A sociophonetic analysis of perception of sexual orientation in Puerto Rican Spanish

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Abstract

Listeners display acute sensitivity to phonetic variation that marks social identity; this sensitivity is observable in listener perceptions of a variety of social identities, including social class, ethnicity, gender, and sexual orientation. Most previous research on phonetic variation and sexual orientation has focused on English, with little data available from other languages. The current study addresses this gap by exploring associations between phonetic variation and perception of social categories in Spanish, with a focus on perception of sexual orientation. The study examined listener perceptions of speaker sexual orientation, height, age, and social class to determine to what extent Spanish-speaking listeners make uniform evaluations of sexual orientation based on speech, and, if so, what acoustic parameters correlate with those evaluations. The study also analyzed the relationships between perceptions of speaker sexual orientation and speaker height, age, and social class. Clusters of listeners determined a posteriori using factor analysis were found to share patterns of evaluations, and F2 frequencies of two mid front vowel (/e/) tokens were significant correlates of evaluations of sexual orientation. Listener evaluations of perceived sexual orientation were correlated with evaluations of perceived height, highlighting the complexity of indexicality as well as the multifaceted nature of social identity.

1. Introduction

It is well documented that listeners are sensitive to specific linguistic features that they associate with different social groups. An oft-cited example is Labov's (1966, 2006) examination of New Yorkers' sensitivity to post-vocalic /r/, and, more specifically, how its variation cued differing perceptions of occupational suitability for listeners from distinct social classes. More recently, Purnell, Idsardi, and Baugh (1999) documented listener sensitivity to variable cues that trigger different evaluations of ethnic identity. In this case, F2 values

for the open mid front vowel (/ɛ/) in certain contexts, along with pitch peak and syllable length, provided enough acoustic cues for distinguishing Chicano English, African-American Vernacular English, and Standard American English. Similar types of relationships between acoustic cues and distinct social variables have been documented by a growing number of recent studies. For example, variable production of *–ing* correlates with evaluations of education, formality, region, and urban/rural divide in North American English (Campbell-Kibler 2005), and production of intrusive /r/ and phrase-final /t/ is related to perception of age and social class in New Zealand English (Walker 2007). Furthermore, the relationship between acoustic cues and perceptions of social identity is observable in both directions. That is, studies such as those mentioned above have observed how acoustic cues influence perception of social identity, while other studies have observed that the perception of speaker social identity, established by even a mere suggestion of a social category, impacts listener perception of acoustic cues themselves (Niedzielski 1999; Strand 1999, 2000; Hay, Warren, and Drager 2006; Hay, Nolan, and Drager 2006).

From these studies it is increasingly clear that even small differences in phoneme realization cues exert enough of a socioindexical impact to influence perception of speaker identity in categories traditionally used as classifiers of individual social identity: gender, ethnicity, social class, education, and region of origin. This research paradigm has also been extended to explore the socioindexical processes involved in listener sensitivity to variation that cues evaluations of sexual orientation. Perception of sexual orientation is particularly intriguing to socioindexical and sociophonetic inquiries because of the popular culture mystique of gay and lesbian speech, and, specifically, the idea that certain patterns of speech variation are accurate and reliable markers of sexual orientation for gay men.

The notion that listeners can reliably judge speaker sexual orientation based on voice alone seems to prevail in popular culture depictions of gay identity in North American English culture. This myth is intimately linked to the stereotype of gay men's speech, promulgated in mainstream movies and television by what has become a formulaic, recognizable set of variants used to establish a character's gay identity. In spite of the persistence of these stereotypes, few links between discrete phonetic variants and self-identified sexual orientation have emerged across systematic investigations of speech production. Production studies have revealed only subtle differences between acoustic characteristics of self-identified gay and self-identified heterosexual individuals' speech (Munson et al. 2006). And, of course, there is certainly not a necessary correspondence between one's sexual orientation and the perception of sexual orientation. For example, Smyth, Jacobs, and Rogers (2003) reported that the voice that had been rated as straightest sounding in their study was, in fact, the voice of a gay man, while the sixth gayest sounding voice was the voice of a straight man. However, it is clear that variation in pronunciation does cue

trends in evaluations of speaker sexual orientation across groups of listeners; that is, when listeners are asked to evaluate speaker sexual orientation based on audio-only stimuli, patterns of evaluations emerge.

As with earlier work on phonetic variation and social characteristics, investigators have attempted to understand these patterns of evaluations by examining specific acoustic factors with which there may be correlations. These investigations have examined the influence of acoustic factors such as pitch range and pitch variability (Gaudio 1994; Smyth et al. 2003; Levon 2007), production of sibilants (Munson et al. 2006; Smyth et al. 2003; Levon 2007), various aspects of vowel production, including both average F1 and F2 frequencies, and overall vowel-space expansion on listener perceptions of speaker sexual orientation (Podesva, Roberts, and Campbell-Kibler 2001; Munson et al. 2006; Pierrehumbert et al. 2004). In addition, studies have investigated relationships between perceptions of sexual orientation and perceptions of other speaker characteristics such as height, speech clarity (Babel and Johnson 2006; Munson et al. 2006), perceived personality characteristics (Gaudio 1994; Levon 2006) and speech style (Smyth et al. 2003).

The picture that has emerged thus far is that differences in listener evaluations of male speaker sexual orientation, at least group-wise, are attributed partially to various factors (see Munson and Babel 2007, for a full review). For example, in Munson et al. (2006), F1 frequency of low front vowels was the most significant predictor of perceived sexual orientation judgments with front-vowel word stimuli, with men with higher F1 values more likely to be evaluated as gay sounding than men with lower F1 frequencies. F2 frequency of back vowels was the most significant predictor with back vowel words, with men with higher mean F2 frequencies more likely to be rated as gay sounding than men with lower F2 frequencies. Sibilant production is another possible influence, but presents a somewhat complicated picture. Levon (2007) reports the sibilant duration affected listener evaluations in certain contexts. Speakers in the Munson et al. (2006) study were more likely to be rated as gay sounding if they produced a highly negatively-skewed /s/ (i.e., an /s/ which had compact energy in the higher frequencies), which could be characterized as a hyper-correct /s/; however, a key component of the stereotype is what is popularly known as the "gay lisp", which corresponds to a less precise or less correct articulation (usually a frontal or dental misarticulated /s/). Indeed, Munson and Zimmerman (2006) found that all speakers, regardless of their perceived sexual orientation, were rated as more gay sounding when a matched-guise "lisped" /s/ was appended to natural VC segments. Finally, fundamental frequency and variable pitch, also arguably key components of a cultural stereotype of gay sounding speech, have not been conclusively shown to influence listener perceptions. Gaudio (1994) reported a suggestive relationship (at a non-statistically significant level, $p < .10$) between measures of pitch range and pitch variability and perceived sexual orientation and perceived

masculinity/effeminacy. Levon (2007), however, reported no relationship between fundamental frequency modulation and perceived sexual orientation.

In addition, studies looking at the relationship between perceptions of sexual orientation and perceptions of other speaker characteristics have made it increasingly clear that there is not a one-to-one matching of phonetic variants and social identities or other characteristics. For example, Gaudio (1994) reported that listener ratings of speakers on a straight/gay continuum were significantly correlated with ratings on the effeminate/masculine and affected/ordinary continua; similarly, Levon (2006) showed gayness to be correlated with effeminacy, friendliness, and neatness. Differences in perceptions of sexual orientation have also been shown to co-vary with differences in perceptions of reading ability in at least one case, with speakers rated as gay sounding more likely to be rated as better readers (Babel and Johnson 2006). In other words, patterns of variation that trigger evaluations of a given social identity trigger (and, perhaps, are triggered by) evaluations of other characteristics as well.

While many studies have explored associations between speech variability and perception of male sexual orientation in English, there has been relatively little systematic examination or documentation of such links in other languages. The dearth of cross-linguistic data is an obstacle to building linguistic models of socioindexicality; without the taxonomy of acoustic features based on a wide sampling of languages and language families it is difficult to identify the acoustic parameters that are likely to cue indexical categories. By comparison, consider models of the phonetics of obstruent voicing features. The phonetics of voicing based solely on Germanic languages (in which obstruents in word-initial position contrast only voiceless unaspirated and voiceless aspirated) would lead researchers to posit that one only need to perceive the presence or absence of aspiration to understand voicing. This hypothesis would fail soundly when considering languages like Thai, Korean, and Hindi, where obstruent voicing involves a more complex and higher-dimension set of acoustic features. The emerging evidence available on linguistic differences in socioindexicality supports the hypothesis that languages use parameters differently (see Johnson 2006), and it would be beneficial to establish whether or not there is a parallel for speech and sexual orientation.

The current study addresses this gap by examining perceptions of sexual orientation in Spanish. It focuses on relationships between phonetic variation and listener perceptions of speaker sexual orientation and on the relationship between perceived sexual orientation and other perceived characteristics. Until now, the relationship between phonetic variation and perception of sexual orientation has been documented only anecdotally, and few sources make explicit reference to gayness; more commonly, discussions of speech variability and male sexuality rely on allusion to effeminacy rather than overt mention of gayness. It is clear that equating effeminacy and gayness gives rise to a host

of methodological issues (see Kulick 2000), but these concepts have been found to be distinct, yet correlated, perceptual parameters in English, as mentioned above (Levon 2006; see also Munson 2007). Outside of English, effeminate speech styles have been linked to stereotypes of homosexuality in francophone Canada (Higgins 2004), as well as in Indonesia (Boellstorff 2004). Most relevant to the current study, Murray (1995: 180) notes, "In the Spanish-speaking cities of both Old and New Worlds, there is a consistent derogation of male effeminacy and a widespread assumption that such effeminacy is the mark of homosexuality." In a discussion of Mexican sexuality, Carrier (1995: 17) notes: "From early childhood on, Mexican males are made aware of the labels used to denote homosexual males—*pinto, joto, maricón*—with the clear understanding that these homosexual males are guilty of unmanly, effeminate behavior."

Some of the anecdotal evidence specifically regarding speech and perceived sexual orientation points to stereotypical elements shared between English and Spanish. For example, Sowards (2000: 146) presents interview data from Mexico that links "a high pitched voice" to effeminate behavior in general, mirroring the association with fundamental frequency and sexual orientation explored as part of the gay speech stereotype in English by Gaudio (1994) and others. Another stereotypical association between speech and male sexual orientation in Spanish, as in English, are distinctive patterns of /s/ production. As mentioned above, studies in English have shown listener sensitivity to a more hyper-articulated /s/; anecdotal evidence from Spanish points to a possible connection between distinctive patterns of /s/ production related to a specific phonological process that occurs in Caribbean Spanish, aspiration and deletion of the /s/. These patterns correspond to a carefully or hyper-articulated /s/ in situations where syllable-final /s/ is often produced as [h] or deleted altogether, and, in some cases, /s/ epenthesis. In a discussion of standard and local linguistic norms in Dominican Spanish, Zentella (2003) cites the comic, often mocking phrase *hablar fisno*, a play on the expression *hablar fino* ('to speak fine'), in which hypercorrective /s/-epenthesis occurs at the end of the first syllable in the word *fino*. The phrase *hablar fisno* is known in several dialects, but is seen as an especially apt commentary on Dominican Spanish. Although the weakening process is very advanced in the dialect, speakers realize that the absence of [s] is stigmatized, and insert [s] in the syllable rhyme, even in places where there is no underlying /s/, in an attempt to sound more educated, as in the case of *abogado* 'lawyer' > *asbogado* or *abosgado* (Nuñez-Cedeño 1994: 30). While *hablar fisno* is often equated with formality, higher socioeconomic status, or "posh speech" (Roca 2005: 38), it has come to be associated with male effeminacy in some contexts (Zentella 2003: 60).

While the influence of vowel characteristics on listener evaluations has been documented in English, potential differences in vowel production are not as readily evident in anecdotal characterizations of stereotypical gay male speech

in Spanish. This may be due in part to the relative stability of the Spanish vowel system. Dalbor (1980: 148–149) states, "Spanish vowels are quite uniform from dialect to dialect. In fact, the Spanish vocalic system is simpler, more uniform, and more symmetrical than that of any other language commonly studied . . ." More recently, Schwegler and Kempff (2007: 30) posit "Las vocales en español son, generalmente, muy estables; la variación en su pronunciación, sobre todo al compararla con la de las consonantes, es poca." [Vowels in Spanish are, generally, very stable; variation in their pronunciation, especially in comparison with that of consonants, is little.] Nonetheless, stylistic and regional variation does occur. Harmegnies and Poch-Olivé (1992) reported differences in stressed and unstressed vowel realizations in spontaneous and laboratory speech situations. They observed a highly significant centralization tendency in /e/, /i/, /o/, and /u/, with more marked centralization in the front vowels in spontaneous speech. In Puerto Rican Spanish, Santoro (2007) reports higher and more open vowels than occur in the Spanish of Spain. Holmquist (2008) and Oliver Rajan (2007) report vowel raising in unstressed contexts (/e/ to [i] and /o/ to [u]) in western Puerto Rico that is correlated to both phonological and social factors. However, thus far vocalic variation has not been linked to masculine or effeminate speech in the same way that /s/ realization has been.

   Although there is anecdotal evidence that specific ways of speaking cue evaluations of male gayness in Spanish, and that some of these patterns of variation are associated with multiple social identities (such as gayness and social class), there is no systematic examination or documentation of what those cues might be, or how they may interact with different ideas of speaker social identity. This study, part of a larger project on the association between sociophonetic variation and voice recognition in Spanish and English, attempts to contribute to this area of inquiring by addressing three specific questions: 1) Do Spanish-speaking listeners uniformly rate speakers' voices in terms of perceived sexual orientation? 2) If so, what phonetic variation correlates with different evaluations of perceived sexual orientation? And 3) What is the relationship between listener judgments of speaker sexual orientation and other perceived speaker characteristics?

2.   Methods

2.1. *Participants*

The study was carried out in the San Juan, Puerto Rico, metropolitan area, and included 43 total participants: 20 male participants who recorded the study stimuli (henceforth "speakers") and 23 (five male, 18 female) participants who evaluated the stimuli (henceforth "listeners") in an explicit-measures percep-

tion task. All participants were native speakers of Spanish who had grown up in Puerto Rico and were undergraduate or masters level students at a large public university in the San Juan metro area. The mean age of the listeners was 22 years. All listeners reported at least basic knowledge of English; six spoke an additional language (other than Spanish or English), and six spoke more than one additional language. Each listener also completed a short interview on speech and stereotypes in order to explore whether or not he or she was cognizant of speech stereotypes related to three of the speaker characteristics explored in this study: sexual orientation, age, and social class. Stereotypes of speech and speaker height were not addressed in the interview. The data from the short interviews is reported separately (Mack 2008), but it is relevant to note that all of the participants in the study were aware of speech stereotypes in general, all participants reported an awareness of a speech stereotype for gay men, and nearly all participants reported an awareness of speech stereotypes associated with age and social class.

2.2. *Stimuli*

To create the stimuli, the speakers were recorded as they read a list of article-noun combinations. All article-noun combinations included nouns that are among the top 175 highest frequency words in Spanish (Davies 2006). The list was designed to include equal numbers of masculine and feminine article-noun combinations. It included three of the five vowels present in the Spanish vowel system in stressed position: /e/, /i/, and /u/, and included /a/ in pretonic position. The fifth vowel, /o/, occurred only in posttonic, phrase-final position. As mentioned earlier, this study was part of a larger project on the association between sociophonetic variation and voice recognition. The role of this study in the overall project was to evaluate stimuli to be used in a voice recognition task that investigated the relationship between sibilant production and perception of sexual orientation; therefore, stimuli for the current study did not include any instances of /s/. The article-noun combinations were the following (frequency ratings appear in parentheses):

el día *'the day'* (71)
la vida *'the life'* (88)
el tiempo *'the weather'* or *'the time'* (68)
la gente *'the people'* (158)
el mundo *'the world'* (118)
la manera *'the manner'* (152)

2.3. *Procedures*

The perception task was designed and delivered using *E-Prime* experiment management software (Schneider, Eschman, and Zuccolotto 2002). During the

perception task, listeners reported their evaluations of four different speaker variables: age, height, social class, and sexual orientation. The experiment included 80 trials total; each of the 20 speakers' recordings was presented four times, with a question addressing one of the four variables each time. In each trial, listeners heard the six short article-noun combinations (*la gente, la manera, la vida, el tiempo, el día, el mundo*) produced by the same speaker. The phrases were presented onscreen as the recordings played. After listening to the six phrases, listeners were presented with a question addressing one of the four variables. For age, listeners provided direct magnitude estimates of age in years. For height, social class, and perceived sexual orientation, listeners were presented with a five-point scale and entered the whole number (one through five) that corresponded to their evaluation. Each scale was developed in conjunction with trained linguists from the study community. For perceived height, "1" corresponded to much taller than average and "5" corresponded to much shorter than average; for perceived social class, "1" equaled higher social class and "5" equaled lower social class. In the scale for perceived sexual orientation "1" corresponded to gay, "2" corresponded to very gay, "3" corresponded to more or less gay, "4" corresponded to straight/heterosexual, and "5" corresponded to not gay or straight/heterosexual. This scale was selected as the most appropriate for local norms, and after the data were gathered the scale was normalized to be comparable with the height and social class scales. The presentation order of speakers and questions was randomized (i.e., the experiment was not blocked by question).

3.   Analysis and results

3.1. *Uniformity of listener evaluations*

The first analysis aimed to determine whether or not Spanish-speaking listeners uniformly rate speakers' voices in terms of perceived sexual orientation (PSO). A number of statistical techniques were used to examine this. First, a matrix of Spearman ρ correlations between the 23 listeners' ratings and the 20 speakers' perceived sexual orientation was calculated. Approximately half of the listener pairs' correlations did not achieve statistical significance at the $\alpha < 0.05$ level, suggesting that different listeners were indeed rank-ordering speakers differently. Second, a factor analysis was performed on the listeners' ratings of the speakers' perceived sexual orientation. Principle components extraction and varimax rotation were used. Six factors were extracted. An examination of individual listeners' loadings on the six factors showed that there were seven listeners in the first factor, five on the second, three each on the third, fourth, and fifth, and two on the sixth. Listeners that clustered together were the same as those that had been established as significantly correlated in

the Spearman ρ correlation analysis. This suggests that there are distinct patterns of listener performance on this measure. Two Kruskal-Willis tests showed that these groupings were not due to differences across listeners in either the mean score that they gave to the 20 speakers or in the standard deviation of their scores. The demographic data for each listener was also examined to see if there were links between speakers that might provide an explanation for the clustering pattern. However, there were few differences between clusters in terms of demographic information that was collected. The five men who took part in the study were spread throughout the clusters (two in one cluster, and the other three in separate clusters). Listeners in each cluster were similar in terms of language background, age, and level of education. We return to listener consistency and variation in ratings in Section 3.3.4 by examining whether the clusters of listeners are based on variation in attention to different acoustic parameters in the stimuli.

3.2. *Correlation among different social judgments*

In order to address the relationship between listeners' judgments of speaker sexual orientation and other perceived speaker characteristics, a correlation analysis of listener evaluations of perceived sexual orientation, perceived height, perceived age, and perceived social class was carried out. A summary of these data is found in Table 1. There was a significant relationship between perceived sexual orientation and perception of height, $r = -.461$, p (two-tailed) $< .041$, with speakers rated as gay sounding more likely to be rated as shorter than speakers rated as straight sounding. There were no significant relationships between perceived sexual orientation and perceived age or perceived social class. However, perceived height was significantly correlated to perceived age, $r = -.605$, $p < .05$, as well as perceived social class, $r = .566$, $p < .05$, with speakers rated as taller sounding more likely to be rated as older sounding and from a higher social class. Perceived age and perceived social class

Table 1.   *Correlation analysis of perceived sexual orientation, perceived height, perceived age, and perceived social class (Pearson's correlation coefficient).*

Subscale	1. Perceived Sexual Orientation	2. Perceived age	3. Perceived height	4. Perceived social class
(n = 23)				
1. Perceived sexual orientation	–	−0.29	−0.46*	−0.05
2. Perceived age		–	−0.61*	−0.53**
3. Perceived height			–	0.57*
4. Perceived social class				–

* $p < .05$ (two-tailed); ** $p < .01$ (two-tailed)

had a significant relationship, $r = -.525$, $p < .01$, with speakers perceived as older also being perceived as being from a higher social class.

3.3. *Acoustic analyses*

3.3.1. *Summary of acoustic data.*   Measurements of acoustic elements were made using Praat signal-processing software (Boersma and Weenink 2003). The analysis included an examination of vowel characteristics including individual and mean F1 (Bark), individual and mean F2 (Bark), and individual and mean F_0 of each stressed vowel (/e/ in *manera, tiempo*, and *gente*; /i/ in *vida* and *día*; /u/ in *mundo*) and the pretonic /a/ in *la manera*. Although /o/ appeared in the stimuli, all instances were posttonic and phrase-final, so it was not possible to interpret the acoustic characteristics as something unique to the speakers or to the fact that they were unintentionally sampled in that prosodic position. Estimates of speaker vocal tract length in cm were also calculated by measuring the F3 of pretonic /a/ in manera, treating it as if it had been produced by an unmodified vocal tract, and deriving vocal-tract length using the odd-quarter formula (Fant 1966). Average vowel space expansion was also calculated, using the bark-scaled F1 and F2 values (following the formula found in Bradlow, Torretta, and Pisoni 1996). A summary of the acoustic characteristics of the stimuli is found in the Appendix.

3.3.2. *Correlation between acoustic measures and social variables.*   In order to understand the role of the acoustic characteristics on listener evaluations of speaker sexual orientation, a correlation analysis between the listener evaluations of perceived sexual orientation and the acoustic data was conducted. The analysis showed a statistically significant correlation between perceived sexual orientation and F2 frequencies of two tokens of mid front vowels: /e/ in *la manera* ($r = -.478$, $p < .05$) and /e/ in *el tiempo* ($r = -.456$, $p < .05$). Higher F2 frequencies correlated to perception of a speaker as more gay sounding. There were no significant correlations between perceived sexual orientation and individual F1 frequencies, individual F_0 values, estimated vocal tract length, average dispersion, or for the F2 frequencies of /i/ (*la vida, el día*), /u/ (*el mundo*), or pretonic /a/ (*la manera*). Since this is an exploratory study, it is beneficial to note one relationship approaching significance, which was the F2 frequency for the remaining mid front token, /e/ in *la gente* ($r = -.412$, $p = .071$).

A correlation analysis of acoustic characteristics of individual vowels and listener evaluations of height, social class, and age showed several statistically significant relationships. Perceived height correlated with F_0 values in pretonic /a/ of *la manera* ($r = .681$, $p < .01$), /e/ of *la gente* ($r = .611$, $p < .01$), /e/ of *la manera* ($r = .617$, $p < .01$), /e/ of *el tiempo* ($r = .627$, $p < .01$), and /i/ of *la*

vida ($r = .471$, $p < .05$); speakers with lower F_0 values were rated as taller sounding than those with higher F_0 values. Perception of social class showed significant correlations with F1 values in three of the high vowels: /i/ in *el día* ($r = .630$, $p < .01$), /i/ in *la vida* ($r = .648$, $p < .01$), and /u/ in *el mundo* ($r = .598$, $p < .01$). In these cases, higher F1 frequencies (lower vowels) were correlated with speakers perceived as from a lower social class, and lower F1 frequencies (higher vowels) were correlated with speakers perceived as from a higher social class. Perceived age correlated with one acoustic measure, F_0 values of /e/ in *la gente* ($r = -.446$, $p < .05$), with speakers with lower F_0 perceived as older and those with higher F_0 perceived as younger.

3.3.3. *Analysis by speaker groups.* The next analysis examined the patterning of individual and groups of speakers' F1 and F2 values. In this case, the speakers were divided into three groups: most gay sounding, least gay sounding, and intermediate. In order to have well-defined groups of gay and least gay sounding talkers, the speaker group was divided by mean perceived sexual orientation ratings. This resulted in a most gay sounding group of six speakers (mean rating = 2.87, SD = 0.64, range = [2.04–3.48], an intermediate group of nine speakers (mean rating = 4.00, SD = 0.13, range = [3.78–4.17], and a least gay sounding group of five speakers (mean rating = 4.31, SD = 0.06, range = [4.22–4.39]. Data from the analysis of F1 and F2 values is displayed in Figure 1. In this view of the data the differences in F2 of /e/ are evident. What is perplexing is the differences between groups in F1 frequencies, which in most
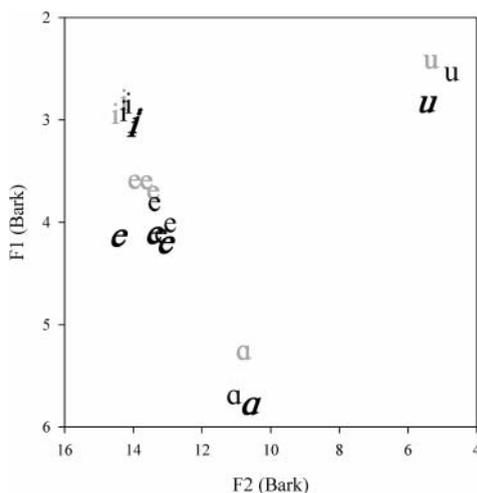

Figure 1. *Group averages of vowel formant frequency by word, for speakers rated as most gay sounding (light gray), least gay sounding (plain text), and intermediate (italics).*

cases seem to be greater than the differences between F2, but nonetheless were not found to have a significant relationship with evaluations of perceived sexual orientation. A possible interpretation is that the differences in F1 were immediately associated with something other than perceived sexual orientation. Data from the correlation analysis in Section 3.3.2 suggests that the most likely association of F1 is with social class.

3.3.4. *Factor analysis of listener ratings.*   In the above examination of listener consistency and variation in ratings it was determined that there were distinct patterns of listener evaluations of perceived sexual orientation, but that these differences were not due to differences in mean ratings or standard deviations of the ratings. A possible explanation for the differences observed is that different groups of listeners responded differently to specific acoustic parameters in the stimuli. In order to explore this hypothesis, a correlation (Spearman ρ) analysis between perceptions of sexual orientation and mean acoustic characteristics of the stimuli was conducted. The listener data was separated by the clusters derived in a factor analysis. A summary of these data is found in Table 2. The correlation analysis showed that there were listeners whose ratings were significantly correlated to mean F2 values in all but one cluster. Five individual listeners in three clusters had significant correlations between ratings and mean F1 values, while two listeners' ratings (in two unique clusters) were significantly correlated with estimated vocal tract length. Just one listener had scores significantly correlated with mean F_0, and one listener had ratings significantly correlated with average vowel space dispersion. This does little to clear up the issue of uniformity, as it suggests that the majority of listeners for whom there is a significant correlation responded to the same acoustic parameter (mean F2 frequency that, as we have seen, is attributable to F2 of certain tokens of /e/), regardless of the patterning of their individual ratings. One possible explanation is that beyond the arguably primary role of those F2 frequencies, unique combinations of acoustic factors make a difference in each listener's perceptions of sexual orientation, and there is an aggregate effect (see Eckert 2000; Levon 2007) that is unique to each individual. If that is the case, it may be beneficial for future studies to examine differences across individuals as well as group-wise patterning.

3.3.5. *Correlation between average acoustic characteristics and social judgments.*   The relationship between mean acoustic characteristics and average listener ratings of sexual orientation, perceived height, perceived age, and perceived social class was also analyzed. Correlation analyses revealed that perceived sexual orientation was significantly correlated with mean F2 measures, $r = -.572$, p (two-tailed) $< .05$, with speakers perceived as more gay sounding having higher F2 frequencies; this is likely carried by /e/. There were no

Table 2.   *Correlations (Spearman ρ) between individual listeners' perceived sexual orientation ratings and average acoustic characteristics of the stimuli, separated by the clusters derived from a factor analysis [see text for details].*

Listener ID	Sex	Cluster Number	Mean F1 (Bark)	Mean F2 (Bark)	Est. vocal tract length (cm)	Mean F_0 (ERB)	Dispersion (Bark)
s208	female	1	−.163	−.119	.068	.112	.191
s211	female	1	.216	−.360	−.092	.029	−.048
s503	male	1	.071	−.492*	.122	.057	−.076
s505	female	1	−.035	−.216	.038	.139	−.189
s510	male	1	.372	−.584**	.270	−.270	−.128
s512	female	1	.137	−.277	.416	−.019	.094
s514	female	1	.626**	−.388	.158	−.215	.084
s204	female	2	.421	−.287	.072	.082	.062
s501	female	2	.098	−.565**	.249	.102	−.014
s504	female	2	.195	−.499*	.282	.238	−.347
s506	female	2	.356	−.660**	.514*	−.089	−.149
s513	female	2	.240	−.168	−.257	.196	.047
s201	female	3	−.158	−.304	.061	.449*	−.012
s202	female	3	.381	−.557*	.673**	.135	−.167
s307	male	3	.090	−.274	.443	.381	−.272
s203	female	4	.179	−.198	.278	.150	−.007
s205	female	4	.170	−.440	.213	.093	−.034
s209	female	4	.319	−.283	−.159	−.177	−.088
s210	female	5	−.341	.172	−.419	.307	.187
s502	female	5	.558*	−.616**	.299	−.083	.462*
s509	male	5	.539*	−.549*	.395	−.052	−.209
s206	male	6	.530*	−.462*	.222	−.042	−.282
s207	female	6	.473*	−.417	.265	−.097	−.249

* $p < .05$ (two-tailed); ** $p < .01$ (two-tailed)

significant correlations between perceived sexual orientation and mean F1, mean F_0, or mean vowel space expansion or estimated vocal tract length.

The relationship between mean acoustic factors and perceived height, social class, and age differed from the relationship between mean acoustic factors and perceived sexual orientation. Perceived height was significantly correlated with mean F2 ($r = .467$, $p < .05$), with speakers perceived as taller having lower mean F2 frequencies (backer vowels). Perceived height was also significantly correlated with mean F_0 ($r = .603$, $p < .05$), with speakers perceived as taller having lower mean F_0. Perceived social class had a significant relationship with mean F1, $r = .553$, $p < .05$, with speakers evaluated as being from a higher social class having lower mean F1 frequencies for the high vowels. Perceived age, on the other hand, was not significantly related to any of the mean acoustic measures.

4.   Discussion and conclusions

The results of the study indicate that there are distinct patterns of listener evaluations of perceived sexual orientation shared among clusters of listeners, and that there is variation among individuals within those groups as far as which acoustic cues are significantly correlated to evaluations. Although it is indisputable that there are "shared socially constructed beliefs (i.e. stereotypes)" (Strand 1999: 87) about speech variation, and that listeners make evaluations of speaker sexual orientation, there is observable variation in listener evaluations in an overt task such as the one in this experiment. As mentioned above, more studies are needed to examine differences across individuals as well as group-wise patterning. Additional quantitative data on the possibility of aggregate effects may also be useful to larger discussions of how social identity is created and interpreted, as well to discussions of linguistic profiling and discrimination.

The data show that evaluations of perceived sexual orientation are significantly correlated with F2 values of two mid front vowel (/e/) tokens, with speakers with higher F2 values (more front [e]) more likely to be rated as gayer sounding, and those with lower F2 values (more back [e]) as straighter sounding. This role of F2 is somewhat parallel to a result reported in Munson et al. (2006), in which the investigators found that one of the significant correlations of judgments of sexual orientation in English was the F2 frequency of back vowels, although in this study it was the F2 frequency values of mid front vowels that showed a significant effect. This suggests that although there may be similarities in the type of phonetic factors (e.g., F2 frequencies) that contributes to evaluations of sexual orientation cross-linguistically, the context in which those factors are relevant (e.g., in front or back vowels) depends on local interpretations. This corresponds with Johnson's (2006) cross-linguistic analysis of relationships between height, gender, and vowel production. More cross-linguistic data is needed in order to establish a taxonomic scheme for the influences of acoustic factors on perception of social identities across languages. More investigation is also needed to identify the relevant variables within languages and across the gender and sexuality continua.

The finding that F2 frequencies of /e/ are correlated to listener evaluations of sexual orientation also has implications for the study of Spanish vowel variation. As mentioned earlier, some variation according to contextual and social factors has been reported for unstressed vowels in Spanish, but there are few studies documenting variation in stressed vowels and little data that links stressed vowel variation to social attributes. This study, however, has shown that the variation in F2 that occurs in a particular stressed vowel (/e/) has enough socioindexical weight to influence evaluations of sexual orientation. This finding, as well as the finding that F1 values of high vowels are linked to evaluations of social class, highlight a need for acoustic studies of

the Spanish vowel system that examine variation beyond that which can be captured in narrow phonetic transcription.

Listener judgments of speaker sexual orientation had a significant relationship with listener judgments of perceived height, but not with perceived social class or perceived age. In this case, speakers who were evaluated as gayer sounding were more likely to be evaluated as shorter. This corresponds with data from Munson et al. (2006), which showed a correlation between listener judgments of speaker perceived sexual orientation and perceived height. Taking into account the anecdotal elements of the gay male speech stereotype, it is somewhat surprising that there was no correlation between perceived sexual orientation and perceived social class. One possible explanation for this is the fact that the stimuli for this study, which was part of a larger project on /s/ variation, did not include any instances of /s/. Variable /s/ production has been one of the most extensively studied sociolinguistic phenomena of Spanish and is well documented as a correlate of social class in Caribbean Spanish (Alba 1990; Cedergren 1978; Lafford 1986; López-Morales 1983; *inter alia*). It is possible that evaluations were affected by the absence of a variable strongly correlated with social class such as /s/; perhaps the remaining cues did not carry enough of a socioindexical impact in terms of social class to reveal relationships that might exist. Since /s/ realization is so highly correlated with social factors from a production standpoint, future studies are needed to assess the impact of /s/ production on perception of social identities as well.

The results of the study contribute to the understanding of acoustic factors and perception of social identities from a cross-linguistic perspective. The study points to the need for more data on individual variation and group-wise patterns in social evaluations. It underscores the complex nature of identity, as well as the acute sensitivity that listeners have for phonetic variation and social identity regardless of their native language background.

5.   Acknowledgements

Appendix

Summary of mean acoustic characteristics of the stimuli, by speaker.

Speaker ID	Mean F1 (Bark)	Mean F2 (Bark)	Est. vocal tract length (cm)	Mean F_0 (ERB)	Dispersion (Bark)
101	3.75	12.45	14.76	3.64	2.63
102	3.82	11.94	17.8	4.05	2.91
103	3.48	12.2	13.82	4.03	2.36
104	3.6	12.42	14.99	3.47	2.58
105	3.98	12.22	13.19	3.73	2.68
106	3.73	11.8	14.38	3.59	2.35
107	3.64	11.73	15.94	3.97	2.67
108	4.73	11.92	14.68	4.25	2.5
109	3.8	11.64	18.27	3.79	2.58
110	3.53	12.08	18.05	4.27	2.35
111	3.77	11.81	21.57	3.28	2.3
112	4.12	12.13	16.29	4.18	2.57
113	3.47	12.26	17.21	4.01	3.04
114	3.25	12.44	13.79	3.98	2.53
115	4.05	12.33	14.78	3.99	2.58
116	2.96	12.48	15.31	4.71	2.71
117	3.1	12.11	14.55	4.1	2.54
118	4.14	11.96	14.93	3.8	2.47
119	3.58	12.24	13.16	4.45	2.72
120	4.06	11.78	15.73	3.86	2.34

Summary of acoustic characteristics of individual vowels, by speaker.

Speaker ID	Word	Vowel	F1 (Bark)	F2 (Bark)	F_0 (ERB)	Est. vowel tract length (cm)	Dispersion (Bark)
	manera	a	5.22	10.85	3.34	14.76	2.17
	gente	e	4.00	14.07	3.58	14.76	1.64
	manera	e	4.13	13.86	3.41	14.76	1.46
101	tiempo	e	3.95	14.22	3.77	14.76	1.78
	dia	i	3.14	14.46	3.77	14.76	2.10
	vida	i	3.32	14.38	3.83	14.76	1.98
	mundo	u	2.52	5.31	3.79	14.76	7.24

Speaker ID	Word	Vowel	F1 (Bark)	F2 (Bark)	F_0 (ERB)	Est. vowel tract length (cm)	Dispersion (Bark)
	manera	a	6.44	8.80	3.78	17.80	4.09
	gente	e	4.37	14.12	3.78	17.80	2.24
	manera	e	3.65	12.82	3.93	17.80	0.89
102	tiempo	e	4.03	13.49	4.34	17.80	1.56
	dia	i	2.74	14.19	4.22	17.80	2.49
	vida	i	2.65	14.46	4.37	17.80	2.78
	mundo	u	2.88	5.73	3.93	17.80	6.28
	manera	a	4.48	10.67	3.64	13.82	1.82
	gente	e	3.91	13.40	4.09	13.82	1.28
	manera	e	3.59	13.73	3.96	13.82	1.53
103	tiempo	e	4.50	13.51	4.35	13.82	1.66
	dia	i	2.93	13.96	3.54	13.82	1.85
	vida	i	2.79	14.10	4.21	13.82	2.03
	mundo	u	2.16	5.99	4.44	13.82	6.34
	manera	a	7.27	11.14	3.25	14.99	3.89
	gente	e	3.01	13.57	3.61	14.99	1.29
	manera	e	2.76	13.86	3.49	14.99	1.66
104	tiempo	e	3.58	13.10	3.43	14.99	0.68
	dia	i	3.02	13.58	3.41	14.99	1.30
	vida	i	2.97	15.38	3.32	14.99	3.02
	mundo	u	2.56	6.31	3.80	14.99	6.20
	manera	a	5.72	11.46	3.39	13.19	1.90
	gente	e	4.51	13.51	3.70	13.19	1.40
	manera	e	4.60	13.37	3.71	13.19	1.31
105	tiempo	e	4.44	13.87	3.89	13.19	1.72
	dia	i	2.54	14.12	3.90	13.19	2.38
	vida	i	2.94	14.47	3.73	13.19	2.48
	mundo	u	3.09	4.73	3.78	13.19	7.55
	manera	a	5.73	12.15	3.35	14.38	2.03
	gente	e	4.11	12.62	3.54	14.38	0.89
	manera	e	3.80	11.93	3.38	14.38	0.15
106	tiempo	e	3.76	13.42	3.78	14.38	1.61
	dia	i	3.18	14.07	3.58	14.38	2.33
	vida	i	2.92	13.81	3.66	14.38	2.16
	mundo	u	2.63	4.64	3.84	14.38	7.25

Speaker ID	Word	Vowel	F1 (Bark)	F2 (Bark)	F_0 (ERB)	Est. vowel tract length (cm)	Dispersion (Bark)
107	manera	a	5.53	10.48	3.50	15.94	2.27
	gente	e	4.53	13.42	3.88	15.94	1.91
	manera	e	4.38	12.98	3.77	15.94	1.45
	tiempo	e	3.49	13.24	3.73	15.94	1.52
	dia	i	2.91	13.67	4.15	15.94	2.07
	vida	i	2.92	13.72	4.17	15.94	2.11
	mundo	u	1.70	4.63	4.57	15.94	7.36
108	manera	a	6.38	11.12	3.99	14.68	1.83
	gente	e	5.14	12.74	4.21	14.68	0.92
	manera	e	5.30	13.17	4.21	14.68	1.38
	tiempo	e	5.29	13.16	4.32	14.68	1.37
	dia	i	3.62	14.06	4.30	14.68	2.41
	vida	i	3.85	14.25	4.26	14.68	2.50
	mundo	u	3.55	4.91	4.45	14.68	7.10
109	manera	a	5.01	9.85	3.58	18.27	2.17
	gente	e	4.48	12.83	3.82	18.27	1.37
	manera	e	4.69	12.65	3.68	18.27	1.35
	tiempo	e	4.60	13.41	3.83	18.27	1.95
	dia	i	2.57	13.85	4.06	18.27	2.52
	vida	i	2.84	13.61	3.73	18.27	2.19
	mundo	u	2.37	5.30	3.85	18.27	6.50
110	manera	a	4.95	10.95	3.98	18.05	1.82
	gente	e	3.77	13.26	4.42	18.05	1.21
	manera	e	3.45	13.33	4.19	18.05	1.26
	tiempo	e	3.91	13.33	4.21	18.05	1.31
	dia	i	3.02	14.19	4.40	18.05	2.17
	vida	i	2.95	14.03	4.40	18.05	2.03
	mundo	u	2.63	5.45	4.28	18.05	6.69
111	manera	a	5.24	10.96	2.74	21.57	1.70
	gente	e	3.86	12.92	3.36	21.57	1.11
	manera	e	3.82	12.91	2.89	21.57	1.11
	tiempo	e	4.01	12.48	3.42	21.57	0.72
	dia	i	3.18	14.03	3.55	21.57	2.30
	vida	i	3.29	14.20	3.52	21.57	2.44
	mundo	u	3.00	5.15	3.49	21.57	6.70

Speaker ID	Word	Vowel	F1 (Bark)	F2 (Bark)	F_0 (ERB)	Est. vowel tract length (cm)	Dispersion (Bark)
	manera	a	6.47	10.29	3.75	16.29	2.99
	gente	e	4.33	13.71	4.15	16.29	1.59
	manera	e	4.79	13.48	4.09	16.29	1.50
112	tiempo	e	4.38	13.51	4.36	16.29	1.40
	dia	i	3.08	13.98	4.17	16.29	2.12
	vida	i	3.03	13.94	4.42	16.29	2.12
	mundo	u	2.76	6.01	4.32	16.29	6.27
	manera	a	6.29	10.31	3.36	17.21	3.43
	gente	e	3.64	13.53	4.28	17.21	1.27
	manera	e	3.52	13.47	3.93	17.21	1.20
113	tiempo	e	3.40	13.93	4.05	17.21	1.67
	dia	i	2.50	14.84	3.89	17.21	2.75
	vida	i	2.63	15.25	4.23	17.21	3.10
	mundo	u	2.32	4.53	4.30	17.21	7.82
	manera	a	4.28	10.67	3.69	13.79	2.06
	gente	e	3.27	13.96	4.04	13.79	1.52
	manera	e	3.73	13.66	3.56	13.79	1.31
114	tiempo	e	3.25	14.25	4.36	13.79	1.81
	dia	i	2.82	14.26	4.05	13.79	1.87
	vida	i	2.95	14.68	4.12	13.79	2.26
	mundo	u	2.44	5.61	4.04	13.79	6.88
	manera	a	7.47	11.59	3.53	14.78	3.49
	gente	e	3.98	13.32	4.17	14.78	0.99
	manera	e	4.18	13.41	3.99	14.78	1.09
115	tiempo	e	3.94	13.88	3.91	14.78	1.55
	dia	i	2.68	14.44	4.27	14.78	2.52
	vida	i	3.25	13.91	3.93	14.78	1.77
	mundo	u	2.88	5.77	4.17	14.78	6.67
	manera	a	5.29	11.59	4.46	15.31	2.50
	gente	e	2.57	13.64	4.52	15.31	1.23
	manera	e	2.92	13.72	4.82	15.31	1.25
116	tiempo	e	2.60	14.75	4.76	15.31	2.30
	dia	i	2.58	14.57	4.72	15.31	2.13
	vida	i	2.72	14.26	4.43	15.31	1.80
	mundo	u	2.03	4.79	5.23	15.31	7.74

Speaker ID	Word	Vowel	F1 (Bark)	F2 (Bark)	F_0 (ERB)	Est. vowel tract length (cm)	Dispersion (Bark)
117	manera	a	4.76	10.47	3.86	14.55	2.33
	gente	e	2.79	14.42	4.13	14.55	2.33
	manera	e	3.42	13.05	3.93	14.55	0.99
	tiempo	e	3.33	13.28	4.13	14.55	1.19
	dia	i	2.59	14.07	4.34	14.55	2.03
	vida	i	2.76	14.14	4.22	14.55	2.06
	mundo	u	2.04	5.34	4.13	14.55	6.85
118	manera	a	5.69	11.30	3.48	14.93	1.69
	gente	e	4.48	13.73	3.97	14.93	1.80
	manera	e	4.97	12.50	3.60	14.93	1.00
	tiempo	e	3.79	13.30	3.83	14.93	1.38
	dia	i	3.23	14.00	3.93	14.93	2.23
	vida	i	3.16	13.91	3.90	14.93	2.18
	mundo	u	3.64	4.99	3.89	14.93	6.99
119	manera	a	4.55	10.70	4.31	13.16	1.82
	gente	e	4.31	13.68	4.47	13.16	1.61
	manera	e	4.03	12.80	4.37	13.16	0.72
	tiempo	e	3.63	14.11	4.65	13.16	1.87
	dia	i	2.86	14.91	4.41	13.16	2.76
	vida	i	3.03	14.82	4.37	13.16	2.63
	mundo	u	2.65	4.68	4.55	13.16	7.62
120	manera	a	5.46	10.66	3.61	15.73	1.80
	gente	e	4.58	12.78	3.85	15.73	1.13
	manera	e	4.59	12.59	3.70	15.73	0.97
	tiempo	e	3.94	13.63	3.90	15.73	1.85
	dia	i	3.51	13.52	4.06	15.73	1.82
	vida	i	3.28	13.93	3.79	15.73	2.29
	mundo	u	3.03	5.36	4.09	15.73	6.50

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References

Alba, Orlando. 1990. *Variación fonética y diversidad social en el español dominicano de Santiago*. Santiago: Pontificia Universidad Católica.

Babel, Molly & Keith Johnson. 2006. Global talker characteristics and judgments of gay-sounding speech. Paper presented at the 35th Annual Meeting of New Ways of Analyzing Variation, The Ohio State University, 9–12 November.

Boellstorff, Tom. 2004. "Authentic, of course!": Gay language in Indonesia and cultures of belonging. In William Leap & Tom Boellstorff (eds.), *Speaking in queer tongues*, 181–201. Champaign, IL: University of Illinois Press.

Boersma, Paul & David Weenink. 2003. PRAAT v. 4.1.7 (computer software). Amsterdam: Institute of Phonetic Sciences.

Bradlow, Ann, Gina Torretta, & David Pisoni. 1996. Intelligibility of normal speech: Global and finegrained acoustic-phonetic talker characteristics. *Speech Communication* 20. 255–272.

Carrier, Joseph. 1995. *De los otros: Intimacy and homosexuality among Mexican men.* New York: Columbia University Press.

Campbell-Kibler, Kathryn. 2005. *Listener perceptions of sociolinguistic variables: The case of (ING).* Unpublished doctoral dissertation, Stanford University.

Cedergren, Henrietta. 1978. En torno a la variación de la s final de sílaba en Panamá: Analysis Cuantitativo. In Humberto Morales (ed.), *Corrientes actuales en la dialectología del caribe hispánico*, 37–50. Rio Piedras, Puerto Rico: Editorial Universitaria.

Dalbor, John. 1980. *Spanish pronunciation: Theory and practice.* New York: Harcourt Brace Jovanovich.

Davies, Mark. 2006. *A frequency dictionary of Spanish.* New York: Routledge.

Eckert, Penelope. 2000. *Linguistic variation as social practice: The linguistic construction of social meaning in Belten High.* Oxford: Blackwell.

Fant, Gunnar. 1966. A note on vocal tract size factors and non-uniform F-pattern scalings. *Speech Technology Laboratory: Quarterly Progress and Status Report* 4. 22–30.

Gaudio, Rudolf. 1994. Sounding gay: Pitch properties in the speech of gay and straight men. *American Speech* 69 (1). 30–57.

Hay, Jennifer, Aaron Nolan & Katie Drager. 2006a. From Fush to Feesh: Exemplar Priming in Speech Perception. *The Linguistic Review* 23(3). 351–379.

Hay, Jennifer, Paul Warren & Katie Drager. 2006b. Factors influencing speech perception in the context of a merger-in-progress. *Journal of Phonetics* 34(4). 458–484.

Harmegnies, Bernard & Dolors Poch-Olivé. 1992. A study of style-induced vowel variability: laboratory versus spontaneous speech in Spanish. *Speech Communication* 11. 429–437.

Higgins, Ross. 2004. French, English, and the idea of gay language in Montreal. In William Leap & Tom Boellstorff (eds.), *Speaking in queer tongues*, 72–104. Champaign, IL: University of Illinois Press.

Holmquist, Jonathan. 2008. Gender in context: Features and factors in men's and women's speech in rural Puerto Rico. In Maurice Westmoreland & Juan Tomás Testa, J. (eds.), *Selected Proceedings of the 4ᵗʰ Workshop on Spanish Sociolinguistics,* 17–35. Somerville, MA: Cascadilla Proceedings Project.

Johnson, Keith. 2006. Resonance in an exemplar-based lexicon: The emergence of social identity and phonology. *Journal of Phonetics* 34. 485–499.

Kulick, Don. 2000. Gay and lesbian language. *Annual Review of Anthropology* 29. 243–285.

Labov, William. 1966. *The social stratification of English in New York City.* Washington, D.C.: Center for Applied Linguistics.

Labov, William. 2006. *The social stratification of English in New York City.* Cambridge: Cambridge University Press.

Lafford, Barbara. 1986. Valor diagnóstico-social del uso de ciertas variantes de /s/ en el español de Cartagena, Colombia. In Rafael Núñez-Cedeño, Iraset Páez & Jorge Guitart (eds.), *Estudios sobre la fonología del español del Caribe*, 53–75. Caracas: La Casa de Bello.

Levon, Erez. 2006. Hearing "gay": Prosody, interpretation, and the affective judgments of men's speech. *American Speech* 81(1). 56–78.

Levon, Erez. 2007. Sexuality in context: Variation and the sociolinguistic perception of identity. *Language in Society* 36. 533–554.

López-Morales, Humberto. 1983. *Estratificación social del español de San Juan de Puerto Rico.* México: Universidad Nacional Autónoma de México.

Mack, Sara. 2008. *Sexual Orientation, Gender, and Speech Stereotypes in Puerto Rican Spanish.* Poster presented at the 5th Biennial Meeting of the International Language and Gender Association, Victoria University of Wellington, 3–5 July.

Munson, Benjamin. 2007. The acoustic correlates of perceived masculinity, perceived femininity, and perceived sexual orientation. *Language and Speech* 50(1). 125–142.

Munson, Benjamin & Molly Babel. 2007. Loose lips and silver tongues, or, projecting sexual orientation through speech. *Language and Linguistics Compass* 1(5). 416–449.

Munson, Benjamin, Elizabeth McDonald, Nancy DeBoe & Aubrey White. 2006. The acoustic and perceptual bases of judgments of women and men's sexual orientation from read speech. *Journal of Phonetics* 34(2). 202–40.

Munson, Benjamin & Lindsay Zimmerman. 2006. *Perceptual bias and the myth of the gay lisp.* Paper presented at the American Speech-Language-Hearing Association annual convention. Miami Beach, 16–20 November.

Murray, Stephen. 1995. *Latin American Male Homosexualities.* Albuquerque: University of New Mexico Press.

Niedzielski, Nancy. 1999. The effect of social information on the perception of sociolinguistic variables. *Journal of language and Social Psychology* 18(1), 62–85.

Nuñez-Cedeño, Rafael. 1994. The alterability of Spanish geminates and its effects on the Uniform Applicability Condition. *Probus* 6. 23–41.

Oliver Rajan, Julia. 2007. Mobility and its effects on vowel raising in the coffee zone of Puerto Rico. In Jonathan Holmquist, Augusto Lorenzino, & Lofti Sayahi (eds.), *Selected Proceedings of the 3rd Workshop on Spanish Sociolinguistics*, 44–52. Somerville, MA: Cascadilla Proceedings Project.

Pierrehumbert, Janet, Tessa Bent, Ann Bradlow, Benjamin Munson & Michael Bailey. 2004. The influence of sexual orientation on vowel production. *Journal of the Acoustic Society of America* 116(4). 1905–1908.

Podesva, Robert, Sarah Roberts & Kathryn Campbell-Kibler. 2002. Sharing resources and indexing meaning: the production of gay styles. In Kathryn Campbell-Kibler, Robert Podesva, Sarah Roberts, and Andrew Wong (eds.), *Language and sexuality: Contesting meaning in theory and practice,* 175–189. Palo Alto, CA: Center for the Study of Language and Information Publications.

Purnell, Tom, William Idsardi & John Baugh. 1999. Perceptual and phonetic experiments on American English dialect identification. *Journal of Language and Social Psychology* 18(1). 10–30.

Roca, Iggy. 2005. Saturation of parameter setting in Spanish stress. *Phonology* 22. 345–394.

Santoro, Maurizio. 2007. Puerto Rican Spanish: A case of partial restructuring. *Hybrido: arte y literatura* 10(9). 47–57.

Schneider, Walter, A. Eschman & A. Zuccolotto. 2002. *E-Prime user's guide.* Pittsburgh, PA: Psychology Software Tools, Inc.

Schwegler, Armin & Juergen Kempff. 2007. *Fonética y fonología españolas.* Hoboken, NJ: Wiley.

Sowards, Stacey. 2000. Juan Gabriel and audience interpretation: Cultural impressions of effeminacy and sexuality in Mexico. *Journal of Homosexuality* 39(2). 133–158.

Smyth, Ron, Greg Jacobs & Henry Rogers. 2003. Male voices and perceived sexual orientation: An experimental and theoretical approach. *Language in Society* 32. 329–350.

Strand, Elizabeth. 1999. Uncovering the role of gender stereotypes in speech perception. *Journal of Language and Social Psychology* 18(1). 86–99.

Strand, Elizabeth. 2000. *Gender stereotype effects in speech processing*. Columbus, OH: The Ohio State University dissertation.

Walker, Abby. 2007. The effect of phonetic detail on perceived speaker age and social class. In Jürgen Trouvain & William Barry (eds.), *Proceedings of the 16th International Congress of Phonetic Sciences*. Saarbrucken, Germany.

Zentella, Ana Celia. 2003. José, can you see: Latin@ responses to racist discourse. In Doris Sommer (ed.)*, Bilingual Aesthetics*, 51–66. New York: Palgrave Press.