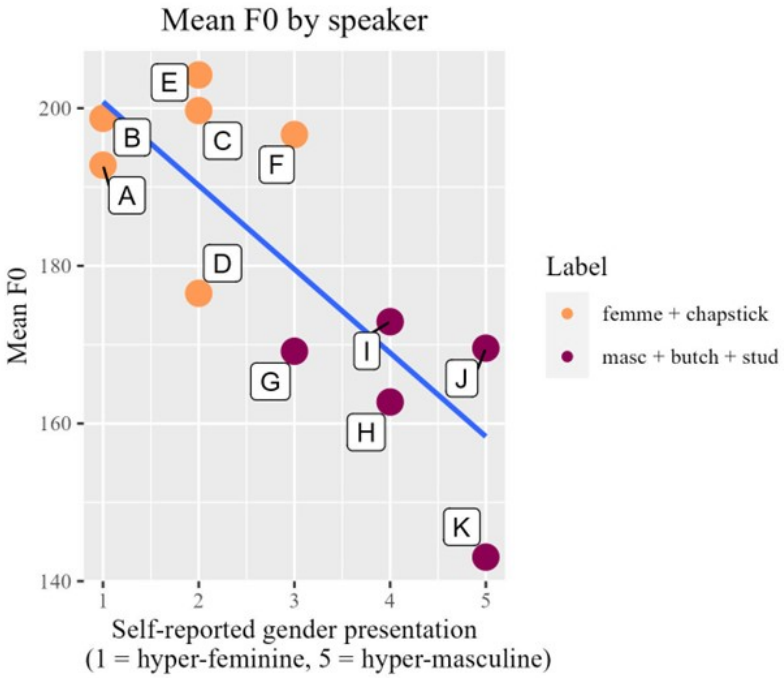

Figure 1. Mean F0 for each speaker by gender presentation (Sulkin 2024).

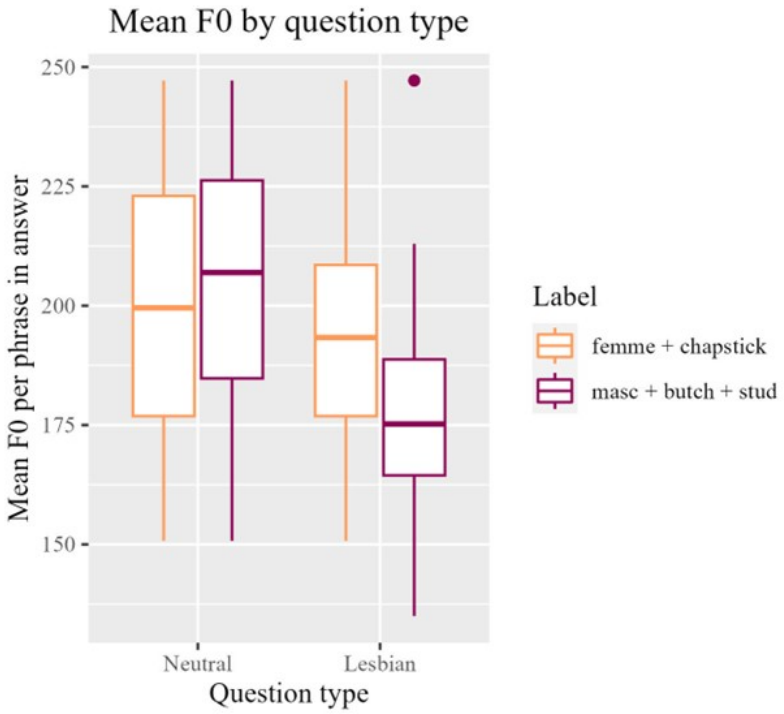

Figure 2. Mean F0 for vowels coded for question type, binary gender presentation value and question type.

Predictors	Estimates	Mean F0 CI	p-value
(intercept)	200.03	198.98 - 201.08	<**0.001**
question [Queer]	-6.89	-8.83 - -4.96	<**0.001**
label [masc + butch + stud]	4.40	2.71 - 6.09	<**0.001**
question [Queer] × label [masc + butch + stud]	-19.34	-22.80 - -15.87	<**0.001**
Observations	4625		
R^2/R^2 adjusted	0.074/0.074		

Table 2. Linear regression model showing the F0 of a given vowel with fixed effects of question topic, speaker label, and the interaction between question topic and speaker label. As question topic is a relevant variable, the analysis only includes the subset of data that could be clearly annotated as queer or neutral topics. The reference level in this model is a neutral topic and a femme or chapstick gender presentation label.

5.2. CREAKY VOICE. As in Sulkin (2024), creaky voice correlates strongly with gender presentation such that speakers who rate themselves as more masculine tend to have greater proportion of creak in their speech in general. Speakers' total creaky voice use plotted by their self-reported gender presentation is shown in Figure 3. However, as creak is heavily confounded by F0, it is difficult to determine what drives this result. Speakers' F0 plotted by their total creaky voice use is shown in Figure 4. None of workplace, LGBTQ+ community familiarity, or conversation topic had any effect on a speaker's overall use of creak.

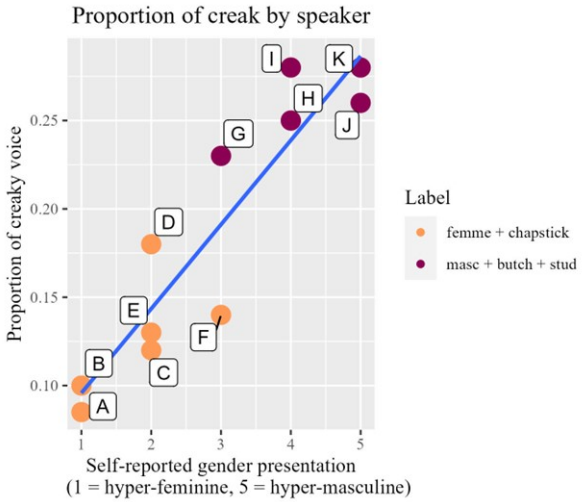

Figure 3. Proportion of creak for each speaker by gender presentation (Sulkin 2024).

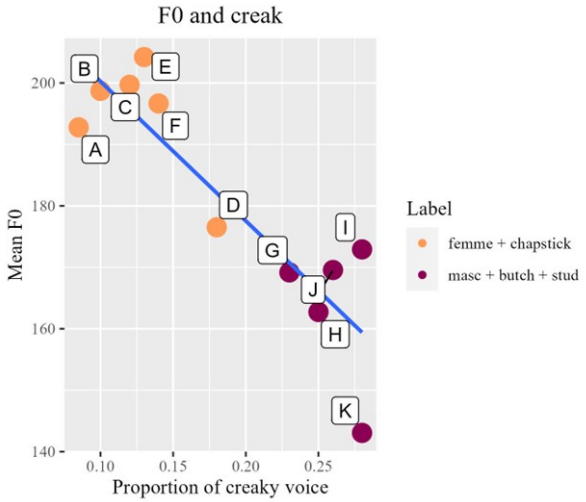

Figure 4. Correlation between speakers' mean F0 and creak (Sulkin 2024).

To more fully investigate creak patterns, each speaker's creak use was plotted by its position in the utterance. Figure 5 shows the creak rate for each speaker at 10% increments throughout the phrase. Qualitatively, there seem to be two patterns to creak use: speakers who creak consistently throughout the phrase (such as speakers D, F, and K) and speakers who use more phrase final

creak (such as speakers B, C, G, and H). Despite the strong correlation between overall creak use and gender presentation, gender presentation was not a significant predictor in which phrase pattern a speaker was more likely to use. However, workplace gender makeup was found to be a significant predictor of which creak style a speaker used. The relative positions of creak in each phrase for each type of workplace are shown in Figure 6. The model in Table 3 shows the logistic mixed effects regression model for the odds ratio of each vowel token containing creak. More creak was found for all speakers near the end of the phrase (not unexpected for US English) but this result is magnified for speakers in female-dominated workspaces. There was no effect of community familiarity or question topic on where creak appeared in the phrase.

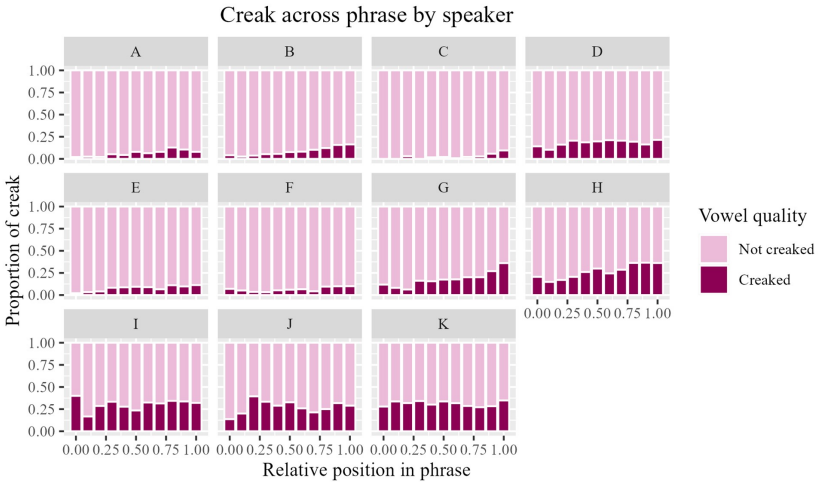

Figure 5. Proportion of each speaker's creaked vowels by relative position in phrase.

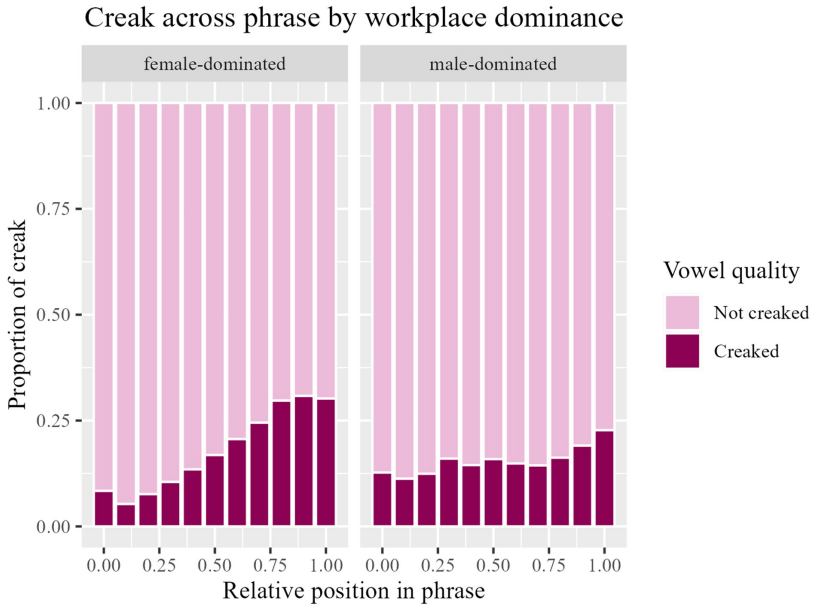

Figure 6. Proportion of creaked vowels by relative position in phrase and workplace dominance.

Predictors	Odds Ratios	Creak Rate CI	p-value
(intercept)	0.05	0.02 - 0.13	<**0.001**
phrase proportion	2.25	1.94 - 2.61	<**0.001**
work [female dominated]	0.82	0.42 - 1.60	0.569
label [masc + butch + stud]	4.22	2.37 - 7.53	<**0.001**
familiarity	0.99	0.79 - 1.24	0.902
phrase prop × work [female dominated]	1.59	1.20 - 2.10	<**0.001**
Observations	30302		
R^2/R^2 adjusted	0.167/0.217		

Table 3. Logistic mixed effect regression model showing the log odds of a given vowel being creaked with fixed effects of phrase placement, workplace, speaker label, and the interaction between phrase placement and workplace. The reference level in this model is a femme or chapstick label in a male-dominated workplace.

5.3. VOWEL SPACE EXPANSION. We created a linear model measuring the average vowel's Euclidean distance from a normalized vowel space center with speaker identity as a random effect and gender presentation, question type, workplace, and community familiarity as mixed effects. Only the interaction between question type and gender presentation was significant and included in the analyses. The speakers' vowel spaces based on their gender presentation and question type are plotted in Figure 7, and the corresponding model is shown in Table 4.

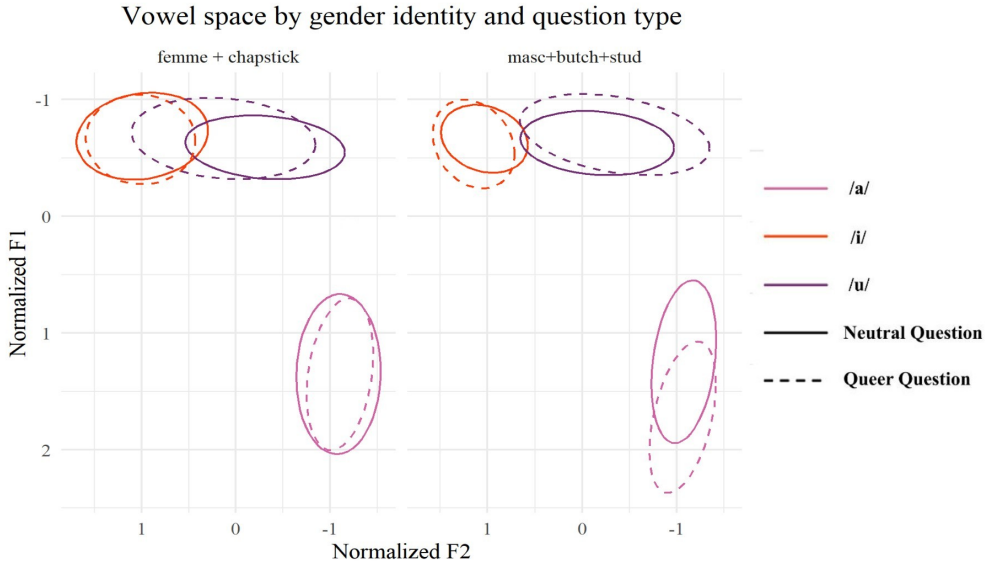

Figure 7. Speakers' average vowel space by question type and binary gender presentation label.

There was no effect of gender presentation on overall vowel space expansion, but we found an interaction between question type and gender presentation such that masculine-presenting speakers have more expanded vowels spaces when discussing queer topics. There was no effect of workplace or LGBTQ+ community familiarity on vowel production.

Predictors	Distance from normalized vowel center Estimates	CI	p-value
(intercept)	1.30	1.20 - 1.41	<**0.001**
label [masc + butch + stud]	-0.04	-0.11 - 0.03	0.211
Question [Queer]	0.04	-0.01 - 0.09	0.115
work [male dominated]	0.03	-.0.03 - 0.02	0.677
familiarity	-0.00	-0.03 - 0.02	0.677
label [masc + butch + stud] × Question [Queer]	.15	0.07 - 0.23	<**0.001**
Observations	22		
R^2/R^2 adjusted	.631/0.774		

Table 4. Linear regression model showing the average vowel expansion for each set of vowels produced by a speaker in different question contexts. The reference level in this model is a neutral topic and a feminine gender identity.

6. Discussion. In these results, it seems that gendered speech cues mirror gender presentation. We find an interaction between gender presentation and conversation topic that affects F0 and vowel space. Queer topics magnify speech traits associated with queer womens production. Our results suggest that speakers' more strongly index their queerness when queerness is a salient discussion topic. However, this trend was found only in speakers who rated themselves as more masculine. One explanation is that these interaction effects are stronger with more masculine speakers because those speakers eschew societal expectations more strongly than women who present as feminine. Another explanation is that indexing masculinity and indexing queerness are similar such that speakers who present as feminine avoid saliently indexing queerness to avoid indexing masculinity.

We find that gender presentation and workplace type affect lesbian speakers production of F0 and creaky voice. The heavy phrase-final creak pattern for all speakers is not uncommon as it is the most canonical use of creaky voice for speakers of American English. One explanation for why speakers in masculine environments use creak more continuously than phrase-finally could relate to this canonical status. The salience of creaky voice in women's voices combined with its prevalence in phrase-final position might cause the perception that phrase-final creak is more feminine. Speakers in a masculine workplace might try to avoid these styles. However, as the use of creaky voice in different position has not been fully researched, and there were no effects of workplace on total creak use or effects of gender presentation on creak placement, it is also possible that this trend is a result of small sample size.

We did not see any significant effect or interactions of LGBTQ+ community familiarity on any acoustic cues. As the Likert rating system used in the corpus was presented exactly as in Barron-Lutzross (2015), and the effect of community familiarity was not present within the lesbian population in that study, these results support the idea that LGBTQ+ community familiarity does not have an effect on inter-speaker variation in the lesbian community. However, the lack of effect in these results could be due to a small sample size, or it could be the case that the Likert scale used does not accurately capture the measure of LGBTQ+ community familiarity within

lesbians.

7. Limitations and Further Research. The major limitations in this study involve the size and representation in the corpus. A larger corpus containing more participants would be useful in ascertaining the results found here are generalizable. Additionally, a larger sample is needed to fully investigate how race and ethnicity intersect with sexuality and gender presentation. The corpus also only contains data from cis self-identified lesbians, which does not include trans and non-binary members of the lesbian community. In order to better understand individual variation in lesbian voices, future research should investigate individual differences across all types of lesbians.

A further limitation is that gender presentation is more complex than the scale used in the study. Speakers may consider masculinity and femininity as separate, non-mutually exclusive entities rather than opposite sides of the same scale. Furthermore, speaker's gender presentation may fluctuate over time, requiring the need for a more dynamic scale.

Finally, as the current results show strong effects of gender presentation and its interaction conversation topic, future research would do well to compare how these variables affect other communities of queer women (such as bisexual and asexual identities).

8. Conclusion. This study adds to increasing evidence suggesting that lesbian speech is not monolithic: there are many individual difference in acoustic production. In particular, we see differences based on gender presentation, and an interaction between gender presentation and conversation topic. Future research on queer voices should consider the nuances affecting queer identity and speech and continue exploring intra-community variation.

References

Barron-Lutzross, Auburn. 2015. The production and perception of a lesbian speech style. *UC Berkeley PhonLab Annual Report* 11(11).

Barron-Lutzross, Auburn Lupine. 2018. *Speech stereotypes of female sexuality*: dissertation.

Bates, Douglas, Martin Mächler, Ben Bolker & Steve Walker. 2015. Fitting linear mixed-effects models using lme4. *Journal of Statistical Software* 67(1). 1–48. https://doi.org/10.18637/jss.v067.i01.

Becker, Kara, Lal Zimman et al. 2022. Beyond binary gender: creaky voice, gender, and the variationist enterprise. *Language Variation and Change* 34(2).

Biemans, Monique. 1998. The effect of biological gender (sex) and social gender (gender identity) on three pitch measures. *Linguistics in the Netherlands* 15(1). 41–52.

Bucholtz, Mary & Kira Hall. 2010. Locating identity in language. *Language and identities* 18(1). 18–28.

Calder, J. 2024. Harsh SoMa vs Beige Castro: the cross-modal construction of contrasting femininities in queer San Francisco. *Language and Communication* .

Camp, Margaret. 2009. *Japanese lesbian speech: Sexuality, gender identity, and language*. The University of Arizona.

Cuddy, Salina. 2019. *Can women "sound gay"?: A sociophonetic study of /s/ and pitch of gay and straight British-English speaking women*: University of York dissertation.

Dallaston, Katherine & Gerard Docherty. 2020. The quantitative prevalence of creaky voice (vocal fry) in varieties of English: A systematic review of the literature. *PloS one* 15(3).

Drugman, Thomas, John Kane & Christer Gobl. 2014. Data-driven detection and analysis of the patterns of creaky voice. *Computer Speech & Language* 28(5). 1233–1253.

Eves, Alison. 2004. Queer theory, butch/femme identities and lesbian space. *Sexualities* 7(4).

Huang, Yaqian. 2023. *Phonetics of period doubling*: dissertation.

Keating, Patricia A, Marc Garellek & Jody Kreiman. 2015. Acoustic properties of different kinds of creaky voice. In *Icphs*, vol. 1, 2–7.

Lee, Kaitlyn E. 2016. *The Perception of creaky voice: Does speaker gender affect our judgments?*: University of Kentucky MA thesis. https://uknowledge.uky.edu/ltt_etds/17.

Levon, Erez. 2009. Dimensions of style: Context, politics and motivation in gay Israeli speech 1. *Journal of Sociolinguistics* 13(1). 29–58.

Levon, Erez. 2011. Teasing apart to bring together: Gender and sexuality in variationist research. *American Speech* 86(1). 69–84.

Lewis, Julie Anne. 2002. *Social influences on female speakers' pitch*: University of California, Berkeley dissertation.

McElhinny, Bonnie. 1998. I dont smile much anymore: Affect, gender and the discourse of Pittsburgh police officers. *Language and Gender: A Reader* .

Moonwomon-Baird, Birch. 1997. Toward a Study of Lesbian Speech. *Queerly phrased: Language, gender, and sexuality* .

Munson, Benjamin. 2007. The acoustic correlates of perceived masculinity, perceived femininity, and perceived sexual orientation. *Language and Speech* 50(1).

Munson, Benjamin. 2011. Lavender lessons learned; or, what sexuality can teach us about phonetic variation. *American Speech* 86(1). 14–31.

Munson, Benjamin, Elizabeth C McDonald, Nancy L DeBoe & Aubrey R White. 2006. The acoustic and perceptual bases of judgments of women and men's sexual orientation from read speech. *Journal of Phonetics* 34(2). 202–240.

Pierrehumbert, Janet B, Tessa Bent, Benjamin Munson, Ann R Bradlow & J Michael Bailey. 2004. The influence of sexual orientation on vowel production. *The Journal of the Acoustical Society of America* 116(4).

R Core Team. 2021. *R: A language and environment for statistical computing*. R Foundation for Statistical Computing Vienna, Austria. https://www.R-project.org/.

Rickford, John R, Faye McNair-Knox et al. 1994. Addressee-and topic-influenced style shift: A quantitative sociolinguistic study. *Sociolinguistic perspectives on register* 235(276). 10–1093.

Simpson, Adrian & Christine Ericsdotter. 2007. Sex-specific differences in f0 and vowel space. In *Xvith international congress of phonetic sciences*, 933–936.

Sulkin, Liza. 2024. Analyzing acoustic correlates of gender presentation in the lesbian community. https://drive.google.com/file/d/1Yeyz75D2Fbmk3Ihg6CTM5pepZkE2hE22/view. Accessed: 2025-01-01.

Towarnicky, Dayle M. 2022. *Examining the linguistic ideology "Throaty sounds are bad for performers": The history of negative attitudes towards glottal stops and laryngealization in English*: City University of New York MA thesis. https://academicworks.cuny.edu/gc_etds/5025.

Van Bezooijen, Renée. 1995. Sociocultural aspects of pitch differences between Japanese and Dutch women. *Language and Speech* 38(3). 253–265.

Van Borsel, John, Jana Vandaele & Paul Corthals. 2013. Pitch and pitch variation in lesbian women. *Journal of Voice* 27(5).

Waksler, Rachelle. 2001. Pitch range and women's sexual orientation. *Word* 52(1).

Yuasa, Ikuko Patricia. 2010. Creaky voice: A new feminine voice quality for young urban-oriented upwardly mobile american women? *American Speech* 85(3).