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Fundamental vocal frequencies and sexual orientation stereotypes

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FUNDAMENTAL VOCAL FREQUENCIES AND
SEXUAL ORIENTATION STEREOTYPES

A Thesis
Presented to
the Faculty of the Department of Communication
Disorders and Sciences
San Jose State University

In Partial Fulfillment
of the Requirements for the Degree
Master of Arts

by
Saralyn L. Clough
December, 1995

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ABSTRACT

FUNDAMENTAL VOCAL FREQUENCIES AND SEXUAL ORIENTATION STEREOTYPES

by Saralyn L. Clough

This thesis addresses the topic of speaking fundamental frequency (SFF) in lesbian and heterosexual women. It examines stereotypes of lesbians and voice and the mean SFF of lesbian and heterosexual women.

Research on stereotypes of lesbians reveals that many individuals believe that lesbians have a "deeper voice" than that of heterosexual women. This study attempts to dispel this stereotype.

The subjects in this study were 13 lesbian and 13 heterosexual women. They were each asked to read two standardized passages and sustain the phoneme /a/ into the Visi-Pitch pitch analyzer. The mean SFF of each subject was analyzed and compared to determine whether, and if so to what extent, a difference in SFF existed between the groups. The results of this study indicate that there is no significant difference in the SFF of lesbian women as compared to heterosexual women.

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CHAPTER I

INTRODUCTION

In recent years, an abundance of media attention and educational endeavors have been devoted to the topic of stereotypes in the gay male population. These studies have examined, for example, the changing social, economic, and political factors associated with the stereotypes of gay men and have subsequently found that many of the stereotypical beliefs about this population are myths which have little or no factual support. This has prompted some individuals to examine the validity of the many stereotypes of gay men. However, less social and research attention has been given to the concerns of lesbians, including examining popular stereotypes of lesbian women. This lack of information has been noted by at least one professional organization. Herek (1987) stated that the "American Psychological Association's Committee on Gay and Lesbian Concerns expressed a need for research that focuses specifically on the concerns of lesbians" (cited in Eliason, Donelan, & Randall, 1992, p. 131).

According to Basow the term "homophobia," popularized by George Weinburg in 1972, refers "to a wide range of negative attitudes, feelings, and behaviors towards...[gays and lesbians] evidenced on both individual and societal levels" (cited in Gochros, H., Gochros, J., & Fischer, 1986, p. 177). On the societal level, homophobia may be a partial result of heterosexism. Heterosexism

refers to the belief that heterosexual activity is inherently superior to the activity of gays and lesbians. Similar to sexism, racism, and ethnocentrism, heterosexism is a form of social prejudice which is based mostly on misconceptions and stereotypes (Gochros, Gochros, & Fischer, 1986).

One of the largest obstructions to understanding unfounded stereotypes of gay men and lesbian women is society's denial of oppression of gays and lesbians as a group. In fact, gay men and lesbians are the only minority group against whom, in most states, discrimination remains legal (Gochros, Gochros, & Fischer, 1986).

One of the many important areas of concern for all gay men and lesbians is employment. Homophobia, or "homohatred" (Kirk & Madsen, 1989, p. 103), which will be the preferred term used in this study, is institutionalized in many occupational fields. Some examples of the occupations in which institutionalized "homohatred" currently exists are law enforcement, blue-collar, and child-centered occupations (e.g., teaching), as well as in the United States military. In many cases, a documented competent or even exceptional gay or lesbian employee is likely to lose his or her job if his or her sexual orientation becomes known or is even suspected (Gochros, Gochros, & Fischer, 1986, p. 170). A blatant example of this institutionalized "homohatred" is the Supreme Court of the State of Washington ruling that the Tacoma School District was "justified in firing an outstanding teacher simply because the teacher admitted he was [sic] gay" (Gochros, Gochros, & Fischer, 1986).

For as long as history has been recorded, self-identified lesbians have been presented as different from women in general. In the majority of previously published literature, lesbians have been portrayed as mannish or butch. An exquisite example of this stereotypical portrayal is in *The Well of Loneliness* (1928) by Radcliffe Hall, "the most infamous ... lesbian [novel], ... [considered to be] the lesbian novel" until the 1970's (Newton, 1989, p. 282). It was from approximately the year 1900 on that Stephen Gordon, the cross-gender figure and protagonist of the novel, became "the public symbol of the new social/sexual category 'lesbian'" (Newton, 1989, p. 283). *The Well of Loneliness* continues to "have meaning to lesbians because it confronts the stigma of lesbianism- as most lesbians have had to live it. Most ... have had to face being called, or at least feeling like, freaks" (Newton, 1989, p. 282).

In the nineteenth-century and even prior to this time, some lesbian women passed as men by acting and dressing like them. This was a result of economic necessity (Newton, 1989, p. 282). Many of these cross-dressing women were forced to portray themselves in this fashion due to the lack of economic stability and status they held in their society as a result of their gender and sexual orientation. In the late nineteenth-century partial cross-dressing became fairly common among bourgeois women. There were, however, earlier, isolated instances of partial cross-dressing which appear to have been associated with unabashed

"feminism (e.g., French writer George Sand and American physician Mary Walker)" (Newton, 1989, p. 282).

In order for these cross-dressing women to be successful in their attempt at the portrayal of men, they certainly must have done much more than simply adorned themselves with men's clothing. It seems reasonable to assume that they must have also had to model their vocal pitch and styles of speech after those of men's voices, as well as make other serious attempts at the imitation of men.

According to Newton (1989), with the closing years of the century, cross dressing and masculine behavior by women became closely associated with "sexual inversion" by the medical profession. Was it that physicians invented or solely described the inherent masculine quality of the lesbian that "remains an article of faith in the Anglo-American culture," even though today most lesbians are not cross-dressers (Newton, 1989, p. 282)? Regardless, and more importantly, how did this stereotype influence our social attitudes toward lesbians?

Lesbian women, through cross-dressing and posing as men in order to survive financially and socially, have become associated with masculinity. Further, society with the endorsement of the medical profession has perpetuated this persona. This study is concerned with one aspect of behavior, speaking fundamental frequency, which may be measured in order to test the feminine-masculine differences in this population. Vocal fundamental frequency (Fo) is the primary trait which has been shown to

differentiate male and female voices (Coleman, 1976). Therefore, if they are attempting to adapt a more masculine image lesbian women may be lowering the pitch of their voices as well as cross-dressing or adapting other masculine traits.

Statement of the Problem

If this stereotype is indeed accurate, and lesbian women as a group act more masculine than heterosexual women, lesbians' vocal fundamental frequency, or habitual pitch, could be expected to be lower than that of heterosexual women. That is, lesbians' fundamental vocal frequency should be more like the vocal fundamental frequency of men their age.

The purpose of this study was to determine whether, and if so to what extent, lesbian and heterosexual women differ in fundamental voice frequencies.

Hypothesis

The hypothesis under investigation was:
That there would be no significant difference in the fundamental frequencies of lesbian and heterosexual women's voices as measured by the Visi-Pitch pitch analyzer.

CHAPTER II

SURVEY OF RELATED LITERATURE

A review of the literature suggests that there have been no published studies involving the investigation of lesbian women and their vocal characteristics, including fundamental frequency. Only one unpublished doctoral dissertation was found which examined the "relationships of speaker sex and masculinity, femininity judgments, and ... measures of rate, fundamental frequency, and intensity from taped reading and spontaneous speech samples of female... heterosexual..." (Travis, 1981, p. 2323B) and lesbian women.

Stereotypes and Categorizations

According to Gilman (1985), the term *stereotype* was first used in the late eighteenth century. It was used as a "technical designation for the casting of multiple paper-mache copies of printing type from a paper-mache mold" (p. 15). It wasn't until the mid-nineteenth century that this word began to be applied in the abstract form that is used today. In the early twentieth century, social psychologists began to use the word *stereotype* to delineate the images through which individuals categorize the world.

"Stereotypes are a crude set of mental representations of the world" (Gilman, 1985, p. 17) which each individual creates. Stereotypes are thought to cushion individuals from their most compelling fears, allowing for individuals to act as though their

source is beyond their control. They are a method in which individuals deal with the instabilities of their perception of the world. Mary Douglas stated,

The yearning for rigidity is in us all. It is part of our human condition to long for hard lines and clear concept. When we have them we have to either face the fact that some realities elude them, or else blind ourselves to the inadequacy of the concepts (cited in Gilman, 1985, p. 19).

Stereotypes are not randomly assigned to objects. Rather, stereotypes are the direct product of both history and culture combined. They can be perpetuated, resurrected, and shaped by a society in various ways, including the utilization by the media. This occurs when information is supplied that contains a whimsical description of the group, without consideration for the individual within the group.

These stereotypes often gain and lose potency, partly due to actions taken by the real entities, or the focus of the stereotype. For example, "when...a group makes demands on a society, the anxiety produced by those demands characteristically translates into a sense of loss of control" (Gilman, 1985, p. 20). In a situation such as this, a group that has been essentially invisible, and is presently becoming visible, can suddenly become the focus of a stereotype.

Gordon Allport (1958) stated that each society has a distinct convention that determines its stereotypes. In general, stereotypes occur out of a society's collective sense of control over its world. They provide a way for the sense of difference to be discussed. According to Gilman (1985), "difference is that which threatens order and control; it is the polar opposite to [a] ... group. The mental representation of difference is only the "projection of the tension between control and its loss present within each individual in a group" (p. 21). Individuals attempt to project the derivation of their anxiety onto various objects selected from the social world in which they operate. Storms (1978) stated,

during the everyday interaction of individuals with strangers, a process of labeling and categorizing occurs in which a number of attitudinal and social characteristics are assigned to a new acquaintance. Among these attribution[s] is the identification of another person's sexual orientation. In many instances stereotypical attributions are used to identify sexual orientation.

(cited in Berger, Hank, Rauzi, & Simpkins, 1987, p. 83)

Stereotypes of Lesbians

Throughout history lesbians have been incorrectly defined according to the biases of physicians and sexologists. Richard von Krafft-Ebing, a distinguished sexologist, described "lesbian" as the

following, "masculine features, deep voice, manly gait, without beard, small breasts; cropped hair short and made the impression of a man in women's clothes" (cited by Newton, 1989, p. 287).

Eliason et al. conducted a study of lesbian stereotypes. This group attempted to detect stereotypes of lesbians by examining 278 female nursing students' responses to open-ended questions. Content analysis of the questionnaires revealed several consistent stereotypes. One of the most prevalent stereotypes detected was that heterosexual individuals believe that lesbians have a "masculine aura" (p. 131) about them. The subjects in this study believed that "lesbians as a group...look and act like men" (p. 139). To act like men could include speaking like men.

Viss and Burn (1992) conducted a study of lesbians. The survey method was utilized to measure the "stereotypes of lesbian women held by heterosexual college students in the United States" (p. 172). Three groups were surveyed (two introductory psychology classes and one lesbian college support group) to determine if the ratings each group gave lesbians statistically differed. In this study, 46% of the subjects used the word *masculine* to describe lesbians.

"Maleness" and "Femaleness" in the Voice

The literature reveals that there is much support for the idea that vocal fundamental frequency is the most salient acoustic cue to a speaker's sexual identity (Coleman, 1973). Coleman's (1976) study found that the fundamental frequency of natural voice was highly

correlated with the degree of "maleness" and "femaleness" in the voice. The voices included in this study were obtained from 20 male and 20 female normal adults selected from an American university. Only those individuals with foreign accents or communication disorders were eliminated from the study. Coleman selected the five females and five males with the highest vocal tract resonances to be included in a listening tape that contained the ten voices in a random order. This tape was presented to "25 young adults (seven males; 18 females) who were asked simply to determine whether each speaker was a male or female" (p. 175). He found male characteristics to be "perceptually more prominent than their female counterparts" (p. 178). In his study, the subjects' speaking fundamental frequency was found to be a primary determinant of how male or female a voice sounded.

Another area of research which involves Fo is the analysis of transsexual voices. Spencer's (1988) study on transsexuals' voices revealed that speakers who used higher average vocal fundamental frequencies received mostly "female" ratings, while those with lower fundamental frequencies received mostly "male" ratings. In her study a linear relationship existed between vocal fundamental frequency and the degree of sexual representativeness.

Travis (1981) conducted a study which "explored relationships of speaker sex and masculinity-femininity judgments and 12 measures of rate, ...[Fo], and intensity from taped reading and spontaneous speech samples ..." of both heterosexual and gay and

lesbian women and men. She determined that "females judged more masculine displayed a greater mean number of syllables per second, a lower mean fundamental frequency high, and a more restricted mean fundamental frequency range than those correctly described" (p. 2323-B). She also found that gay and lesbian individuals were more often incorrectly described as masculine or feminine than were the heterosexual subjects.

Fundamental Voice Frequency

Fundamental frequency (Fo), is an acoustic measure that reveals the rate of vibration of the vocal folds. Fo refers to the most habitually or frequently occurring frequency, that characterizes a distinct vocal production, and is measured in Hertz (Hz) (Colton & Casper, 1990).

Practically all variations of vocal frequency are created with the intrinsic muscles of the larynx (Colton & Casper, 1990). Yet, Sonninen (1954) exemplified how the extrinsic musculature also contributes to the frequency variation, in addition to the positioning of the larynx. Colton and Estill (1981) explain that it would be adequate to assume that Fo is "determined by differences in relative tension, length, and mass [of the vocal folds], and as frequency rises, length and tension increase as mass decreases" (p. 391).

According to Colton and Casper (1990), the average speaking fundamental frequency of women aged 18-30 is 213 Hz (range 165-275). The average speaking fundamental frequency of men aged 18-30 is 120 Hz (range 85-155).

Therefore, if lesbians indeed act more masculine than heterosexual women, we could expect to find lesbians' speaking fundamental vocal frequency to be lower than that of heterosexual women. In fact, the mean speaking fundamental frequency of the lesbian subgroup should be closer to 120 Hz than 213 Hz.

CHAPTER III

METHODOLOGY

The purpose of this study was to determine whether, and if so to what extent, lesbian and heterosexual women differ in fundamental vocal frequencies as measured by the Visi-Pitch pitch analyzer. The Visi-Pitch is a device that is capable of objectively analyzing the frequency, range, and perturbation of a voice.

Data Collection

The subjects consisted of 13 heterosexual women (ages 22-29 years; mean age= 25 years) and 13 lesbians (ages 22-30 years; mean age= 25 years). All subjects' primary language was English. Subjects were excluded if they were teachers, coaches, vocal singers, aerobic instructors, had severe allergies, had a history of vocal pathologies, were smokers or consumed more than two ounces of alcohol per day. The lesbian subjects were recruited from the San Jose State University-Gay and Lesbian Alliance (GALA), the California State University at Chico- Gay, Lesbian and Bisexual Alliance (GLBA), the Billy DeFrank Center in San Jose, through personal contact or referral in the San Jose, Chico and Santa Cruz, California areas, as well as through media advertisement. The heterosexual subjects were recruited through media advertisement, as well as through personal contact or referral in the San Jose, Chico, Santa Cruz and San Bernardino, California areas.

A voice history report was utilized to obtain the necessary information to include the subjects in the study. A copy of the voice history form is included (see Appendix, Table 1). Colton and Casper (1990) noted that the fundamental frequency will vary depending upon the type of speech materials used in a study. Therefore, two standardized readings were used to ensure the reliability of the average fundamental frequency. The first reading passage that was utilized was Fairbank's (1960) "Rainbow Passage"; the second passage, Van Riper's (1963) "The Grandfather Passage."

The Visi-Pitch (Kay Elemetrics Corporation) pitch analyzer Model 6087PC was used to analyze the subjects' live speaking fundamental frequency. A high quality voice-actuated desktop cassette tape recorder and Maxell Professional/Industrial Communicator Series audio tapes were employed to record the subject's voices during this experiment.

The subjects were instructed to practice reading the "Rainbow Passage" and "The Grandfather Passage" until they were able to read the passages comfortably and fluently. The Visi-Pitch microphone was held by the subjects at approximately 20 cm from their mouths while reading the passages, as was done in Stoicheff's (1981) study. The subjects were also asked to sustain /a/ into the Visi-Pitch microphone for 7.5 seconds. The subjects' speaking fundamental frequency was recorded and analyzed for each of the tasks with the Visi-Pitch (see Appendix, Table 2).

CHAPTER IV

RESULTS AND DISCUSSION

Results

The hypothesis predicted that the subjects in the lesbian group would not demonstrate significantly different Fos when compared to the heterosexual group as measured by the Visi-Pitch pitch analyzer while reading two passages and sustaining the phoneme /a/. The basic statistics of each of the tasks for both research groups are presented in Table 3 (see Appendix).

Examination of the summary tables reveals that no significant differences between the groups existed in each of the following tasks: the reading of "The Grandfather Passage" (Van Riper, 1963), the reading of the "Rainbow Passage" (Fairbank, 1960), and sustained /a/ phoneme.

The mean speaking fundamental frequency (SFF) on "The Grandfather Passage" (Van Riper, 1963) for the heterosexual group was 190.5 Hz (SD= 12.27) and for the lesbian group it was 195.2.Hz (SD= 8.99). A *t*-test for independent samples revealed no significant difference in SFF between groups at the .05 level [*t*(24) = .361].

The mean SFF on the "Rainbow Passage" (Fairbank, 1960) for the heterosexual group was 194.7 Hz (SD= 10.21) and for the lesbian group it was 196.2 Hz (SD= 11.25). A *t*-test for independent samples revealed no significant difference in SFF between groups at the .05 level [*t*(24) = 1.13].

The mean SFF on the sustained /a/ for the heterosexual groups was 225.2 Hz ($\underline{SD}$ = 34.5) and for the lesbian group it was 221.1 Hz ($\underline{SD}$ = 30.9). A t -test for independent samples revealed no significant difference between groups at the .05 level [$t(24) = .321$].

Discussion

As a review of the literature revealed there are no prior findings regarding the SFF of lesbian and heterosexual women, it occurred to the investigator that there was a need to dispel the stereotype of the masculine-voiced lesbian. As this study demonstrates there appears to be no significant difference between the SFF of the groups. Therefore, this study is significant.

Limitations of this study include the limited number of subjects who participated in this study. It may be possible that the subjects who participated in this study were unique. Therefore, a further study which includes a larger number of individuals may answer any questions regarding this possibility.

Differences in subjects' phrasing and inflection may also contribute to the differentiation of "maleness" and "femaleness" of the voice. This factor should be investigated in the future.

Further research into stereotypes of lesbians is needed to establish whether, and if so to what extent, a stereotype of lesbian voice presently exists. In addition, it would be beneficial to determine whether, and if so to what extent, a person's prejudgmental knowledge of sexual orientation influences one's

perception of a speaker's SFF. It would be interesting to determine if individuals would make assumptions regarding subjects' fundamental vocal frequency based solely on sexual orientation.

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Appendix

VOICE HISTORY FORM

Name: (Initials only)_____

Date of Birth:_____ Age:_____

Are you: ___Lesbian? ___Heterosexual?

Do you have any of the following?

___Allergies ___Neurological Problems
 ___Respiratory Problems ___Endocrine/Hormone Problems

Have you had any of the following?

___Surgery on your larynx? When?_____
 ___Heart Surgery When?_____
 ___Chest Surgery When?_____
 ___Thyroid Surgery When?_____
 ___Stroke? When?_____
 ___Injury to the Neck? When?_____
 ___Chemical or Inhalation Exposure? When?_____

Do you:

___Smoke? (tobacco or other substances)
 How much?_____
 ___Drink? (alcoholic substances)
 How much?_____
 How frequently?_____
 ___Take medication regularly?
 What?_____
 ___Talk above noise?
 What noise?_____
 How frequently?_____
 ___Sing?
 With Choir?___ Solo?___ With musical group?___

Are you employed? ___yes ___no

What type of work do you do?_____

Is talking required for your job?_____

Fundamental vocal frequencies of each research participant during each of the three tasks.

Case	Heterosexual Grandfather	Heterosexual Rainbow	Heterosexual AH
1	184.6	196.9	216.2
2	192.5	191.5	265.4
3	199.5	190.2	266.3
4	205.5	206.1	267.7
5	187	199.3	181
6	212.8	213.8	231.8
7	189.1	191.7	214.1
8	182.8	185.5	218.9
9	163.1	176.9	207.4
10	195.5	202.4	273.8
11	183	184.4	217
12	185.1	189	163.2
13	196.1	204.3	205.8

Case	Lesbian Grandfather	Lesbian Rainbow	Lesbian AH
1	200.4	196.1	281.2
2	201.5	200.2	273.5
3	199	210.6	230.6
4	204.7	211.8	201.9
5	188.9	188.1	181.4
6	182.3	192.3	201.7
7	184.6	177	192.7
8	194.8	194.3	206.6
9	184.6	178.1	250.1
10	200	203.1	206.3
11	187.8	190.9	198.3
12	212	209.9	218.5
13	198.2	199.4	232.1

Basic statistics of each group while performing each task.

Basic statistics for Heterosexual Grandfather

Active cases:	13
Missing values:	0
Mean:	190.5077
Sum:	2476.6000
Sum of squares:	473619.4800
Variance:	150.6774
Std deviation:	12.2751
Std error:	3.4045
Minimum:	163.1000
Maximum:	212.8000
Range:	49.7000

Basic statistics for Heterosexual Rainbow

Active cases:	13
Missing values:	0
Mean:	194.7692
Sum:	2532.0000
Sum of squares:	494407.4000
Variance:	104.3090
Std deviation:	10.2132
Std error:	2.8326
Minimum:	176.9000
Maximum:	213.8000
Range:	36.9000

Basic statistics for Heterosexual AH

Active cases:	13
Missing values:	0
Mean:	225.2769
Sum:	2928.6000
Sum of squares:	674064.9200
Variance:	1193.2436
Std deviation:	34.5434
Std error:	9.5806
Minimum:	163.2000
Maximum:	273.8000
Range:	110.6000

Basic statistics of each group while performing each task.

Basic statistics for Lesbian Grandfather

Active cases:	13
Missing values:	0
Mean:	195.2923
Sum:	2538.8000
Sum of squares:	496779.4400
Variance:	80.9441
Std deviation:	8.9969
Std error:	2.4953
Minimum:	182.3000
Maximum:	212.0000
Range:	29.7000

Basic statistics for Lesbian Rainbow

Active cases:	13
Missing values:	0
Mean:	196.2923
Sum:	2551.8000
Sum of squares:	502419.6400
Variance:	126.7441
Std deviation:	11.2581
Std error:	3.1224
Minimum:	177.0000
Maximum:	211.8000
Range:	34.8000

Basic statistics for Lesbian AH

Active cases:	13
Missing values:	0
Mean:	221.1462
Sum:	2874.9000
Sum of squares:	647266.6100
Variance:	957.7944
Std deviation:	30.9483
Std error:	8.5835
Minimum:	181.4000
Maximum:	281.2000
Range:	99.8000