Biology, socialization and identity: Accounting for the voices of female-to-male transsexuals

Lal Zimman (University of Colorado, Boulder)

Differences between men's and women's voices are frequently attributed to physiological differences between the sexes. However, ample linguistic literature has shown that many of these distinctions are in fact socially learned (see Simpson 2009 for a review). One particularly strong piece of evidence for the social nature of the gendered voice comes from the literature on childhood language socialization, which shows that boys and girls taken on gender-appropriate phonetic traits long before physiological differentiation occurs (e.g. Sachs et al. 1973). Even features linked to biology – such as vocal pitch – differ across cultures, as can be seen in work like Yuasa's (2009) treatment of the pitch in American English and Japanese. However, we still lack a comprehensive understanding of a number of issues, among them: which phonetic features are influenced by biology, and how strong is this influence? Which are learned as part of language socialization? Finally, how malleable are these features beyond childhood?

I take steps toward addressing these questions by focusing on a group that is almost completely absent from the linguistic literature: female-to-male transsexuals, or trans men. Trans men are individuals who are assigned to a female gender role at birth and raised accordingly, but who come to identify as men and take steps to transition from a female gender role to a male one. Previous studies of transsexuals' voices have shown that we can learn quite a bit from looking at speakers who cross the gender divide, though the focus has generally been on trans women (i.e. male-to-female transsexuals). For instance, Gelfer and Schofield (2000) analyzed the differences between trans women whose voices were perceived as male and those perceived as female and identified 160 Hz as a cross-over point that distinguished the two groups. Trans men, on the other hand, promise a unique set of insights for a number of reasons. First, one of the most common medical interventions sought by trans men is testosterone therapy, which produces many of the physiological changes men typically experience during puberty, including a marked drop in vocal pitch that usually results in a male-sounding voice. Second, in addition to shedding light on gender differences in the voice, trans men also show how different kinds of masculinity are perceived, as my work on gay-sounding voices among trans and non-trans men has shown (discussed below). Finally, trans men underscore the importance of viewing masculinity as a social achievement. As Kulick (1999) notes, it is all too easy to assume that trans women are actively constructing their femininity while treating trans men as if they are doing nothing in particular by accomplishing masculinity. In other words, the near-exclusive focus on trans women over trans men reinforces the unmarked status of male speech.

In this paper I discuss two analyses I have done as part of an on-going investigation of the properties of trans men's voices. The first of these, which sheds light on the role of language socialization in shaping the gendered aspects of an individual's voice, focuses on the similarities and differences between the voices of trans and non-trans men when it comes to the perception of sexual orientation. For this project, I have thus far analyzed the voices of six trans men and seven non-trans men whose voices have been rated by listeners on a scale of gay- to straight-sounding on the basis of speakers' readings of the Rainbow Passage. The goal was to discover whether trans men would be perceived as gay-sounding, and, if so, whether this might be related to their experiences with gender socialization early in life. This was motivated in part by the observation made by Smyth and Rogers (2002), among others, that many of the phonetic features linked to gay-sounding men's voices are also known to distinguish women's voices from men's. As I hypothesized, the listeners in this study did perceive the trans men as gay-sounding, and in

fact there was no significant difference between the ratings given to the trans men and the gay non-trans men (all of whom were also gay-sounding). At the same time, both of these groups were rated as significantly more gay-sounding than the straight men. Given that none of the trans men who participated in this part of my study identified as gay, nor had networks containing many gay men, and given that many gendered phonetic features are acquired during childhood language socialization, it seems likely that trans men's experiences growing up in a female gender role has some influence on how their voices are perceived in adulthood after transitioning to a male social role.

Having established that the trans men in my study were perceived as gay-sounding, I also considered whether the trans and gay groups were as similar acoustically as they were perceptually. While the precise findings of this analysis are beyond the scope of the current discussion, what is significant is that I found very few differences between the trans men and non-trans men, taken as groups. For most of the features I measured, including mean F0, F0 range, degree of creaky versus breathy voice quality, mean F1 and F2, the degree of expansion or peripherality in the vowel system, and the spectral properties of /s/, the trans men fell within the range typical among the non-trans men.[1] The only exception was the center of gravity for /s/, which was higher among the trans men than the non-trans men. What these similarities show is that childhood gender socialization is far from deterministic; these trans speakers either failed to acquired normative feminine styles during childhood and/or were able to change the gendered characteristics of their voices during gender role transition. In either case, self-defined identity plays a crucial role in filtering and shaping speakers' reception of socializing forces.

The second analysis that is relevant to this discussion focuses on intra- and inter-speaker variation among the trans men I have recorded. This project builds on the speaker pool discussed above, with the addition of two additional speakers. These individuals were between 19 and 51 years old, and had been on testosterone – which is typically a lifelong treatment regimen –from seven months to 10 years. However, I will begin by focusing on the intra-speaker variation found among two of these speakers who were available for follow up recordings a year after the initial meeting. This approach mirrors the one taken by one of the only other studies done on the acoustics of trans men's voices, carried out by van Borsel and his colleagues (van Borsel et al. 2000; Adler & van Borsel 2006). Based on read speech, these authors found a significant drop in F0 during the speakers' first year on testosterone, along with a significant narrowing of pitch range; one speaker's mean went from 215 Hz to 155 Hz, while the other dropped from 160 Hz to 132 Hz. My findings, however, show that further masculinization occurs beyond the first year.

One of the two speakers I was able to record twice, who I call Sam, is a college student from Massachusetts, living in Colorado, who was 21 and had been on testosterone for 11 months when we first met. The other speaker, Phil, was a 24 year old Californian who had been on testosterone for eight years. As individuals at different points in the gender role transition process, Sam and Phil give a broad indication of how far the phonetic masculinization process extends. Beginning with Sam, Table 1 shows the changes that occurred between our first and second recording session, made when Sam had been on testosterone for 11 and 23 months, respectively. Due to space concerns, I focus on measurements made from a set of 52 stressed vowels in the same ~30 second portion of the Rainbow passage taken from each speaker's recording, and have omitted my analysis of /s/ due to its relative complexity. Looking at the p-

[1] Note that the men in this study included those with both normative and non-normative speaking styles. More differences are found when the trans men are compared only to straight-sounding non-trans men. However, I believe such a comparison would be artificially restrictive.

values in Table 1, it's clear that a number of the differences between the measurements taken when Sam had been on testosterone for 11 months and those from his second recording at 23 months are highly statistically significant. His mean F0 is significantly lower in the later recording, though there is no significant change in his pitch range. His first and second formants show no significant change, which is notable considering that Sam, whose recording at 11 months on testosterone was included in the first analysis mentioned above, was already among those trans speakers who had formant values indistinguishable from the non-trans men in the study. Sam's voice is also significantly creakier in quality during the second recordings, though the gendered implications of this change are less clear. As I just mentioned, space restrictions preclude the presentation of my analysis of /s/, but there too Sam showed masculinization, particularly in center of gravity. In sum, then, it seems that Sam experienced significant linguistic changes during his second year on testosterone.

Table 1

Feature	*11 months*	*23 months*	*Difference*	*P-value*
Mean F0	129 Hz	111 Hz	-13.95%	0.001016
F0 range[2]	79 Hz	76 Hz	-4%	Not significant
Mean creakiness[3]	-1.724528302 db	-8.294339623 db	-380.96%	0.0000000002404
Mean F1	493 Hz	481 Hz	-2%	Not significant
Mean F2	1737 Hz	1720 Hz	-.9%	Not significant

Looking at the measurements of Phil's two recordings, which are represented in Table 2, we see a somewhat different picture. In this case, the only statistically significant difference is in voice quality. However, even though it reached significance, this change is much less dramatic than the one experienced by Sam, and did not produce an audibly creakier quality. Unlike Sam, Phil did not show any consistent masculinization when it comes to /s/. We might conclude, then, that what we see here is simply ordinary intra-speaker variation and after nearly a decade on testosterone, Phil's voice is no longer undergoing significant masculinization.

Table 2

Feature	*8.5 years*	*9.5 years*	*Difference*	*P-value*
Mean F0	92 Hz	98 Hz	+6.52%	Not significant
F0 range	33 Hz	33 Hz	0	Not significant
Mean creakiness	0.866037736 db	-0.6415094 db	-174%	0.0000000002404
Mean F1	551 Hz	534 Hz	-3%	Not significant
Mean F2	1651 Hz	1752 Hz	+6.12%	Not significant

[2] Measured here as the mean difference between highest and lowest pitch points within each intonational phrase.

[3] Measured in terms of H1-H2. Positive numbers indicate relatively breathier quality while negative numbers indicate relatively creakier voice quality.

Finally, an inter-speaker comparison of all eight trans speakers showed that individuals who had been on testosterone longer had lower mean F2 ($p < 0.035$), providing further evidence for ongoing masculinization beyond the first year on testosterone. Additionally, older speakers showed a more negative skew in the distribution of energy in /s/, which is linked to both female and gay-sounding male speakers. Because these speakers have spent more of their lives occupying a female gender role than the younger men have, it may be that certain speaking patterns associated with women are more deeply entrenched in the older group. In total, this evidence points to the conclusion that language socialization is a process that takes place throughout the lifetime.

Researchers of gender socialization have often focused on the way that the process works to reinforce gender inequality by forcing children into tightly restricted (and hierarchically arranged) roles on the basis of biological sex. However, the research I have presented demands a somewhat different perspective. Although the dimension of power cannot be denied, those undergoing socialization are not passive recipients of the social order, but rather have considerable agency in determining what kinds of gendered styles they take on. Nor are gendered phonetic traits acquired during childhood alone, for even as early life experiences do seem to play an important role, quite a bit of change is possible beyond childhood and adolescence as well. In one sense, the ongoing nature of socialization promises quite a bit of room for change, but it also has the power to constrain speakers by making change more difficult over time. In short, language socialization is a process that interacts intimately with the complexities of identity throughout the lifetime in shaping the gendered characteristics of the voice.

References

Adler, Richard K. & John van Borsel (2006). Female-to-male considerations. In Richard K. Adler, Sandy Hirsch & Michelle Mourdaunt (eds.), *Voice and Communication Therapy for the Transgender/Transsexual Clients: A Comprehensive Clinical Guide*. San Diego, CA: Plural Publishing. 139-167.

van Borsel, John, Griet de Cuypere, Robert Rubens & B. Destaerke (2000). Voice problems in female-to-male transsexuals. *International Journal of Language & Communication Disorders* 35(3):427-442.

Gelfer, Marylou Pausewang & Kevin J. Schofield (2000). Comparison of Acoustic and Perceptual Measures of Voice in Male-to-Female Transsexuals Perceived as Female Versus Those Perceived as Male. *Journal of Voice* 14(1):22-33.

Kulick, Don (1999). Transgender and language. *GLQ*. 5(4):605-622.

Sachs, Jacqueline, Philip Lieberman, & Donna Erickson (1973). Anatomical and cultural determinants of male and female speech. In Roger W. Shuy & Ronald W. Fasold (eds.), *Language Attitudes: Current Trends and Prospects*. Washington, D.C.: Georgetown University Press. 74-84.

Simpson, Adrian P. (2009). Phonetic differences between male and female speech. *Language and Linguistics Compass* 3(2):621-640.

Smyth, Ron & Henry Rogers (2002). Phonetics, Gender, and Sexual Orientation. Paper presented at the the 2000 Meeting of the Canadian Linguistic Association, Toronto.

Yuasa, Ikuko Patricia (2009). *Culture and Gender of Voice Pitch: A Sociophonetic Comparison of the Japanese and Americans*. London: Equinox.