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His anger motivates him. His anger empowers him and carries authority. The anger that is at issue in sexual harassment now is the anger of the accused at having been accused. Anita Hill's anger at having been harassed is not the anger at issue.

Virginia Thomas ends the exclusive interview with *People* magazine with:

> I am coming forward to thank everyone who believed in Clarence ... I also hope we have set a new low, that Americans in their outrage can say, "No, there is a level at which it is disgusting, horrible, and wrong." And if the Senate's not going to stand up for what is right and wrong, then American people have to. Enough is enough. (116)

What is the outrage concerned with? I do not deny that Clarence Thomas was right to be outraged by what he called electronic lynching. Virginia Thomas, and all of us, ought to be angered by this as well. He was absolutely right to rail against the stereotype of black male as rapist. But as Valerie Smith and Angela Davis have argued, there is a companion stereotype to black male as rapist and that is black woman as promiscuous, as having a less valuable body than a white woman. These stereotypes invest the black race with bestiality, and Clarence Thomas was right to be naming and fighting against them. But in the process of fighting against the stereotype of black men, the stereotype of black women was reinforced. As a man, Clarence Thomas has the authority and anger to say, "I am not like that." As a white woman who is married to Clarence Thomas, Virginia Thomas has the authority and privilege to say, "Clarence is not like that." But Anita Hill's voice to define herself apart from the stereotype is either absent or silenced.

Virginia Thomas says that she hopes that we have set a new low and that we cannot sink any further. Yes, Virginia, I hope that this exclusive interview in *People* has set the lowest of lows.

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INTRODUCTION

Anatomy, psychology, and pitch

There are anatomically based differences between the female and male voice. There are differences, for example, in the size of the vocal tract, which result in different pitches.[2] Men typically have larger vocal tracts with longer vocal cords and thus produce sounds that are lower in pitch than those produced by women. However, linguists have observed that the gap in terms of pitch levels between the genders is greater than what would be expected from the difference in the size of their vocal tracts alone (e.g., Mattingly 1966; Sachs, Lieberman, & Erikson 1973). The Japanese language provides an interesting research ground with respect to pitch phenomena that go beyond biological expectations because the dichotomy between women's and men's language is far more salient than in many other languages. The purpose of this study is to explore questions related to gender variations in pitch in Japanese and to shed some light on the role that cultural expectations play in determining pitch. More specifically, it attempts to show that Japanese females use a higher pitch when they speak in Japanese than when they speak in English and to give a sociolinguistic interpretation to the findings.

The notion that the most noticeable difference between adult female and male speech is the pitch of the voice cannot be doubted. It is usually not difficult to distinguish speech produced by a female from that produced by a male based on acoustic differences. Obviously, there are anatomically based differences that contribute to the production of relatively different pitches between the two sexes. The pitch is controlled by the larynx and is proportional to the frequency of the vibration of the vocal cords. The greater the frequency, the higher the pitch, and the smaller the frequency, the lower the pitch. Generally, men have longer vocal cords which vibrate more slowly and thus produce lower frequencies. Females, having shorter vocal cords, which produce a higher frequency, have voices higher in pitch. In this paper, the focus is on determining whether perceived sex variations in Japanese pitch can be demonstrated mechanically.

It has been claimed by scholars that neither females nor males utilize the full range of pitch they are capable of producing in speech (Mattingly 1966; Sachs et al, 1973). As early as 1966, Mattingly claimed that the acoustic differences between the adult female and the adult male voice cannot be accounted for by anatomical differences alone. In addition, there have been several studies displaying the differences between physiologically and sociologically determined pitch. Sachs et

al., who had their subjects listen to the recorded speech of female and male children, state that their subjects were able to tell the sex of children based on acoustic differences. There was no physical basis for female and male children necessarily producing different pitches because they were deliberately matched for size and they had not yet reached secondary sexual dimorphism. They speculated that "the children could be learning culturally determined patterns that are viewed as appropriate for each sex" (1973:80). The results of these studies clearly indicate that the acoustic differences between female and male voices cannot be completely explained by the physiological differences.

Female and male speech in Japanese

The distinguishing characteristics of female and male speech in the Japanese language have been studied by various scholars. Shibamoto states that "linguists characterize Japanese as special by virtue of having a 'true' women's language" (1985:171). This idea is elaborated by others (e.g., Reynolds 1986) who contend that women's language and men's language are psychologically quite real to the Japanese because the Japanese language has many sex-exclusive or almost sex-exclusive differences. Given that Japanese makes syntactic and lexical distinctions between female and male language to a greater degree than many other languages, it can be speculated that the same kind of distinction also occurs in pitch phenomena.

HYPOTHESIS

I hypothesize that native Japanese speakers modify their pitch level when speaking in Japanese relative to when they speak in English: specifically, Japanese females will tend to raise their pitch when speaking their native language, but not when speaking English. The problem is to separate anatomical factors from other factors such as attitudes and reactions toward the stereotyped expectation. However, using crosscultural data such as two languages can shed some light on the question. Additionally, the notion of Loveday (1986) that instrumental measurement of fundamental frequency, the frequency of the fundamental tone, is strongly associated with psychological perception of pitch, and the well-known finding, reported by Onishi (1981), among others, that fundamental frequency determines the pitch of a sound, were followed concerning the relationship between instrumental measurement of pitch and the psychological perception of pitch. The purpose of this study is to test the hypothesis on the basis of empirical data. I measured the fundamental frequencies of native speakers of Japanese (female and male) speaking in both languages. The findings supported the hypothesis: female subjects used significantly higher pitch when speaking in Japanese than in English.

METHOD

Subjects

All subjects for this experiment were native speakers of Japanese who were students of the University of Hawaii at Manoa during the time of the study. The subjects consisted of six females and six males. Their ages ranged from 21 to 31: 22 to 29 for females and 21 to 31 for males.[3] According to Curry (1940), the voice change occurs between 14 and 18 years of age; therefore, the male subjects were assumed to be past the stage of voice change.

Material

Subjects were asked to read ten English sentences and ten Japanese sentences. The English sentences were taken from the chapter concerning intonation patterns in *A Course in Phonetics* (Ladefoged 1982). The sentences chosen were used in the book to show differences in pitch and intonation contour in English. The Japanese sentences were the Japanese equivalents of the above (the translations were my own). Both the English sentences and the Japanese translations can be found in the appendix. The subjects were assured that the experiment was not designed to evaluate their English-speaking ability. They were asked to attempt to produce the sentences as naturally as possible.[4] Recordings took place at the phonetics laboratory at the University of Hawaii at Manoa.

The fundamental frequency of each individual's voice was measured by Visi-pitch 6087DS, which was manufactured by Kay Elemetrics Corp., Pine Brook, New Jersey.

RESULTS

The data shown in Table 1 indicate each speaker's overall frequency in Japanese and in English. One overall pitch level per speaker per language was obtained by calculating an average of the three highest points in a sentence and averaging them among ten sentences. Various statistical tests were performed in order to support inferences concerning average frequency both within groups (females and male groups independently) and across groups (between female and male groups).

Table 2 shows the difference in highest frequency, that is, the Japanese highest frequency minus the English highest frequency, for each individual. The range of overall frequency of each individual is indicated in Table 3.

TABLE 1. *Overall frequency (Hz)*

Subjects	English		Japanese	
	Highest	Lowest	Highest	Lowest
F1	260	151	276	175
F2	270	243	289	179
F3	231	178	256	177
F4	267	180	294	186
F5	230	160	269	175
F6	252	142	300	194
M1	136	85	128	83
M2	155	101	160	101
M3	124	109	133	100
M4	198	121	204	122
M5	148	113	142	110
M6	141	110	138	110

TABLE 2. *Difference in highest frequency (Hz)*

	Japanese minus English		
F1	16	M1	-8
F2	19	M2	5
F3	25	M3	9
F4	27	M4	6
F5	39	M5	-6
F6	49	M6	-3

TABLE 3. *Range (Hz)*

	English	Japanese		English	Japanese
F1	109	101	M1	51	45
F2	27	10	M2	54	59
F3	53	79	M3	15	33
F4	87	108	M4	77	82
F5	70	94	M5	35	32
F6	110	106	M6	31	28

Statistics are given in Table 4, and the results of the statistical tests are summarized in Table 5. The tests are at a 95% certainty level.[5] The testing for statistical significance was done by following the procedures in *Elementary Applied Statistics* (Lentner 1972). The results of the tests are as follows:

TABLE 4. *Statistics (Hz)*

	Female	Male
Average df	29.0	0.5
Standard deviation	12.3	7.1

TABLE 5. *Results (95% certainty level)*

Participants	Results
Females	For females, the average frequency is at least 19 Hz. greater when speaking Japanese than English (df > 19 Hz).
Males	For males, there is no evidence that the average frequency is different across the two languages (df = 0).
dfm/dff	The df for females was at least 17 Hz greater than the df for males (dff—dfm > 17 Hz).

It is clear from the results of the experiment that female subjects employ higher pitch when they speak Japanese relative to the pitch used when speaking English. All of the female subjects employed a significantly higher pitch level when speaking in Japanese than when speaking in English. The differences in frequency between Japanese and English range from 19 Hz in the case of F1 to 48 Hz in the case of F6. In addition, the difference in highest and lowest pitch level within a language shows a different pattern. The range of pitch level in Japanese is much greater than that in English. On the other hand, the results in male subjects are somewhat mixed. For instance, subjects M1, M5, and M6 employed higher pitch and the other subjects employed lower pitch when speaking Japanese. However, the overall differences for male subjects are statistically insignificant. Based on casual observation, my impression had been that Japanese males generally employ lower pitch when they speak in Japanese; however, this point was not confirmed by my data.

DISCUSSION

The meaning of feminine pitch in Japanese

Assuming that subjects in this study are representative of native speakers of Japanese, there are a few things that can be said concerning the results. In order to understand why Japanese females employ higher overall average fundamental frequency when they speak their native language, the terms *sex* and *gender* must be distinguished. *The International Encyclopedia of Sociology* differentiates the two terms as follows: "Sex refers to biological males and females distinguished by reproductive organs. Gender refers to feminine and masculine attributes and social roles." It is clear from the results of this study that the differences in overall pitch levels cannot be adequately explained solely in terms of sex differences. Researchers have already attempted to explain the exaggerated gap between female

and male voices. McConnell-Ginet, for example, states that "intonation ... may well prove to be the chief linguistic expression of femininity and masculinity" (1978:542). Also, in a study of contrasting pitch in effeminate and masculine voices in American males, it was found that the voice which was perceived as effeminate had a wider pitch range than the voice which was perceived as masculine (Terango 1966). In addition, Moonwomon (1985) found that her heterosexual female subjects employed higher and also wider pitch range compared to their homosexual counterparts.

A conclusion may be that people modify their pitch in order to convey a particular image or to conform to stereotyped expectations prescribed by their society. In different societies, different values may be assigned to different pitches based on expectations and attitudes concerning the relationship between pitch and its significance for the speaker—and/or her or his gender—in the society. Each culture determines what is the appropriate pitch range for each gender; therefore, what is appropriate for the people of one culture may not be appropriate for the people of another. The differences in pitch between the two languages observed in this study may well reflect the conceptualization of gender roles in Japanese society. As noted by Pharr, in Japanese society the distinction between gender roles is sharper than in Western societies. Women have long been accorded a lower status than men and until the Second World War were expected to "show deference to men of their own as well as higher classes through the use of polite language and honorific forms of address, bowing more deeply than men, walking behind their husbands in public and in numerous other ways deferring to men" (1976:306).

It seems to follow that Japanese females adopt higher pitch in order to convey the impression of femininity when speaking in Japanese; however, this remains to be proven. The social expectation that the female should be *onna-rashiku* 'womanly' is much greater in the Japanese culture. A female speaker of Japanese is socialized in all behavioral patterns—linguistic and paralinguistic—to display a higher level of femininity. It seems that their socialization process extends into the use of their native language, where pitch has become another way to display a higher level of femininity. To conform to Japanese society's ideal of femininity is so crucially important for a female speaker that the feminine pattern of behavior becomes part of her personality. Displaying femininity is an automatic process in most cases. Controlling the larynx to produce higher-pitched sound may be a part of that automatic process. In view of the general trait that the gender-role distinction is sharper in Japanese society than in American culture, the fact that Japanese females use conspicuously higher pitch in speaking Japanese is not difficult to understand, but that does not explain why this phenomenon does not transfer over to their English speech. It can be speculated that when they speak Japanese, they tend to conform to the expectations of the Japanese culture whereas perhaps when they speak English they are free from those expectations.

Male speakers of Japanese

As for native speakers of Japanese who are male, pitch does not shift significantly across the two languages studied; it does not necessarily lower when they speak Japanese. There may be more than one reason for this. One of the reasons may be that they use the lowest level of pitch possible from the size of their vocal tract when they speak both Japanese and English because high pitch is stigmatized for male speakers in both societies. Another consideration may be that in Japanese society male gender is viewed as "unmarked"; therefore, Japanese males do not utilize pitch as a mode to separate themselves from the other gender. Japanese males may simply let Japanese females do the job of distinguishing themselves from the "unmarked" gender.

CONCLUSION

In this study, I have attempted to investigate the pitch of native speakers of Japanese across language and gender and to place the results in a sociolinguistic perspective. The hypothesis that female native speakers of Japanese employ higher relative pitches when speaking in Japanese than in English was supported by this study. From the data obtained, it was clear that Japanese females employ significantly higher pitch levels whereas Japanese males do not show a similar pattern. Speaking a different language apparently did not have any significant effect on male pitch variation. These findings are in accordance with the theory that the differences in overall pitch level cannot be adequately explained solely by the sex-differences. In Japanese society, the distinction between gender roles is sharper than in Western society. Society expects females to speak *onna-rashiku* 'womanly' and use *onna kotoba* 'women's language', which includes "feminine" pitch as well as "feminine" patterns at other linguistic levels.

FURTHER STUDIES

In this study, I have focused on the acoustic nature of speech; however, the twofold characteristic of speech, production and perception, should not be ignored. I am incorporating auditory phonetics, perception of pitch, into this study, and elaborating Loveday's (1986) notion of the relation between fundamental frequency and psychological perception of pitch. More precisely, I would like to answer the question: what intrinsic value does the feminine pitch of Japanese have in relation to its social structure? I am in the process of testing the psychological perception of pitch using matched-guise tests similar to those used by Labov (1968). I would also like to test JND, just-noticeable difference, of pitch in relation to the hearer's attitude concerning the notion of femininity and masculinity as a social identity. It has been claimed that intonation expresses a speaker's emotion and attitude toward the situation or toward the hearer (Ladd 1978), and that it can also express social identity (Crystal 1987). Since intonation, or patterns of pitch, involves fundamental frequency as well as other prosodic features, it can be speculated that pitch itself can also convey paralinguistic features such as those mentioned above. This small study is indicative of the importance of cross-cultural research and of the role that paralinguistic factors play in shaping language conventions.

APPENDIX

(1) *English sentences and Japanese translations*

The girl gave the money to her father.
He wanted to go to Germany.
Is water a liquid?
Do you want some coffee?
Do you take cream in your coffee?
Where did you put the paper?
Give me some apples, oranges, and peaches.
His name is Peter.
I think so.
How are you?
Onna no ko wa otoosan ni okane o ageta.
Kare wa doitsu e ikitakatta.
Mizu wa ekitai desu ka.
Koohii ikaga desu ka.
Kohii ni kuriimu ireru.
Shinbun o doko ni oita.
Ringo to orenji to momo o kudasai.
Kare no na wa piitaa desu.
Soo omoimasu.
Ogenki desu ka.

(2) *Terms and abbreviations*

fe	=	frequency in English
fj	=	frequency in Japanese
avg	=	average of fundamental frequency
df	=	difference in fundamental frequency
dff	=	difference in fundamental frequency in females
dfm	=	difference in fundamental frequency in males

NOTES

1. This project would not have been possible without guidance and instruction from Dr. Katsue Reynolds of the Department of East Asian Languages and Literature and Dr. Iovanna Condax of the Department of Linguistics, University of Hawaii at Manoa. I would like to thank Eric Shortt, a Ph.D. student in the Department of Linguistics, who helped me with the statistical analysis of the data. I would also like to thank the informants for taking the time to read sentences when they had numerous assignments of their own to complete.

2. For the sake of simplifying the argument, I have decided not to distinguish objective and acoustic notions of fundamental frequency and subjective and auditory notions of pitch.

3. The average age was 25.7 for female subjects and 25.8 for male subjects.

4. The artificial nature of this kind of experiment was not overlooked; however, the difficulty of gathering data which consisted of the same semantic content, and the impossibility of recording natural conversation of a quality which would permit the data to be measured by a pitch meter, forced me to modify the methodology to be less natural than if data were based on natural conversation.

5. An inference is valid unless the particular data set is one which would appear only once in 20 experiments.

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