IDENTITY, SOCIALIZATION AND ENVIRONMENT IN TRANSGENDER SPEAKERS: SOCIOPHONETIC VARIATION IN CREAK AND /S/

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ABSTRACT

This study investigates sociophonetic variation in creak and /s/ in 17 transgender speakers in the UK, comparing 12 transmasculine (TM) speakers and 5 transfeminine (TF) speakers. Assuming that transgender speakers would attempt to distance themselves from the norms of their assigned sex and recruit or avoid recruiting the perceptually low pitch of creak, it was predicted that TM speakers would have a lower centre of gravity for /s/ and use more creak than TF speakers. However, TM speakers were found to have a significantly higher centre of gravity for /s/ than TF speakers and did not differ significantly from TF speakers in creak usage. Taken together with qualitative data, this suggests that speaker identities, socialization experiences and environment all contribute to variation in /s/ and creak in these speakers.

Keywords: sociophonetics, transgender, /s/, creaky voice

1. INTRODUCTION

'Trans' and 'transgender' are umbrella terms that refer to individuals who do not identify as the gender they were assigned at birth. This includes trans men and women as well as non-binary individuals. Much existing research on trans speech is clinical, but an emerging body of work [3, 12, 24, 35] takes a sociophonetic perspective, investigating variation in trans speech. In trans speakers, physiology, experience and identity do not necessarily align in the same way as expected for cisgender (i.e. non-transgender) speakers, so this kind of research not only sheds light on trans speech, but also on cisgender speech and the origins of gender variation in speech. The present study examines how transmasculine and transfeminine speakers in the UK negotiate gender through speech using creak and /s/, and what factors affect this variation.

1.1. /s/

The articulation and resulting frequency profile of the voiceless alveolar sibilant /s/ have been found to differ between male and female speakers across many varieties of English, with cisgender men producing /s/ with a lower centre of gravity (COG) and cisgender women producing /s/ with a higher COG [9, 13, 10, 11, 15, 24]. While it has been suggested that physiological differences between cisgender men and women are responsible for differences in the acoustics of /s/ [9], sociophonetic studies such as [31, 15, 35] show that regardless of possible physiological influences, speakers can use articulatory strategies to create variation in /s/ production. Transgender speakers, then, could recruit /s/ to negotiate their gender linguistically and distance themselves from speakers of their assigned sex: Transmasculine speakers may use a lower COG /s/, while transfeminine speakers may use a higher COG /s/. However, other aspects of identity and other social and environmental factors also affect /s/ in trans speakers [12, 24, 34, 35]. Therefore, trans speakers may fall in the range where cisgender male and female productions of /s/ overlap.

Linguistic factors affect the acoustic profile of /s/. It is likely that at the onset of a stressed syllable /s/ will have a higher COG than elsewhere in a word [31, 15, 24]. /s/ may also have a higher COG when adjacent to /i/, as the place of constriction of /s/ may assimilate to that of /i/ and shorten the front cavity [29, 17]. However, this has not been found universally [28, 15]. Occurring in the context of rounded vowels or consonants lowers the COG [28, 15, 24], and therefore, here only tokens of /s/ occurring in the context of unrounded vowels were included.

1.2. Creak

Creak is a phonatory voice quality produced with the vocal folds and the ventricular folds adducted [19], allowing separate low frequency glottal pulses to be identified auditorily [14, p. 4]. Studies on UK English varieties looking at cisgender speakers have often found men to be creakier than women; this is the

case in Scotland [30, 2], in Havering, London [32], and in RP and Modified Northern, which refers to speakers from Yorkshire who later moved away for long periods of time [14]. However, this finding is not universal [32]. Additionally, the often low f0 of creak means it is perceived as having a lower pitch than modal speech. Transmasculine speakers may use more creak to produce a lower pitch and index masculinity, while transfeminine speakers may use less creak to avoid this effect. Linguistic factors also influence the prevalence of creak - it is likely that creak will be more prevalent towards the end of an utterance [14, 22, 33, 1] and in tokens followed by glottal stop variants of /t/ [23].

2. METHODS

This study included 17 participants who identified as trans, transgender and/or non-binary. They were grouped into the broad categories of transmasculine (TM) or transfeminine (TF) based on their gender assignment at birth and current identity. 12 participants were TM (assigned female at birth and now identifying as something else) and 5 participants were TF (assigned male at birth and now identifying as something else). Due to the difficulty of finding trans participants, participants did not come from a single speech community, but were all native speakers of UK varieties of English, now residing in Scotland. None of the participants had ever undergone masculinising or feminising voice therapy.

Participants read a list of words containing 35 tokens of /s/. 16 tokens were in word-initial position (e.g. *sun, sand*), 9 word-medial (e.g. *fleecy, vessel*) and 10 word-final (e.g. *ice, pass*). Due to coarticulatory effects, /s/ always occurred in the context of unrounded vowels. For examination of creak, participants read a list of 35 sentences. Participants also engaged in an 20 minute conversation to elicit a casual speech style; this portion is not analysed here but may be presented in future work. Participants were then interviewed about their gender identity and relationship to their speech and voice.

Tokens of /s/ were manually segmented in Praat [4] and COG was measured with a script [7] that uses the time-averaging method following [27]. Each token was coded for COG, speaker gender category (TM or TF), word position (initial, medial, final), and preceding and following vowel (/i/ or other) due to potential coarticulatory effects. Results were analysed using multiple linear regression in R[25]. Recordings of the reading task were annotated with orthographic transcriptions in Praat then forced aligned using the Montreal Forced Aligner [21] using DARLA [26]. This was processed in [18]'s creak detection algorithm, available in COVAREP (v. 1.4.1) [6], implemented in MatLab R2017a with the Neural Network toolbox [20]. The output was converted to a TextGrid file using [5]. Each vowel was coded for voice quality (creaky or not creaky, as determined by the output of the algorithm), following sound (glottal stop or other) and syllable position (final or non-final). Results were analysed using multiple logistic regression in R.

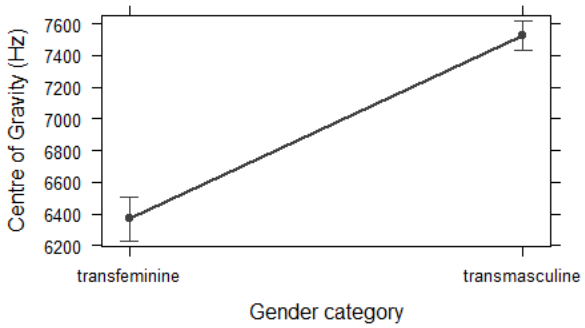
3. RESULTS

3.1. /s/

Tokens of /s/ had a significantly higher COG in word-initial position than in medial (β=-510.79, p<0.001) or final position (β=-596.34, p<0.001). However, being adjacent to /i/ had no effect.

As shown in Fig. 1, TM speakers had a significantly higher COG than TF speakers (β= 1152.22, p<0.001). As shown in Fig. 2, there was also considerable variation within categories and speakers as well as overlap between TF and TM speakers.

Figure 1: The effect of gender category on centre of gravity of /s/ (Hz)



3.2. Creak

Vowels in utterance-final position were significantly creakier than vowels elsewhere in the utterance (β=-0.35866, p<0.001). In utterance-final position, a following glottal stop had no effect; elsewhere in the utterance vowels followed by a glottal stop were significantly creakier (β=0.22350, p<0.01). There was no significant difference in the percentage of creaky vowels used by TM and TF speakers; instead, there was a large amount of variation between individual participants and within categories, as shown in Fig. 3. Two participants are particularly creaky: Alice (TF) uses creak in 16% of vowels, while Jam (TM) uses creak in 33%.

Figure 2: Centre of gravity of /s/ by individual participants (Hz)

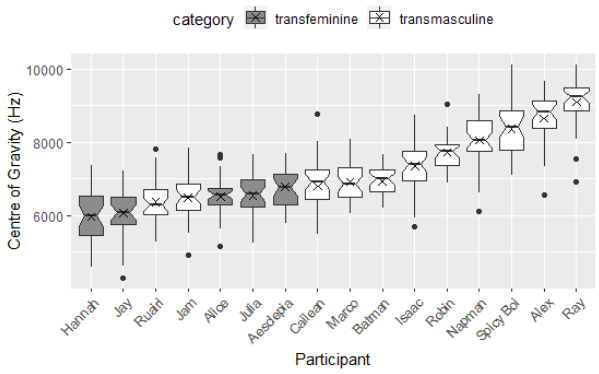
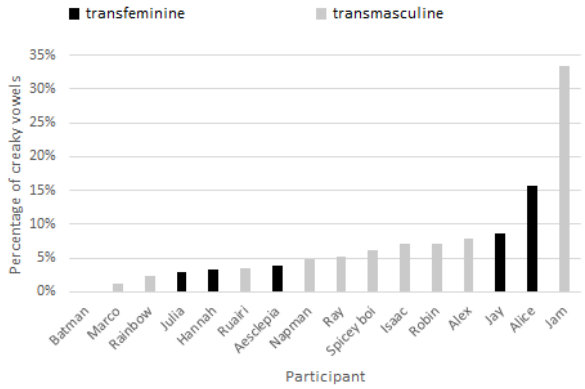


Figure 3: Percentage of creaky vowels used by individual participants



4. DISCUSSION

4.1. /s/

It was predicted that TM speakers may have a lower COG than TF speakers. This prediction was based on previous findings that cisgender men tend to have a lower COG than cisgender women, and assumed that participants' gender identity and attempts to distance themselves from speakers of the gender they were assigned at birth would take precedence. However, TM speakers have a higher COG than TF speakers, suggesting other factors must play a role. Here we consider the potential influence of physiology, accent, and non-binary and queer identity.

Physiology is a possible influence. Some authors [9] point to potential physiological differences between cisgender men and women to explain differences in the acoustic properties of /s/. As [11] found a correlation between palate size and the acoustic properties of /s/, potential physiological differences between the TM and TF speakers or between individual speakers may be at play here. However, the present study did not consider palate size differences, so the impact of physiology here is unclear.

Participants' accents may also play a role; generally, participants from the south of England (Aesclepia, Alice, Isaac, Napman, Alex) had a higher COG than participants of the same gender category from elsewhere. However, due to the small sample size, this could not be investigated further.

A third possible influence is participants' queer and non-binary identities. In his study of /s/ in TM speakers, Zimman [35] explains much of the variation in his participants' COG in terms of participants' non-binary and queer identities and gender presentation. In the present study, Isaac reported not minding if his voice sounded feminine or gay because of his identity as a gay man; this may be reflected in this mean COG of 7346Hz, which is on the higher side of what has previously been found for cisgender male speakers, but within the range of gay-sounding speech in UK English [16]. However, all participants in the present study identified as LGB+ outside of their trans identity and many also identified outside of the gender binary, and there is no clear relationship between participants' specific identities and COG for /s/.

4.2. Creak

Based on previous findings that cisgender men are creakier than cisgender women and the low pitch of creak, it was predicted that TM speakers would use more creak than TF speakers. However, there was no significant difference between the two groups.

This finding could suggest that trans speakers do not recruit creak in negotiating their identities. Looking at cisgender speakers, [14] found that female speakers of Modified Northern and RP used creak in an average of 6% and 7% of syllables respectively, while male speakers of Modified Northern and RP used creak in 61% and 23% of syllables respectively. Here, most TF speakers use creak in 3-9% of vowels, suggesting that TF speakers at least appear to be using a lack of creak to avoid indexing a masculine identity and creating the perception of low pitch. The creakiest TF speaker, Alice, uses creak in 16% of vowels. Alice mentioned being raised by her father and grandparents who came from Yorkshire but lived in the south of England and said this had affected her accent, implying she may have predominantly acquired her speech from male speakers of Modified Northern. While Alice is creakier than many in this sample, given that [14] found male speakers of Modified Northern to be par-

ticularly creaky, she may not be particularly creaky for someone of her linguistic background.

While TM speakers had low rates of creak overall, Jam stood out by using creak in 33% of vowels. This may be because they reported having actively attempted to make their voice sound deeper and felt that they had succeeded in this. It is possible that rather than lowering their f0, they may have been using creak to create the perception of a lower pitch.

[2] speculate that hormonal fluctuations and laryngeal changes caused by testosterone during puberty may lead to increased rates of creak. However, similar to previous findings by [3], the TM participants here in the early stages of testosterone therapy (Ruairi and Batman) appear to use fairly low rates of creak, suggesting that in adults undergoing testosterone therapy, the laryngeal changes of testosterone do not cause increased creakiness.

The data here comes from read speech, which has been found to be less creaky than spontaneous speech [3]. Additionally, the amount of creak used may have been different if participants had read a passage rather than single sentences. Further, the creak detection algorithm only identifies 81% of auditorily coded creak [18]. Thus, the results reported here may not representative of participants' audible creak usage in daily life.

4.3. Transgender speakers and style

While TM speakers had a higher COG for /s/ than TF speakers, there was no difference in creak between the two groups. These findings will now be considered together, within a wider context, because social meaning in variation comes when different linguistic resources are clustered together [8] and particularly in trans speakers, a variant can have very different meanings in different contexts [34].

Language socialisation experiences are a possible influence that some participants noted in their interviews. Ray (TM) mentioned they had only come to identify as trans during adolescence, had gone to a single-sex girls' school and had not been around men growing up. They said this meant they did not know what a masculine speech style sounded like, so had difficulty aiming towards it. These experiences may contribute to their having the highest mean COG out of these participants (9034Hz), combined with low creak usage (5%).

Environmental factors may also contribute. Many participants reported that when they had first come out as children or teenagers, they had been prevented from coming out fully as a result of living in a transphobic environment. Some participants noted how their environment affected the way that their gender presentation and speech. For example, Jay (TF) reported that they wanted to present more femininely but chose a masculine presentation because it was easier - this may be reflected in their speech, as they have a fairly low mean COG at 6061Hz and, while not especially creaky, use more creak (9%) than many other participants. Similarly, Spicey Boi (TM), who has a COG of 8359Hz and creak in 6% of vowels, reported finding it difficult to present in a masculine way because of how he was perceived, noting that he spoke in a more feminine way at work around customers who assumed he was female.

Environmental factors and socialization experiences can also interact in many cases. Aesclepia (TF) reported that she had never spoken in a particularly masculine way, but that she had had to try to make her voice sound more masculine during adolescence to avoid being bullied at school. With a low amount of creak (4%) and a mean COG of 6777Hz, Aesclepia's voice could be considered more typically feminine than the other TF participants - but her experience during adolescence may explain why her speech still inhabits a middle ground between masculine and feminine norms.

Creak and /s/ are only two of the features that participants may be using as part of a wider linguistic style. Participants remarked on pitch, lexicon, intonation, speech rate and loudness as features that had changed in their speech since coming out, or that they wished to change. This is evident in the speech of Alex, a trans man, who exhibits a high mean COG of 8649 Hz and creak in 8% of vowels. Despite not being on testosterone, Alex appears to have a low f0 of 130-160Hz, offsetting other more typically 'feminine' features in his voice. Future research would benefit from examining a wider range of variables to investigate how trans speakers incorporate different variables into their wider linguistic style. Perceptual work on how listeners' perceive the voices of trans speakers and how trans listeners perceive gender in the speech of others may be useful to guide the choice of variables examined in production studies.

5. CONCLUSION

Overall, these results show that creak use and /s/ in trans speech are not determined solely by the identities, socialization, or environment of the speaker; instead, these factors interact to produce variation. Future research on trans speech should consider not only creak and /s/, but a wider array of linguistic resources, to gain a more complete picture of trans speakers' linguistic practices.

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