

Pitch Characteristics and the Perception of Female Sexual Orientation in Cantonese

Janice Wing-Sze Wong¹, Jung-Yueh Tu²

¹Hong Kong Baptist University, Hong Kong SAR

²Shanghai Jiao Tong University, China

janicewong@hkbu.edu.hk, jytu@sjtu.edu.cn

ABSTRACT

The current study aimed to examine the pitch characteristics of Hong Kong Cantonese-speaking lesbian women and listeners' perception of the speakers' sexual orientation. The first experiment examined whether the pitch patterns of lesbian females (N=15) mirror that of heterosexual women (N=20). Results indicated that while the lesbian group demonstrated a lower average pitch than the heterosexual group, the differences were not always significant on all six tones. Regarding listeners' (N=54) perceptual judgements on the sexual orientation of the speakers, the perceived rating of homosexuality showed robust differences between the two groups, suggesting that listeners' accurate judgment on sexual orientation of lesbian women may depend on acoustic cues other than pitch. The present findings were only partially in line with previous research in which pitch serves as a means to convey one's sexual orientation.

Keywords: speech perception, lesbian speech, Cantonese, pitch, gender

1. INTRODUCTION

Previous studies (e.g., [1], [5], [6], [11], [13]) have investigated whether pitch functions as a marker of homosexual identity. Although results varied largely, in general, listeners show some sensitivity to the pitch characteristics that allow correct judgements towards the speakers' sexual orientation. For instance, some of these studies (e.g., [1], [6]) found that homosexual men have a tendency to speak with a higher pitch and a wider pitch range when compared with heterosexual males, assembling that of female speakers. While a growing body of literature has investigated the acoustic and perceptual correlates of gay speech in English, little data was available for the lesbian speech style. Several studies (e.g., [8], [9], [11], [13]) focusing on the speech of lesbian women showed, in line with the common stereotype, that they tend to use a smaller pitch range, a lower pitch and a flatter intonation than the heterosexual females. However, conflicting results with regard to the role of pitch were still observed. Waksler [12] found no significant

differences in pitch and pitch variation between lesbian and heterosexual women. Barron-Lutzross [2] did not find pitch to be a phonetic variable that reflected the lesbians' sexual orientation either, but was certain that there existed some other variables that allowed accurate identification of sexual orientation in her study.

The above studies also focused predominantly on the speech of English speakers. With the exception of a few studies on homosexual males (e.g., [6] on Mandarin and [4] on Cantonese), little is known as to what phonetic correlates lesbian females speaking a tone language use to convey their sexual orientation, and whether or not listeners are able to identify the speakers' sexual orientation simply by listening to their voices. The purpose of the current study, therefore, was to contribute to this line of research, with a focus on the Hong Kong Cantonese-speaking homosexual female speakers' use of pitch and pitch variation. As part of a larger socio-phonetic study investigating more acoustic correlates that were associated with both the perception and production of the lesbian speech style, the current report served as a preliminary examination of whether pitch was used by these Cantonese-speaking lesbian women to express their masculinity and sexual identity. Masculinity rating was chosen due to the stereotypical perception that lesbian women are more masculine. Moreover, whether or not listeners attended to pitch as the phonetic correlate that served as the basis of judgement on the speakers' sexual orientation was studied as well.

2. EXPERIMENT 1: SINGLE-WORD READING

Experiment 1 focused on investigating the pitch characteristics of a group of self-professed lesbian females whose native language was Hong Kong Cantonese. The mean, maximum, minimum, and range of the fundamental frequency (F0) of all six Cantonese tones were measured. The data were compared against the heterosexual group.

2.1. Participants

Participants consisted of 35 female speakers (15 self-

reported lesbian females, 20 heterosexual females). They were all between 18 to 21 years of age (mean age = 20.21 years, SD=1.32) and were native Hong Kong Cantonese speakers from two universities located in Hong Kong. The lesbian participants were recruited by word-of-mouth/snowball sampling while the heterosexual females were recruited among acquaintances of the first author. Participants all reported no history of speech and hearing disorders.

2.2. Stimuli and Procedures

All stimuli were 30 CV real high-frequency words (/si/, /ji/, /pa/, /fu/, /tsʰɔ/, with exceptions when no such words are available, see below) containing all six Cantonese tones (T1, T2, T3, T4, T5, T6). The following table illustrates all the word tokens used in this production experiment:

Table 1: Cantonese word tokens used in Expt. 1.

| Tones [relative pitch value] | Tonal feature | Syllables used in Experiment 1 | | | | |
|---------------------------------------|------------------|--------------------------------|--------------|------------------|--------------|-----------------|
| | | /si/ | /ji/ | /pa/ | /fu/ | /tsʰɔ/ |
| T1 [55] | high- level | 詩 poem | 衣 clothes | 爸 dad | 夫 man | 初 begin |
| T2 [25] | high- rising | 史 history | 椅 chair | 把 hold | 苦 bitter | 楚 clear |
| T3 [33] | mid- level | 試 exam | 意 idea | 霸 might | 副 assist | 挫 grind |
| T4 [21] | low- falling | 時 time | 兒 son | 爬 [pʰa] crawl | 符 tally | 鋤 eradicate |
| T5 [23] | low- rising | 市 market | 耳 ear | 馬 [ma] horse | 婦 woman | 坐 sit |
| T6 [22] | low- level | 事 matter | 二 two | 罷 cease | 腐 corrupt | 助 [tsɔ] help |

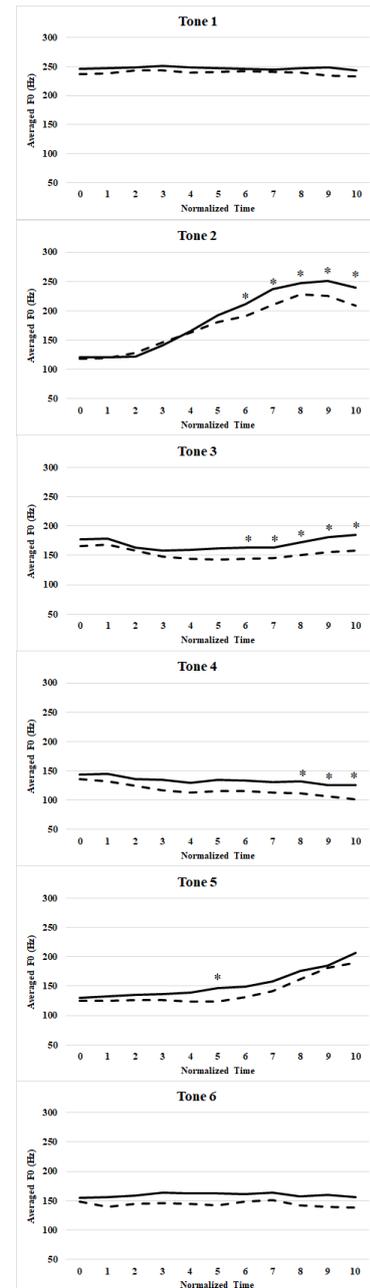
In a sound-treated language laboratory in Hong Kong, speakers recorded the words in isolation using a desktop with a microphone (Electro-Voice RE20 dynamic cardioid microphone) through the Praat software [3] at a sampling rate of 44.1 kHz, with 16-bit resolution. Speakers were all instructed to read the words with a natural pace and loudness.

2.3. Results

All the words produced by the 35 participants were included into the acoustic analyses using Praat to examine the F0 patterns of all six Cantonese tones. F0 values, measured in Hertz, were estimated at 11 evenly-spaced time points, starting from the onset (0%) of the contour to the offset (100%), with subsequent data points at every 10% of the duration of contour, meaning that the data were time normalized for each tone. Figure 1 below displays the F0 contours on the vowels of all six Cantonese tones in the syllable [si] produced by the two groups. A series of Mann-Whitney U tests between the two groups were also conducted at all 11 time-points of each tone to find if there were any differences in F0

values between groups. Significant differences between the average F0 values are indicated using an asterisk ($p < .01$) above the lines. Only some time-points in tones 2, 3, 4, and 5 showed significant differences between the two speaker groups.

Figure 1: F0 contours of the six Cantonese tones in the syllable [si] produced by the lesbian female and heterosexual female groups. Solid lines indicate the mean F0 of the heterosexual females; dotted lines indicate that of the lesbian females.



Several Mann-Whitney U tests were conducted to compare the differences of four particular F0 parameters (mean, maximum, minimum, and range) between the groups. Results revealed that the lesbian women group only had a significantly lower F0 minimum than the heterosexual group, but the

differences between the other three F0 parameters were not significant. Table 2 shows the overall values of the four different F0 parameters:

Table 2: Mean, maximum and minimum values, and ranges of F0 (in Hz) across all six tones for each group.

| | homosexual | heterosexual |
|----------|------------|--------------|
| mean F0 | 163.67 | 176.03 |
| F0 max | 239.90 | 251.56 |
| F0 min | 101.91* | 120.45* |
| F0 range | 137.99 | 131.11 |

(* = $p < .01$)

2.3. Discussion

The F0 contours of all six tones of the lesbian females were lower—although only slightly—than the heterosexual group. However, by comparing different time-points of the six tones, it was found that most of the differences between the two groups were often not significant. The results of the Mann-Whitney U tests on the specific individual F0 parameters between the two groups also showed that the differences were not robust, except for F0 minimum. This is not to conclude that F0 in general is not one of the phonetic variables that composes a stereotypical lesbian speech style; rather, there may exist a cluster of or/and an interaction among a number of phonetic correlates that form such a speech style in Cantonese. This speculation must be confirmed by investigating more acoustic cues used in the language in future.

Studies in the extant literature concerning the use of pitch between female speakers with different sexual orientations have not shown conclusive results, with a few showing no significant differences and most showing a trend of lesbian females using a lower F0 to convey their sexual orientation. These studies also only investigated speakers of stress/intonational languages, unlike the present one that examined a tone language, Cantonese, which relies heavily on F0 to convey lexical meaning. Although the role of F0 varies in those languages, the present findings showed that lesbian speakers had a tendency to produce their speech with a lower F0 minimum, although their F0 contour, for most of the time, did not differ significantly from the heterosexual group.

3. EXPERIMENT 2: LISTENERS' PERCEPTUAL RATINGS ON SPEAKERS' SEXUAL ORIENTATION AND MASCULINITY

The purpose of Experiment 2 was to investigate if listeners could perceive the sexual orientation of the speakers in Experiment 1 by listening to isolated

words only. Besides rating the sexual orientation of the speakers, masculinity of the speakers was also rated. As part of a larger project within which more phonetic variables were investigated, the present paper only reported the rating of these two variables and their associations with each other.

3.1. Participants

A total of 54 listeners (34F, 20M) were recruited into this perceptual experiment. No explicit reference as to the goal of the experiment was made to the listeners. The average age of these listeners was 21.96 years ($SD=2.43$). They were all native Hong Kong Cantonese speakers with no self-reported history of speech or hearing disorders.

3.2. Stimuli

Stimuli were all obtained from Experiment 1. Twelve monosyllabic words (6 tones \times 2 CV structures, /si/ and /fu/) produced by all 35 speakers were selected, making a total of $12 \times 35 = 420$ stimuli.

3.3. Procedure

The experiment was conducted in a sound-proof language laboratory in Hong Kong. All the stimuli were presented to the listeners in a random order. Listeners were instructed to rate the stimuli on six affective scales in the form of a 7-point equal-interval semantic differential scale written in Chinese. For example, 1 indicates “heterosexual / feminine”, 4 indicates “hard to tell”, and 7 indicates “homosexual / masculine”. As part of a larger project that studied the perceptual evaluation of speakers' personality characteristics or traits, the current paper only reports the results of these two traits: sexual orientation and masculinity.

3.4. Results

For homosexuality ratings, the average perceptual score for the lesbian group was 5.31 ($SD = 1.21$), and 3.32 ($SD = 1.02$) for the heterosexual group. A Mann-Whitney U test revealed that there were significant differences between the two groups ($Z = 2.12, p < .0001$). For masculinity ratings, the average perceptual score for the lesbian group was 4.81 ($SD = 2.21$), and 3.82 ($SD = 1.81$) for the heterosexual group. A Mann-Whitney U test also showed that the scores of the two groups differed significantly ($Z = 2.34, p = .02$). There were also significant correlations between the homosexuality and masculinity ratings (Spearman's rho = .49, $p < .001$) for the two groups.

As to the correlations between the two perceptual scores and the four F0 measurements, not all

parameters showed significant correlations with homosexuality and masculinity ratings; only mean F0 values and F0 minimum were correlated with both ratings while F0 range was correlated only with the masculinity rating. Table 3 displays the data.

Table 3: Correlations (Spearman’s rho) between perceived sexual orientation / masculinity and the F0 measurements.

| | Variables for listener ratings | |
|----------|--------------------------------|-------------|
| | homosexuality | masculinity |
| mean F0 | -0.35* | -0.24*** |
| F0 max | -0.25 | -0.36 |
| F0 min | -0.34** | -0.28** |
| F0 range | 0.19 | 0.21* |

(*** = $p < .0001$; ** = $p < .001$; * = $p < .01$)

3.5. Discussion

The goal of Experiment 2 was to examine if pitch is one, if any, phonetic variable that composes a perceived lesbian speech stereotype in Cantonese. Listener ratings in this experiment showed that listeners succeeded in determining the speakers’ sexual orientation even by only hearing one single word uttered by the speaker. Some F0 parameters were shown to be correlated with the accurate judgement on female sexuality in this case, although F0 was not the means by which the speakers used to indicate their own sexual orientation through speech, as indicated in Experiment 1. Other phonetic correlates and their interaction may indeed be associated with the representation of this lesbian speech stereotype. The underlying complexity of the interaction among these acoustic cues demands further research attention.

Previous research findings have revealed a close link between homosexuality and masculinity. The stereotypical belief that lesbian women have a lower pitch has also been shown as a general tendency in the current findings. The two social variables, homosexuality and masculinity, were also positively correlated in the present study. However, not all F0 parameters which were associated with masculinity were correlated with homosexuality, suggesting that there are possibly other variables serving as the predictors of the sexual orientation ratings.

4. GENERAL DISCUSSION

Findings in Experiment 1 only partially aligned with previous results, as seen from the non-significant differences in pitch patterns between the homosexual and heterosexual groups. Nevertheless, as shown in Experiment 2, listeners could still accurately judge the sexual orientation of the speakers by listening to their speech. While there could be no correlation

between self-reported sexual orientation and some of F0 measurements in the production data, the fact that listeners could still accurately identify the speakers’ sexual orientation implied that they were, evidently, using other phonetic cues which were not investigated in the current study in the judgement.

On the basis of preliminary observation of the current data, we speculated that the perception results might be closely associated with the creaky feature of the voice in some lesbian speech samples. Creaky voice has been perceived in the recent popular culture to be a phonation type used by young women as a marker of masculinity, a trait that may have some association with one’s sexual orientation. Previous studies [7, 11] showed that creaky voice can be distinguished by several acoustic properties, one of which being a lower F0. The lesbian speakers in this study showed a significantly lower F0 minimum than the heterosexual group which might be due to the creakiness of the voice. Creakiness was indeed observed in a number of samples in the present study. Note that the original aim of the present study did not explore the creaky phonation of lesbian speech style, but the findings and the anecdotal observation raised the awareness that this might be one of the possible phonetic correlates or phonation type that led to the present results. Further investigation as to the relationship between F0, creak, sexual orientation and masculinity is thus demanded.

Cautions also have to be taken when interpreting the listener ratings because one should not directly equate lesbian women as masculine women, although the current findings suggested such a correlation. The average F0 and its range are still considerably higher and more varied than both homosexual and heterosexual men (cf. results in [1], [3], [4], [6]). What is even more intriguing in the present data is that the F0 range of the lesbian females (137.99 Hz) was highly similar to (even slightly higher albeit not statistically significant) that of the heterosexual group (131.11 Hz), but this phonetic cue was indeed correlated with the masculinity rating. Further data are thus necessary for unraveling the complications.

5. CONCLUDING REMARKS

Despite the paucity of studies exploring the acoustic correlates of lesbian women from language backgrounds other than English, the present study provided further support that a lesbian-sounding speech stereotype in a tone language involving a combination of phonetic variables may indeed exist, and discrepancies between a speaker’s perceived and actual sexual orientation are possible. The interaction between the lesbian speech style and actual/perceived sexual orientation certainly merits more research.

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