

# Phonation type as a stylistic variable: The use of falsetto in constructing a persona<sup>1</sup>

Robert J. Podesva

*Georgetown University, Washington, D.C.*

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Although the field of sociolinguistics has witnessed a growing interest in the sociophonetic aspects of segmental and intonational variation, few studies have examined variation in voice quality. This paper addresses the gap by investigating the stylistic use of falsetto phonation. Focusing on the speech of Heath, a speaker exhibiting considerable cross-situational variation, I show that when attending a barbecue with friends, Heath's falsetto is more frequent, longer, and characterized by higher fundamental frequency (f0) levels and wider f0 ranges. Advancing recent approaches to variation which treat linguistic features as stylistic resources for constructing social meaning, I draw on an analysis of the discourse contexts in which falsetto appears to illustrate that the feature carries expressive connotations. This meaning is employed to construct a 'diva' persona and may also participate in building a gay identity.

**KEYWORDS:** Phonation type, falsetto, stylistic variation, social meaning, persona, sexuality

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## 1. INTRODUCTION

In recent years, the field of sociolinguistics has witnessed a growing interest in the sociophonetic aspects of segmental variation, and to a lesser extent, intonational variation. In spite of great advances in these areas, few studies have examined variation in voice quality. This paper addresses the gap by investigating the stylistic use of the falsetto phonatory setting as well as creaky voice in the speech of Heath, a gay medical school student who exhibits a considerable phonetic range across situations. Situating Heath's falsetto utterances in their conversational contexts, I infer the social meaning of falsetto and show that variable phonation can be used as a resource to construct personae and perhaps gay identity.

Voice quality, also called phonetic setting, refers to the extragrammatical suprasegmental properties of speech resulting from the configuration of the vocal apparatus. As Foulkes (2002) points out, the term voice quality sometimes refers to supralaryngeal properties of speech like nasality, but is often used to describe only phonation type (e.g. creaky and breathy voice). Honikman (1964) and two decades later Scherer (1986) lamented the underexplored status of voice quality

in linguistics. Scherer suggests that methodological hurdles could be responsible in part for the scarcity of research on voice quality; there is reason to believe that the extreme complexity of the relationship between the production of voice quality and its acoustic consequences (Laver 1980; Nolan 1983) has deterred sociolinguists from investigating the phenomenon more thoroughly. Another twenty years have now transpired, and the number of studies on voice quality variation remains scant (Foulkes 2002, 2005; Thomas 2002). Nonetheless, a few noteworthy studies deserve mention.

Honikman (1964) was perhaps the first to explicitly comment on social axes of voice quality variation, impressionistically describing differences in oral setting between English and French. A number of other studies have followed a similar methodology, relying on trained phoneticians to describe the auditory properties of the voices under investigation. Most of these studies have aimed to characterize the voice qualities associated with particular speech communities, with Trudgill (1974) focusing on Norwich, Knowles (1978) on Scouse, Esling (1978) on Edinburgh, and Stuart-Smith (1999) on Glasgow. While distinct voice qualities appear to mark each of these communities, voice quality also distinguishes between groups within them. For example, when compared to middle-class speakers, working-class speakers in the Esling and Stuart-Smith studies made greater use of harsh voice and whispery voice, respectively.

Other studies have used the matched guise technique to access listeners' attitudes toward various voice qualities. Pittam (1987) shows that both Australian and American listeners accorded high status to English-speaking males with tense voices, consistent with Esling's (1978) observation that high prestige speakers in Edinburgh used more creaky voice. Pittam additionally reports that the same listeners attributed higher status to female speakers with breathy voices.

A final group of studies has turned to an acoustic approach for investigating voice quality. Pittam and Gallois (1986) correlate impressionistic labels for the breathy, creaky, tense, and whispery voice qualities with a variety of distinct acoustic properties. Investigating breathy voice and creaky voice among speakers of two dialects of British English, Henton and Bladon (1985, 1988) report a higher degree of breathiness among female speakers and a higher degree of creaky voice among male speakers. In addition to exhibiting sex-based differences in phonation, creaky voice distinguishes between speakers of the two dialects, with Northern speakers producing more creak than RP (Received Pronunciation) speakers.

Although these studies have brought about a much greater understanding of the link between voice quality features and the social factors affecting their use, they leave two research gaps. First, while they have attended to most kinds of phonation, such as breathy, creaky, and whispery voice, they have not considered another commonly employed phonation type: falsetto, a phonatory setting in which the vocal folds are adducted tightly and stretched lengthwise, resulting in a high fundamental frequency (Esling 1984).<sup>2</sup> Second, although these studies

have examined how voice quality patterns are distributed across speakers, none examine intraspeaker variation patterns. Implicit in the approach of previous studies is the belief that voice quality is a static characteristic of individuals, that different voice qualities distinguish one social group from another.<sup>3</sup> This study seeks to partially fill these gaps by investigating the intraspeaker, stylistic variation patterns of a speaker who employs falsetto phonation.

The glottal configuration for falsetto gives rise to rapid vocal fold vibration, correlating acoustically with a high fundamental frequency ( $f_0$ ) level which can range from 240 Hz to 634 Hz in the speech of men (Hollien and Michel 1968; Svec, Schutte and Miller 1999). This contrasts sharply with the average modal voice  $f_0$  level for adult men of approximately 100 Hz (e.g. 106 Hz in Eady 1982). Using the high  $f_0$  levels characteristic of falsetto phonation is a socially marked behavior, at odds with more culturally normative pitch practices for men, and may be involved in the performance of stereotypical gay identity. Indeed, much of the research on male pitch patterns has focused on the potential role of fundamental frequency as a marker of gay male identity.

Work on the pitch properties of gay-sounding voices began with Gaudio's (1994) experimental study on listeners' perceptions of the speech of gay and straight men. After recording speakers in a laboratory setting, Gaudio asked listeners to identify the sexual orientation of the speakers. He found that even though listeners were adept at correctly identifying whether or not speakers were gay, neither  $f_0$  range nor  $f_0$  variability provided sufficient cues to yield a gay percept. **These findings suggest that  $f_0$  is not the only phonetic resource available for performing gayness, and have inspired a number of researchers to look beyond prosody and consider the potential role of segmental variables in performances of gayness** (Crist 1997; Linville 1998; Rogers, Smyth and Jacobs 2000; Podesva, Roberts and Campbell-Kibler 2002; Pierrehumbert, Bent, Munson, Bradlow and Bailey 2004; Munson, McDonald, DeBoe and White 2005; Levon 2006; Munson, Jefferson and McDonald 2006).

The most comprehensive study to investigate pitch as an acoustic correlate of perceived gay male identity is the ongoing project of Smyth, Jacobs, and Rogers (2003). They recorded 25 subjects (17 gay, 8 straight) speaking three kinds of text (scientific and dramatic reading passages as well as responses to an open-ended question designed to elicit a spontaneous speech sample). Forty-six listeners were then asked to categorize speakers as gay/straight or masculine/feminine. Smyth, Jacobs and Rogers found that although listeners appeared to associate pitch with masculinity/femininity, there was no correlation between pitch and sexual orientation ratings.

Thus, even though in many English-speaking communities the lay person commonly identifies high pitch as a property of gay-sounding voices, the link between the phonetic feature and the identity category has not been established empirically in any community, not even in the speech of a single individual. The observed tendency for gay-sounding men to resist using  $f_0$  stylistically in these studies, I argue, stems less from characteristics of the speakers themselves

than from the constraints imposed on them by the research paradigm used to analyze their speech. Speaking with high  $f_0$  levels is not simply a way to sound gay, but a way to sound flamboyant, and reading passages are unlikely to inspire flamboyance in any reader, especially in the confines of a phonetics laboratory recording booth. The value of the controlled experimental design of laboratory studies cannot be denied, particularly with regard to the careful execution and experimental rigor characterizing the study by Smyth, Jacobs, and Rogers (2003). Their approach goes far in controlling the form of the data, facilitating comparisons across speakers. However, in addition to controlling the form of the data, the design constrains speakers' performances. In a critique of formal, scheduled sociolinguistic interviews Wolfson (1976: 202) asserts that 'people do not speak in a social or situational vacuum,' yet reading passages and laboratory methodology require subjects to speak in the kinds of situations Wolfson warns against. Smyth, Jacobs, and Rogers improve on previous studies by considering spontaneous speech in addition to read speech. It must be granted, though, that speakers' stylistic ranges when responding even to carefully designed questions pale in comparison to the linguistic performances typical of conversational interactions, as illustrated in the attention to speech style-shifting literature (e.g. Labov 1972, 2001). If the  $f_0$  properties of speech can be employed to perform gay identity, perhaps they are only likely to be used in such a way when speakers find themselves in situations in which gay identity matters, that is, in conversational contexts yielding what Wolfson calls 'appropriate speech.' When it comes to the use of falsetto, conversational speech may be the only appropriate speech.

The research paradigm used to examine gay speech has been based on the assumption that the place to look for variation is between groups, under the rationale that linguistic features appearing in the speech of those who sound gay (and not in the speech of those who sound straight) can be labeled gay. Podesva, Roberts, and Campbell-Kibler (2002) identify two flaws with this kind of essentialist reasoning. First, it erases the linguistic diversity within the gay community (Penelope and Wolfe 1979; Jacobs 1996). Second, it reifies as gay linguistic practices that permeate the whole of society, mainstream and marginal alike. Moreover, the focus on interspeaker variation also fails to recognize the symbolic potential of intraspeaker variation. As noted by Zwicky (1997), variation in gay-sounding speech occurs not only between individuals, but within individuals depending on the situation, and speakers can make use of such variation to do various kinds of social work.

It should be noted, then, that previous scholarship on both the social dimensions of voice quality variation, and the phonetic features of sounding gay, take an approach that examines linguistic differences between pre-defined groups only. Following recent constructionist approaches to variation (e.g. Eckert 2000, 2003, 2005; Zhang 2001, 2005; Moore 2003), rather than viewing variables as markers of pre-defined social categories, I view them as resources for the construction of social meaning. I therefore examine

variation in the speech of a single speaker across speaking situations (intended in the broadest sense of the word to encompass not only context, but topic and audience as well) to get a window into the ways he manipulates phonation dynamically and strategically to construct personae and perhaps gay identity.

This work, part of a larger project on the speech of gay professionals, focuses on the use of falsetto by Heath, an individual who exhibits a considerable phonetic range not only with regard to voice quality, but also segmental and intonational phonology (Podesva 2006). Before proceeding, it is necessary to say a word about the case study design of this paper. Although community-wide survey studies comparing large numbers of speakers are invaluable to the tasks of explaining the social influences on language change and understanding the ideologies and values that define speech communities, they are not well suited for investigating what variation means to speakers and hearers in the here and now. Finer-grained analyses delving deep into an individual's linguistic performances, though they lack generalizability, may offer more insight into why speakers make the linguistic choices they do. As Schilling-Estes (1998) points out, the study of how individuals speak differently in different situations, or style-shifting, has become an object of study in its own right. The case study may be the best method of analysis for developing an understanding of why speakers style-shift:

To arrive at the principles underlying style-shifting in real-life conversational interaction, individual and small-group studies are more appropriate than large-scale surveys, because small-group studies allow for detailed examination of the conversational contexts and personal identificational considerations that surround the style shifts in question. (Schilling-Estes 1998: 55)

Indeed, some of the most illuminating studies on the motivation for style-shifting have drawn conclusions based on the case study (Hindle 1979; Rickford and McNair-Knox 1994; Johnstone 1996; Coupland 2001a, b; Sweetland 2002). In the tradition of these studies, this paper attempts to shed new light on the forces that underlie style-shifting in phonation type, venturing a step further to investigate what shifts in style mean.

In the following section, I outline the design of the study, providing an explanation of recording procedures, speaker and situations under consideration, and data analysis techniques. I begin the discussion of results in section 3 by providing an acoustic analysis of Heath's use of falsetto, particularly as he uses it differently across speaking contexts. In the following section I argue that another phonation type, creaky voice, can be used stylistically in concert with falsetto to expand *f*<sub>0</sub> ranges to their extremes, offering acoustic evidence for this trend. In section 5, I continue with a discussion of the social meaning of falsetto, arguing that this phonation type is a phonetic means of performing expressiveness and by extension a diva persona, which together may lead to the perception of stereotypical gayness. I conclude by discussing the implications of the present study.

## 2. THE STUDY

### 2.1 *Subject and situations*

The subject of this study is Heath, a white medical school student in his mid-twenties, whom I have known well for six years. He grew up on Long Island and attends an East Coast university, where he is concentrating on developing a specialization in clinical psychiatry. In his social life, Heath is openly gay and dating a fellow medical school student, Jack. *Although Heath does not attempt to hide his sexual orientation in his professional life, it is not often a relevant aspect of his professional identity.*

Heath was instructed to record himself in as wide a variety of settings as possible, but only in situations in which he and his interlocutors would feel comfortable being recorded. I was not present for the recordings, hoping that my absence would yield more naturalistic, less self-conscious recordings. Heath was outfitted with a walkman-sized cassette recorder (Sony WM-SR10) and a lavalier microphone (Sony ECM-C10).

Three situations representing Heath's range of stylistic performances were chosen for analysis. I provide a basic description for each situation here, though the particulars of these situations and Heath's behavior in them will be discussed in greater detail as they become relevant to the patterns observed in the data. *The first situation, the one which will be discussed in greatest detail, is a barbecue with four close friends (two male, two female), all fellow medical school students to whom Heath is out of the closet.* The five friends form a rather close-knit group, spending a great deal of time together while eating meals, watching movies, and studying. The barbecue, which takes place at Eliza's apartment complex, is very casual. Topics of conversation are generally informal, ranging from food preparation to habits of consumption. The next situation, a phone conversation primarily between Heath and his father, is also rather informal. Heath is out to his father, though the topic of Heath's sexuality is rarely broached and does not come up in the course of the phone conversation. *In the final situation, Heath is meeting with a patient, an older white male with Parkinson's disease. During their meeting, Heath reports on the patient's basic physical health and goes on to test his reflexes and short-term memory.*

### 2.2 *Data analysis*

The recordings, each lasting 30 minutes, were digitized at a sampling rate of 11,025 Hz for subsequent acoustic analysis in Praat (version 4.0). All of Heath's utterances were transcribed, and sentences containing falsetto were tagged, based on an auditory analysis. Falsetto was identified on a perceptual, rather than acoustic, basis because no one acoustic correlate of falsetto can adequately differentiate between falsetto and modal voice (the unmarked phonation type characterizing voiced sounds).



Most of the recent phonetic scholarship on the falsetto phonation type has investigated its articulatory (Esling 1984; Hirano, Kiyokawa and Kurita 1988; Svec, Schutte and Miller 1999) rather than acoustic properties, though some earlier work by Colton (1973a, b) explores the acoustic dimensions of falsetto. Falsetto phonation, when compared to modal voice, has been shown to exhibit a higher fundamental frequency, lower intensity (Colton 1973a, b), and fewer high-energy harmonics (Colton 1972). These acoustic parameters are insufficient for objectively distinguishing between falsetto and modal voice, however, as the two phonation types exhibit considerable acoustic overlap along each dimension (Colton and Hollien 1973). Colton and Hollien (1973) ultimately conclude that no single acoustic parameter can reliably distinguish falsetto from modal voice. Rather, they suggest that a given phonation type is unique not so much on an acoustic dimension, but on an articulatory one. The physiological state characterizing a given phonation type gives rise to various acoustic combinations of f0s, spectra, and intensities. It is in these non-straightforward combinations, they argue, that perceptual differences arise.

Although identifying falsetto based on acoustic criteria poses a problem, falsetto and modal voice can be reliably distinguished from one another perceptually. Colton and Hollien (1973) report that listeners (singers and non-singers) correctly discriminated between the falsetto and modal registers with 95 percent accuracy, even with stimuli at the same f0. Thus, in this study I distinguished falsetto and modal voice from one another on perceptual grounds, though, as I discuss below, an acoustic analysis was performed once the presence of falsetto was determined. In order to ensure the accuracy of my falsetto identifications, I prepared a representative subset of Heath's falsetto and modal utterances (20 utterances comprising 139 syllables) and asked an informant with some degree of formal training in both voice (singing) and phonetics to identify syllables bearing falsetto. The informant's judgments agreed with mine with 94 percent accuracy. It is also worth noting that all tokens with differing judgments exhibited the same pattern, with the informant choosing modal voice for tokens I had labeled as falsetto (i.e. there were no 'false alarms'). This pattern suggests that the informant and I used similar criteria for identifying falsetto, with the informant applying slightly more conservative standards.

For all utterances containing falsetto, pitch tracks, waveforms, and wide-band spectrograms were generated to aid in acoustic analysis. Using Praat, the following measurements were taken for all utterances: maximum f0; time of maximum f0; minimum f0; time of minimum f0; duration of falsetto and duration of creaky voice.<sup>4</sup> From these measurements, formulae were used to derive a number of other variables. The f0 range was taken over the entire utterance, subtracting the f0 minimum from the f0 maximum. Finally, the rate at which the f0 changes was grossly estimated as the absolute value of the slope of the line connecting the f0 maximum and the f0 minimum (the difference between the maximum f0 and minimum f0 divided by the difference between the time of

**Table 1:** Acoustic measures and method of calculation

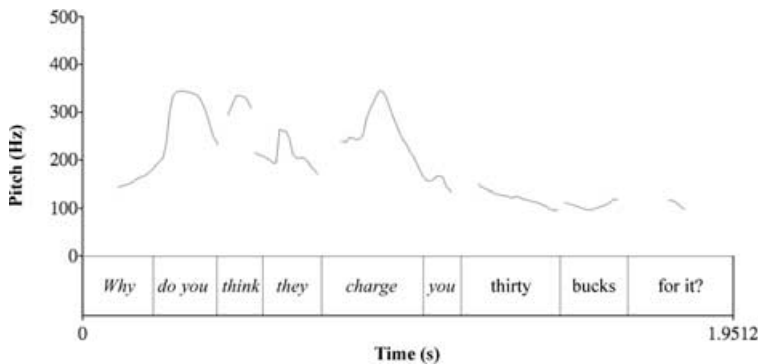
Acoustic measure	Method of calculation
maximum f0 (Hz)	
duration of falsetto (ms)	t (falsetto end) – t (falsetto begin)
duration of creaky voice (ms)	t (creak end) – t (creak begin)
f0 range (Hz)	f0 max – f0 min
rate of f0 change (Hz/ms)	(f0 max – f0 min)/[t (f0 max) – t (f0 min)]

the maximum f0 and time of the minimum f0). The acoustic measures under consideration are summarized in Table 1.

3. THE STYLISTIC USE OF FALSETTO

Figure 1 shows the pitch track for one of Heath’s representative falsetto utterances. Time is represented on the horizontal axis, and fundamental frequency on the vertical axis. The utterance begins with a rather long stretch of falsetto, on the words ‘*Why do you think they charge you.*’ Words pronounced in falsetto are indicated with italics, a convention I follow throughout. Modal voice, the typical vocal fold configuration for voiced sounds, is represented with plain typeface. In this example, the f0 reaches its peak on the word *charge* at 347 Hz, considerably higher than the average level for adult males of around 100 Hz.

Heath uses falsetto most frequently at the barbecue with friends, less frequently on the phone with his family, and least commonly meeting with his patient ( $\chi^2 = 12.70$ ,  $df = 2$ ,  $p \leq 0.01$ ). As shown in Table 2, Heath employs falsetto in 9.07 percent of his utterances at the barbecue, over twice as frequently as he uses falsetto on the phone or with his patient. Although this may seem only a small percentage of the utterances, falsetto actually does a great deal of stylistic work. As discussed by Eckert (1987), some variables contribute more to the establishment



**Figure 1:** Representative pitch track of a falsetto utterance



**Table 2:** Frequency of falsetto occurrence across situations

	Barbecue	Phone	Patient
falsetto utterances (N)	35	10	15
total utterances (N)	386	260	403
percent falsetto utterances (%)	9.07	3.85	3.72

of social identity than others. Falsetto, with its high degree of perceptual salience, is one such variable. Even at the low end of its range, falsetto is higher than the average (English-speaking) female  $f_0$  mean of around 200 Hz (202 Hz in Yamazawa and Hollien 1992, and 224 in Stoicheff 1981 for women in their twenties).

In addition to exhibiting situational differences in the frequency with which falsetto occurs, Heath's speech shows stylistic differences in the phonetic character of falsetto. The duration, maximum  $f_0$ , and the  $f_0$  range of falsetto all vary according to the situation, as shown in Figure 2. First, Heath's mean falsetto duration is significantly longer when speaking with friends at the barbecue than either when on the phone ( $t = 3.14$ ,  $df = 42$ ,  $p \leq 0.002$ ) or when meeting with his patient ( $t = 3.69$ ,  $df = 38$ ,  $p \leq 0.0004$ ). Second, his mean maximum  $f_0$  in falsetto utterances at the barbecue was higher than in the other two situations (vs. phone conversation:  $t = 2.49$ ,  $df = 12$ ,  $p \leq 0.014$ ; vs. meeting with patient:  $t = 3.09$ ,  $df = 39$ ,  $p \leq 0.002$ ). Third, Heath's mean  $f_0$  range in falsetto utterances is wider at the barbecue than in the other two settings (vs. phone conversation:  $t = 1.56$ ,  $df = 11$ , statistically suggestive at  $p \leq 0.07$ ; vs. meeting with patient:  $t = 2.19$ ,  $df = 25$ ,  $p \leq 0.019$ ). The rate of  $f_0$  change in falsetto utterances does not vary according to the speaking situation. Thus it appears that, of the phonetic parameters falsetto can vary along, Heath makes stylistic use of duration, maximum  $f_0$ , and  $f_0$  range. Moreover, he uses these variables in the same way, with the most perceptually salient variants appearing when speaking to friends in the barbecue setting. That is, Heath's falsetto is longer (in duration), higher (in  $f_0$ ), and more variable (in  $f_0$  range) at the barbecue.

A final situational difference in Heath's use of falsetto lies in the types of utterances on which falsetto can appear. In the barbecue setting, falsetto appears freely on a wide variety of utterances, ranging from questions ('What are you talkin' about?') to quotations ("I'm gonna fail!") to evaluative exclamations ('You people are just so screwed up!'). The landing sites of falsetto are more limited in the phone conversation, with falsetto appearing mostly on questions ('Whatcha up to?') and on the discourse marker 'oh.' Falsetto is constrained even more severely in the patient meeting, with 14 of the 15 falsetto tokens appearing on the discourse markers 'okay' or 'alright.'

To summarize thus far, Heath's falsetto appears more frequently, is acoustically more extreme, and attaches to a wider variety of utterances in the barbecue setting.

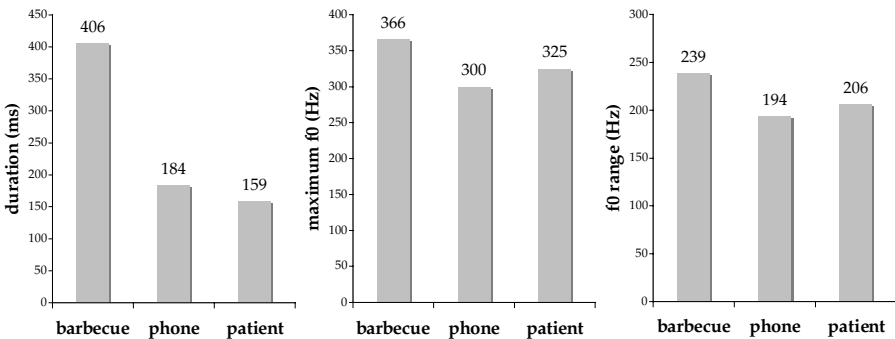
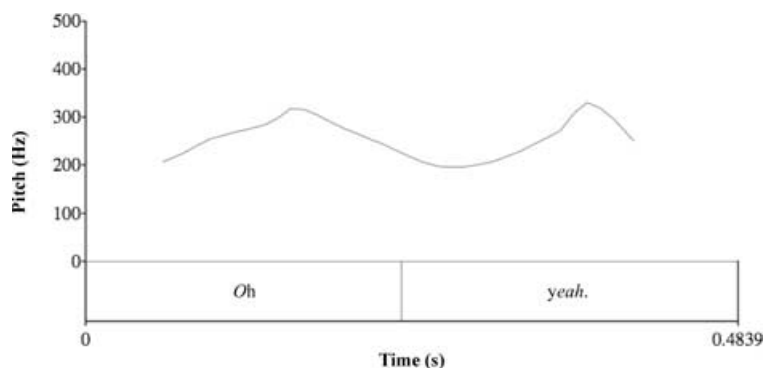


Figure 2: Mean falsetto duration, maximum f0, and f0 range across situations

4. THE STYLISTIC USE OF CREAKY VOICE

Heath’s use of falsetto is frequently accompanied by creaky voice, a voice quality roughly the opposite of falsetto. While falsetto is characterized by stretched vocal folds vibrating rapidly, creaky voice is marked by somewhat bunched vocal folds in slow vibration (Esling 1984).

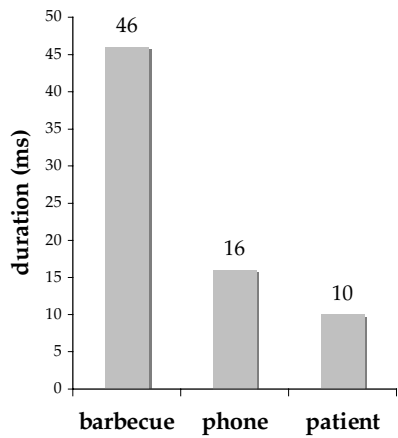
Before discussing the stylistic uses of creaky voice, it should be noted that three internal factors promote the appearance of creaky voice (alongside falsetto): glottal segments; ends of utterances; and vocal fold elasticity. First of all, word-initial glottal stops, common among vowel-initial words in English (Dilley, Shattuck-Hufnagel and Ostendorf 1996), sometimes appeared in falsetto utterances. Heath produces three glottal-initial words in the utterance, ‘Ooh, ooh, a little vent thing,’ where creaky voice is represented in the transcription with underscores. Glottal variants of word-final /t/ also motivate the appearance of creaky voice, as in ‘What are you talkin’ about?’ Second, ends of utterances tend to condition creaky voice (Henton and Bladon 1988), which is generally attributed to declination, or the steady drop in f0 throughout the course of an utterance (Ladefoged 1993). According to Sternberg, Wright, Knoll, and Monsell (1980), the amount of declination in English is typically 20–40 Hz over the course of an utterance (utterance types were sentences and lists). In addition to using falsetto in the utterance, ‘And this *other* kid, like, two minutes *later*, has a little *gun*, *completely* separate area,’ Heath ends the relatively lengthy turn with a creaky variant of the word ‘area.’<sup>5</sup> Finally, the elastic properties of the vocal folds partly encourage the occurrence of creaky voice alongside falsetto. Van den Berg (1958) reports that the vocal ligament must be stretched between 20 percent and 40 percent to achieve falsetto phonation, requiring a significantly large contraction of the cricothyroid muscle. Once this longitudinal force on the vocal ligament is released, the vocal folds, due to their elastic properties, can snap through the neutral position characteristic of modal voicing. The phonatory result of this contracted vocal fold position is creaky voice.



**Figure 3:** Smooth transitions between modal voicing and falsetto

Although vocal fold elasticity may promote creaky voice and abrupt  $f_0$  changes into and out of falsetto (Svec, Schutte and Miller 1999), falsetto need not be accompanied by creaky voice. In addition to having elastic properties, the vocal folds are composed of hundreds of muscles and ligaments with which speakers can finely control glottal states (van den Berg 1958). Heath's data reveal that his transitions from falsetto to modal voice can be quite gradual, as evidenced by the utterance '*Oh yeah*' in Figure 3, in which the phonation type moves smoothly from falsetto into modal voice by the end of the first word, '*Oh*,' and back into falsetto for the second, '*yeah*.' This finding points to the importance of conversational data for the study of speech, not only in sociolinguistics, but in phonetics as well. Phonetic studies on configurations of the glottis are typically performed using excised human larynges or living larynges producing isolated vowels (Esling 1984; Hirano, Kiyokawa and Kurita 1988; Svec, Schutte and Miller 1999), and although these studies are invaluable in their own right, they are limited by their inability to allow room for a speaker to realize social goals while producing falsetto. Heath's phonation type transitions suggest that he commands a great deal of control over his laryngeal muscles, and he may exercise such control to achieve social ends.

In point of fact, these three internal factors cannot account for all creaky voice occurrences, as creak often occurs in disfavored phonological environments, a pattern I attribute to stylistic factors. Social influences on the use of creak have been identified in a number of other studies. Mendoza-Denton and Jannedy (1998), for example, report on the use of creak by a Chicana gang girl only when speaking to her girlfriends or telling a fight story (a higher pitched style is employed when speaking to her boyfriend or mother). Ogden (2001) demonstrates that in Finnish creak can serve interactional purposes, observing a higher incidence of creaky voice when yielding a turn in conversation. Finally, Grivicic and Nilep (2004) argue that in English creak can be used to express stance; creaky instances of the word '*yeah*' expressed an unfavorable attitude toward either the topic or the



**Figure 4:** Mean duration of creaky voice in falsetto utterances across situations

interlocutor. Here, I argue that creak is used in conjunction with falsetto to widen the overall pitch range. In addition to using his laryngeal muscles to produce falsetto, thus expanding his *f*<sub>0</sub> range upward, I suggest that Heath uses creaky voice to simultaneously expand his *f*<sub>0</sub> range in the downward direction, in effect maximizing his range. The social meaning of wide pitch ranges is discussed in the following section.

The hypothesis that Heath uses creaky voice stylistically in the barbecue setting to expand his *f*<sub>0</sub> range downward is consistent with the finding that Heath’s *f*<sub>0</sub> ranges are in fact wider in the barbecue setting than in the other two situations (see Figure 2), though independent evidence for the stylistic use of creak would strengthen the claim. Figure 4 provides such evidence, showing that the mean duration of creaky voice is significantly longer in the barbecue setting (46 ms) than in either the phone conversation ( $t = 1.69$ ,  $df = 33$ ,  $p \leq 0.05$ ) or the meeting with a patient ( $t = 2.34$ ,  $df = 48$ ,  $p \leq 0.012$ ). Thus, at the barbecue Heath uses falsetto relatively frequently and with a long duration, high *f*<sub>0</sub>, and wide *f*<sub>0</sub> range while at the same time producing creaky voice for relatively long stretches of time, giving himself time to lower his *f*<sub>0</sub> levels.<sup>6</sup> In sum, Heath uses phonation type to expand his *f*<sub>0</sub> range to the physical extreme, with falsetto at the high end and creaky voice at the low.

5. THE SOCIAL MEANING OF FALSETTO

Having identified the distributional and acoustic patterns characterizing Heath’s use of falsetto, I turn now, in this section, to consider the social meaning indexed by the variable. As a starting point, I propose that falsetto carries a core expressive meaning, drawing on an analysis of the discourse functions Heath’s falsetto

utterances serve, as well as findings from previous work. I then discuss how the expressive meaning of falsetto, along with additional linguistic and non-linguistic practices, can be used to build one of Heath's personae, that of a flamboyant diva. Finally, I offer an explanation of how falsetto may facilitate the construction of a gay male identity.

### 5.1 Expressiveness

Researchers face a challenging task when attempting to access the social meaning of phonological variables. Explicitly asking subjects to provide metalinguistic commentary on the meaning of linguistic features may reveal more about listeners' attitudes and ideologies than their linguistic practices. Further, perceptual experiments, though they can be used to tap into complex networks of meanings shared across a large community (see Campbell-Kibler's 2005 work on the social interpretation of (ing)), cannot test for meanings arising on a much more local level and situated in a particular community of practice. Here, I examine the conversational contexts in which falsetto occurs with the aim of identifying recurring patterns. The discourse functions of utterances featuring a particular variant, in this case falsetto, may reveal commonalities in stance or footing from which meanings can be inferred.

As the most striking patterns of falsetto use appeared in Heath's barbecue setting, I focus on the discourse functions typifying falsetto there. When speaking with his friends, Heath uses falsetto for five primary purposes: to yell; to express surprise or excitement; to offer evaluative commentary; to enliven a direct quotation; and to engage his audience when telling a narrative. The utterances in Table 3 exemplify these discourse functions. Although I do not rule out the possibility that Heath may wish to sound gay, Heath's immediate goals for using falsetto are based more locally in carrying out the intended discourse functions.

Although the discourse functions appearing in Table 3 are quite distinct, they are unified by their expressive connotations. Previous work investigating the use of falsetto provides additional support for this core expressive meaning. Blount and Padgug (1976), for example, have shown that English-speaking mothers use relatively high rates of falsetto in child-directed speech, perhaps to facilitate the salience of the talk. Tarone (1973) describes a rather divergent use of falsetto as a

**Table 3:** Discourse functions of falsetto

Function	Example
1. Yelling	<i>Ahh! Stop it!</i>
2. Expressing surprise or excitement	<i>I'm so excited about your little vent thing.</i>
3. Offering evaluative commentary	<i>You people</i> are just so screwed up.
4. Enlivening a direct quotation	Like, <i>'I haven't studied for an hour now.'</i>
5. Engaging the audience when telling a narrative	And this <i>other</i> kid, like, two minutes <i>later</i> , has a little <i>gun</i> , completely separate area.

form of protest in a competitive game context, with black adolescents using a wide pitch range that frequently ventures into the falsetto range. Similarly, Goodwin, Goodwin, and Yaeger-Dror (2002) describe the use of falsetto by Latina girls to express an oppositional stance while playing games. While the emotions attaching to falsetto in each of these studies and in Heath's data are quite different, they are bound by a common factor, their connotations of expressiveness. Further, psycholinguistic studies investigating the acoustic correlates of emotion find that expressive emotions like happiness and anger were marked by higher *f0* levels than less expressive emotional states like sadness and neutrality (Scherer 1974; Pell 2001).

This 'expressive' meaning of falsetto is rather vague; it may be useful to conceptualize the feature as semantically underspecified. Yet, when one hears falsetto, the feature does not sound ambiguous or vague, leaving us with the question of how the meaning comes to life when the feature is employed. I argue that the social and linguistic contexts in which a variable is uttered color its social meaning, enabling the variable to participate in the construction of more specific, identity-based meanings. I turn now to a deeper inspection of Heath's linguistic performance at the barbecue in order to investigate falsetto's role in Heath's construction of a diva persona.

## 5.2 *The diva persona*

The preceding discussion dealt with the meaning of falsetto as it related to the discourse function of the message. This section looks in greater detail at the particulars of the barbecue setting, a situation in which falsetto was highlighted, examining how Heath positions himself socially and linguistically in this situation.

The barbecue attendees are all in their second year of medical school, and Heath is out to all of them. A rather close-knit group of people, they share many things in common. All attend medical school, they suffer through the same classes and rotations, they are all in their mid-twenties, and they all hail from middle-class backgrounds. These characteristics, though perhaps noteworthy to outsiders, are rarely discussed within the friendship group. Rather, their interests lie in their differences. With regard to stylistic difference and distinction, Irvine (2001: 22) notes the following:

To describe a style's characteristics, examining the features that identify it, and to contemplate links between these features and the style's particular function, is to suppose that function suffices to explain form, without reference to system. The characteristics of a particular style cannot be explained independently of others.

This excerpt points out that speaking styles acquire meaning by contrasting with other styles. Although Irvine's discussion of stylistic differentiation targets inter-group differences, her point extends to differentiation within groups as well. In spite of their shared characteristics, the group-internal differences between



Heath and his friends determine the personae they take on. While spending time with this group of friends, Heath sometimes distinguishes himself as a flamboyant diva, a persona markedly different from the personae he takes on in other situations, such as the phone conversation and the meeting with his patient.

Before describing the behavior that has led me to the 'diva' label, it is necessary to discuss what I mean by the term. *The American Heritage Dictionary of the English Language* (4th edition) conventionally defines the word as 'an operatic prima donna.' A similar denotation appeared in the 21 October 2002 issue of *Time* magazine: 'By definition, a diva is a rampaging female ego redeemed only in part by a lovely voice' (Tyrangiel 2002: 75). The term has also taken up currency among non-singers, referring to a person, usually a woman, who is characterized simultaneously by beauty (achieved through talent and/or appearance) and off-putting superiority. Divamind.com, a website devoted to all things diva, lists among others the following definition for the term: 'Anyone who can employ a tiara and blowtorch with equal effectiveness is a Diva.' It is this definition which Heath sometimes embodies. He has an attitude, likes everything to be just so, and does not shy from expressing even his most negative opinions. He is also image conscious, wearing eye-liner and blush when he dresses up and allowing no one, not even his boyfriend, to touch his hair.

One might wonder why the term 'diva' is used to characterize Heath's persona, as opposed to 'queen,' a term with wider circulation in the gay community (Rodgers 1972). First, it should be noted that neither Heath nor his friends at the barbecue, who comprised Heath's primary friendship network at the time of the recording, use either of the terms – 'diva' or 'queen' – to describe Heath's style of self-presentation. While his friends do sometimes comment on how 'gay' Heath sounds, I choose not to use this term, as its vagueness cannot adequately capture the richness of the style. That Heath's friendship group does not use a more descriptive label can be attributed to the fact that most members of the group identify as heterosexual, while terms like 'queen' are generally reserved as in-group labels. Heath's friends may lack both the knowledge and the license to use the term. The term 'queen' is also avoided in this paper because it does not carry sufficient connotations of strength, at least not when used in reference to gay men. In the years since these recordings were made, Heath has graduated from medical school and moved to another city, where he is completing his residency. Unlike his circle of friends during medical school, Heath's friends are now predominantly gay and frequently use the term 'bitch' to describe his style. The term 'diva' is preferred here, due to its less overtly negative connotations as well as its ability to capture the image-conscious aspects of Heath's style.

Issues of terminology aside, Heath performs the diva persona at all levels of self-presentation, not only through the behaviors identified above, but also through his linguistic choices. As Koestenbaum (1993) points out, divas construct their personae in part by employing the linguistic features of 'divaspeak,' which includes strategies like praising oneself, presenting every utterance as the truth,

and stealing the show. Falsetto serves as an additional resource which Heath can harness, along with its associations with expressiveness, to create his diva persona on a phonetic level. The conversational excerpt in (1) illustrates Heath's establishment of the diva persona while using falsetto, as well as his friend Eliza's joint role in constructing the persona. In this excerpt, falsetto is indicated in bold italics, and overlapping turns are represented with vertically aligned bars on adjacent lines. Heath begins creating his diva persona in line 1 by asking Eliza if she needs help with food preparation, addressing her as 'dear,' a non-heteronormative vocative when uttered by a twenty-five-year-old man. Eliza makes her own contribution toward constructing this persona, mentioning Heath's duty to look 'pretty' (line 2). Her choice to use a gendered adjective here is evocative of the diva persona in ways in which equally flattering possibilities ('handsome' or 'cute') would not be. Heath could have resisted this undercurrent of gender atypicality, but instead embraces Eliza's request (line 3), indicating his complicity in the construction of the diva persona.

1.

- |    |       |   |
|----|-------|---|
| 1  | Heath | Do you want me to do anything, dear?  |
| 2  | Eliza | No, just to stay and be pretty.   |
| 3  | Heath | <laughter> You know that's my job.  |
| 4  |       | <b><i>Ooh, ooh</i></b> , a little <b><i>vent</i></b> thing!                 |
| 5  | Eliza | Yeah.   |
| 6  | Heath | <b><i>Oh cool</i></b> . I <b><i>like</i></b> it!                            |
| 7  |       | I 'm so <b><i>excited</i></b> about your little <b><i>vent</i></b>   thing. |
| 8  | Eliza | I know.   |
| 9  |       | Isn't it awesome? It's such a cute little   outfit.                         |
| 10 | Heath | It <b><i>is</i></b> ,   |
| 11 |       | I really, I like it.  |

In the remainder of the excerpt, Heath reacts to a vent feature allowing air to pass in and out of Eliza's clothing. Heath punctuates his turns with the frequent use of falsetto, which appears at least once in each of Heath's remaining turns. As I suggested above, falsetto is a linguistic means of conveying expressiveness. More importantly, this excerpt illustrates that expressive connotations do not exist independent of referential meaning. In other words, we must consider not only whether Heath is expressing excitement, but also the topic about which Heath expresses excitement. While it is possible that Heath's phonetic rendering of excitement may be socially marked enough to construct the diva persona on its own, the topic about which Heath is excited (Eliza's outfit) evokes the diva persona even more vividly, since clothes and more generally appearances are topics in which divas take particular interest.

The image consciousness characterizing Heath's persona comes through even more plainly in excerpt (2). This segment of the conversation begins with Jack trying to mess up Heath's hair (line 1), and Heath responding by yelling '*Ahh! Stop it!*' with falsetto phonation in excess of 500 Hz. Drawing attention to his concerns about physical appearance, a primary concern for a diva, Heath

explains that he cannot be seen with messy hair (lines 4–5), ultimately expressing indignation with falsetto on the word ‘*amusement*.’ Jack and Tiffany proceed by challenging whether his hair styling practices are necessary, a challenge which Heath responds to with a justification (lines 13–15). At this moment, a moment requiring Heath to justify his grooming habits, Heath occupies an interactionally weak position, one which is inconsistent with his powerful diva persona. Heath maneuvers himself out of this position in lines 15–17 by deriding his roommate Jeff for putting his inferior hair product near his salon-quality gel. This move simultaneously places Heath in a more powerful position and sets up an opposition between those who care enough about their appearance to use upscale hair products (Heath) and those who do not (Jeff). Here, as in the previous example, the phonetic form of falsetto carries expressive connotations, which in turn can be employed in creating and maintaining a specific kind of persona situated in discourse and in setting.

2.

- 1 Jack For that, I’m gonna mess up your crunchy hair today.
- 2 Heath No-o [no o] you so can’t. *Ahh! Stop* it!
- 3 Jack | <laughter>
- 4 Heath | <noises of struggle> Wait - I have to interact with
- 5 people all day. You can’t mess it up [a p].
- 6 Jack <laughter>
- 7 Heath You sure take great *amusement* in this.
- 8 You really do.
- 9 Jack I think your hair actually looks good when there’s
- 10 not crunchy stuff in it.
- 11 Tiffany Yeah, doesn’t that, like, make it, like, break and
- 12 stuff?
- 13 Heath If my, my hair could survive years of bleaching, it’s
- 14 uh, it’ll survive with with salon-quality hair gel
- 15 in it. <turning to Jeff> Which, ca- can you stop
- 16 putting your your hair gel on my side of the thing?
- 17 People think it belongs to me.

### 5.3 *Gay identity*

In the remainder of this section, I speculate on some ways in which Heath’s falsetto utterances may (or may not) be constitutive of a gay identity. Before proceeding, I would like to be clear that I am not claiming that Heath is in fact performing gayness at all. As Kulick (2000) and Cameron and Kulick (2003) have pointed out, it is important to avoid labeling certain linguistic features as gay just because gays and lesbians happen to be using them; it is now a common practice for scholars of language and sexuality to problematize the inherent fixity of linguistic monoliths like ‘gay speech’ (though see Leap 1996 and Leap and Boellstorff 2004 for treatments of ‘gay language’). While granting that linguistic features do not constitute a singular gay code, most researchers also agree that linguistic features

can nonetheless be interpreted as having gay meaning (Bucholtz and Hall 2004). Although highlighting gay identity may in fact be Heath's goal in the barbecue setting, the kinds of data under analysis here do address Heath's intentions. Yet still it is possible that Heath's speech may be interpreted as sounding gay, and a theoretical framework for conceptualizing social meaning should be able to capture such a possibility.

One need not look far to find a theoretical construct capable of drawing the link between falsetto and gay identity. According to the notion of indexicality, linguistic forms are endowed with interactional meanings which can be ideologically and indirectly associated with identity categories (Silverstein 1976; Ochs 1992, 1993). Ochs argues, for example, that tag questions may index stereotypical femininity, but only through their associations with a stance of uncertainty or the act of asking for confirmation. The link between the stance and the identity category is ideologically governed, regardless of whether women are employing tag questions to express uncertainty or to confirm facts. The mediating role of ideology in relating form to meaning can also be observed in lexical semantics. Words with unclear referents or 'fuzzy meanings,' chief among them being 'queer' in English (McConnell-Ginet 2002) and 'tongzhi' in Chinese (Wong 2002, 2003, 2005) are prime sites for ideological struggles over meaning. The elasticity of meaning discussed by McConnell-Ginet and Wong as a property of words is an inherent part of phonetic variation as well, with ideology figuring just as prominently.

Ochs' framework for indexing gender may be extended to explain why Heath's falsetto utterances can be interpreted as sounding gay. Recall from the discussion above that the proposed meaning of falsetto is expressiveness. The use of falsetto to perform expressiveness may in turn be interpreted as gay, largely due to the dominant ideology that performing expressiveness is a non-normative behavior for men. As Sattel (1983: 20) argues, inexpressiveness serves to preserve the male position of power: 'What better way is there to exercise power than *to make it appear* that *all* one's behavior seems to be the result of unemotional rationality' (original emphasis). Under this view, to express emotion is to relinquish power, which according to Connell (1995) is the embodiment of hegemonic masculinity. By performing expressiveness, Heath relinquishes not only power, but heteronormative masculinity, thus completing the link between falsetto and gay meaning.

There is good reason to question the validity of the ideology that men are inexpressive (and women are expressive). At best, the ideology overgeneralizes the situation. As Lupton (1998) notes, certain emotions, such as anger, rage, aggressiveness, and triumph, are perfectly acceptable for men to express. The 'acceptable' male emotions all connote power, suggesting that it is really powerlessness that men should avoid expressing. At worst, the ideology of the inexpressive man is plain wrong. In an examination of 286 interviews with men and women on the subject of emotion, Lutz (1994) found that her interviewees exhibited no gender-based differences in their syntactic expression of emotions.

For example, Lutz notes that when one describes emotion, syntax can be used to either associate or dissociate oneself from the emotional experience. For example, emotionally expressive people might be expected to speak of themselves as the subject of the experience ('*I'm* very anxious about it,' Lutz 1994: 84), or slightly less expressively, as the object ('It's making *me* angry just talking about this,' 1994: 84). Inexpressive people might leave the subject unspecified ('*It* was a very strong feeling of hate,' 1994: 85) or speak about emotion in the abstract ('Well, hate and frustration usually go hand in hand, I would say,' 1994: 85). Lutz examined this and three other syntactic variables and found no gender-based differences. It appears, then, that the ideology under consideration – that men are inexpressive and unemotional and women are expressive and emotional – may not be universally true. It is important to realize, however, that this ideology is exactly that, an ideology; it need not be true to figure into linguistic behavior. Ideologies, whether based in fact or fiction, inform our interpretations of speech and of other behaviors.

I have shown in this section that it does not require a very large leap in reasoning to imagine how Heath's diva performance (as accomplished through the use of falsetto) might evoke an interpretation pointing to gay identity. Indeed, Koestenbaum (1993: 132) has made the argument before: 'Divaspeak is not limited to opera culture. It is a gay dialect . . . a way of asserting power, preeminence, and invulnerability through language alone . . . .' Nonetheless, the interactional data examined above appear to more clearly suggest that what Heath is performing is not gay identity per se, but rather an attitude. This analysis supports Eckert's (2002) argument that stylistic variation is more likely to index situationally grounded personae than ideological constructs like identity categories. It is important to recognize, however, that whether gay identity is relevant to the analysis depends on one's definition of identity. If one treats identities as 'linguistically constructed subject positions' (Bucholtz and Hall 2004: 472) or as ' . . . temporary and interactionally specific stances and participant roles' (Bucholtz and Hall 2005: 592), then the diva persona may itself constitute an identity. However, if one defines identity as something a subject 'claims' or 'disclaims' community membership in, as in Cameron and Kulick (2005: 112), then identity may not present itself as the most relevant dimension to this analysis, as it is unlikely that Heath claims membership in a 'diva community.' To conclude, while the analysis proposed here draws a rather unproblematic link between the falsetto phonation type and both expressiveness and the diva persona, whether falsetto indexes gay identity is open to interpretation, on the part of both the linguist and those who might hear Heath use falsetto.

## 6. CONCLUSION

To summarize, this paper has explored the stylistic use of a voice quality feature, falsetto phonation, by a speaker exhibiting significant variation across situations. Heath's use of falsetto stands out in one particular occasion, a barbecue with

friends, over the course of which Heath's falsetto is more frequent, longer in duration, higher in  $f_0$ , and wider in  $f_0$  range.<sup>7</sup> An examination of the conversational moments in which falsetto occurs in that situation suggests that falsetto bears an expressive meaning, and that this meaning can be used to construct a diva persona and perhaps a gay identity.

One of the primary aims of this study has been to illustrate the value of considering voice quality, particularly phonation type, as a stylistic variable. Specifically, I have attempted to show that in addition to indexing group distinctions and distinctiveness, which have been the focus of previous work on the sociolinguistic dimensions of voice quality, voice quality variation can serve as a resource for managing one's shifting positions in the social world. In order to demonstrate this point, I have departed from previous approaches by examining intraspeaker rather than interspeaker variation. Falsetto provides Heath with a means of constructing a diva persona which, crucially, he performs on some occasions (at a barbecue with friends) and not on others (when speaking to his father on the phone or when meeting with a patient at the medical clinic). Voice quality can thus index either stable group affiliations or shifting interactionally achieved positions, and a challenge of future work on voice quality variation will be to uncover the relationship between these more and less stable social meanings.

The voice quality on which this article has concentrated is falsetto, a phonatory setting characterized by very high  $f_0$  levels. Since high  $f_0$  levels are stereotypical of gay identity, the preceding discussion has considered the possible role of falsetto in indexing gay identity. In so doing, this study has advocated for an alternative approach to investigating the phonetic components of gay styles. The approach best represented in the literature thus far seeks to discover acoustic differences between the speech of individuals that sound gay and the speech of individuals that do not (Gaudio 1994; Smyth, Jacobs and Rogers 2003; Munson, McDonald, DeBoe and White 2005). The approach advanced here treats gay identity not as directly observable in the speech stream, but rather as emergent in the ways that phonetic features are employed in particular interactional contexts. Taking such an approach requires the use of conversational data, which compromises the control typifying most phonetic studies, but which also allows for the performance of identities that might not surface in experimental contexts.

I would like to be clear that the approach I am promoting here is not intended as a replacement for previous approaches. The fact that previous studies have found acoustic differences between gay-sounding and straight-sounding voices clearly illustrates that gay styles can be elicited in laboratory environments. However, we should heed the warnings of scholars who emphasize the plurality of gay ways of speaking (Kulick 2000; Podesva, Roberts and Campbell-Kibler 2002; Cameron and Kulick 2003), and not assume that the gay-sounding speech collected in the context of experimental studies is phonetically the same as the speech used when highlighting gay identity in more natural conversational contexts. As research on the phonetic properties of gay-sounding speech progresses, it will likely need to progress along two paths. The experimental approach can be



used to tap into the ideological associations between linguistic form and gay meaning shared across a speech community (Bloomfield 1933; Gumperz 2001 [1968]) or imagined community (Anderson 1991 [1983]), thus making possible the generalization of findings. On the other hand, the conversational approach proposed here investigates the mapping between form and meaning on a smaller scale, in particular communities of practice (Eckert and McConnell-Ginet 1992). While generalizations are not possible, insight into speakers' motivations for using variables strategically may be gleaned.

The micro-level approach I have followed attempts to infer the social meaning of linguistic features by situating phonetic forms in their discursive contexts. This marks a new analytical tactic for determining the meaning of variation, an enterprise which has recently experienced a resurgence of interest in variationist sociolinguistics. Studies falling under the rubric of this 'third wave' of variation research (Eckert 2005) have appealed to a number of complementary methodologies: most studies locate social meaning against the backdrop of thorough ethnographic research (Labov 1963; Eckert 2000; Moore 2003; Zhang 2005; Rose 2006); others consider the diachronic emergence of social meaning as linguistic features acquire social value (Agha 2003; Johnstone, Andrus and Danielson 2006; Zhang 2006); and others obtain listener's interpretations in experimental contexts (Campbell-Kibler 2005). The present article, drawing on work by Coupland (2001b) that situates dialect features in discourse, suggests that the study of social meaning would benefit from additionally examining the interactional moves conducted when linguistic resources are employed.

Whatever the approach one utilizes to tap into the social meaning of variation, it is hoped that voice quality variables will be well represented in future 'third wave' studies. Phonation, and voice quality more generally, carries a great deal of symbolic potential, and sociolinguists should continue to zero in on the social meanings it encodes.

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## NOTES

1. This research has benefitted greatly from the thoughtful comments and criticisms of Penny Eckert, Edward Flemming, Rudi Gaudio, Jane Hill, Don Kulick, John Rickford, Devyani Sharma, Ron Smyth, Laura Staum, Tham Shiao Wei, Keith Walters, Arnold Zwicky, and audiences at Georgetown University and NWAV 31. I would also like to extend my sincerest gratitude to the two anonymous reviewers and the editors of the journal, particularly Nikolas Coupland, for sharing their time and wisdom with me. Though their suggestions have surely improved this work, I accept sole responsibility for any errors or shortcomings it may still contain.
2. A more comprehensive description of the production of falsetto, the details of which are not relevant to the present study, can be found in Laver (1980: 118–119).
3. It should be noted that Brown and Levinson (1987) did recognize context-dependency in the use of falsetto. Although their focus lies in politeness and not a formal analysis of variation patterns, they briefly mention the use of falsetto as an honorific feature in Tzeltal.

4. Following Henton and Bladon (1988: 9), the presence of creaky voice was identified auditorily, 'whereby creak consists of separately resolvable vibrations of low frequency.' Once creaky voice was judged as present, acoustic criteria were employed for isolating the beginning and ending points, with the boundaries marked by (a) the irregular spacing of the vertical striations characterizing glottal pulses in wideband spectrographic displays, (b) an abrupt dip in  $f_0$  as observed in the pitch track, and/or (c) the cessation of an observable  $f_0$  in the pitch track, due to the slowing of vocal fold vibration.
5. Although the creaky voice in this word could also be motivated by a glottal onset, it should be noted that without declination creaky voice need not persevere into the following two syllables.
6. I do not report on  $f_0$  levels for creaky utterances, as vocal fold vibration slowed to the point that  $f_0$  levels could not be resolved.
7. While Heath's falsetto patterns during the barbecue have occupied the great majority of this discussion, it is also possible to examine the social meaning of falsetto in the other two settings. A detailed analysis of falsetto as Heath uses it in these situations lies well beyond the scope of the present discussion, but a few brief comments can be offered. Heath's less frequent and acoustically less prominent falsetto when speaking with his father can be captured straightforwardly within Bell's (1984, 2001) audience design framework. Heath's father does not use falsetto at all, a pattern to which Heath himself might be accommodating during their phone conversation. When meeting with his patient, too, Heath uses falsetto sparingly. When the feature does occur, it appears nearly exclusively on the first syllable of the discourse markers 'okay' and 'alright,' frequently preceding a command (e.g. 'Okay, touch your nose'). Heath may be taking advantage of falsetto's expressive connotations to assist him in nurturing or soothing his patient.

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Address correspondence to:

Robert J. Podesva  
 Department of Linguistics  
 Intercultural Center 454  
 Georgetown University  
 Washington, DC 20057  
 U.S.A.

*rjp39@georgetown.edu*